Differences in Automatic Social Information Processing Between Nondepressed and Subclinically Depressed Individuals

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ABSTRACT The present research examined individual differences in automatic social information processing. We hypothesized that because nondepressed and subclinically depressed persons have different interpersonal experiences, they may process social information in different ways. In this experiment, participants were asked to make judgments about social relationships after being reminded of a target person. They had to make these judgments under either a light or a heavy memory load. Results showed that when nondepressed participants were reminded of people with whom they

had frequent pleasant interactions, they made a greater number of positive judgments about their social relationships than did subclinically depressed participants. When subclinically depressed participants were reminded of people with whom they had had frequent unpleasant interactions, they made a greater number of negative judgments about their social relationships than did their nondepressed counterparts. Moreover, performance in these experimental conditions was unaffected by memory load, suggesting that automatic thoughts about their social relationships had been evoked.

Interaction with others involves not only behavioral and emotional responses, but also cognitive processes such as storage and retrieval of information about others (e.g., Downey & Feldman, 1996; Fiske, 1995; Sarason, Sarason, & Pierce, 1994; Shoda, Mischel, & Wright, 1993a, 1993b, 1994). Previous research (e.g., Coyne et al., 1987; Hokanson, Rubert, Welker, Hollander, & Hedeen, 1989) has shown that depressed persons experienced negative social interactions more frequently than did nondepressed persons. Having different social experiences, individuals with different depression levels may perceive, interpret, or assign meaning to social information in distinct manners. Because individuals' emotional and behavioral responses to a person or situation are largely influenced by how the information is processed (see, e.g., Averill, 1993; Fiske & Taylor, 1991), an examination of the social information processing of depressed persons may enhance our understanding of the etiology and maintenance of depression.

   The present research sought to examine possible differences in social information processing between nondepressed and depressed individuals. Based on social-cognition and depression literature, we propose that the social information processing by nondepressed persons may differ from that by depressed persons in three ways, namely accessibility of social information, content of automatic processing, and context-dependency in the occurrence of automatic processing.

Accessibility of Social Information

One major feature that may differentiate social information processing of nondepressed and depressed individuals is the accessibility effect, which refers to the ease with which relevant information comes to mind. Previous research (e.g., Higgins, Bargh, & Lombardi, 1985; Higgins & King, 1981) has shown that information to which individuals are frequently exposed is processed and retrieved more

easily than information with which individuals are less familiar. Because depressed persons have a preponderance of unpleasant interpersonal events, we propose that negative social information is more accessible to them. However, positive social information may be more accessible to nondepressed persons, who have more frequent pleasant interpersonal experiences.

Because social information processing is largely nonconscious and unintentional, the present research employed a priming paradigm (see, e.g., Baldwin, Carrell, & Lopez, 1990; Pierce & Lydon, 1998) to examine individual differences in the accessibility effect. Previous research on depression (e.g., Hokanson et al., 1989; Youngren & Lewinsohn, 1980) employed a nomothetic approach by comparing global perception on interpersonal experiences between nondepressed and depressed persons. However, it should be noted that interpersonal experience is largely unique to each person. For instance, if Mary has frequent arguments with her brother John, anything related to John may serve as a cue that reminds Mary of the negative experiences she has had with him. When the word "John" comes up in her conversation with another person, some negative thoughts and moods may be elicited. However, John's wife Anne always has had a pleasant relationship with John. A thought of John may provoke her to have positive thoughts and mood. Hence, the presence of cues that remind individuals of the same person may influence social information processing in distinct ways. In this light, the present research extended previous depression research by adopting an idiosyncratic approach to examine the hypothesized accessibility effect. Specifically, a unique set of relational cues derived from participants' own interpersonal experiences was used to examine priming effects (see the Pretest). The relational cues used in this research would thus be idiographically meaningful to each participant. Given that the interpersonal experience of each individual is unique, an idiographical-nomothetical approach may enhance the explanatory and predictive power of the relationship between the interpersonal experiences of individuals and depression.

Automaticity in Social Information Processing

Another major feature that may distinguish nondepressed individuals from their depressed counterparts is the automatic processing of social information. Cognitive processes can be regarded as the "flow" of

information within a web of associative pathways. "Automatic pathways" will be developed along routes that have heavy traffic, making the transfer of frequently encountered information more efficient (see Bargh, 1994, 1997). Therefore, the more frequently a class of stimuli is encountered, the more efficiently this class of stimuli will be processed, up to a point where information processing becomes fully automatic. Indeed, cognitive research (e.g., Shiffrin & Schneider, 1977) has shown that automatic processing depends on frequent exposure to a particular type of stimuli.

In the context of depression, previous research has shown that depressed persons experience more upsetting interpersonal events (e.g., Hammen & Peters, 1978; Howes & Hokanson, 1979) and have a higher frequency of recurrent depressive thoughts (Teasdale & Rezin, 1978a, 1978b). Frequent "practice" in the processing of negative social information may render such processing automatic for depressed persons. In contrast, nondepressed persons have less frequent negative social interactions. Negative social information, which is less familiar to them, may induce a transient depressive mood that leads to ruminative thinking (Ellis & Ashbrook, 1988). Such ruminative thinking takes up a considerable amount of attentional resources, and subsequent processing of negative social information may become effortful for nondepressed persons. In a similar vein, because nondepressed persons generally experience more positive interpersonal events than their depressed counterparts, the processing of positive social information may be automatic for them but may be effortful for depressed individuals.

Automatic depressive processes involve a sequence of operations that is provoked without the need for attention and are less likely to be subject to the conscious awareness and deliberate control of the person (Beck, 1976; see also Williams, Watts, Macleod, & Matthews, 1988). Instead of relying on self-reports, the present research adopted experimental procedures to identify the specific conditions that elicit automatic processing of social information. Understanding these automatic processes may contribute to the detection, and thus the reduction, of automatic depressive thoughts.

Context-dependency in Automatic Processing of Negative Social Information

Although nondepressed and depressed persons may process information automatically, the stimuli that elicit automatic information processing

may be different. Beck (1976, 1983) posited that, among depressed persons, only self-referential information (i.e., information related to oneself, one's environment, and one's future) is processed automatically. Specifically, depressed persons tend to perceive self-referential information in a pessimistic way, but such dysfunctional perceptions and distortions do not extend to information related to others (e.g., Bargh & Tota, 1988; Kuiper & Higgins, 1985). These findings also showed that nondepressed persons tend to process positive self-referential information more efficiently, while automatic process is not evident in the processing of information about other people.

