

# Retrieval of Autobiographical Information

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## Introduction

Survey questions about past behavior often require respondents to retrieve autobiographical information from memory – a combination of personal experiences (episodic memory) and general knowledge (semantic memory; Conway, 1996; Baddeley, 1992). An example would be recalling whether you recently purchased any sweaters and, if so, the price that you paid. The retrieval of autobiographical information is fundamental to the goals of many surveys and yet remains poorly understood. It is not known how the design of the questions may inhibit or facilitate recall, and ultimately affect data quality and respondent burden in recall-based surveys.

Consider for example the Consumer Expenditure Survey (CEQ) in which respondents are led by an interviewer through a series of prompts to consider all of the expenses they have had in the last three months. The prompts are clustered by semantic similarity; for example, there is a section on home furnishings that begins with “living, family, or recreation room furniture,” and continues on to “dining room and kitchen furniture,” “bedroom furniture,” and so on. These categories are likewise composed of smaller related clusters of items, such as “sofas,” “living room chairs,” and “living room tables.” Designing the interview using this list method ensures that the respondent conducts an exhaustive search of their memory for past expenses. Despite this strength, however, the method has at least three limitations that may harm data quality and respondent burden.

First, the method is optimized for a respondent that can search through their memory like a computer can search through an inventory. The one-size-fits-all approach assumes respondents to all have a similar organization of items in memory, based on the generic definitions of items rather than personal life experience. A respondent’s personal autobiographical associations, such as yesterday buying a pair of shoes and a suitcase from the same store, are not used. Rich contextual information that is naturally brought to mind with any retrieval attempt (Tulving & Thomson, 1973) is discarded as the respondent is instead asked to consider the next prompt on the fixed order list. Burden may increase when the respondent must retrieve the same information again, or when confusion is created by reporting items when they come to mind and again when they are explicitly prompted.

Second, the list method may suffer from retrieval-induced forgetting or part-set cueing effects, whereby the automatic retrieval of information related to autobiographical associations may inhibit or interfere with the retrieval of related expenses (Anderson, Bjork, & Bjork, 2000). The strengthened association between the suitcase and the shoes may mean reduced strength of associations with other related items that don’t have that shared context or immediate and personal connection. For example, while the associations between types of shoes is usually strong, they may be dampened as the respondent thinks of their personal experience. After remembering the reason for yesterday buying those shoes (sandals for a beach vacation) the respondent may focus on other vacation-related shoes (comfortable walking shoes, water shoes, and flip flops) and forget about the new work shoes bought last month. Requiring respondents to recall all members of an expenditure category together, despite respondent memory not being aligned with that expenditure category structure, may mean that items are left unreported.

Third, asking the same prompts of all respondents regardless of their actual expenses often results in more than one long series of “no... no... no... no...” responses when a respondent does not have any relevant expenses to report. For example, the interview includes dozens of vehicle-related expense questions for all respondents, including those in households without vehicles. The fixed structure of the interview inevitably results in a poor fit with some respondent’s actual expenses. Engagement with the interview may be lost and effort reduced as respondents learn that the survey questions are not relevant.

Given these and other limitations of the list method, there may exist an alternative questionnaire design that improves data quality or reduces respondent burden. Research is needed to understand how retrieval strategies, questionnaire design, and autobiographical information interact in the survey response processes.

## Strategies for Recall from Memory

Recall from memory is widely believed to be a process that includes the activation of an item in memory based on the strength of its association with an initial cue. Once an item is successfully retrieved, it is believed that the newly retrieved item now serves as the cue for the retrieval of a subsequent item from memory. Typically, the literature on such models of memory assumes that the probability of recalling an item from memory is proportionate to the strength of its association with a cue (Raaijmakers & Shiffrin, 1981). However, in the context of targeting memories that include personal information, the basis on which these associations are evaluated is unclear. Personal information and experiences may alter the associations between memories that are objectively unrelated to each other (Greenberg & Verfaellie, 2010; Tulving, Schacter, McLachlan, & Moscovitch, 1988). For example, the strength of the associations between shoes and suitcases is typically low but an experience of purchasing a pair of shoes and a suitcase from the same store may strongly associate the two items together, even without explicit awareness of any association.

