

# Comparing two perceived characteristics of autobiographical memory: Memory detail and accessibility

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Four samples of participants recalled autobiographical memories. While some evidence emerged from regression analyses suggesting that judgements of the amount of detail contained in each memory and judgements of the ease with which events could be recalled were partially independent, the analyses generally showed that these judgements were similarly predicted by various event characteristics (age, typicality, self-importance, emotional intensity at event occurrence, rehearsal types). Co-occurrence frequency data yielded similar conclusions, showing that while ease ratings and detail ratings occasionally diverged, they were more often consistent with each other. Finally, the data also suggested that events that prompted emotional ambivalence were not judged to be more easily recalled, or to contain more detail, than non-ambivalent events.

Studies exploring autobiographical memory (Conway & Bekerian, 1987; Linton, 1986; Skowronski, Betz, Thompson, & Shannon, 1991) have sometimes used participants' self-reported ratings to assess how well autobiographical events are recalled. Despite the biases and errors that can accompany such self-reports, it was expected that if there were some core of truth in the memory ratings, those ratings would yield sensible results that would be similar to results obtained using traditional memory measures (e.g., free recall, cued recall, recognition). Indeed, such sensible findings have emerged from a number of studies (for an overview, see Thompson, Skowronski,

Larsen, & Betz, 1996; for additional information on the predictive validity of such judgements, see Leonesio & Nelson, 1990).

However, the memory ratings that were used in prior research often seemed to implicitly assume that those ratings tapped into a unidimensional construct: People's perceptions of the amount of detail contained in the memory. This assumption is being challenged by recent theory and research suggesting that memory ratings might reflect multiple mental constructs.

For example, Brewer (1986, 1996) argued that there are at least two different types of autobiographical memories. One of these is a

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*recollective memory*. When recalling these kinds of memories, an individual might have access to the phenomenological details of the event: its sights, sounds, and smells. The individual might also be prompted to feel emotions prompted by the event, as well as bodily sensations experienced while the event was occurring. On the other hand, an individual might recall *autobiographical facts*. These are events in a person's life that are recalled, but without accompanying sensory or experiential details. This distinction has implications for self-reported memory: Research examining "remember-know" judgements (Eldridge, Sarfatti, & Knowlton, 2002) suggests that events can be perceived to be "well remembered" either because the memory has a high level of detail (i.e., recollective memory component), or because the description of the event is well remembered (i.e., autobiographical fact component). Conway, Singer, and Tagini (2004) recently made a similar argument when referring to a tension between adaptive correspondence (i.e., the ability of a memory to retain its perceptual "truth") and self-coherence (i.e., the ability of a memory to fit into a global sense of self).

Johnson and her colleagues expanded on Brewer's idea by developing a self-reported memory questionnaire that assessed people's recall for a number of different qualities of memory, including memory clarity, the sensory content of memory, and memory for the context in which an event occurred (Johnson, Foley, Suengas, & Raye, 1988; for more recent research using this questionnaire, see Schaefer & Philippot, 2005). Rubin, Schrauf, and Greenberg (2003) argued that these different aspects of autobiographical memory might be differentially related to other memory-relevant variables. Accordingly, they found that some memory self-report measures (e.g., measures of spatial imagery) were more related to measures of memory that assess belief (e.g., the belief that the event really occurred), while other self-report measures (e.g., measures of visual imagery) were more related to measures of recollection (e.g., reliving the original event).

While the results obtained so far have been enlightening, Rubin et al. (2003) encourage additional empirical research. Indeed, when discussing the implications of their research (p. 898) they suggest that:

What is really needed for autobiographical memory, and in the laboratory measures of recollection, is the formulation of many different variants of the theoretical question of interest followed by empirical testing of them. We have only shown the necessity for such work, not resolved questions of how the various measures of the same underlying construct relate and which offer the purest measure of the theoretical constructs of interest.

The research reported in the present paper takes a step towards meeting this need. This research attempts to compare the patterns of data obtained from two different self-report memory items: judgements of *how much detail* is contained in the memory and judgements of the *accessibility* of a memory (the perceived ease with which the event is recalled).

It is expected that to make a judgement of memory detail, participants retrieve the memory, assess the content of the event retrieved, and make a judgement about whether the overall amount of detail contained in the event memory is large or small. While this judgement glosses over different detail types (e.g., visual versus spatial) that might be differentially predicted by other variables, it does have the advantage of allowing a comparison to results of prior research. As noted earlier, that prior research often used a general memory question (e.g., Rate how well you remember the event), but assumed that participants' responses reflected the amount of detail contained in the event. If that assumption is incorrect, then variables that predicted memory responses in earlier experiments may not predict memory responses to the more specific question about memory detail used in the studies reported in the present article. With respect to responses to a memory detail question, then, the results of the present study represent a potential conceptual replication of studies described in Thompson et al. (1996).

The present article also reports results comparing judgements of memory detail to judgements of a memory's accessibility, or the perceived ease with which the event is retrieved. The attribute of perceived retrieval ease was selected as a target of exploration for two reasons. First, perceived ease is an attribute of memory that can be independent of content, at least in theory. Memories that contain much detail can sometimes easily come to mind, but can also come to mind only with great difficulty. So-called

“repressed” traumatic memories might be an example of a type of memory that is hard to recall, but that contains much detail when recalled (note that we do not endorse the concept of repression, but use this only as an example of a type of memory that might have these properties; see Kihlstrom, 2004; Loftus, 1993; McNally, 2003). Alternatively, events can seem to be easily remembered but devoid of detail when recalled. This would seem to fit the meaning of a “know” judgement in the remember–know task (e.g., I might know that I graduated from college, but recall little of the ceremony). Of course, a memory might be both difficult to remember and devoid of detail. For example, one might be unable to recall having a specific conversation with a friend, and might not be able to access much event detail even when reminded of the event.

