Effect Of Phonemic Cuing On Recall Of Personally Relevant Names Derived From Email

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Abstract

This is the first study to study memory using email-derived stimuli. Email is a lingual that can be mined to study cognition in an ecologically valid context. Our laboratory is applying a system that automatically creates stimuli from participants’ emails to probe memory for proper names in an autobiographical memory context (MUSE, Hangal, Lam, and Heer, 2011). In this web based study, participants view email messages they previously sent and are asked to insert the proper name that was omitted. The task thus involves recall of a proper name and source memory when the participant realizes it is the appropriate email context. We have recently demonstrated that the accuracy of recalling these proper names declines over the course of a year (Hangal, Rosen, Mathur and Lam, 2014). The objective of this current analysis is to test whether a cue is helpful to recall and whether the benefit of this phonemic cuing decreases with increasing delays over the course of the year.

Introduction

Everyone has had the experience of struggling to recall a proper name, often when we most need it in everyday life. For example we might need to remember the name of someone we are about to meet for lunch or a place we have to go. Previous studies of proper name recall typically focus on recall of people’s names and have involved laboratory experiments, case studies of patients with focal lesions and even invasive brain stimulation (stimulation-for-a-review-see-Halasy,2014). Ultimately it is important to study the ability to recall personally relevant proper names in their appropriate life context. This study aims to develop an approach to testing people’s ability to recall proper names in relation to personally relevant context by selecting email stimuli using computerised text-based analysis (MUSE: Hangal, Lam, and Heer, 2011) and asking people to recall proper names based on the original sentence context. Aside from the benefit of having varied vertical context of communication episodes that have been prospectively gathered in an ecologically valid context, emails provide exact information about delay to capture more exact detail about decay over time. The focus of this study will thus be on the impact of delay on memory strength of proper names. Of particular interest was the question of whether access to the proper name was at a lexical level. Rather than the problem related to binding the context to the name (since with name retrieval was lexical, we could expect a letter phonemic cue to be equally effective throughout the delay). If the process involved binding to the memory context then the cue would be less effective with delay.

Methods

Participants: Forty eight people (average age 30.2 [range 19-60]) were recruited nationally from Craigslist’s List and paid $10 for participation. All participants needed to recall the name of someone we are about to meet for lunch or a place we have to go. Previous studies of proper name recall typically focus on recall of people’s names and have involved laboratory experiments, case studies of patients with focal lesions and even invasive brain stimulation (stimulation-for-a-review-see-Halasy,2014). Ultimately it is important to study the ability to recall personally relevant proper names in their appropriate life context. This study aims to develop an approach to testing people’s ability to recall proper names in relation to personally relevant context by selecting email stimuli using computerised text-based analysis (MUSE: Hangal, Lam, and Heer, 2011) and asking people to recall proper names based on the original sentence context. Aside from the benefit of having varied vertical context of communication episodes that have been prospectively gathered in an ecologically valid context, emails provide exact information about delay to capture more exact detail about decay over time. The focus of this study will thus be on the impact of delay on memory strength of proper names. Of particular interest was the question of whether access to the proper name was at a lexical level. Rather than the problem related to binding the context to the name (since with name retrieval was lexical, we could expect a letter phonemic cue to be equally effective throughout the delay). If the process involved binding to the memory context then the cue would be less effective with delay.

Stimuli: Email archives were analyzed on a secure, FIPS 140-2 encrypted server at the Stanford University Department of Computer Science and 40 names were derived as stimuli using a method previously described (Hangal et al., 2011). To ensure that people processed the mails there were several constraints on item selection such as only mails that were in the sent mailboxes were included.

Test items were structured so that the task was to type the name that should fill in where the proper name was missing. Items were cued with black lines to substitute for the letters. After 15 seconds with no response participants saw the first letter of the correct name. (Figure 3). For each test item participants made judgments about their memory for the items (Figure 3) even if certain, how recent, and how vivid the memory episode was.

Proper names and sentence contexts were selected based on parameters that have been demonstrated to be related to the likelihood that people would be able to recall a unique name. For example if it is a challenging problem to generate these stimuli since without these algorithms most sentences would not provide sufficient context (“TH ___ how are you?”). These features that were used to select items and other descriptions are available for further analyses. Examples are provided in Figure 3.

Procedures: Participants first were screened and then given an example of the test items before the trial and answered the Test item judgments for each trial. Next they were shown their errors and asked to rate whether a cue was helpful to recall and whether the benefit of this phonemic cuing decreases with increasing delays over the course of the year.