We hypothesize that personal information may influence retrieval outcomes, whereby the associations between items retrieved from memory may be based on personal experience rather than on semantic similarity alone. To explore these associations, we designed an online recall task in which participants were cued to consider one of several Consumer Expenditure Survey categories, which were chosen to elicit a range of associations during retrieval from memory. In the context of the Consumer Expenditure Survey, with the targeted items for retrieval from memory being recent expenditures, we hypothesized that retrievals would be based on personal connections related to the expenditures, such as being purchased at the same store (e.g., for the category “Shirts, sweaters, blouses, or tops”). We hypothesized also that typical autobiographical associations between items in memory would also be used, such as being for the same purpose or goal (“Hospital room or hospital expenses”; Reiser, Black, & Abelson, 1985). In addition to the autobiographical- and expenditure-related cues, we included one cue category for which we believed intra-semantic category associations would remain stronger than personal autobiographical associations (“Room-size rugs or other non-permanent floor coverings”). And finally, to explore the effect of context, we included a pair of cue categories for comparison: one category designed to cue a broad range of items in memory (“Sports”), and one category designed to cue a small subset of those items from memory (“Health clubs, fitness centers, swimming pools, weight loss centers, or other sports or recreational organizations”). The narrower context might reduce the recall of other related items or the broader context might not elicit any strong associations. A full list of the categories explored in the study are shown in Table 1.

Table 1. Initial category cues and hypothesized retrieval strategies in the Consumer Expenditure Survey

<i>Consumer Expenditure Category</i>	<i>Retrieval Strategy</i>
Shirts, sweaters, blouses, or tops	Retrieval based on the store at which the item was purchased
Hospital room or hospital services	Retrieval based on the purpose for incurring the expense
Room-size rugs or other non-permanent floor coverings	Retrieval based on associations within the same semantic category
Sports	A broad context to use for searching for items in memory
Health clubs, fitness centers, swimming pools, weight loss centers, or other sports or recreational organizations	A narrow context within the “Sports” category

## Methods

### *Design and Materials*

To explore recall from memory, we designed an online recall task comprised of two phases that asked participants first to recall a sequence of five recent purchases based on a given cue (shown in Table 1) and then to describe the

connections between the successive recalls.<sup>1</sup> Although the participant may not have explicitly used the subsequently named connection at the time of retrieval, the reported information about the connections between successive recalls provides insight into the recall strategy used. Using a between-groups design, we randomly assigned each participant to receive one of five different cues in order to explore the use of a range of retrieval strategies. The instructions for recall emphasized that the recalled expenses did not need to be directly related to the cue, the indicated reference period of the last three months, or any previously recalled expense.

### *Participants*

Participants were recruited online using the online participant recruitment platform Amazon Mechanical Turk (mTurk). To be eligible to participate, individuals must report being located in the United States, have an mTurk approval rating equal to or greater than 95%, and have completed 1,000 or more mTurk tasks. The final sample included 825 participants reporting a mean age of 34 years ( $SD = 11.3$ ) and household size of 2.74 people ( $SD = 1.36$ ). A total of 79 participants (9% of the sample) were excluded from analysis based on data quality concerns, such as leaving blank fields that were critical to analysis or clearly misunderstanding task instructions.

### *Procedure*

The online study was administered between March 26 and April 1, 2014. Participants volunteered through mTurk by responding to the following study description: “We’ll ask you to recall a few items that you have bought, and then ask you follow-up questions about those items.” Interested participants were directed to Qualtrics, an online survey platform, where the data were collected and stored. Upon providing informed consent to participate in the study, participants read the task instructions, completed the task, and answered debriefing questions. The task took approximately 10 minutes to complete and, upon completion, participants were paid \$2.00.

### *Coding of Expenditures and Retrieval Reasons*

The open-ended text descriptions of expenditures and reasons that were collected from the participants were coded by two independent coders knowledgeable about the research questions (the authors). Each case was coded by one coder but 20% of cases were coded by both coders in order to check inter-rater reliability.