In light of these findings, we propose that automatic information processing among depressed persons may be confined to negative information concerning people with whom they have significant social relationships, rather than negative information concerning strangers or less familiar people. Consistent with this proposal, previous research (Hinchliffe, Hooper, & Roberts, 1978; Meyer & Hokanson, 1985) has shown that depressed persons have more negative perceptions and behaviors when they interact with people with whom they have social relationships such as family members and friends, rather than those unrelated to them, such as strangers and acquaintances. Other findings (e.g., Hops et al., 1987; Kahn, Coyne, & Margolin, 1985) revealed that the interpersonal difficulties experienced by depressed persons are more pronounced in social relationships that involve frequent interaction than in social relationships that entail less frequent contact. The body of research by Andersen (e.g., Andersen & Cole, 1990; Andersen, Glassman, Chen, & Cole, 1995) further revealed considerable differences in the processing of information concerning significant others and that concerning individuals who are not as close. Taken together, we predict that automaticity effects may be found only in the processing of information about people with close relationships.

Based on the social-cognition and the depression literature, we propose that the social information processing of depressed persons may differ from that of nondepressed persons in (a) accessibility, (b) automaticity, and (c) context-dependency in application. We designed an experiment that adopted a priming paradigm (see the Main Study) to test these predictions. In this experiment, relational cues representing interactants of positive and negative social relationships were presented to remind participants of their interpersonal experiences with those interactants. Before the experiment, participants were asked to record their interpersonal experiences in daily logs (see the Pretest),

from which the relational cues for the Main Study were derived. This procedure ensured that the derived relational cues were idiographically meaningful to each participant.

THE PRETEST

In the Pretest, each participant was asked to record in a daily log the names of all the people with whom they had interacted over a 2-week period. Previous findings (e.g., Gotlib & Whiffen, 1989; Krantz & Moos, 1987) showed that depressed persons frequently encountered problems in their interpersonal relationships. Hence, subclinically depressed participants should report a greater number of negative interpersonal events than their nondepressed counterparts.

Apart from recording the interpersonal events, participants had to give ratings to the interaction with each interactant. Past studies (e.g., Hammen, Marks, deMayo, & Mayol, 1985; Ingram, Smith, & Brehm, 1983) revealed that subclinically depressed persons tended to have aberrant constructions of reality, and thus to have negative views about things related to themselves. We thus predicted that subclinically depressed participants would give more negative ratings to people with whom they had unpleasant relationships than would nondepressed participants.

METHOD

Participants

Prior to the study, participants were selected from a pool of undergraduates taking psychology courses, based on their scores on the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961; Chan & Tsoi, 1984). One hundred Hong Kong undergraduates were selected to participate in this study to fulfill course requirements. The sample consists of two groups. The nondepressed group comprised of 50 participants (32 females, 18 males) whose BDI scores fell between 0 and 2. The subclinically depressed group consisted of 50 participants (36 females, 14 males) whose BDI scores ranged from 16 to 25. This cutoff scheme has been commonly adopted in cognitive research on depression (e.g., Chan & Tsoi, 1984; Hammen et al., 1985). The mean BDI scores of these two groups were .54 (SD = .71) and 20.68 (SD = 2.70), and the average age of the participants in the two groups was 21.26 (SD = 1.17) and 20.80 (SD = 1.28), respectively. Informed consent was obtained from all participants before the study began.

Perceived Interpersonal Experience

A daily log sheet was designed for this study. Participants were asked to list the names of people with whom they had had social interaction that had lasted for 10 minutes or longer on alternate days within a 2-week period (i.e., a total of 7 days). Participants were first instructed to give the name frequently used in referring to a particular interactant in their daily life. For instance, a participant who always calls her brother by the nickname of "Piggy" was instructed to indicate "Piggy" whenever she mentioned her brother in the daily log. After indicating the interactant's name, participants rated each interpersonal event with the interactant along a 6-point scale. A rating of 4 or above indicated that the interaction was appraised as pleasant, whereas a rating of 3 or below indicated that the interaction was appraised as unpleasant.

Wheeler and Nezlek's (1977) definition of social interaction was included on the cover page of every set of daily log sheets. According to Wheeler and Nezlek, a social interaction is any encounter with one or more social others for more than 10 minutes in which the involved persons attend to each other and adjust their behavior in response to each other. Activities such as chatting, dancing, and playing tennis with one or more social others are examples of social interaction. However, sitting side by side with one or more social others watching television or working independently in a large office is not considered an example of social interaction. Participants were instructed to read this definition of social interaction before filling in the daily log.

Procedure

Participants were given a package of seven daily log sheets and were instructed to fill in each log sheet at home on alternate nights within a 2-week period. A research assistant reminded them to complete the log sheet by phone, and any questions concerning the completion of log sheets were answered at that time. A cover sheet with detailed instructions and a sample log sheet were attached to the package so that participants could refer to them whenever they had difficulties in completing the daily logs.

RESULTS AND DISCUSSION

The present study examined the hypothesized differences between nondepressed and subclinically depressed participants in the quality of interpersonal experience, which is indicated by (a) the number of pleasant and unpleasant interpersonal events experienced and (b) the

subjective rating of pleasant and unpleasant interactants. A myriad of studies has revealed that females generally experience higher depression levels than do males (e.g., Ernst & Angst, 1992; Weissman, Bland, Peter, & Newman, 1993). We examined whether there would be sex differences in the number of interpersonal events experienced and the rating of the interactants.

MANOVA was employed to examine between-participants effects of sex and group on the quality of interpersonal experience. A significant main effect of group was found, $F(4,93) = 24.27$, $p < .001$ (effect size = .51). However, the main effect of sex and the Sex $\times$ Group interaction effect were nonsignificant, Fs = 1.47 and .99, ns. These findings indicate that the depression levels of individuals, regardless of sex, were associated with the experience of real-life interpersonal events.

Although females generally have higher needs for affiliation and nurturance than males, the lack of sex effects is consistent with the findings of Strough, Berg, and Sansone (1996), which revealed that interpersonal elements of everyday problems are salient to both males and females. Despite the robust findings on sex differences in depression, these results imply that interpersonal experience may mediate or moderate the effects of sex on depression. Because there were no sex effects, subsequent analyses were conducted to examine further the main effect of group for the pooled sample.

Number of Interpersonal Events Experienced

A mixed-design MANOVA was adopted to examine the between-participants effects of group and within-participant effects of valence of interpersonal events on the number of interpersonal events experienced by participants. Results revealed a significant Group $\times$ Valence of interpersonal event interaction, $F(1,98) = 90.94$, $p < .001$ (effect size = .48).