A second reason to choose accessibility as a property of perceived memory is that evidence suggests people do have a sense of when memories are easy to remember or when they are difficult to remember. For example, Schwarz and his colleagues suggest that such accessibility perceptions affect later memory-relevant judgements (e.g., Schwarz, 1998; Schwarz, Bless, Strack, Klump, Rittenauer-Schatka, & Simons, 1991; Schwarz, Bless, Wanke, & Winkielman, 2003; Winkielman & Schwarz, 2001). In addition, perceptions of accessibility have also been thought to affect temporal judgements, with events that are difficult to recall being judged as older than events that are easy to recall (Bradburn, Rips, & Shevell, 1987; Brown, Rips, & Shevell, 1985).

Obviously, the emergence of such effects depends on the fact that people have differential “accessibility experiences”—that there can be differences in the perceived ease of retrieval of events. Some goals of the present research are: (a) to explicitly assess these “accessibility experiences” in autobiographical memory; (b) to determine whether they are, indeed, different from the experience of recalling event content; (c) to examine those variables that are predictive of such accessibility experiences; and (d) to determine whether these variables similarly, or differently, predict perceptions of a memory’s content and perceptions of a memory’s ease of retrieval.

With regard to the last of these goals, one set of predictors that we used in the research described in the present article are generally the same as those that we (and others) have used in prior research. These included an event’s: (a) age,

(b) perceived importance to the self, and (c) perceived typicality, and (d) the perceived extent to which the event had been rehearsed. Data from Thompson et al. (1996) and Betz and Skowronski (1997) lead us to expect that all of these variables will predict memory, independently of the predictive effects of the other variables in the list. Whether such predictive value will be equivalent for perceived detail and perceived accessibility is an open question.

In addition, the data that we report in the present article assesses the emotional impact of an event, but does so in a more complex manner than has been done in the past (e.g., Betz & Skowronski, 1997; Thompson et al., 1996). Influenced by work exploring the construct of ambivalence in the attitudes literature (Breckler, 1994; Kaplan, 1972), we did not simply obtain one overall measure of an event’s pleasantness. Instead, for each event we obtained separate measures of amount of positive emotion and the amount of negative emotion produced by the event, both at its occurrence and at its recall.

One possibility that occurred to us was that some events produce mixed emotions, characterised by high amounts of both positive affect and negative affect. We wondered if these mixed emotions might cause an event to be more extensively processed than events in which the associated emotions were extreme, but relatively pure. Thus, we were especially interested in: (a) whether evidence for such mixed emotion events would characterise some of the autobiographical events that people recalled, (b) whether there would be evidence that perceived memory was better for events that produced mixed emotions than for events in which the emotions were relatively pure, and (c) whether such effects might be differentially related to judgements of a memory’s level of detail and judgements of its retrieval ease.

Finally, in the present investigation we also explored whether different rehearsal types are related to autobiographical memory in general or whether they differentially affect judgements of an event’s level of detail and judgements of its retrieval ease. This exploration was prompted by Skowronski and Walker (2004), who suggested that different rehearsal types might differentially alter long-term autobiographical memory for events. For example, events that are rehearsed solely to ensure memory for the events might be rehearsed in a less elaborated way than when events are rehearsed in the process of describing

those events to others, or are rehearsed for the purpose of better understanding the events. These more elaboration-intensive rehearsal types might be more effective in promoting memory for autobiographical events. Accordingly, in the present paper we were especially interested in: (a) whether there would be evidence that the impact of some rehearsal types on memory was independent of the effect of other rehearsal types, (b) whether some rehearsal types consistently seemed to be related to better judged memory, and (c) whether the different rehearsal types were differentially related to judgements of a memory's level of detail and judgements of its retrieval ease.

## METHOD

### The data sets

This article reports the results obtained from four data sets. Participants who contributed data to these sets were asked to recall autobiographical events from many specific time-periods in their lives, to provide descriptions of those events, and to rate several characteristics of those events. The data sets were collected from different groups of participants. The data sets differed largely in the number of events that were reported and in the time-periods that were used to structure recall of the events. For convenience, these data sets are labelled *110a*, *110b*, *50*, and *42*—these labels refer to the number of items that each participant was asked to recall. Because of the similarities in the methods used across four data sets collected and in the results obtained, in this article we opted to use a common Method section to describe how the data were obtained and a common Results section to describe the major findings.

### Participants

Each sample comprised college students who received course credit for completion of the study. The *110a* data set contains data from 30 females and 9 males; the *110b* data set contains data from 47 females and 19 males; the *50* data set contains data from 36 females and 10 males; and the *42* data set contains data from 30 females and 9 males. Although participant ages ranged from 18 to 45, most were between 20 and 23 years of age.

### Procedure

*Event collection:* Participants described autobiographical events by writing a description of each in a booklet that we gave to them. They were asked to provide a range of events, but were cautioned to avoid including items that might be too sensitive for public consumption. The booklets provided to participants in different samples were similar in that they asked participants to report autobiographical events from specific periods of their lives. The samples differed in the time-periods used and in the total number of events requested.

The *110a* and *110b* data sets requested five events that were 1 week old or less; five events that were between 1 and 2 weeks old; five events that were between 2 and 4 weeks old; five events that were between 1 and 4 months old; five events that were between 4 and 8 months old; five events that were between 8 months and 1 year old; 20 events that occurred in the time between the person's 16th birthday and 1 year ago; 20 events that occurred between the person's 13th and 16th birthdays; 20 events that occurred between the person's 10th and 13th birthdays; and 20 events that occurred before the person's 10th birthday. The *50* data set used the same time-periods but requested only five events from each time-period.

The *42* data set requested two events from 21 time-periods. Using the academic schedule as a structuring device, participants were asked to report two events per year from each of four quarters: the summer before the start of an academic term, the autumn of an academic term, the winter of the academic term, and the spring of the academic term. The starting point was the summer before the start of high school; the ending point was the summer between a person's freshman and sophomore years of college. Although the academic year was the structuring device, participants were given the same instructions as participants in the other samples: they could report any events that fell within the time-period.

Participants took their booklet home and completed it at their convenience, but with a submission deadline. Participants provided demographic information on the first page of the booklet, including their current age and gender. Each subsequent page of the booklet specified a time-period, requested that participants provide, in a few sentences, a written account of an

autobiographical memory that occurred in the time-period, and requested the participant's age at the time the event occurred.

Following each autobiographical event description, participants provided a number of ratings of the event. All ratings were made on 7-point scales.

