

# Memory for emotional and neutral information: Gender and individual differences in emotional sensitivity

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In studies of autobiographical memory, women typically remember more emotional information than do men. The present study evaluated whether women recall more emotional information than men when the content of an event is controlled. Participants read a script containing emotional and neutral information, under instructions to prepare advice for the characters addressing either interpersonal issues (emotional focus), concrete plans (neutral focus), or with no particular topic suggested (undirected focus). After writing out advice, on a surprise memory test women recalled more emotional information than men in all focus conditions with no deficit in neutral recall. Women recalled more neutral information than men in the neutral focus condition. A measure of emotional sensitivity mediated the gender difference in emotional recall suggesting that memory for emotional information is not solely a function of gender.

In recent years there has been a growing interest in the relation between gender and memory. A number of studies demonstrate that men and women's memories for personal experiences (autobiographical memories) and laboratory materials differ in quantitative and qualitative ways. In studies of autobiographical memory, men's and women's accounts of personal experiences differ in richness and complexity. Women's autobiographical memories are longer and more detailed (e.g., Cowan & Davidson, 1984; Fivush, Berlin, McDermott Sales, Mennuti-Washburn, & Cassidy, 2003; Friedman & Pines, 1991; Pohl, Bender, & Lachmann, 2005), and are usually embedded in a richer context than men's descriptions, containing more references to other people and events (e.g., Bauer, Stennes, & Haight, 2003; Fivush et al., 2003). Men's and women's memories of life events also differ in the inclusion of emotional and interpersonal information. Women use a greater quantity and variety of emotion words than men when describing their past experiences (Adams, Kuebli, Boyle, & Fivush, 1995; Bauer

et al., 2003; Fivush et al., 2003; Hess et al., 2000). Women include not only a greater number of references to their own emotional states but also a greater number of references to the emotional states of others. In addition, when asked to recall emotional life experiences, women recall more memories of both positive and negative personal experiences than men (Davis, 1999; Fujita, Diener, & Sandvik, 1991; Seidlitz & Diener, 1998).

While research on autobiographical memory has identified how men's and women's memories for personal experiences differ, conclusions from autobiographical memory reports are limited because the content of reported autobiographical events is not controlled. For instance, women may remember more emotional information because they have more frequent or more intense emotional experiences than men; or men and women may have, on average, experiences similar in frequency and emotional intensity, but emotional information may be more salient to women and hence better attended and remembered. The present study examines whether women

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remember more emotional information than do men from events with controlled amounts of emotional and neutral information. If women focus on the emotional and interpersonal aspects of the environment more than men do, then they should remember more emotional information than do men even when the amount of emotional and neutral information is controlled.

Also of central interest in the present study is the effect of focusing on one type of information on memory for other types of information. Previous research suggests that having an emotional focus when encoding or rehearsing an event improves memory for the emotional aspects of the event but may reduce memory of the more neutral aspects (e.g., factual and perceptual) of the event (Hashtroudi, Johnson, Vnek, & Ferguson, 1994; Johnson, Nolde, & De Leonardis, 1996; Suengas & Johnson, 1988). For example, Hashtroudi et al. found that participants who were instructed to focus on the emotional aspects of a short play recalled less objective information from the play than participants who were instructed to focus on the factual aspects of the play. This finding suggests that post-event focus on one type of information may reduce post-event processing and subsequent recall of other types of information. If women reflect (e.g., Johnson & Hirst, 1993) more on emotional and interpersonal aspects during or after an event, then they may have improved recall of these aspects but diminished recall of the unattended (e.g., factual, perceptual) aspects. Recalling emotional information at the expense of more neutral information may put women at a disadvantage in situations where memory for the latter type of information is important. Again, autobiographical memory reports are limited in addressing these issues because the relative frequency of emotional and neutral information in the reported events is not known. The current study evaluates whether women's expected greater memory for emotional information is accompanied by reduced memory for non-emotional (neutral) information under different focus conditions.

Investigations of episodic memory for information presented in the laboratory show a consistent memory advantage in favour of women even for emotionally neutral information. Women have better memory than men for words (Herlitz, Nilsson, & Backman, 1997; Hultsch, Masson, & Small, 1991; Kramer, Delis, & Daniel, 1988; West, Crook, & Barron, 1992), faces (Eals & Silverman, 1994; Herlitz et al., 1997; Lewin, Wolgers, &

Herlitz, 2001; West et al., 1992), concrete pictures (Herlitz, Airaksinen, & Nordstrom, 1999), names (West et al., 1992), word associates (West et al., 1992), and short narrative texts (length=300 words) (Hultsch et al., 1991). These findings suggest that women may process any kind of information more reflectively (Johnson & Hirst, 1993) than men. For example, women may engage in more rehearsal (e.g., Rundus, 1977), or they may be more inclined to or better at discovering relations (e.g., Tulving, 1962).

Davis (1999) suggested that parents' more elaborative reminiscing style (i.e., placing events in a wider more detailed context of other events; see Fivush, 1998, for a review) with their female children than with their male children may teach girls from an early age to build more complex internal representations of past experiences that are richer in the number of associative connections with other events. This suggests that, over time, women may become more practised and more efficient at organising their internal representations of events around whatever information is most salient. Thus, women may recall more neutral information than men when neutral information is the salient or task-relevant type of information (i.e., they are directed to focus on neutral information). However, the neutral stimuli used in previous studies showing women's greater memory were not in competition with emotional information, which women may find more compelling and salient. The current study assesses whether women will recall more neutral information than men even when it is intermixed with emotional information or whether they will recall emotional information at the expense of neutral information.