Expenditure category codes were based on the Consumer Expenditure Survey’s expenditure categories. Coders were instructed to categorize each open-ended description as belonging to one expenditure category. The CE Information Booklet, which contains a list of categories collected during the CE interview and examples of the items belonging to those categories, was used to identify the majority of expenditure categories. Expenditures that would otherwise be collected from the CE diary, which does not have a categorical structure, were coded as belonging to one of the following ad hoc created categories: groceries (e.g., milk), household goods (cleaning spray), or personal care (cosmetics). A total of 53 codes were used. The overall inter-rater agreement was  $\kappa = 0.894$ .

Reason codes were created through an iterative bottom-up coding process and a coding manual with definitions and examples of reasons was developed. Across several rounds, the coders double-coded small batches of cases and discussed the classification scheme. To assign a code, coders were to consider an ordered list of seven codes and assign the first code that applied to the target text; in other words, the last code of “Similarity” was only to be assigned if none of the other codes applied to the text. A list of the codes and short descriptions are shown in Table 2. The overall inter-rater agreement was  $\kappa = 0.633$ .

## **Results**

### *Expenditures Retrieved*

Across the 53 expenditure categories represented in the data, the most frequently retrieved expenditure categories were clothing (1,230 retrieved expenses), followed by personal care goods (343), household goods (333), and groceries (333).

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<sup>1</sup> A third phase was excluded from the analysis. In the third phase, each participant was shown the open-ended descriptions of the associations between recalled items he or she had typed during the second phase and asked to self-categorize those open-ended responses into one of several a priori defined categories. The data of the third phase were excluded due to the limited representativeness of the a priori defined categories. The first and second phases were completed before the third phase began and were not impacted by the third phase.

Table 2. Reason codes

<i>Reason Code</i>	<i>Dominant characteristic of the reason given</i>
Visualization	Visual re-imagining of an experience related to the item
Same Shopping Episode	A specific shopping trip, day, or store
Narrative Sequence	Temporal or causal connection between retrievals
By or for the Same Person	A specific person
Shared Activity	A specific action, function, or event, which may include sub-tasks and one-time or repeated activities
Shared Goal	A specific goal, which may encompass multiple activities over an extended period of time
Similarity	An exemplar of the cued category or a previously reported expense, a feature similarity, a repetition of the reason provided for the previous item, or an unspecified association

Analysis of the first expense retrieved shows that participants often began recall by reporting items related to the cued category. In-category rates ranged from 50.3% (SD = 3%; Health clubs) to 97.6% (3%; Shirts). Overall, however, participants' recall sequences did not follow the CE expenditure category structure. Participants cued to consider hospital expenses reported a mean of 1.5 out of 5 possible expenses (SD = 0.1) that would be coded as hospital expenses. The mean was highest for participants cued to recall expenses related to shirts, with a mean of 3.4 out of 5 possible expenses (SD = 0.1) that would be coded as clothing. While some of these retrievals outside of the cued expenditure category are likely due to the participant simply not having such expenses, there is evidence that some portion of the retrieval of unrelated items is due to the nature of recall itself. The data suggest that participants did have related expenses to report but that their recall sequence did not align with the CE structure by expenditure category. To examine this, we looked at how the retrieved expenses aligned with expenditure categories. Analysis shows that at least 4.3% of reported expenses were related to the *original cue category* but were retrieved only after the participant had already begun to report unrelated expenses. This behavior of recalling an expense related to the original cue after exiting the category occurred at least once for 12.1% of all participants. In other words, these expenses may have gone unreported if the conventional list method had been used, where the participant would have been instructed to move on to another expenditure category prompt.

#### *Reasons for Retrievals*

Across the seven reason codes used to summarize the data, the most frequently coded reasons were Similarity (2,499 reason codes), Shared activity (681), Shared goal (299), Same shopping episode (281), and Narrative sequence (151). The high proportion of reasons assigned the Similarity code is as expected, given that the code was designed to capture all unspecified associations and associations based on recall of a cluster of expenses using a single retrieval strategy.