*Event ratings:* Two ratings assessed different perceptions of each memory. Participants rated the ease with which each event was retrieved (1 = *Very Much Effort*, 4 = *Moderate Effort*, 7 = *Hardly Any Effort at All*). They also rated the amount of detail remembered about each event (1 = *Almost No Detail*, 4 = *Moderate Detail*, 7 = *Very Rich and Detailed*).

Each participant provided up to eight ratings of the characteristics each event. Using a unipolar scale (1 = *None*, 4 = *Moderate*, 7 = *Very Much*), participants rated the perceived amount of positive affect produced by the event when it occurred. A similar scale was used to rate the amount of negative affect produced at the event's occurrence, the amount of positive affect that was produced when the event was retrieved, and the amount of negative affect produced when the event was retrieved. However, these latter two ratings were not made for the 110b data set.<sup>1</sup>

Participants rated the event's typicality on a bipolar scale (1 = *Very Atypical or Unusual*, 4 = *Neither Typical nor Atypical*, 7 = *Very Typical or Usual*). The extent to which each event was important to participants was reported on a unipolar scale (1 = *Not Important*, 4 = *Moderate*, 7 = *Very Important*). The extent to which an event was self-defining was also reported on a unipolar scale (1 = *Not At All*, 4 = *Moderately*, 7 = *Very Much*). Preliminary analyses suggested that these two self-relevant ratings were highly correlated, so they were averaged for each event. Finally, the extent to which each event was rehearsed in the time since the event occurred was rated on a unipolar scale (1 = *Very Infrequently*, 4 = *Moderately Often*, 7 = *Very Frequently*).

<sup>1</sup>The analyses that we report focus on the ratings of emotion at occurrence and do not include the emotions experienced at retrieval. This decision was made largely because prior research has focused on the former and not the latter. However, analyses that include the two ratings of emotion at recall were performed. The results of these analyses did not differ substantially from the results of analyses including the two ratings of emotion at event occurrence. To avoid redundancy, we do not report results of analyses including those variables.

*Rehearsal type ratings:* A final set of eight ratings asked participants to be specific about the kinds of rehearsal in which they engaged when they rehearsed each event. The rehearsal types were: (a) rehearse for no apparent reason, (b) rehearse when reminded by environmental cues, (c) rehearse in response to one's own good or bad mood, (d) rehearse to reflect on the meaning of an event or to better understand it, (e) rehearse the event so it is not forgotten, (f) rehearse the event to make myself think or feel about myself in a certain way, (g) rehearse in the process of describing the event to others so that they know about the event, and (h) rehearse in the process of describing the event to others so they understand me better. All ratings were made using the same unipolar scale: (1 = *Very Infrequently*, 4 = *Moderately Often*, 7 = *Very Frequently*).

## RESULTS

### Perceived detail and perceived retrieval ease: One construct or two?

*Descriptive analyses:* We examined the results of several descriptive analyses to gain insight into the question of whether the perceived level of detail contained in a memory and the perceived ease of retrieval of a memory were simply two indicators of the same underlying construct (which might be labelled perceived memory strength) or whether they assessed separable constructs. One useful indicator is the simple correlation between the detail and ease rating for each event. This correlation was reasonably high and was significant in each data set:  $r_{110a}(4608) = .74, p < .0001$ ;  $r_{110b}(7237) = .68, p < .0001$ ;  $r_{50}(4585) = .69, p < .0001$ ;  $r_{42}(1625) = .79, p < .0001$ .

These correlations might be inflated because multiple events were provided by the same person. We attempted to correct the correlations for this state of affairs by running pooled within-participant regression analyses in which one of the memory variables is used to predict the other (see Cohen & Cohen, 1984). In these analyses participants are treated as a categorical variable with levels equal to the number of participants; this variable is entered into the regression model. The relation between judgement types can then be assessed after adjusting for the response tendency of each participant and can be expressed as a change in  $R^2$  (i.e.,  $\Delta R^2$ ).

Even after adjusting for each participant’s response tendency, one memory variable evinced a strong ability to predict the other: data set 110a  $F(1, 4606) = 2810.34, p < .0001, \Delta R^2 = .54$ ; data set 110b  $F(1, 7237) = 3208.76, p < .0001, \Delta R^2 = .46$ ; data set 50  $F(1, 4585) = 2123.14, p < .0001, \Delta R^2 = .48$ ; data set 42  $F(1, 1625) = 2617.79, p < .0001, \Delta R^2 = .61$ .

An additional indicator of the strength of the relationship between the two memory variables in each of the data sets comes from squaring the raw correlations between the memory variables and comparing the magnitude of those correlations to the  $\Delta R^2$  values obtained after accounting for individual response tendencies. The results of those comparisons show that the impact of accounting for individual response tendencies had minimal effect on the strength of the relation between the two memory variables in each data set (e.g.,  $r^2_{110a} = .55; \Delta R^2_{110a} = .54$ ). These strong relations suggest that the same underlying construct influenced responses to both the ease judgements and the detail judgements.

Nonetheless, the data also suggest that perceived retrieval ease and perceived level of detail are not perfectly correspondent. For example, participants sometimes reported that the experience of high ease of recall is accompanied by a relative absence of detail in the memory (this accounted for approximately 3.1% of the retrieved memories; see Table 1 for the data from each individual data set). Participants also occasionally reported that an event that was difficult to retrieve was also perceived to be highly detailed (this accounted for approximately 1.0% of the retrieved memories). These rating patterns suggest that there is, at least for some memories, a degree of independence between

ratings of the ease with which a memory can be retrieved and ratings of the amount of detail contained in the memory.

*Inferential analyses: Event-descriptive variables:* Insight into whether the ease and detail ratings reflect different constructs can also be gained by examining whether they are similarly predicted by other variables, such as the ratings that we collected that describe various attributes of each event. To accomplish this task we conducted a set of within-participant regression analyses that were focused on interactions between several measures of attribute characteristics (i.e., event age, event typicality, positive emotion experienced at event occurrence, negative emotion experienced at event occurrence, the overall frequency with which an event was rehearsed, and average event self-importance) and the type of memory rating provided (ease or detail).<sup>2</sup> In all analyses participants were treated as a categorical variable with levels equal to the number of participants; this variable is entered into the regression model to control for within-participant tendencies in responding.