Finally, differences in reflecting on and remembering emotional information may not result solely from being male or female, *per se*, but rather from individual characteristics that overlap with gender, such as how attuned an individual is to emotional aspects of their environment or how important they believe emotional information is in their experiences. The present study examines whether individual differences in emotional sensitivity are a better predictor than gender of how much emotional information a person remembers.

We assessed gender differences for an event with controlled amounts of emotional and neutral information. Participants read a script of a married couple discussing concrete plans (e.g., home remodelling) and emotional/interpersonal

issues (e.g., communication problems). Participants were focused on different aspects of the script with different instructions about advice they would prepare for the couple after reading the script: addressing either the couple's concrete plans (neutral focus), their interpersonal issues (emotional focus), or advice with no particular topic suggested (undirected focus). After reading the script, participants were instructed to provide specific examples from the conversation in their written advice. We assumed that, in generating advice, participants would review the relevant aspects of the script. In the undirected focus condition, women were predicted to refer more to emotional aspects of the script in giving advice and subsequently recall a greater amount of emotional information from the script relative to men. In the emotional focus condition, we expected the gender difference in memory for emotional information to be reduced, because here both men and women would be encouraged to devote reflective processing to emotional information. In the neutral focus condition, the main question was whether women show less impact of the focus instruction on recall of neutral information, indicating a cost of interest in more emotional information.

In order to investigate the relationship between emotional sensitivity and memory, the current study used a measure of emotional sensitivity composed of items from the Social Skills Inventory (SSI; Riggio, 1986) and several new items intended to assess individuals' sensitivity to the emotional and interpersonal aspects of their experiences. Individuals' emotional sensitivity was expected to be a stronger predictor of memory for emotional information than gender.

## METHOD

### Study 1: Gender and emotional sensitivity (pretesting)

*Participants.* Undergraduate students ( $n = 425$ ; 172 men; mean age = 18.7) at Yale University received class credit for their participation.

*Materials and procedure.* The Emotional and Interpersonal Sensitivity Measure (EISM) was composed of 12 statements (see Appendix); participants rated the degree to which each statement is characteristic or descriptive of them on a 5-point scale (1 = Not at all like me, 3 =

Like me, 5 = Exactly like me). The 12 statements consisted of four questions from the Emotional Sensitivity Subscale, four questions from the Social Sensitivity Subscale, of the SSI (Riggio, 1986), and four new questions. The EISM is scored by summing responses to the 12 items (range: 12–60), with higher scores representing higher levels of emotional and interpersonal sensitivity. Participants completed the EISM as part of an online survey in conjunction with a variety of other psychological measures that were subsequently used in other investigations.

*Results and discussion.* The EISM had acceptable split-half reliability with a coefficient alpha of .72. The validity and discriminate validity of the overall SSI and the Emotional and Social Sensitivity subscales, from which the eight items used here were taken, has been well established in a number of studies by Riggio (1986) and others (e.g., Doherty, 1997; Riggio & Carney, 2003; Riggio, Messamer, & Throckmorton, 1991; Riggio, Watring & Throckmorton, 1993). The validity of the individual items comprising the subscales of the SSI has also been supported by an exploratory factor analysis in which items from the full SSI loaded into six factors that replicated the SSI's six subscales (Riggio & Carney, 2003). The items from the Emotional and Social Sensitivity subscales, included in the current study, loaded highly onto the emotional and social sensitivity factors, respectively. The sum of the four new items in the EISM strongly correlated with the sum of the eight items from the SSI subscales,  $r = .51$ ,  $p < .01$ ,  $R^2 = .26$ , suggesting that the new items are measuring a similar construct (i.e., emotional and interpersonal sensitivity) to that measured by the items from the SSI subscales.

The average EISM score of the pretest sample was 37.9 ( $SD = 6.3$ , range 16–56). Women ( $M = 38.8$ ) reported significantly higher levels of emotional sensitivity than men ( $M = 36.6$ ), on the EISM,  $F(1, 423) = 12.90$ ,  $MSE = 38.96$ ,  $p < .01$ ,  $\eta_p^2 = .03$ , consistent with gender differences previously found on the Emotional and Social Sensitivity subscales of the SSI (Riggio, 1986). It is also consistent with self-report measures of empathy (Eisenberg & Lennon, 1983) and interpersonal orientation (Swap & Rubin, 1983) indicating that, on average, women report themselves to be more aware of other people in their environment and more responsive to the emotions of others.

Subsequently, participants from the pretested sample were invited to participate in the main study (titled "A Study of Advice Quality"). Participants were not aware that the experiment was related to memory or to the emotional sensitivity questionnaire they had previously completed.