Results

Analysis of Error Types: Few participants noticed trouble with tip of the tongue (Type 2). For items where they reported that their answer was correct they were given credit (e.g. giving Bill for William). This too, was rare since the answer was based on the number of letters (Type 3). Items were excluded from further analyses where subjects stated they did not have enough context to gauge (Type 5) such as a sentence like “TH ___ my name is ___” Some of the investigators (S4 and A.M.) checked several of the response types and in all cases the judgments were reasonable suggesting that this inspection would not be needed in normal participants.

Figure 1: Proper Name Recall

Figure 2: Metacognitive Judgments

Test item judgments (Collect after each response)

Success: "This sentence was correct."
1. I should have given this context
2. The item was on the tip of my tongue
3. My answer was essentially correct
4. This is an insignificant detail that I’m unlikely to have remembered

Error judgments: “About this answer…” (Collected after 40 test items completed)
1. I don’t remember anything about it
2. I’m unsure -- my answer may or may not be right.
3. I only recall the general context, not the message
4. This is an insignificant detail that I’m unlikely to have remembered
5. My answer was essentially correct
6. This is a tip of the tongue error "about this sentence”
7. I really should have gotten this context
8. The item was on the tip of my tongue
9. My answer was essentially correct
10. I was right but I didn’t get this context
11. The sentence was correct
12. The item was on the tip of my tongue

Certainty: "Approximately when do you think was this sentence written? ”
1. I don’t remember anything about it
2. I’m unsure -- my answer may or may not be right.
3. I only recall the general context, not the message
4. This is an insignificant detail that I’m unlikely to have remembered
5. My answer was essentially correct
6. This is a tip of the tongue error "about this sentence”
7. I really should have gotten this context
8. The item was on the tip of my tongue
9. My answer was essentially correct
10. I was right but I didn’t get this context
11. The sentence was correct
12. The item was on the tip of my tongue

Vividness: "What do you remember about this sentence?”
1. I don’t remember anything about it
2. I’m unsure -- my answer may or may not be right.
3. I only recall the general context, not the message
4. This is an insignificant detail that I’m unlikely to have remembered
5. My answer was essentially correct
6. This is a tip of the tongue error "about this sentence”
7. I really should have gotten this context
8. The item was on the tip of my tongue
9. My answer was essentially correct
10. I was right but I didn’t get this context
11. The sentence was correct
12. The item was on the tip of my tongue

Number of messages that a wrong answer occurs in
Number of messages that a wrong answer co-occurs with the correct answer
Number of messages in which a wrong answer co-occurs with the correct answer
Number of messages containing the sentence
Length of the sentence (number of characters)
Number of named entities in the sentence
Number of emoticons in the sentence
Span of thread containing the message (number of days)
First and last date of usage of term

Figure 2: Adcitional Descriptors

Figure 3: Proper Name Recall

Figure 4: Span of thread containing the message (number of days)

Accuracy Over Three Month Intervals

In order to test for evidence of source memory, memory for the context surrounding the email event, we evaluated whether there was an association between how accurately people could judge the time of when the email was written and how far back in time they wrote it. For example people who were so low, we performed a fixed effects analysis separately for correct and incorrect responses. The figures above demonstrate that both correct (r=0.68) and incorrectly (r=-0.68) recalled items displayed a correlation between estimated and actual time delay. There were enough items correctly generated to calculate correlation was calculated for each subject and then the correlations were compared to a normal distribution (p<0.04, 460/503, p<0.001 with the lowest observed correlation was 0.7).

Conclusions

There are many neuropsychological conditions such as the case of an acute brain injury, where there is no possible way to measure premorbid abilities. Leveraging lifelog data such as email offer this opportunity. This study is the first to apply text-based analysis of lifelogging to demonstrate that meaningful and systematic patterns can be abstracted. There key results were:

• Delay-related decline in accuracy, certainty and increased use of hints are consistent with the feasibility of having tested items graded in difficulty.

• Phonemic cuing declined in effectiveness with delay and subjects denied tip of the tongue experiences suggesting the problem with accessing proper names not being a function simply of lexical access, but instead of binding word and context.

• Recall judgments in normal subjects were quite reliably accurate even when there was a failure to recall the proper name. This task should be evaluated in clinical populations since it may prove useful.

Acknowledgements

References