In fact, to simplify presentation we treated all predictors in the regression analyses as categorical variables rather than as continuous variables. This practice allows us to present the data in terms of least squares means calculated for each level of each variable. It also assigns more degrees of freedom to each effect term and removes them from the error term. However, given the large number of observations and the correspondingly large number of degrees of freedom in the error term, the loss of degrees of freedom from the error term does not substantially affect analytic power and is easily justifiable by the descriptive benefits that accrue.

The levels assigned to responses for four of the variables (*event typicality, positive emotion experienced at event occurrence, negative emotion*

**TABLE 1**

The frequency with which participants provided specific rating combinations of the extent to which they experienced detail in event recall and recall ease

Ease	Detail						
	1	2	3	4	5	6	7
1	261	55	38	31	12	13	38
2	219	254	165	72	20	26	10
3	163	299	371	303	116	58	24
4	138	277	595	971	443	183	75
5	60	177	384	864	1017	509	144
6	45	75	180	493	936	1439	479
7	34	62	92	311	446	1059	4029

Counts are summed across all four data sets.

<sup>2</sup> A number of different analyses could be used to explore this point. One would be to output the residuals after using one of the memory type variables to predict the other in a regression analysis, then to predict the residuals using the event-descriptive variables. A second method would be to include one of the memory type variables in the set of variables used to predict the other memory type. In both of these analyses, the ability of an event-descriptive characteristic to significantly predict the memory type variable used as the dependent measure would suggest that the two memory type variables have some degree of independence. We conducted such analyses, but do not discuss them because their results substantially duplicate the results obtained from the interaction analyses that we report.

experienced at event occurrence, the overall frequency with which an event was rehearsed) were straightforward: Assignment was based directly on participants' responses (e.g., a response of 1 was assigned to category 1, a response of 2 to category 2, etc.). We averaged the two self-ratings (i.e., self-relevance and self-importance) and used that average to assign the self-rating to one of seven categories. The classification scheme simply assigned a value to the *average self-importance* variable that was derived from the integer value of the average (e.g., averages of 1 and 1.5 were assigned a value of 1; averages of 2 and 2.5 were assigned a value of 2, etc.).

The coding for the remaining variable, *event age*, was more complex. We used the data provided by each participant to calculate an approximate age for each event. Then, based on that calculation, the event was assigned to one of eight age categories. These categories are identical for the 110a, 110b, and 50 data sets, and are: (a) up to 1 week old, (b) about 2 weeks old, (c) about 1 month old, (d) about 4 months old, (e) about 8 months old, (f) between 1 year and 4 years old, (g) between 5 and 10 years old, and (h) between 11 and 20 years old. Because the 42 data set used different time-periods in the collection of memories, we used a different set of eight time categories for the analyses performed on that data set. Those categories are: (a) less than 1 year old, (b) about 1 year old, (c) about 2 years old, (d) about 3 years old, (e) about 4 years old, (f) about 5 years old, (g) between 6 and 9 years old, and (h) 10 or more years old.

One set of regression analyses that we conducted simultaneously assessed the interactions between the memory type variable (ease versus detail) and each of the other event-descriptive variables. The effects reported control for the effects of all other two-way interactions among the descriptive variables, as well as for their main effects. Across the four data sets, the analyses evaluated results for 24 two-way interactions involving the memory type variable. Six of these were each simultaneously evaluated in each of four regression analyses, one analysis for each data set. Of the 24 interactions with the memory type variable, 8 were statistically reliable ( $p < .05$ ) and 4 more approached significance ( $p < .10$ ). Significant interactions emerged twice for the rehearsal frequency variable and at least once for all of the variables except average self-importance. However, as a rule, each of the

interactions accounted for only a modest amount of variance (largest  $\Delta R^2 = .002$ ).

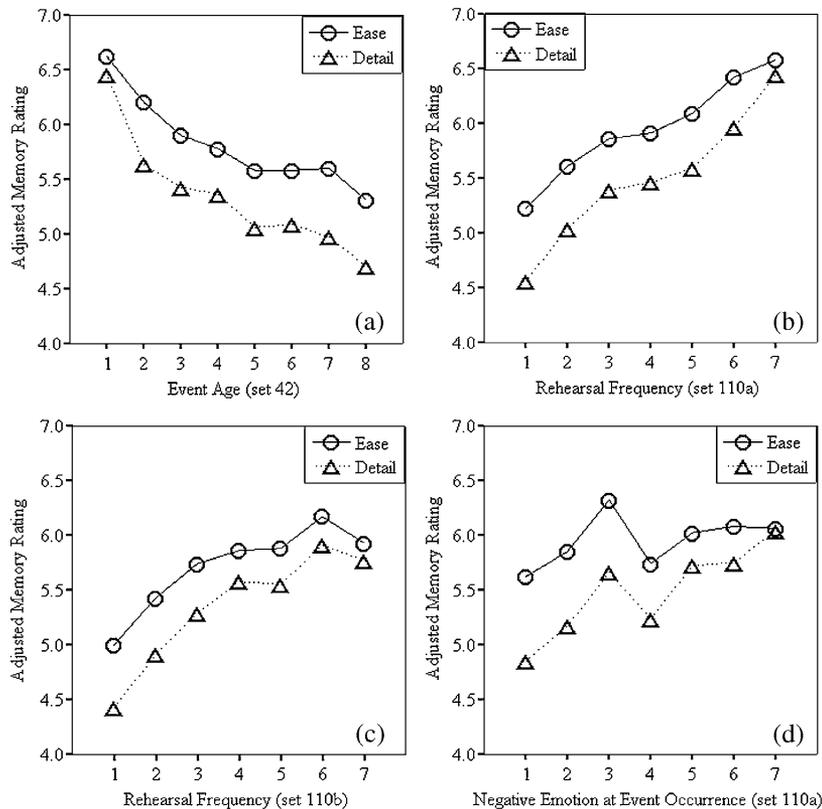
We discuss these interactions collectively because, although they appeared across different variables, when they appeared they generally evinced a similar pattern: Ease ratings tended to be higher than detail ratings, but the difference between them tended to be smaller when overall memory was high than when it was low. Four examples of this are presented in Figure 1a–1d. Figure 1a depicts the Memory Type  $\times$  Event Age interaction,  $F(7, 2606) = 3.84, p < .0005$ , in the 42 data set; Figure 1b depicts the Memory Type  $\times$  Rehearsal Frequency interaction,  $F(6, 8492) = 2.86, p < .0001$ , in the 110a data set; Figure 1c depicts the Memory Type  $\times$  Rehearsal Frequency interaction,  $F(6, 13718) = 4.72, p < .0001$ , in the 110b data set; and Figure 1d depicts the Memory Type  $\times$  Negative Emotion at Event Occurrence interaction,  $F(6, 8492) = 6.90, p < .0001$  in the 110a data set.<sup>3</sup>