## Study 2: Gender, emotional sensitivity, and memory

### (A) Norming materials

*Materials.* Two scripts depicted a conversation of a married couple. In Script 1, a couple discussed plans to remodel their home and some issues concerning their communication and relationship. In Script 2, a couple discussed plans for an upcoming vacation and issues concerning their communication and relationship. In each script, each character made an equal number of statements regarding their concrete plans (neutral) and their relationship (emotional). Some examples of neutral statements are: "The contractors estimated it will cost \$1000 to retile the bathroom", "Ceramic bathtubs retain heat better than plastic bathtubs", "A roundtrip ticket for two people from New York to Rome will be \$2000", "We can take a train to Florence". Some examples of emotional statements are: "Every time we start talking about something important you change the subject", "I feel like you have been avoiding me", "It will be good for us to get away from everything", "I am trying to make the best decisions for us". Script 1 contained 112 statements (56 emotional, 56 neutral). Script 2 contained 136 statements (68 emotional, 68 neutral). Two coders coded all statements from Script 1 and 2 as emotional or neutral, and inter-rater reliability as measured by Cohen's  $k$  (Cohen, 1960) was .94 for Script 1 and .93 for Script 2. Differences between the two coders were resolved by discussion, or if necessary by a third coder.

The emotional and neutral content of the two scripts was also evaluated by a separate group of participants in a norming study as follows.

*Participants.* A total of 24 undergraduate and graduate students (12 men, mean age = 19.5) at Yale University participated for course credit or payment.

*Method.* Participants read Scripts 1 and 2 and rated the emotionality of each statement on a 6-

point scale (1 = unemotional/neutral, 6 = very emotional/intense).

*Results and discussion.* Emotionality ratings did not differ between Script 1 and 2 for either the emotional statements,  $t(46) = 1.65$ ,  $p = .11$ , or the neutral statements,  $t(46) = -1.31$ ,  $p = .20$ . Thus, the two scripts were collapsed together and entered into a  $2 \times 2$  ANOVA with statement type (emotional, neutral) as a within-subjects factor and gender as a between-subjects factor. A main effect of statement type,  $F(1, 44) = 210.85$ ,  $MSE = 43.47$ ,  $p < .01$ ,  $\eta_p^2 = .83$ , indicated that emotionality ratings were significantly greater for emotional statements ( $M = 3.88$ ) than neutral statements ( $M = 1.98$ ). There was no main effect of gender,  $F(1, 44) = 2.31$ ,  $p = .14$ , and no interaction between statement type and gender,  $F < 1.00$ . Since men and women did not differ in their emotionality ratings of the emotional statements, gender differences in memory for the emotional statements in the main experiment likely reflect differences in post-encoding reflection rather than differences in initial perception or reaction.

### (B) Main experiment: Gender, sensitivity, and memory

*Participants.* A total of 63 undergraduate students (30 men; mean age = 18.8) at Yale University participated for course credit or payment.

*Design.* A  $2 \times 3$  between-subjects design compared gender (men, women) and type of focus (undirected, emotional, and neutral). Each focus condition contained 21 participants (10 men).

*Procedure.* Participants were tested in small groups of mixed gender and were told that the study was examining the quality of advice that people give for different types of problems. They were randomly assigned to Script 1 ( $n = 27$ , 11 men) or Script 2 ( $n = 26$ , 13 men), and told that they would read a sample of conversation and later prepare some advice for the characters about some of the problems they discuss during the conversation. Participants were not informed of the memory test. Participants were randomly assigned to one of the three encoding and rehearsal focus conditions before reading the script. In the *emotional focus condition*, participants read written instructions indicating that they would later prepare advice for the couple about how to improve the quality of their relationship and communication. In the *neutral*

*focus condition*, participants read instructions that they would later prepare advice for the couple about how to choose from the remodelling (or vacation) options they discussed. In the *undirected focus condition*, participants were only told that they would later prepare advice for the couple and were not given specific instructions about the type of advice they should give. Participants read the script at their own pace (average reading time was 5 minutes), then read instructions reiterating the type of advice they should prepare, and wrote advice for up to 7 minutes.

During a 15-minute retention interval, participants completed an abbreviated version of the Vocabulary subset of the Wechsler Adult Intelligence Scale – Revised (maximum possible = 30, WAIS- R; Wechsler, 1987) and worked on unrelated laboratory tasks (e.g., Luchins water jar problem).

Next, participants were given a surprise free recall test. They were given 10 minutes to write down anything they remembered from the conversation they had read at the beginning of the experiment. Participants were then given a surprise recognition memory test containing 72 statements from the script randomly intermixed with 36 semantically related distractor statements (e.g., “Ceramic bathtubs resist scratching better than plastic bathtubs” as a distractor for “Ceramic bathtubs retain heat better than plastic bathtubs”). Half of both old and new statements were emotional and half were neutral, with an equal number of each type of old statement from each character. Participants identified target and distractor statements by circling the words “old” or “new”, which appeared alongside each statement.

*Coding: Advice and free recall protocols.* To code responses on the advice task and the free recall test, each script was broken down into neutral and emotional meaning units, each capturing a unique piece of information within the script: Script 1 (64 emotional, 64 neutral); Script 2 (76 emotional, 76 neutral). No main effect of script was found in advice or recall when calculated using either percent of meaning units reported or raw number of meaning units reported. Therefore, all analyses are reported in raw meaning units.