Post hoc independent-samples t-tests were conducted to examine group differences in the number of positive and negative interpersonal events experienced. For positive interpersonal events, a significant group difference was found, $t(98) = 4.22$, $p < .001$. Nondepressed participants reported a greater number of positive interpersonal events ($M = 23.84$, $SD = 5.80$) than did subclinically depressed participants ($M = 19.12$, $SD = 5.38$). For negative interpersonal events, results also showed a significant difference between the two groups, $t(98) = 6.74$,

$p < .001$. Subclinically depressed participants reported a greater number of negative interpersonal events ($M = 18.24$, $SD = 5.10$) than did their nondepressed counterparts ($M = 10.86$, $SD = 4.66$). These results were consistent with previous findings (e.g., Nelson & Beach, 1990; Sanislow, Perkins, & Balogh, 1989).

Ratings on Interactants

Moreover, we used a mixed design MANOVA to examine the between-participants effects of group and within-participant effects of valence for rating on interactants. Results showed a significant interaction effect between group and valence of rating on interactants, $F(1,98) = 38.64$, $p < .001$ (effect size = .28). Post hoc independent-samples t-tests showed reliable group differences in the rating on negative interactants, $t(98) = 7.81$, $p < .001$. Compared with their nondepressed counterparts ($M = 2.49$, $SD = .37$), subclinically depressed participants ($M = 1.88$, $SD = .40$) were more negative in rating their negative interactants. However, no significant differences in the rating on positive interactants were found between the groups, $t(98) = 1.05$, ns. Subclinically depressed and nondepressed participants gave similar ratings to interactants with whom they had positive interpersonal experience (Ms = 5.18 and 5.08, SDs = .42 and .48).

Taken together, the present findings revealed that, compared with their nondepressed counterparts, subclinically depressed participants reported a greater number of unpleasant interpersonal events and rated their unpleasant interactants more negatively. These results are consistent with interpersonal theories of depression (e.g., Coyne, 1976) that posit that the interpersonal experience of subclinically depressed individuals is tinged with a depressive theme. With a negative perception of their interpersonal experiences, subclinically depressed persons may process negative information about their social relationships more readily and efficiently than do their nondepressed counterparts. These propositions were tested in the Main Study.

THE MAIN STUDY

Overview

In this study, we examined how individuals with different depression levels processed distinct types of social information by examining the

accessibility, automaticity, and context-specificity effects. To test the context-specificity effect, participants were instructed to make judgments about the quality of a target person's social relationships. The *judgment target* was either the participants themselves (the self-referential condition) or an average other, that is, "an average person of your [the participants'] same sex and age" (the other-referential condition). Apart from judgment target, we also examined the *judgment valence*. Taken together, there were four types of judgments, namely positive self-referential, negative self-referential, positive other-referential, and negative other-referential judgments. The context-specificity effect would be present if nondepressed participants gave a greater number of positive self-referential judgments and subclinically depressed participants gave a greater number of negative self-referential judgments than their counterparts, but no such group differences were found in the making of other-referential judgments.

To test the accessibility effect, participants were primed with the name of a person. We examined both the *prime type* and the *prime valence*. Hence, there were four types of primes, namely positive relational, negative relational, positive control, and negative control primes. Both positive and negative relational primes were derived from the daily logs obtained in the Pretest. Specifically, positive relational primes were those interactants who (a) had frequent interaction with the participant and (b) were consistently rated as pleasant to be with. Negative relational primes were those who (a) had frequent interaction with the participant and (b) were consistently rated as unpleasant to be with. Control primes refer to famous figures unrelated to the participants (e.g., Adolf Hitler). The presence of accessibility effect would be indicated by a facilitation effect (i.e., response time is shorter than those in the control conditions) on subsequent social information processing after the presentation of relational primes.

To test the automaticity effect, participants were instructed to memorize either a six-digit number (for the heavy-load group) or a one-digit number (for the light-load group) while making judgments (see Bargh, 1994, 1997). The judgment process would be considered automatic if its efficiency was not influenced by an increased cognitive load (i.e., if there was no significant difference in response time between the heavy-load and the light-load groups). It would be considered effortful if an increased load resulted in less processing efficiency, that is, if the heavy-load group had longer response times than the light-load group (see, e.g., Andersen, Spielman, & Bargh, 1992; Bargh & Tota, 1988).

The major dependent measures were (a) the number of positive and negative judgments and (b) the response time taken to make such judgments. We predict that when nondepressed participants are primed with positive interactants, they will make a greater number of positive judgments about their social relationships than will subclinically depressed participants. In these situations, nondepressed participants will make the judgments more quickly than their subclinically depressed counterparts, and the memory load effects will not be present among nondepressed participants. In contrast, when subclinically depressed participants are primed with negative interactants, they will make a greater number of negative judgments about their social relationships than will nondepressed participants. In these situations, subclinically depressed participants will make the judgment more quickly than their nondepressed counterparts, and the memory load effects will not be present among subclinically depressed participants. However, we predict that such differences will not be evident when participants make judgments in the other-referential condition or when their judgments are activated by positive or negative control primes.

In summary, a 2 (Group: nondepressed or subclinically depressed) × 2 (Memory load: heavy-load or light-load) × 2 (Prime type: relational primes or control primes) × 2 (Prime valence: positive primes or negative primes) × 2 (Judgment target: self-referential judgments or other-referential judgments) × 2 (Judgment valence: positive judgments or negative judgments) design was used in this research to examine individual differences in the accessibility, automaticity, and context-specificity effects of social information processing. Group and memory load are between-participants variables, whereas the other four variables are within-participant variables.

METHOD

Participants

Participants from the Pretest returned for the present study after a 2-week interval.

Experimental Design

The experimental design was based on the study by Andersen and associates (1992). The experiment consisted of two blocks of trials. Participants judged

a number of interpersonal events for themselves in one block of trials (the self-referential condition), and judged the same set of interpersonal events for an average other in another block of trials (the other-referential condition). Half of the participants were randomly given the self-referential condition first, whereas the other half were given the other-referential condition first.

Each block consisted of 32 trials. On each trial, the prime was presented for 1 sec, followed by a 250-msec blank inter-stimuli interval. Then, either a one-digit number (for the light-load group) or a six-digit number (for the heavy-load group) was shown on the monitor screen for 2 sec, followed by a 250-msec blank inter-stimuli interval. Half of the participants were randomly assigned to the light-load condition, whereas the other half were assigned to the heavy-load condition.