The interactions between the ease and detail ratings are of potential interest because they reflect the idea that different constructs might underlie the ease and detail ratings. On the other hand, the main effects of the descriptive variables are also of interest because, to the extent that the ease ratings and detail ratings can be considered to be a common measure of perceived memory, they may reflect the extent to which these variables predict overall perceived memory for events.

To examine this overall memory idea, one set of analyses explored the extent to which event age (controlling for between-participant differences and memory type), and each of the other variables taken one at a time (controlling for event age, between-participant differences, and memory type), predicted the memory ratings. In these simple regression analyses, these descriptive variables always significantly predicted the memory ratings.

A more stringent test of the predictive effects of these variables comes from simultaneous regression analyses. Even in these simultaneous analyses, all of the variables significantly predicted memory in all the data sets, and they generally did so in sensible ways. Memory ratings were higher when positive emotion was

<sup>3</sup> We note that both the inferential results and the general pattern of means are mirrored by the results of simple regression analyses in which these interactions were unadjusted for any other variables in the model (except event age, where appropriate).



**Figure 1.** The Memory Type  $\times$  Event Age interaction in data set 42 (panel a); the Memory Type  $\times$  Rehearsal Frequency interaction in data set 110a (panel b); the Memory Type  $\times$  Rehearsal Frequency interaction in data set 110b (panel c); the Memory Type  $\times$  Negative Emotion at Event Occurrence interaction in data set 110a (panel d).

high—data set 110a  $F(6, 9099) = 56.48, p < .001, \Delta R^2 = .018$ ; data set 110b  $F(6, 14325) = 143.81, p < .001, \Delta R^2 = .034$ ; data set 50  $F(6, 4497) = 8.27, p < .001, \Delta R^2 = .006$ ; data set 42  $F(6, 3175) = 27.27, p < .001, \Delta R^2 = .021$ —when negative emotion was high—data set 110a  $F(6, 9099) = 48.01, p < .001, \Delta R^2 = .016$ ; data set 110b  $F(6, 14325) = 121.39, p < .001, \Delta R^2 = .029$ , data set 50  $F(6, 4497) = 7.43, p < .001, \Delta R^2 = .006$ , data set 42  $F(6, 3175) = 25.70, p < .001, \Delta R^2 = .020$ —when events were self-important—data set 110a  $F(6, 9099) = 6.61, p < .001, \Delta R^2 = .002$ ; data set 110b  $F(6, 14325) = 4.73, p < .001, \Delta R^2 = .001$ , data set 50  $F(6, 4497) = 23.20, p < .05, \Delta R^2 = .002$ , data set 42  $F(6, 3175) = 2.18, p < .05, \Delta R^2 = .002$ —when events were atypical—data set 110a  $F(6, 9099) = 4.06, p < .001, \Delta R^2 = .001$ ; data set 110b  $F(6, 14325) = 4.30, p < .001, \Delta R^2 = .001$ , data set 50  $F(6, 4497) = 4.49, p < .05, \Delta R^2 = .003$ , data set 42  $F(6, 3175) = 4.85, p < .001, \Delta R^2 = .004$ —and when events were frequently rehearsed—data set 110a  $F(6, 9099) = 113.21, p < .001, \Delta R^2 = .037$ ; data set 110b  $F(6, 14325) = 174.63, p < .001,$

$\Delta R^2 = .042$ , data set 50  $F(6, 4497) = 73.58, p < .001, \Delta R^2 = .055$ , data set 42  $F(6, 3175) = 85.81, p < .001, \Delta R^2 = .066$ . Because these effects emerged from simultaneous regression analyses, they reflect the independent relations between each predictor and judged event memory. These outcomes essentially replicate those reported by Betz and Skowronski (1997) and Thompson et al. (1996).

### Affective ambivalence: Is it present and does it affect perceived memory?

One of the other issues of interest in the present article concerned the extent to which people felt ambivalent about the events that occurred in their lives and the effect that such ambivalence had on perceived recall.

*Descriptive analyses:* Cross-tabulation frequencies tallied the number of times a given negative emotion rating was accompanied by a given positive emotion rating. These were constructed

to explore the frequency with which people felt ambivalent about their memories. The frequencies are presented for each data set in Table 2, and suggest that the affect that people reported when events happened to them was generally pure, mostly consisting of one valence or the other. However, as reflected by those events receiving simultaneous high positive affect ratings or high negative affect ratings, there were also some events that reflected emotional ambivalence (approximately 6.4% of the memories across the data sets). Hence, people do seem to feel emotionally ambivalent about some events in their lives.

*Do mixed feelings enhance perceived memory?:* We reasoned that mixed feelings might prompt additional event processing, which could add to an event's memorability. If this were the case, then our regression analyses should detect an interaction between the measure of the positive emotion experienced at event occurrence and the measure of the negative emotion experienced at event occurrence.<sup>4</sup> This interaction should show that perceived memory was even better than would be expected from the combined main effects of positive affect and negative affect on perceived memory.