Advice protocols were evaluated for the number of emotional and neutral meaning units and the number of emotional and neutral evaluative statements. Protocols were scored by a coder who

was blind to participants’ gender and focus condition. Reported information that matched a meaning unit or was a close approximation of the meaning unit was considered a match and scored as 1 point (e.g., “The couple had seven thousand dollars for their remodelling” for the script statement “We have seven thousand dollars for the remodelling”). Reported information that expressed only part of a meaning unit, but did not reproduce complete details, was scored as half of a point (e.g., “The couple had several thousand dollars for their remodelling” without specifying the exact amount of seven thousand dollars). Evaluative statements were defined as responses that evaluated or offered suggestions about script-related information but did not contain specific script information. Evaluations were coded as emotional if they referred to the characters’ communication or relationship (e.g., “This couple needs to listen to one another”) or neutral if they referred to the characters’ concrete plans (e.g., “They should see a travel agent who could help with their plans”). Each emotional and neutral evaluation was coded as 1 point. Responses containing information that was not contained in the script, such as “He forgot to pay the electricity bill” (in Script 2 the couple discuss a time when the husband bounced a cheque for the car insurance) were coded as intrusions and awarded no points. (The average number of intrusions across advice and recall protocols was .04. There were no differences in the number of intrusions in advice or recall protocols across conditions,  $F_s < 1.00$ , or between genders,  $F_s < 1.00$ .)

Recall protocols were evaluated by the same blind coder according to the same criterion established for the advice protocols, except that for the recall protocols, evaluative responses were awarded no points. (The average number of evaluative responses in the recall protocols was .85. There were no differences in evaluative responses across conditions,  $F < 1.00$ , or between genders,  $F < 1.00$ .)

To check the reliability of scoring, a second coder scored a random sample of data for 12 men and 12 women, for a total of 24 protocols (1 advice and 1 recall protocol per person). There was good reliability, as measured by Cohen’s  $k$ , for the advice protocols (.78 for emotional meaning units, .87 for neutral meaning units, .87 for emotional evaluations, .78 for neutral evaluations, and 1.00 for intrusions) and for the recall protocols (.84 for emotional meaning units, .82 for

neutral meaning units, and 1.00 for emotional evaluations, neutral evaluations, and intrusions). Differences between the two coders were resolved by discussion and, if necessary, third coder review.

## RESULTS

Differences between Script 1 and 2 were minimal. Script did not meaningfully interact with gender or the type of focus (except where mentioned), therefore data for all reported analyses were collapsed across Script 1 and 2.

### Advice statements

Mean scores were analysed separately for emotional and neutral information.

*Emotional meaning units.* A  $2 \times 3$  ANOVA with gender and type of focus (see Table 1) revealed that there was a main effect of focus on the inclusion of emotional meaning units in the advice statements,  $F(2, 57) = 4.95$ ,  $MSE = 2.29$ ,  $p = .01$ ,  $\eta_p^2 = .15$ . Subsequent planned comparisons revealed that more emotional meaning units were included in the emotional focus,  $F(1, 40) = 9.10$ ,  $MSE = 1.51$ ,  $p < .01$ ,  $\eta_p^2 = .19$ , and the undirected focus conditions,  $F(1, 40) = 7.88$ ,  $MSE = 2.54$ ,  $p = .01$ ,  $\eta_p^2 = .17$ , than in the neutral focus condition. Women included more emotional meaning units in their advice statements than men,  $F(1, 57) = 3.88$ ,  $p = .05$ ,  $\eta_p^2 = .06$ , suggesting that women may reflect on the

emotional information in greater detail than men. There was no interaction between gender and type of focus,  $F < 1.00$ .

*Neutral meaning units.* A  $2 \times 3$  ANOVA with gender and type of focus (see Table 1) revealed a main effect of focus on the inclusion of neutral meaning units in the advice statements,  $F(2, 57) = 17.82$ ,  $MSE = 3.31$ ,  $p < .01$ ,  $\eta_p^2 = .38$ . Subsequent comparisons revealed that more neutral meaning units were included in the neutral focus condition than in either the emotional focus,  $F(1, 40) = 23.19$ ,  $MSE = 4.34$ ,  $p < .01$ ,  $\eta_p^2 = .37$ , or the undirected focus conditions,  $F(1, 40) = 17.51$ ,  $MSE = 4.65$ ,  $p < .01$ ,  $\eta_p^2 = .30$ . There was no main effect of gender,  $F(1, 57) = 0.01$ ,  $p = .94$ , and no interaction between gender and type of focus,  $F(2, 57) = 2.27$ ,  $p = .11$ .

*Emotional evaluations.* A  $2 \times 3$  ANOVA with gender and type of focus (see Table 2) revealed a main effect of focus on the inclusion of emotional evaluative statements,  $F(2, 57) = 51.84$ ,  $MSE = 3.39$ ,  $p < .01$ ,  $\eta_p^2 = .65$ . Subsequent comparisons revealed that more emotional evaluations were included in the emotional focus,  $F(1, 40) = 158.55$ ,  $MSE = 1.94$ ,  $p < .01$ ,  $\eta_p^2 = .80$ , and undirected focus conditions,  $F(1, 40) = 42.91$ ,  $MSE = 5.11$ ,  $p < .01$ ,  $\eta_p^2 = .52$ , than the neutral focus condition. The number of emotional evaluations did not differ between the undirected and emotional focus conditions,  $F(1, 40) = 1.27$ ,  $MSE = 5.76$ ,  $p = .27$ . There was a main effect of gender,  $F(1, 57) = 7.07$ ,  $p = .01$ ,  $\eta_p^2 = .11$ , which was qualified by an interaction between gender and focus,  $F(2, 57) = 5.74$ ,  $p = .01$ ,  $\eta_p^2 = .17$ . The

**TABLE 1**  
Meaning units from advice statements

Meaning units	Women			Men		
	Focus			Focus		
	Undirected	Neutral	Emotional	Undirected	Neutral	Emotional
Emotional						
<i>M</i>	2.77	1.23	2.45	1.85	0.65	1.70
<i>SD</i>	2.34	1.08	1.42	1.49	1.00	1.27
Neutral						
<i>M</i>	0.41	4.27	0.32	1.35	2.95	0.80
<i>SD</i>	0.49	2.11	0.51	1.60	3.37	1.23

Mean meaning units reported in the written advice statements (with standard deviations) as a function of gender, focus condition, and meaning unit type.