The participants' task was explained by instructions shown on the screen visually and through the computer speakers orally.

> In this experiment, a one-digit (the light-load group)/six-digit (the heavy-load group) number will appear on the screen. Please memorize this number for later recall.

> Then a statement will be shown on the screen. You have to decide whether the statement applies to yourself (the self-referential condition)/an average person of your same sex and age (the other-referential condition) as soon as possible.

> After you have made the judgment, the following words will appear on the screen: "Please recall the number that appeared before the statement by pressing the appropriate number key(s)." You have to give the answer, and then press the *space bar* to go on to the next item when ready.

Primes

For each block of trials, we used a different prime for each of the 32 trials. The 32 primes consisted of 16 relational primes (names of 8 positive and 8 negative interactants of social relationships) and 16 control primes (names of 8 positive and 8 negative familiar figures unrelated to the participant). The set of relational primes, which was unique for each participant, was derived from the daily log results obtained from the Pretest.

The control primes were 16 familiar figures, consisting of 8 positive control primes (e.g., "Charlie Chaplin," "Bao Qing-tien"[1]) and 8 negative control primes (e.g., "Adolf Hitler," "Empress Cixi"[2]). In selecting the

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1. A judge in the history of China well-known for his righteousness.
2. A tyrant in the history of China well-known for her cruelty.

control primes, we first had 40 university students and 40 working adults generate lists of positive and negative figures with whom most Hong Kong people should be familiar. Next, an independent group of 60 university students and 60 working adults rated each figure on a   7-point scale that ranged from -3 ("extremely negative") to 0 ("neutral") to 3 ("extremely positive"). All the positive control primes selected for this study had a mean rating greater than 1.25, and all the negative control primes had a mean rating below -1.15.

Judgments

The major task of the participants was to appraise their own social relationships or those of an average other. The 32 judgment statements were adopted from the Social Support Appraisals Scale (SS-A; Vaux et al., 1986) that assesses the extent to which respondents perceive themselves as being loved by, respected by, and involved with interactants (see Vaux, 1987; Vaux et al., 1986). These judgement statements consisted of 16 positive and 16 negative items. Examples of the statements are "My family cares for me very much" (positive item) and "I don't feel close to my friends" (negative item). The same set of sentences appeared in the self-referential and the other-referential conditions. Participants related the judgment target (i.e., "I" and "my") to themselves in the self-referential condition, and to an average other in the other-referential condition.

The presentation order for the SS-A items was randomized. On each trial, an item was presented to participants on the computer screen, and participants were asked to indicate whether they agreed or disagreed with the item. Half of the participants were asked to indicate an "agreement" response by pressing the "V" key (left hand) and a "disagreement" response by pressing the "M" key (right hand) on the keyboard. The remaining participants indicated the "agreement" response by pressing the "M" key (right hand) and a "disagreement" response by pressing the "V" key (left hand).

In this experiment, both positive and negative judgments (i.e., judgment valence) would be examined. Positive judgments refer to participants' endorsement of (a) "agreement" responses to the positive SS-A items and (b) "disagreement" responses to the negative SS-A items. Negative judgments refer to participants' endorsement of (a) "agreement" responses to the negative SS-A items and (b) "disagreement" responses to the positive SS-A items.

Digits

As mentioned in the overview, all participants were required to memorize a number as a concurrent memory-load task. For the heavy-load group, their

task was to memorize a six-digit number, which should demand a considerable amount of attentional capacity (see Bargh & Tota, 1988). All six-digit numbers were generated from a random number table. For the light-load group, their task was to memorize a one-digit number, which should not demand much attentional capacity.

Procedure

Participants took the test individually in a cubicle. Instructions and experimental stimuli were presented through a monitor under the control of a computer. Within each block, the trials were presented in a randomized order. Participants were instructed to give their responses through a keyboard connected to a computer, which recorded their judgment and response time.

The experimenter told the participants that their task was to (a) remember a one-digit (the light-load group) or six-digit number (the heavy-load group) and (b) make judgments on the quality of one's own social relationships in one block of trials and those of an average other in another block of trials as promptly as possible. They were also told that their judgments would be timed and that their accuracy rate in the digit-recall task and response time would be compared with those of other participants. In addition, participants were "prompted" that participants who performed well tended to focus their attention on the monitor at all times. In order to keep their eyes on the monitor, an important piece of information, that is, the name of a familiar person, would appear on the computer screen to signal that the digit of the recall task would appear shortly at the same location.

Participants were first given 10 practice trials to familiarize themselves with the experiment. During practice, feedback was given if they pressed a wrong key or did not respond after 8 sec. No feedback was given during the test phase. After they had completed the first block of trials, the participants were given a 10-minute break before they proceeded to the next block.

At the end of the experiment, a manipulation check was conducted. Participants were asked to rate their own set of relational primes on a 6-point Likert scale, which ranged from 1 (*extremely unpleasant to be with*) to 6 (*extremely pleasant to be with*). The average ratings of the manipulation check ranged from 1.38 to 2.21 for negative relational primes, and from 4.93 to 5.87 for positive relational primes. Also, participants were asked to guess the purpose of this experiment. They were told in advance that if their guess was correct, they would be given bonus marks as a reward. However, none of them could correctly identify the research purpose, nor could they relate the relational primes to their judgments. Interestingly, some participants reported having unpleasant feelings when they saw the negative relational primes on the computer screen. Finally, all participants were fully debriefed and any

questions concerning this research were answered. Results of the experiment were discussed in a tutorial session.

RESULTS

This study aimed to examine the hypothesized differences between nondepressed and subclinically depressed participants in the accessibility, automaticity, and context-specificity effects on social information processing. Social information processing was assessed by (a) the number of positive and negative judgments endorsed and (b) the response time for making the judgments.

For the context-specificity effect, we hypothesized that nondepressed participants would endorse a greater number of positive self-referential judgments but a fewer number of negative self-referential judgments than their subclinically depressed counterparts.

For the accessibility effect, we hypothesized that compared with subclinically depressed participants, nondepressed participants would have shorter response times when they gave positive self-referential judgments after the presentation of positive relational primes, but longer response times when they gave negative self-referential judgments after the presentation of negative relational primes.

For the automaticity effect, we hypothesized that for nondepressed participants, there would be no significant differences in response time between the heavy-load and the light-load groups (i.e., the absence of memory load effects) when they gave positive self-referential judgments after the presentation of positive relational primes. For subclinically depressed participants, there would be no significant differences in response time between the heavy-load and the light-load groups when they gave negative self-referential judgments after the presentation of negative relational primes.