Indeed, results from the full simultaneous regression analyses model (all two-way interactions and all main effects entered) yielded evidence of an interaction between positive affect at event occurrence and negative affect at event occurrence in all four data sets: data set 110a  $F(36, 8492) = 2.42, p < .0001, \Delta R^2 = .004$ ; data set 110b  $F(36, 13718) = 4.54, p < .0001, \Delta R^2 = .006$ ; data set 50  $F(36, 3905) = 2.60, p < .0001, \Delta R^2 = .010$ ; data set 42  $F(36, 2606) = 2.34, p < .0001, \Delta R^2 = .009$ . However, examination of the means for these interactions shows that the means are inconsistent with the pattern that was expected. These means suggest that high perceived memory ratings are related to perceptions of *either* strong positive affect at an event's occurrence *or* strong negative affect at an event's occurrence: When

<sup>4</sup> The attitudes literature (e.g., Hodson, Maio, & Esses, 2001) frequently uses ambivalence indices to assess the effects of ambivalence. For example, one such index is  $Ambivalence = (positive + negative)/2 - |positive - negative|$ . However, it seemed to us that such formulas potentially confound affect extremity (the numerator) with affect similarity (the denominator)—the ambivalence score can be heightened because of changes in either. We preferred the interaction approach that we used because it controls for the extremity of both negative and positive affect in evaluating ambivalence.

TABLE 2

The frequency with which participants provided specific rating combinations of the extent to which they experienced positive and negative emotions at event occurrence

Positive	Negative						
	1	2	3	4	5	6	7
1	108	53	64	262	401	503	2232
2	77	82	65	158	333	580	233
3	105	76	86	137	337	197	55
4	490	279	180	886	200	148	54
5	701	631	425	169	156	62	33
6	1301	1034	293	142	63	87	13
7	3475	593	203	133	48	20	97

Counts are summed across all four data sets.

one emotion rating is high, the other does not appear to contribute to perceived memory.

### Different rehearsal types

Participants reported their perceptions of how often they engaged in eight separate types of rehearsal. We were primarily interested in the extent to which these ratings provide enlightenment with respect to the question of whether the ease and detail ratings reflect different underlying memory constructs. However, because we had not previously used these measures to predict memory, we were unsure of whether the rehearsal ratings themselves were unique from each other or whether they reflected a common underlying construct (or constructs). If the former is true, then it makes sense to simultaneously evaluate the predictive relationship between rehearsal type and memory in our regression analyses. If the latter were true, then simultaneous regression analyses might not be maximally informative. In such a case, the shared variance among the rehearsal type predictors might obscure the extent to which a given rehearsal type (or interactions of memory type with each rehearsal type) might predict the memory ratings. Hence, prior to examining the predictive relations between the rehearsal types and memory, we examined relationships among the rehearsal types so that we could better interpret the results of the regression analyses.

*Rehearsal Types: Assessing one construct, or more?:* We examined the correlations among the rehearsal type ratings separately for each of the data sets. Correlations averaged across the data sets are presented in Table 3. The average

**TABLE 3**  
Averaged correlations among rehearsal type ratings in each data set

	<i>No reason</i>	<i>Mood</i>	<i>Cued</i>	<i>Reflect</i>	<i>Describe</i>	<i>Tell others</i>	<i>To not forget</i>
Mood-based	0.69						
Cued	0.45	0.45					
Reflect	0.44	0.50	0.40				
Describe	0.48	0.48	0.48	0.47			
Tell others	0.47	0.54	0.36	0.56	0.64		
To not forget	0.49	0.54	0.38	0.52	0.52	0.56	
Make self	0.43	0.52	0.36	0.54	0.45	0.55	0.67

All  $p$ s < .0001. Correlations shown above are the averages of corresponding relationships from all four data sets.

correlations are always positive, always statistically reliable, and range from moderate (.36) to strong (.69). These suggest the operation of a common construct that is influencing responses to all the rehearsal type items.

To further examine this issue, a principal components factor analysis (PCA) was conducted on the eight specific rehearsal type ratings from each data set. The results suggest that a single factor was a good solution in each of the four data sets. The first factor extracted accounted for a substantial proportion of variance in all data sets (110a = 60%; 110b = 56%; 50 = 56%; 42 = 53%). Even the item that loaded most weakly on that single factor, the *cued by the environment* rehearsal type, evinced substantial loadings (110a = .63; 110b = .68; 50 = .66; 42 = .53). The results of these analyses suggest that even though there are conceptual differences between the rehearsal type ratings, at least one common construct might have substantially contributed to responses to all of the rehearsal type items.

The above findings suggest that the results of the simultaneous regression analyses reported below need to be interpreted with caution—an effect in the simultaneous regression analysis might not emerge as significant either because the effect was not present to begin with, or because the effect shares variance with another effect, and therefore, has no unique ability to predict memory. Accordingly, we report the results of both simultaneous and simple regression analyses.

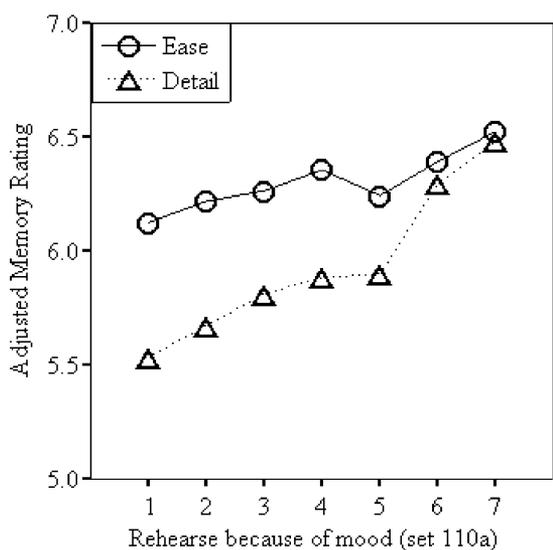
*Inferential analyses: Rehearsal types:* The two memory measures (ease vs detail) might be viewed as reflecting different constructs to the extent that they are differentially related to the various rehearsal types. Accordingly, our primary interest was in the possibility that there were interactions between the rehearsal type variables and the memory type variable. To assess

this possibility, one set of regression analyses simultaneously assessed interactions between the memory type variable and each of the rehearsal type variables. The effects reported control for the effects of all other two-way interactions among the rehearsal type variables, as well as for their main effects. As in the previous within-participant regression analyses that we conducted, in these analyses participants were treated as a categorical variable with levels equal to the number of participants; this variable is entered into the regression model to control for within-participant tendencies in responding.