**TABLE 2**  
Evaluations from advice statements

Evaluations	Women			Men		
	Focus			Focus		
	Undirected	Neutral	Emotional	Undirected	Neutral	Emotional
Emotional						
<i>M</i>	7.45	1.36	6.64	4.00	1.10	6.65
<i>SD</i>	2.76	1.21	1.03	2.11	1.10	2.14
Neutral						
<i>M</i>	1.73	6.73	0.86	3.10	5.00	1.00
<i>SD</i>	2.04	2.19	1.42	1.97	1.49	1.70

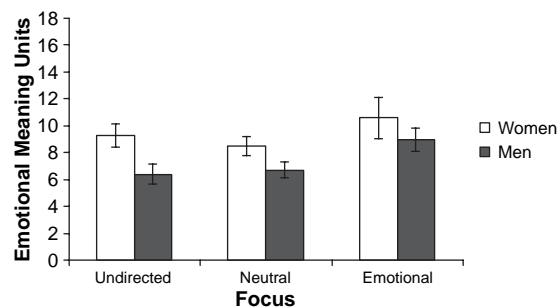
Mean evaluations reported in the written advice statements (with standard deviations) as a function of gender, focus condition, and evaluation type.

interaction was driven by the difference in the number of emotional evaluations made by men and women in the undirected focus condition. Women made significantly more evaluative statements than men when focus was undirected,  $F(1, 19) = 10.22$ ,  $MSE = 6.12$ ,  $p = .01$ ,  $\eta_p^2 = .35$ , suggesting that women tend to focus on emotional information more than men and think about emotional information in a more elaborative manner.

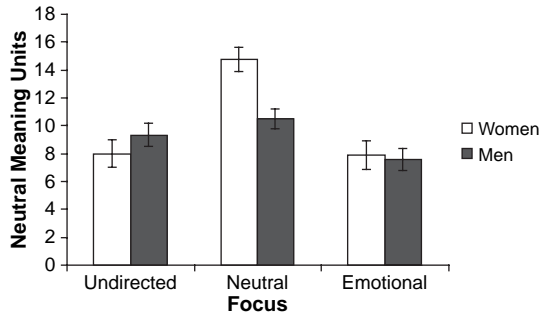
*Neutral evaluations.* A  $2 \times 3$  ANOVA with gender and type of focus (see Table 2) revealed a main effect of focus on the inclusion of neutral evaluations in the advice statements,  $F(2, 57) = 40.08$ ,  $MSE = 3.35$ ,  $p < .01$ ,  $\eta_p^2 = .58$ . Subsequent comparisons revealed that more neutral evaluations were included in the neutral focus condition than in either the emotional focus,  $F(1, 40) = 80.03$ ,  $MSE = 3.25$ ,  $p < .01$ ,  $\eta_p^2 = .67$ , or the undirected focus conditions,  $F(1, 40) = 30.63$ ,  $MSE = 4.26$ ,  $p < .01$ ,  $\eta_p^2 = .43$ . More neutral evaluations were also included in the undirected focus condition than in the emotional focus condition,  $F(1, 40) = 6.68$ ,  $MSE = 3.32$ ,  $p = .01$ ,  $\eta_p^2 = .14$ . While there was no main effect of gender,  $F < 1.00$ , the interaction between gender and type of focus was significant,  $F(2, 57) = 3.81$ ,  $p = .03$ ,  $\eta_p^2 = .12$ . Women included more neutral evaluations than men in the neutral focus condition,  $F(1, 19) = 4.36$ ,  $MSE = 3.59$ ,  $p = .05$ ,  $\eta_p^2 = .19$ . Note, it is not necessarily surprising that the advice protocols contained more evaluative statements than meaning units given the evaluative nature of the advice task (see Table 2).

## Recall

*Recall of emotional information.* A  $2 \times 3$  ANOVA with gender and type of focus (see Figure 1) indicated that there was a main effect of type of focus on recall of emotional information,  $F(2, 57) = 3.09$ ,  $MSE = 9.62$ ,  $p = .05$ ,  $\eta_p^2 = .10$ . Subsequent comparisons revealed greater recall of emotional information in the emotional focus condition than in the neutral focus condition,  $F(1, 40) = 4.44$ ,  $MSE = 11.10$ ,  $p = .04$ ,  $\eta_p^2 = .10$ , but no difference between the emotional and undirected focus conditions,  $F(1, 40) = 2.93$ ,  $MSE = 13.00$ ,  $p = .10$ , or between the neutral focus and undirected focus conditions,  $F < 1.00$ . A main effect of gender,  $F(1, 57) = 7.24$ ,  $p = .01$ ,  $\eta_p^2 = .10$ , indicated that women recalled more emotional information than men. There was no interaction between gender and type of focus,  $F < 1.00$ . A planned comparison revealed that women recalled more emotional information than men in the undirected focus condition,



**Figure 1.** Mean emotional meaning units recalled as a function of gender and focus condition.



**Figure 2.** Mean neutral meaning units recalled as a function of gender and focus condition.

$F(1, 19) = 6.06, MSE = 7.14, p = .02, \eta_p^2 = .24$ . Women's greater recollection of emotional information than men when their focus was undirected suggests that women may naturally focus on emotional information more than do men.