Analysis of the reasons for retrievals shows that participants used more than one retrieval strategy during a recall sequence. The average number of unique reason codes ranged from 2.3 reasons (SD = 0.1; Shirts) to 2.9 (SD = 0.1; Hospitals). The distribution of reasons used also varied depending on the cued category, as shown in Table 3. As expected, participants cued to consider Hospital expenses used goals, narrative sequences, and people to retrieve expenses, at rates higher than participants of other cued categories. Likewise, participants cued to consider Shirt expenses more often used the shopping episode to retrieve additional expenses, compared to participants in other cued categories. Surprisingly, participants cued to consider Rug expenses were more likely to use visualization strategies (e.g., looking around their living room) compared to other participants. These participants were also less likely than others to use associations based on goals and activities. Comparison of the distribution of reasons between the participants cued to consider Health Clubs and those cued to consider Sports does not reveal much insight; both groups show heavy use of activities to retrieve expenses.

Table 3. Distribution of reason codes by cued category

<i>Reason Code</i>	<i>Cued Category</i>					<i>Overall</i>
	<i>Shirts</i>	<i>Hospitals</i>	<i>Rugs</i>	<i>Health Clubs</i>	<i>Sports</i>	
Similarity	70.9%	55.4%	68.0%	57.1%	50.9%	<b>60.6%</b>
Shared Activity	8.5%	13.1%	11.7%	20.4%	28.9%	<b>16.5%</b>
Shared Goal	5.8%	11.9%	5.6%	9.0%	4.3%	<b>7.2%</b>
Same Shopping Episode	9.1%	7.2%	4.3%	5.0%	5.7%	<b>6.3%</b>
Narrative Sequence	1.6%	5.3%	2.6%	4.8%	4.1%	<b>3.7%</b>
By or For the Same Person	1.5%	2.8%	1.3%	1.2%	2.3%	<b>2.2%</b>
Visualization	1.1%	1.9%	5.7%	0.8%	1.4%	<b>1.8%</b>
Other, Not codeable	1.4%	2.3%	0.5%	1.7%	2.2%	<b>1.7%</b>

These data show that participants used a range of retrieval strategies to recall expenditures, of which semantic similarity was only one. Approximately 40% of retrievals were described as being retrieved based on an association other than semantic similarity. We believe that the remaining 60% could be further analyzed to show that many of those retrievals are also not based on semantic similarity in the way that the CE interview is structured.

## Discussion

In this study, participants were asked to recall a sequence of five expenses and then describe the reasons why the recall of each expense led to the recall of the next expense. Recall was free and unstructured, allowing the participant to retrieve expenses in any order and for any reason. Participants were asked to recall expenses related to a starting cue category for a designated reference period, but they were also told to continue recalling expenses even if they could no longer meet those specifications. Participants completed this task only once, ensuring that they did not “learn” through experience to accommodate the exhaustive list paradigm from which the task originates. This recall task allows for an exploration of undirected retrieval strategies, which can provide evidence as to which retrieval strategies come naturally to respondents retrieving expenditure information.

Analyses showed that the recalled expenses were often from the expenditure category that the participants were cued to consider but that a non-trivial proportion of expenses might have not been captured by the conventional semantic category list method of data collection because they were recalled only after “exit”-ing the list category and reporting unrelated expenses. Analyses of the open-ended reasons provided by the participants as to the associations between recalled expenses showed that participants used a range of retrieval strategies that relied on personal details such as the goals, activities, people, and events associated with the expense. These data suggest that the processes of recall of autobiographical information from memory may naturally lead respondents to follow associations related to personal experiences rather than associations based on semantic meaning alone.

Acknowledging the evidence that memory is structured in associative networks rich with context and experiential details is a necessary step toward understanding a respondent’s response process. The reporting of autobiographical information in a survey is a complex process of retrieval that varies between individuals. Many factors affect what items are retrieved and how efficiently they are retrieved, and, unfortunately, these factors are likely based on personal experiences that are not predictable or knowable. Designing a questionnaire based on rigid structure may increase respondent burden through re-retrievals and frustration and lower data quality through underreporting. Flexibility in the design of the questionnaire may warrant further consideration. Research is necessary to evaluate the effectiveness of such an approach.

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