Across the four data sets, there were 40 two-way interactions involving the memory type variable that were simultaneously evaluated in the regression analyses. Of these, six were statistically reliable ( $p < .05$ ) and one more approached significance ( $p < .10$ ). Significant interactions emerged three times for the “cued by the environment” rehearsal type, and once for the “mood manipulation”, “relate the event to others so they can understand me”, and “reflect on the event so that I can understand it better” rehearsal types. However, these interactions accounted for only modest amounts of variance (largest  $\Delta R^2 = .002$ ). Moreover, given the results of the factor analysis, it is likely that shared variance among the memory type ratings contributed to this small number of significant interactions. Accordingly, when interactions between the memory type variable and the rehearsal type variable were examined in isolation (controlling only for between-participant effects, event age, and the memory type and rehearsal type main effects), 14 of the 40 interactions were statistically reliable ( $p < .05$ ) and 4 more approached significance ( $p < .10$ ). In these analyses, all the rehearsal type variables interacted with the memory type variable at least once.

As with the descriptive variables, we discuss these interactions collectively because, although the interactions appeared across different variables, when they appeared they generally evinced a similar pattern: Ease ratings tended to be greater than detail ratings, but the difference between them tended to be smaller when overall memory was high than when it was low. An example of this is presented in Figure 2. This figure depicts the interaction between rehearsal for purposes of mood manipulation and the memory type variable from data set 110a,  $F(6, 7691) = 2.94, p < .01$ .

The interactions between each rehearsal type variable and the memory type variable are of potential interest because of the extent to which these interactions may reflect the fact that different constructs might underlie the ease and detail ratings. On the other hand, the main effects of the rehearsal type variables are also of interest because they reflect the extent to which these variables predict overall perceived memory for events (to the extent that the ease and detail ratings can be considered to be a common measure of perceived memory). One set of analyses explored this common memory idea by looking at the extent to which each rehearsal type (controlling for between-participant differences, event age, and memory type) predicted the memory ratings. In these simple regression analyses, these descriptive variables always significantly predicted the memory ratings.



**Figure 2.** Interaction between rehearsal for purposes of mood manipulation and the memory type variable in data set 110a.

As reflected in Table 4, simultaneous analyses of the rehearsal type variables often significantly predicted memory in all the data sets. The relation was straightforward: When rehearsal rate was high, memory ratings were high. The fact that the rehearsal ratings independently predicted memory is consistent with the idea that the two memory ratings at least partially reflect a common construct (overall memory), and that there is at least some variance in memory that is independently accounted for by each of the different rehearsal types.

## DISCUSSION

### The evidence in context

Self-reported ratings of a person's own memory are sometimes questioned as a method of assessing event memory, and are perceived as inferior to "more objective" memory assessment methods. In particular, critics of the use of such self-report measures frequently, and rightly, point to many different errors and biases that may befall such ratings. However, we think that it is unwise to ignore such ratings just because people make such errors—such a suggestion is tantamount to suggesting that recognition is a faulty memory assessment tool because people falsely recognise foils in recognition experiments, or that free recall is a faulty memory assessment tool because people falsely remember information that never was experienced.

Instead, our view is that each memory assessment tool has its own strengths and weaknesses, that each tool has something unique to bring to the table in our understanding of memory processes, and that a better understanding of memory can be had by using all the tools that are available.

It is in this spirit that the present research was conducted. We assume that people can, with some degree of accuracy, provide self-reports of their memory. However, as have other researchers (e.g., Leonesio & Nelson, 1990; Rubin et al., 2003), we concede that the properties of these self-reports, and the extent to which these self-reports can be made about different qualities of memory, largely remain to be discovered. Accordingly, one goal of this paper was to collect data that: (a) explicitly assessed the accessibility "experience" in autobiographical memory; (b) examined whether that experience was indeed

TABLE 4

Main effect *F*-test results from simultaneous regression analyses and effect sizes for different rehearsal type ratings used to predict memory ratings in each data set

Rehearsal Type	110a		110b		50		42	
	<i>F</i>	$\Delta R^2$						
No Reason	21.92***	0.008	34.37***	0.009	8.70***	0.006	11.38***	0.009
Mood-based	10.15***	0.004	13.30***	0.004	3.36***	0.003	1.42	0.001
Externally Cued	12.01***	0.004	39.61***	0.010	22.17***	0.016	42.92***	0.035
Reflect to learn	9.43***	0.003	4.13***	0.001	2.37*	0.002	2.94**	0.002
Describe to others	22.20***	0.008	15.28***	0.004	16.85***	0.013	5.14***	0.004
Tell others	2.67**	0.001	2.63***	0.004	2.64***	0.002	1.70	0.001
To not forget	4.61***	0.002	7.32***	0.002	5.81***	0.004	3.69***	0.003
Make self remember	0.61	0.000	2.20*	0.001	2.52*	0.002	0.89	0.001

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ ; Table of LS Means is available from the authors upon request.

different from the experience of recalling event content; (c) examined those variables that might be predictive of this accessibility experience; and (d) assessed whether these variables predicted perceptions of a memory's content and perceptions of a memory's ease of retrieval in the same way (or in different ways).

The data that we collected seem to be more reflective of similarity rather than difference in answers to the "ease of recall" and "detail of recall" meta-memory questions. Responses to the two questions were strongly correlated, and the same variables that predicted accessibility ratings (event age, extremity of emotion prompted by the event, event typicality, event self-importance, overall rehearsal frequency, and various individual rehearsal types) also predicted detail ratings. These outcomes suggest that the conclusions drawn from prior research (e.g., Thompson et al., 1996) about relations between these predictive variables and self-reported autobiographical memory hold, regardless of whether participants responded to memory self-report questions using their perceptions of accessibility, their perceptions of detail, or both.