**Recall of neutral information.** A  $2 \times 3$  ANOVA with gender and type of focus (see Figure 2) showed a main effect of focus,  $F(2, 57) = 17.22, MSE = 8.24, p < .01, \eta_p^2 = .38$ . Subsequent comparisons revealed that more neutral information was recalled in the neutral focus condition than in either the emotional focus,  $F(1, 40) = 26.14, MSE = 10.04, p < .01, \eta_p^2 = .39$ , or the undirected focus conditions,  $F(1, 40) = 17.55, MSE = 10.04, p < .01, \eta_p^2 = .31$ , but no difference between the emotional and undirected focus conditions,  $F < 1.00$ . There was no main effect of gender,  $F(1, 57) = 2.15, p = .15$ . However, there was a significant interaction between gender and type of focus,  $F(2, 57) = 5.33, p = .01, \eta_p^2 = .16$ . As can be seen in Figure 2, the interaction arose because of women's significantly greater recall of neutral information than men in the neutral focus condition,  $F(1, 19) = 13.75, MSE = 6.96, p < .01, \eta_p^2 = .42$ , whereas there was no difference between men and women in the undirected and emotional focus conditions,  $ps > .05$ . This result indicates that when neutral information was emphasised, women remembered more neutral information than men even when it was intermixed with emotional information.

### Old–new recognition

Corrected recognition scores (proportion of hits minus the proportion of false alarms) were calculated for both emotional and neutral statements (see Table 3). The pattern of results was

identical when using  $d$  prime, therefore only the corrected recognition scores will be reported here.

**Recognition of emotional statements.**<sup>1</sup> A  $2 \times 3$  ANOVA with gender and type of focus revealed no main effect of gender,  $F(1, 57) = 0.02, MSE = 0.02, p = .90$ , no main effect of type of focus,  $F < 1.00$ , and no interaction between gender and focus,  $F < 1.00$ .

**Recognition of neutral statements.** A  $2 \times 3$  ANOVA with gender and type of focus revealed no main effects of gender,  $F(1, 57) = 0.14, MSE = 0.02, p = .71$ , type of focus,  $F < 1.00$ , and no interaction between gender and focus,  $F(2, 57) = 1.24, p = .30$ .

### Vocabulary subset of the WAIS-R

A  $2 \times 3$  ANOVA with gender and type of focus on the mean scores on the Vocabulary subset of the WAIS-R revealed no main effect of gender,  $F(1, 57) = 0.94, MSE = 12.14, p = .34$ , no main effect of type of focus,  $F(2, 57) = 1.17, p = .32$  and no interaction between gender and focus,  $F < 1.00$ .

### Emotional sensitivity

Similar to the large sample that took the EISM, for participants in the main experiment, women reported higher levels of emotional sensitivity,  $M(SD) = 39.03(6.60)$ , than men,  $M(SD) = 35.80(5.37)$ ,  $F(1, 61) = 4.48, MSE = 36.59, p = .04, \eta_p^2 = .07$ . Across all focus conditions, level of emotional sensitivity and recall of emotional information were positively correlated,  $r = .28, p = .03, R^2 = .08$ . Since a central interest in the present investigation is the relationship between emotional sensitivity and memory for emotional information when focus is not directed, the correlation between emotional sensitivity and emotional recall was examined for men and women in the undirected focus condition. Emotional sensitivity was positively correlated with

<sup>1</sup> For both emotional and neutral statements there was a main effect of script indicating that the Script 2 recognition test was harder than the Script 1 test. However, there were no significant interactions between script and gender, or script and type of focus, and there was no significant three-way interaction. Thus, the recognition data were collapsed across scripts.



**TABLE 3**  
Corrected recognition

Statement	Women			Men		
	Focus			Focus		
	Undirected	Neutral	Emotional	Undirected	Neutral	Emotional
Emotional						
<i>M</i>	0.58	0.56	0.56	0.57	0.59	0.53
<i>SD</i>	0.07	0.14	0.09	0.14	0.16	0.16
Neutral						
<i>M</i>	0.67	0.62	0.60	0.60	0.68	0.58
<i>SD</i>	0.08	0.09	0.12	0.14	0.18	0.19

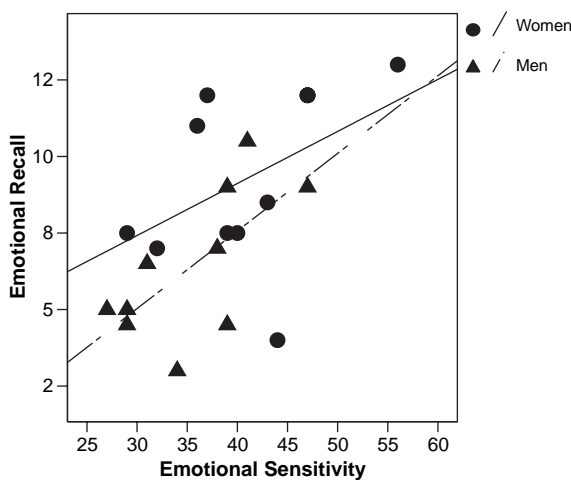
Mean proportion corrected recognition (with standard deviations) as a function of gender, focus condition, and statement type.