Context-Specificity Effect

To examine the context-specificity effect, participants' endorsement of judgments were analyzed in a 2 (Group) × 2 (Prime type) × 2 (Prime valence) × 2 (Judgment target) × 2 (Judgment valence) mixed design MANOVA. The MANOVA results showed a significant four-way Group × Prime type × Prime valence × Judgment target interaction, $F(1,98) = 23.75$, $MSE = 10.51$, $p < .001$ (effect size = .20). Figure 1
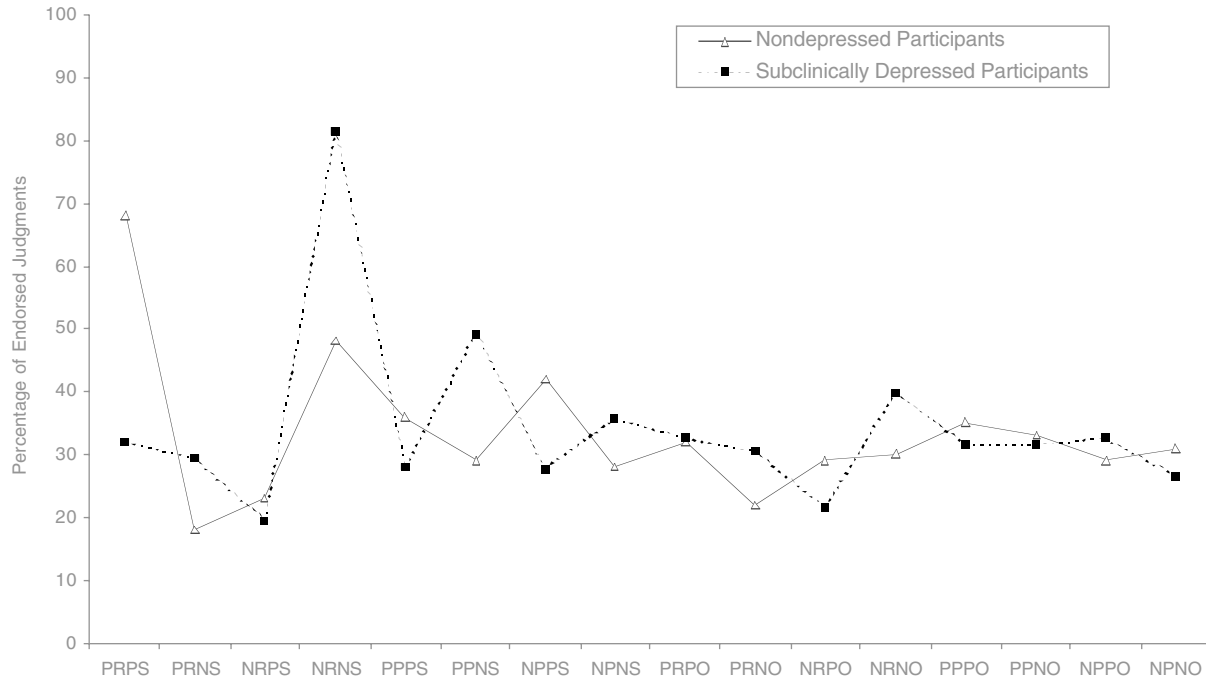
Note, PR = Positive Relational Prime, NR = Negative Relational Prime, PP = Positive Person (Control) Prime, NP = Negative Person (Control) Prime, PS = Positive Self-referential Judgment, NS = Negative Self-referential Judgement, PO = Positive Other-referential Judgement, NO = Negative Other-referential Judgment.

Figure 1
Percentage of positive and negative judgments for 16 experimental conditions by depression level.

shows the average percentage of endorsed judgments in the 16 prime-judgment conditions by group.

To further examine this four-way interaction, we first used post hoc independent-samples t-tests to examine the overall between-participants effect of group. Results revealed that compared with their subclinically depressed counterparts, nondepressed participants gave a greater number of positive self-referential judgments but a smaller number of negative self-referential judgments, ts(98) = 3.15 and −4.24, ps < .01.

Then we used post hoc analyses of simple main effects (see Keppel, 1991) to examine the within-participant effect that indicates the specific situations in which this group effect takes place. This procedure involves several steps. At each step, a variable is chosen as the target variable, and the interaction term is reduced to a simpler level (e.g., from a four-way to a three-way interaction term) and is examined at each level of the target variable respectively.

The first step is to analyze the simple effect of the judgment target that contributes to the hypothesized context-specificity effects. Results showed a significant Group × Prime type × Prime valence interaction effect in the conditions with self-referential judgments, $F(1,98) = 12.83$, $p < .01$ (effect size = .21); but not in the conditions with other-referential judgments, $F(1,98) = .73$, ns.

The next step is to analyze the simple effect of prime type. Results showed a significant Group × Prime valence interaction effect in the conditions with relational primes, $F(1,98) = 22.60$, $p < .001$ (effect size = .19); but not in the conditions with control primes, $F(1,98) = 3.78$, ns.

The last step is to analyze the simple effect of prime valence for each group separately. The post hoc independent-samples t-tests revealed that nondepressed participants endorsed a greater number of judgments in the Positive Relational Prime-Positive Self-referential Judgment (PRPS) condition but a fewer number of judgments in the Negative Relational Prime-Negative Self-referential Judgment (NRNS) condition than did their subclinically depressed counterparts, $t(98) = 5.56$ and −5.50, ps < .001.

To sum up, consistent with the hypothesized context-specificity effects, these results indicate that nondepressed participants made a greater number of positive self-referential judgments (i.e., judgments about their social relationships) after the presentation of positive relational primes, whereas subclinically depressed participants made a

greater number of negative self-referential judgments after the presentation of negative relational primes.

Accessibility Effect

To examine the accessibility effect, participants' response times were analyzed in a 2 (Group) × 2 (Prime type) × 2 (Prime valence) × 2 (Judgment target) × 2 (Judgment valence) mixed design MANOVA. In all the following analyses, a response time greater than two *SD*s from the mean of each participant's own data set was trimmed. The MANOVA results revealed a significant five-way Group × Prime type × Prime valence × Judgment target × Judgment valence interaction, $F(1,98) = 8.17$, $MSE = 2964.18$, $p < .01$ (effect size = .08).