However, it is important to note that two findings suggest there is at least some systematic non-shared variance between the two meta-memory perceptions. The first of these comes from the observation that people do not always seem to respond in a similar way to questions assessing ease of retrieval and detail of the memory retrieved. An analysis of rating co-occurrence frequencies shows that participants sometimes rated an event as easy to recall but also as relatively devoid of detail; the opposite pattern (difficult to recall but detailed) also

occurred. The second finding indicative of non-shared variance between the two meta-memory rating types was that people's ratings of these memory properties are not predicted by other variables in exactly the same way. Ease ratings tended to generally be higher than detail ratings, but the emergence of several interactions showed that the difference between the ease and detail ratings tended to be smaller when event memory ratings were high (e.g., recent events, emotionally extreme events, oft-rehearsed events) than when those ratings were low.

However, the emergence of these interactions was inconsistent. Results reflective of interactions between the memory type variable and other variables were spread across variables and data sets, for both the analyses that included the descriptive variables and for the analyses that included the rehearsal type variables. The fact that such interactions emerged inconsistently across analyses is most likely caused by shared variance among the predictors. This possibility was especially prevalent in the rehearsal type analyses. A number of significant interactions between each of the rehearsal types and the memory type variable emerged from relatively simple regression analyses. In these analyses, the ability of a rehearsal type by memory type interaction to predict memory ratings was evaluated separately from the other interactions involving the rehearsal type and memory rating variables. In comparison, many of these interactions were rendered non-significant in simultaneous regression analyses that examined these interactions in the context of all other two-way interactions. This outcome suggests that the rehearsal type ratings shared significant variance.

This conclusion was bolstered by the results of the correlation analyses and the factor analyses. This pattern of outcomes in those analyses suggests that the results of future research using such measures might be more revealing if the predictive variables are first factor analysed to see whether they are indicators of a smaller number of underlying constructs. If this is the case, then one might combine those variables that map onto the same construct prior to engaging in regression analyses (as we did with the self-importance and self-defining ratings). In such analyses, while one might lose the ability to evaluate how specific predictors, such as typicality, might be related to the memory ratings, one might gain a better understanding of how the constructs that underlie such measures might be independently related to those ratings. Moreover, by appropriately using the results of such analyses, one might have a better chance of obtaining differential patterns of relations between the constructs and the ease and detail ratings. On the other hand, the regression analyses show that many event-descriptive variables independently predict memory, even when the factor analysis results suggest that those event-descriptive variables reflect a common underlying construct. Such results suggest that researchers should be cautious about monolithic approaches to understanding meta-memory judgements, and should be sensitive to analyses that both reflect shared variance among variables and independent variance associated with individual predictors.

One other goal of the present paper was to assess the extent to which emotional ambivalence had an impact on meta-memory perceptions. In particular, we were interested in: (a) whether evidence for mixed emotion events would characterise some of the autobiographical events that people recalled, (b) whether there would be evidence that perceived memory was better for events that produced mixed emotions than for events in which the emotions were relatively pure, and (c) whether such effects might be differentially related to judgements of a memory's detail and judgements of an event's retrieval ease.

People sometimes reported that an event prompted relatively high levels of both positive affect and negative affect, a pattern of mixed feelings. This provides descriptive evidence suggesting that researchers might sometimes consider independently assessing the positive affect and negative affect associated with an event or its

recall. However, the positive affect ratings and the negative affect ratings were related to the meta-memory ratings in much the same way, with higher emotions predicting higher memory ratings. Moreover, our data suggest that, while people might experience emotional ambivalence in response to autobiographical events, they do not perceive their memories for such events to differ substantially from their memories for events that produce an intense, but emotionally pure experience.

### Limitations and future directions

While the results described in this article provide an initial view of the similarities and differences between perceptions of an event's ease of retrieval and perceptions of the level of detail in its content, several issues limit the generality of the conclusions drawn from our research. Among the more important of these is that event memories were collected with only one method: Retrospective recall prompted by lifetime periods. It is possible that this method induced systematic biases into the events that were used in the study. One of the axioms of research in the autobiographical memory area is that it is especially important to control for the impact of such biases on results by using different methods to obtain events (e.g., diary methods, cue-word procedures, event-sampling procedures). Future research needs to proceed in this direction.

A second direction that can be taken by future research is to explore how people's meta-memory judgements are constructed. For example, it may be the case that people might, indeed, make judgements of memory detail by directly assessing their memory and translating that assessment into a judgement. However, such judgements may be subject to the influence of other variables that affect judgements. It might be the case, for example, that judgements of the detail of two memories differ not because of the amount of detail contained in the memories, but because of differences in the standards used to evaluate the amount of detail perceived (for example, see Biernat & Manis, 1994). In addition, people's beliefs about what they *should* remember might affect such judgements, much as they affect people's judgements in Schwarz's accessibility research (Schwarz et al., 2003). The fact that such biases exist argues for caution when

evaluating the extent to which judgements of memory reflect the actual content of memory.

### CODA

Understanding how people make meta-memory judgements is important because people make such judgements all the time. This is reflected in the fact that people frequently offer laments, such as: (a) their memory is getting worse as they age, (b) they are so overloaded they cannot seem to remember anything any more, or (c) they just do not have a knack for remembering material from a particular area of study. Such judgements have practical importance that goes beyond self-perception. For example, they can be important to how people evaluate the reliability of their own memories and the memories of others with respect to legal issues (e.g., How well do I remember the crime that I witnessed?). Such evaluations can also have implications for making future behavioural choices in such domains as health care (e.g., When was my last doctor's appointment and what was it for?), job performance (e.g., How well do I recall what my colleagues said about my research productivity at the last department meeting?), and interpersonal relations (e.g., What did I get for my wife last Christmas?).

The research described in the present paper represents a step towards understanding these kinds of meta-memory judgements. One notable outcome is that because measures of the amount of detail contained in a memory and the accessibility of a memory behave in similar ways and are predicted by similar variables, memory researchers should generally feel comfortable using these measures interchangeably, or in combination, to assess self-perceived memory. While meaningful differences between these measures may be obtained, the data described in the present article suggest that: (a) such differences emerge only for a subset of the autobiographical events that a person recalls, and (b) such differences are related to the prediction of only a small amount of unique variance. Future research should be directed towards exploring such effects, and towards understanding the nature of the events for which such effects occur.

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