recall of emotional information in the undirected focus condition,  $r = .62, p < .01, R^2 = .38$  (see Figure 3). The correlation of emotional sensitivity and emotional recall was positive for men ( $n = 10$ ),  $r = .67, p = .055, R^2 = .45$ , and for women ( $n = 11$ ),  $r = .45, p = .16$ , in the undirected focus condition. A test for the significance of a difference between two independent correlations showed that the correlations for men and women were not significantly different,  $z = 0.63, p = .53$ .

In order to determine whether emotional sensitivity mediated the gender difference in emotional recall when focus was undirected, gender, emotional sensitivity, and emotional recall were entered into a multiple regression mediation model. A mediation analysis was performed according to the steps specified by Baron and Kenny (1986). First, gender was entered into the

regression equation as the predictor variable and emotional recall was entered as the criterion variable. Gender alone was a significant predictor of emotional recall,  $Std\ b = -.49, Adj.\ R^2 = .20, p = .02$ . Second, emotional sensitivity was entered into the regression equation as the predictor variable and emotional recall was entered as the criterion variable. Emotional sensitivity alone was a significant predictor of emotional recall,  $Std\ b = .62, Adj.\ R^2 = .38, p < .01$ . Third, gender and emotional sensitivity were entered into the regression equation as predictor variables and emotional recall was entered as the criterion variable. Emotional sensitivity was a significant predictor of emotional recall,  $Std\ b = .51, Adj.\ R^2 = .40, p = .01$ , and, critically, gender was reduced to a non-significant predictor,  $Std\ b = -.30, p = .13$ . According to the criteria for mediation by Baron and Kenny (1986), emotional sensitivity significantly mediated the gender difference in emotional recall by reducing the relationship between gender and emotional recall to non-significance.

There was no significant relationship between emotional sensitivity and recall of neutral information across all three focus conditions,  $r = .03, p = .79$ , and in the undirected focus condition,  $r = .03, p = .89$ . In addition, there was no significant relationship between emotional sensitivity and recognition memory (emotional statements,  $p > .05$ , neutral statements,  $p > .05$ ).



**Figure 3.** Mean emotional meaning units recalled and emotional sensitivity scores for men and women in the undirected focus condition.

## DISCUSSION

As predicted, women recalled more emotional information than men from a narrative script containing both emotional and neutral informa-

tion. Women's increased recall of emotional information was not associated with reduced recall of neutral information, indicating that there was no trade-off between emotional and neutral information. In fact, when the importance of neutral information was emphasised, women recalled more neutral information than men. Furthermore, in giving advice, women included more emotional meaning units from the script and more emotional evaluations when their focus was undirected, suggesting that women may encode and/or reflectively process emotion in a more elaborated way that facilitates later recall of emotional information. Finally, emotional sensitivity significantly mediated the gender difference in emotional recall, indicating that emotional sensitivity is a stronger predictor of memory for emotional information than is gender.

The finding that women recalled more emotional information than men in all three focus conditions is consistent with research showing both that from an early age girls include more emotional information in their talk about past autobiographical experiences (e.g., Fivush, 1998) and that women include more emotional information in their reports of personal experiences later in life (e.g., Davis, 1999). The current finding extends past research by showing that this gender difference occurs even when the content of the to-be-remembered information is controlled and the events are not specifically self-relevant.

Interestingly, when women were directed to focus on the neutral aspects of the script they remembered more neutral information than did men. This finding provides strong evidence that when neutral information is made salient, women's memory for neutral information will improve even when it is intermixed with emotional information, which they may find more naturally salient. This finding extends previous research showing a memory advantage for women on non-emotional stimuli (when not intermixed with emotional information), and supports the hypothesis that women may be more adept than men at forming detailed representations of salient information.

One explanation for women's memory advantage, proposed by Davis (1999), is that women may be better at organising information from their experiences into retrievable detailed representations because of practice. Support for this hypothesis comes from studies of autobiographical memory in early childhood and in adulthood. Research on early parent-child reminiscing has

shown that girls begin to report more detailed elaborative accounts of their past experiences by 70 months of age, presumably as a result of parents using a more elaborative reminiscing style when discussing past events with their daughters, as opposed to their sons (Fivush, 1998). The differences that emerge in early childhood between boys and girls' memories are the same differences found in men's and women's autobiographical memories, namely that women's memories are longer, more detailed, and contain more emotional information. This pattern of results suggests that women may be taught to form detailed representations of their experiences at an earlier age, and continue to practise this skill throughout their lives.

The results of the current study support the hypothesis that women have an advantage in forming detailed representations of past events by showing that women have greater recollection of either emotional or neutral information depending on the type of information made salient by the task demands. In addition, analysis of the advice statements indicated that women included more detail (meaning units) and more evaluations than men about the emotional information from the script. Women also included more neutral evaluations in their advice statements in the neutral focus condition. These findings suggest that women reflected on the relevant information in more detail and in a more evaluative manner than men. As the pattern of recall results suggests, thinking about the script information in a more detailed and evaluative manner may have assisted women in building rich retrievable representations of the information.