To examine further this five-way interaction, we used post hoc independent-samples *t*-tests to examine the overall between-participants effect of group. Results showed that nondepressed participants had longer response time than did their subclinically depressed counterparts when making negative self-referential judgments, $t(98) = 2.62$, $p < .05$. However, the two groups did not differ in response time when making positive self-referential judgments, $t(98) = -.84$, *ns*.

We employed post hoc analyses of simple main effects to identify the specific situations in which this group effect takes place. The procedures were identical to those adopted in the previous section. The first step is to analyze the simple effect of prime type that contributes to the hypothesized accessibility effects. Results showed a significant Group × Prime valence × Judgment target × Judgment valence interaction effect only in the conditions with relational primes, $F(1,98) = 10.16$, $p < .01$ (effect size = .10), but not in the conditions with control primes, $F(1,98) = .68$, *ns*.

The second step is to analyze the simple effect of prime valence. Results showed a significant Group × Judgment target × Judgment valence in both conditions with positive relational primes and conditions with negative relational primes, $Fs(1,98) = 17.27$ and 30.38, $p < .01$ (effect size = .15 and .24).

The third step is to analyze the simple effect of judgment target. In the conditions with positive relational primes, a significant Group × Judgment valence interaction was found in the making of self-referential judgments, $F(1,98) = 20.98$, $p < .001$ (effect size = .18), but not in the making of other-referential judgments, $F(1,98) = .42$, *ns*.

Similarly, in the conditions with negative relational primes, a significant Group × Judgment valence interaction was found in the making of self-referential judgments, $F(1,98) = 45.48$, $p < .001$ (effect size = .32), but not in the making of other-referential judgments, $F(1,98) = 3.71$, ns.

The last step is to analyze the Group × Judgment valence interaction in the self-referential judgments for conditions with both positive and negative relational primes. Post hoc independent-samples t-tests revealed significant group differences in the PRPS, Negative Relational Prime-Positive Self-referential Judgment (NRPS), and NRNS conditions, ts(98) = −4.74, 3.89, and 8.26, ps < .001. Compared with their subclinically depressed counterparts, nondepressed participants had shorter response time in the PRPS condition but longer response times in the NRPS and the NRNS conditions.

In summary, consistent with the hypothesized accessibility effects, these results indicate that positive relational primes facilitated nondepressed participants' response times in making positive judgments about their social relationships, but negative relational primes hindered their response times in making both positive and negative judgments about their relationships. In contrast, positive relational primes hindered subclinically depressed participants' response times in making positive judgments about their relationships, whereas negative relational primes facilitated their response times in making judgments about their relationships.

Automaticity Effect

To examine the proposed automaticity effect, we conducted ANOVAs to examine differences in memory load effects on response time for nondepressed and subclinically depressed participants. Figure 2 shows the average response time in the 16 conditions by depression level and memory load.

For all the situations, there were significant memory load effects, Fs(1,96) > 16.66, ps < .001 (effect size ranges from .15 to .50), indicating that the heavy-load group generally had longer response times than did the light-load group, regardless of depression level. The significant Group × Memory load interaction was only found in the PRPS and the NRNS conditions, Fs(1,96) = 4.75 and 8.96, ps < .05 (effect size = .05 and .09).

A
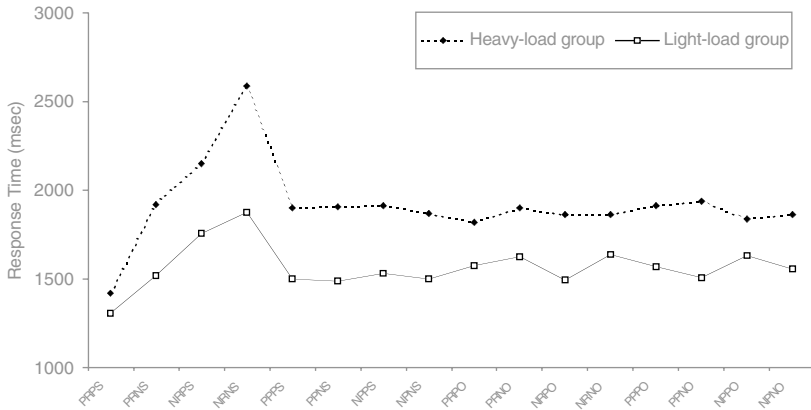
B
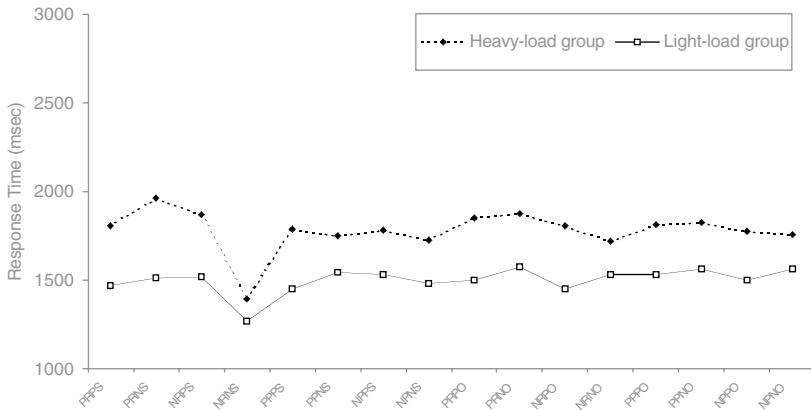
Note, PR = Positive Relational Prime, NR = Negative Relational Prime, PP = Positive Person (Control) Prime, NP = Negative Person (Control) Prime, PS = Positive Self-referential Judgment, NS = Negative Self-referential Judgement, PO = Positive Other-referential Judgement, NO = Negative Other-referential Judgment.

Figure 2
Response time for 16 experimental conditions by depression level and memory load. (A) Response time for nondepressed participants by memory load. (B) Response time for subclinically depressed participants by memory load.

In the PRPS condition, post hoc independent-samples *t*-tests revealed no significant differences in response time between the heavy-load and the light-load groups for nondepressed participants,

$t(48) = 1.51$, *ns*. This result indicates that nondepressed participants' judgments in the PRPS condition were not hampered by the concurrent heavy-load task. However, for subclinically depressed participants, significant differences in response time were found between the heavy-load and the light-load groups in this condition, $t(48) = 4.44$, $p < .001$. These results showed that judgment in this condition, as in other control conditions, was hampered by the concurrent heavy-load task for subclinically depressed participants.