Despite the differences observed in recall, no gender differences were found in recognition memory for either emotional or neutral information. The lack of gender differences in recognition is somewhat surprising given that women are typically found to have better recognition, at least of neutral stimuli, than do men (e.g., Herlitz et al., 1997). It may be that the instructions in this study, to read with the intention of generating advice, and the subsequent act of generating advice, encouraged more reflection than may have occurred without this manipulation. If men are less likely than women to spontaneously engage in elaborated reflection during encoding or post-encoding, then this manipulation may have boosted men's recognition memory and potentially recollection. But although men recognised similar amounts of perceived emotional and

neutral information as women, the gender differences in recall suggest that they had weaker retrieval cues with which to recall information. The gender differences in recall may reflect gender-related differences in the reflective organisational processes that are more important for recall than recognition (Alba, Alexander, Hasher, & Caniglia, 1981; Johnson & Hirst, 1993; Kintsch, 1968). If, compared to men, women more often or more efficiently noted, discovered, and/or rehearsed connections between the details of the script (while reading the script and/or generating advice), then women may have formed more associative connections that could serve as stronger retrieval cues when later trying to recall the script.

Men's lower recall of emotional information in all of the focus conditions may reflect, in part, men's attitudes towards the emotional information. The emotional information in the present study consisted of interpersonal problems in the context of a romantic relationship. It is possible that men perceived this type of emotional information as un-masculine or outside their specific areas of interest or knowledge. Perhaps because of differences in attitudes towards this type of emotional information, men may have fewer or less-developed conceptual schemas than women that could help them organise (and subsequently remember) such information.

Determining how gender differences in interest, familiarity, and/or expertise with different kinds of emotional information affect recall of emotional information is a direction for future research. Using stimuli with emotional information that both genders may have more equal familiarity/expertise with (e.g., medical emergencies) or that men may have greater familiarity/expertise with (e.g., sports team triumphs/failures) may reduce or reverse the gender difference observed in the present study.

An individual's level of emotional sensitivity was a stronger predictor of their emotional recall than their gender, suggesting that memory for emotional information is not determined by gender alone, but instead reflects a person's sensitivity to emotional information in their environment. Thus, gender differences in memory for emotional information observed in the present study most likely reflect that women are, on average, more sensitive than men to the emotional aspects of their environment and experiences, at least their interpersonal experiences. A potential area for future research is to examine

whether individual differences in emotional sensitivity are related to the types of interactions parents have with their children. For instance, children (male or female) whose parents are more elaborative about emotional aspects of past events when reminiscing with them may have greater emotional sensitivity than children whose parents are less elaborative.

Another potential avenue for future research is examining whether gender and individual differences in emotional sensitivity and emotional recall are related to maladaptive responses to negative life events (e.g., rumination) and the development of mood disorders (e.g., depression: Nolen-Hoeksema, 2001). Previous research has shown that focusing on one's emotions after a negative event can prolong and increase the intensity of a bad mood (Butler & Nolen-Hoeksema, 1994). While focusing on emotional information does not always lead to passive unproductive thought (i.e., rumination), habitually focusing on emotional aspects of experiences may increase the risk of ruminating, especially following a negative or stressful experience. Women are more likely than men to engage in ruminative thought following a negative event or negative mood induction (Butler & Nolen-Hoeksema, 1994; Nolen-Hoeksema, 2001). Women may be more susceptible to rumination as a consequence of their greater tendency to reflect on and remember emotional information. Furthermore, emotional sensitivity may be a potential mediator of the gender difference in rumination and possibly of the development of mood disorders, such as depression.

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## APPENDIX

### Emotional and interpersonal sensitivity measure

The following are 12 statements that indicate an attitude or a behaviour that may or may not be characteristic or descriptive of you. Read each statement carefully. Then, using the scale shown below, indicate the response that most accurately reflects your feeling about the statement. Keep in mind there are no right or wrong answers. Choose only one response for each statement.

Not at all like me	A little like me	Like me	Very much like me	Exactly like me	
1	2	3	4	5	
* 1. At parties, I can immediately tell when someone is interested in me.	1	2	3	4	5
** 2. I'm generally concerned about the impression I'm making on others.	1	2	3	4	5
3. I can always feel when there is tension in a room.	1	2	3	4	5
* 4. I can easily tell what a person's character is by watching his or her interactions with others.	1	2	3	4	5
* 5. I sometimes cry at sad movies.	1	2	3	4	5
* 6. I always seem to know what people's true feelings are no matter how hard they try to conceal them.	1	2	3	4	5
7. I can always tell when someone is upset.	1	2	3	4	5
** 8. There are certain situations in which I find myself worrying about whether I am doing or saying the right things.	1	2	3	4	5
9. If someone is angry with me it makes me very uncomfortable.	1	2	3	4	5
10. I always want to know why someone is upset or in a bad mood.	1	2	3	4	5
** 11. I am generally influenced by the moods of those around me.	1	2	3	4	5
** 12. I can be strongly affected by someone smiling or frowning at me.	1	2	3	4	5

\* Statements from the Emotional Sensitivity Subscale of the SSI (Riggio, 1986)

\*\* Statements from the Social Sensitivity Subscale of the SSI (Riggio, 1986)