In the NRNS condition, post hoc independent-samples *t*-tests showed that for nondepressed participants, significant differences in response times were found between the heavy-load and the light-load groups, $t(48) = 7.55$, $p < .001$. This result showed that nondepressed participants' judgments in this condition were hampered by the concurrent heavy-load task. For subclinically depressed participants, however, no significant differences in response times were found between the heavy-load group and the light-load group, $t(48) = .79$, *ns*. This result indicated that subclinically depressed participants' judgments in the NRNS condition were not hampered by the concurrent heavy-load task.

To sum up, these results provide some evidence for automatic social information processing in nondepressed and subclinically depressed persons. It is noteworthy that considerable differences were found between the two groups in situations in which automatic processes take place. Specifically, making positive self-referential judgments following positive relational priming is an automatic process for nondepressed individuals but an effortful process for subclinically depressed persons. However, making negative self-referential judgments following negative relational priming is an automatic process for subclinically depressed individuals but an effortful process for nondepressed persons.

Influence of Negative Relational Prime Ratings

The present results showed that subclinically depressed participants had more negative judgments and shorter response times only when reminded of interactants from unpleasant relationships (i.e., negative relational primes). It is noteworthy that the Pretest showed that they tended to rate their interactants from unpleasant relationships more negatively than did their nondepressed counterparts. Because each participant was primed with her or his own set of relational primes, the

possible confounding effect of idiosyncratic negative prime ratings should be examined. Thus, we reanalyzed the results on both judgments and response times involving negative relational primes (i.e., NRPS, NRNS, NRPO, NRNO) with a 2 (Group) × 2 (Memory load) × 2 (Judgment target) × 2 (Judgment valence) MANCOVA that partials out the effects of participants' rating on negative relational primes in these four conditions.

For judgments, the MANCOVA results showed a significant Group × Judgment target × Judgment valence interaction, $F(1,92) = 17.44$, $p < .001$ (effect size = .16). Consistent with the aforementioned results, post hoc analyses of simple main effects revealed that subclinically depressed participants made a greater number of negative judgments than did nondepressed participants in the NRNS condition, $F(1,94) = 25.43$, $p < .001$ (effect size = .21).

For response times, the MANCOVA results also showed a significant Group × Memory load × Judgment target × Judgment valence interaction, $F(1,92) = 7.07$, $p < .01$ (effect size = .07). Consistent with the aforementioned results, post hoc analyses of simple main effects showed that the effects of memory load were significant for nondepressed participants in the NRNS condition, $F(1,44) = 52.74$, $p < .001$ (effect size = .55). However, for subclinically depressed participants, the effects of memory load were nonsignificant in the NRNS condition, $F(1,44) = .47$, *ns*.

Taken together, these results, with the effects of negative relational prime ratings controlled, were highly consistent with those described in the previous sections, thus providing further support for our hypotheses.

DISCUSSION

Results from this research showed that nondepressed participants were more ready to make positive judgments about their social relationships when being reminded of or primed with positive interactants, whereas subclinically depressed participants were more ready to make negative judgments about their social relationships when being reminded of negative interactants. More importantly, these participants require few cognitive resources in making such judgments, thus providing evidence for the presence of automaticity effects in these conditions.

What are some possible explanations for these results? The *valence-matching hypothesis* (e.g., Clark & Waddell, 1983; Isen, Shalker,

Clark, & Karp, 1978) posits that efficient information processing may be attributable to valence matching between the stimuli (i.e., primes) and the incoming information. Moreover, the *mood-state-dependent hypothesis* (e.g., Riskind, 1983; Teasdale & Taylor, 1981) asserts that efficient information processing may be due to the matching of the nature of incoming information to the person's concurrent mood. However, these two explanations do not account for the findings in the present study. If the results were due to a valence match or mood congruency, automatic processes should also be found in other control conditions, such as the Positive Person (Control) Prime-Positive Other-referential Judgment (PPPO) and Negative Person (Control) Prime-Negative Other-referential Judgment (NPNO) conditions. These two hypotheses fail to account for the issue of situational specificity in the occurrence of automatic processes.

Both issues can be accommodated in the *schema-information matching hypothesis*, which posits that information processing may be facilitated by a match between the content of the activated schemata and that of the incoming information. The relational schema is proposed to be a stored domain of knowledge about one's social relationships, and it influences the processing of new information concerning these relationships by guiding attention, interpretation, expectation, and memory search (e.g., Baldwin, 1992; Pierce & Lydon, 1998). Frequent exposure to a certain type of interpersonal event may leave "marks" in the person's mind (e.g., Baldwin, 1992; Safran, 1990), and the gradual accumulation of such "marks" may form an organized body of knowledge that influences the attribution of meaning and the expectations about social relationships (e.g., Horowitz, 1989; Miell, 1987; see also Wyer & Radvansky, 1999).

When individuals are reminded of a person with whom they frequently interact, they do not merely become momentarily happy or depressed. The relational cue also activates their underlying relational schemata. Due to their frequent processing of a particular type of social information, the relational schemata are easily activated by an actual encounter with or a mere thought of a person with a close relationship. Once the relational schemata have been activated, a cluster of memories relating to previous positive or negative social relationships will be provoked. The activated relational schemata have been "warmed up" with all these recurring thoughts, and thus, subsequent social information that matches the existing theme of the mind is absorbed readily and processed automatically.

In short, these results revealed that automatic processing of social information occurs only when (a) the relational schemata are activated by relevant cues and (b) the valence of incoming social information is congruent with that of the activated relational schemata.

GENERAL DISCUSSION

The present research revealed that subclinically depressed persons differ from their nondepressed counterparts in three aspects of social information processing, namely in the effects of accessibility, automaticity, and context-specificity. Specifically, when reminded of a positive interactant, nondepressed persons process information related to positive aspects of their social relationships more readily and efficiently than do subclinically depressed persons. In contrast, when reminded of a negative interactant, subclinically depressed persons process information related to negative aspects of their social relationships more readily and efficiently than do nondepressed persons. Such results highlight not only individual differences but also situational influences on automatic relational cognition. Automatic processes do not emerge until relational cues that provoke thoughts of social others are present. In the absence of such cues, subclinically depressed persons process social information in a manner similar to their nondepressed counterparts. In this light, the valence of relational cues may be a situational moderator that regulates the operation of the underlying relational schemata, which in turn elicits different types of automatic social information processes for both nondepressed and subclinically depressed persons.

Theoretical Implications

These results may extend existing theories, including personality, interpersonal, and cognitive theories, in four major ways. First, previous cognitive theories of depression (e.g., Beck, 1976, 1983) posited that automatic interpersonal thoughts were characteristics of depressed persons, but did not specify when such thoughts would take place. One implication of our findings is that automatic processes are present only when there is a match between the nature of activated relational schemata and the content of the incoming interpersonal information. Consistent with the Person $\times$ Situation

interactionist approach (e.g., Cantor & Kihlstrom, 1980; Endler, 1982; Mischel & Shoda, 1995, 1998), this research highlights the issues of individual differences and situation specificity and the interaction between these issues in research on depression. Specifically, the present research extends the existing literature by revealing that the automatic interpersonal thoughts of subclinically depressed persons emerge only when (a) their well-developed depressive relational schemata are active and (b) the content of their concurrent thoughts is negative and self-referential. Such knowledge on the situational emergence of automatic processes may be conducive to the explanation of how social information is processed and also to the prediction of when automatic thoughts about one's social relationships will be evoked.

Second, the present study was the first to apply the relational-schema approach (e.g., Baldwin, 1992; Pierce & Lydon, 1998) to the study of depression. In this study, interactants with frequent interactions have been used as a cue to elicit automatic relational thoughts in both nondepressed and subclinically depressed persons. Results revealed that the valence of cues influences individuals with different depression levels in distinct ways. Positive relational cues facilitated nondepressed persons' processing of positive social information, whereas negative relational cues facilitated subclinically depressed persons' processing of negative social information. These results extended the relational-schema approach by implying that the relational schema is a stored domain of knowledge about positive and negative social relationships, and that the valence of relational cues influences social information processing. Apart from positive and negative information concerning one's social relationships, other research on relational schemata further showed that the content of relational schema may also include the needs, feelings, and behaviors of both oneself and social others (see, e.g., Demorest, Crits-Christoph, Hatch, & Luborsky, 1999; Luborsky & Crits-Christoph, 1990).

Third, the social-cognitive approach to depression has received considerable attention recently. Most social-cognitive studies on depression (e.g., Connell, Davis, Gallant, & Sharpe, 1994; Lam, Green, Power, & Checkley, 1994) examined the relationship between social-cognitive variables, such as perceived social support and social roles, and depression. The present study extended this body of research by examining the social-cognitive processes, which revealed the mechanisms explicating how interpersonal experiences influence the

processing of social information. The major advantage of examining the social-cognitive processes is that it integrates the relatively static schema-based approach and the dynamic interpersonal processes. Specifically, our research showed how the interpersonal knowledge stored in relational schemata influences the processing of new incoming social information.

Fourth, we propose that prior interpersonal knowledge influences the processing of not only information about one's social relationships but also information related to other self-domains. This notion stems from Beck's cognitive theory of depression (1976, 1983), which proposes that depressed persons have negative beliefs about themselves, their world, and their future. The study by Beckham and associates (1986) further revealed significant correlations among scores of these three self-domains, indicating that these self-domains are closely related to each other. In this light, depressive relational schemata may influence the processing of information related to other self-domains. Besides, our proposal is also consistent with the interpersonal and the object-relational theories of depression (e.g., Brown & Harris, 1978; Sullivan, 1953). These theories emphasize that a social relationship is essentially a self-other relationship. Specifically, depressed persons depend primarily on significant others to gratify their psychosocial needs and to maintain their fragile self-esteem. Severe disruption of affectional bonds with significant others early in life may durably impair the person's capacity for trust in others, and in their own capabilities as well. Integrating these two theoretical domains, we proposed that depressive relational schemata may influence the processing of not only information concerning one's social relationships but also self-referential information in general, thus implying that negative relational cognition plays a fundamental role in depression.

Research Implications

The present investigation demonstrates the advantages of using the priming paradigm in studying the quality of social relationships in depression research. Although the priming paradigm has frequently been used in cognitive and social-cognitive research, this paradigm has seldom been utilized to examine social information processing among subclinically depressed persons. The present research showed that relational primes can evoke automatic thoughts   about one's close relationships. More importantly, the priming conditions enable

researchers to understand individual differences in the situational emergence of automatic thoughts about social relationships.

The present investigation also illustrates the value of using a combined idiosyncratic-nomothetic approach. Previous research (e.g., Hokanson et al., 1989; Ruehlman & Wolchik, 1988) examined individual differences in the quality of social relationships by comparing groups with distinct depression levels. Apart from adopting the nomothetic approach, the present research also employed an idiosyncratic approach to examine individual differences in interactional experiences. An idiosyncratic approach is necessary because social information processing is largely influenced by one's interactional experience (e.g., Baldwin, 1992; Safran, 1990), which is unique for every person. For instance, thinking of "my youngest brother" may evoke anger for one person, but may elicit happiness for another. Hence, we used daily interactional logs to construct a unique set of relational primes for each participant. This research strategy enhances the ecological validity of the findings on individuals' quality of social relationships.

Qualifications and Concluding Remarks

Before concluding, some caveats are noteworthy. First, although the subclinically depressed participants in this research did differ in the quality of social relationships from their nondepressed counterparts, it should be noted that these depressed persons are not clinically depressed and can still function appropriately in social life. Caution should thus be taken when attempting to generalize these results to clinical populations. Clinically depressed persons are characterized by a vegetative tendency (e.g., Beck, 1976, 1983) and may lack the motivation to engage in social interaction (Chiauzzi, Heimberg, Becker, & Gansler, 1984; Olinger, Kuiper, & Shaw, 1987). Under such a low level of personal involvement, severely depressed persons may have fewer interactions with social others, and may have fewer thoughts about their social relationships. Further studies should extend the present research into the clinical domain in order to explore whether the present findings apply only to the nonclinical range of depression or can be generalized to clinical depression as well.

Second, we used daily logs to track participants' interpersonal experience within a 2-week period and examined interactants of social relationships consistently perceived by participants as pleasant or

unpleasant over that period. In light of previous research that revealed meaningful patterns of behavioral change over time or across situations (e.g., Moskowitz, Brown, & Cote, 1997; Shoda et al., 1994), some social relationships may be more unstable over a longer time span, especially when individuals and their social others encounter stressful events. For instance, a person's family members may show initial support when that person becomes unemployed, but conflicts may arise when unemployment extends for months. After understanding each other's perspectives, the family members may again render support to the person. Hence, longitudinal studies examining participants' interpersonal experience over an extended period of time or across various waves of time may reveal how (a) such "variable" relationships are represented in individuals' minds and (b) information concerning these relationships is processed.

To conclude, this research explored automatic processing of social information in nondepressed and subclinically depressed persons. Through using the priming paradigm, the present research helps to clarify individual differences in social information processing and the conditions that elicit automatic thoughts about social relationships.

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