From: **Psychological Science** onbehalfof+psci+psychologicalscience.org@manuscriptcentral.com
Subject: Psychological Science - Decision on Manuscript PSCI-17-0511
Date: June 18, 2017 at 5:09 PM
To: khealey@msu.edu

PS

18-Jun-2017

Dear Dr. Healey:

Thank you for submitting "Temporal Contiguity in Incidentally Encoded Memories" to Psychological Science. I obtained reviews from 3 experts; their reviews appear below.

As you will see, the reviewers were in agreement that the temporal contiguity effect is an interesting and important phenomenon and that your experiments are intriguing, although there were concerns about what—in the end—we can really conclude from these findings.

The enthusiasm was greatest for Experiment 3, although Reviewer 3 points out that the findings there are not as robust as they might appear at first glance (R3's point IV). He/she also argues that your characterization of Hintzman's (2016) claims (and the extent to which your results conflict with them) are not entirely fair. This reviewer goes so far as to say that someone could write a paper with the same results and frame it around how it provides strong support for (not against) Hintzman's position. I found that line of argument to be pretty concerning.

Reviewer 1 was more positive but concluded the manuscript would be a much better fit for a specialty journal. Reviewer 2 (who identifies himself as Jim Nairne) concludes the same, and he further claims that you missed one of the big points of his work on this topic. He also notes that although an existence proof that the TCE can occur with incidental encoding is not as convincing as a package that demonstrates that you have gained experimental control over the phenomenon (i.e., demonstrating that you can predict when it will and will not occur).

I will add a couple thoughts of my own before wrapping up; these are suggestions you may wish to take into account as you consider how to proceed. First, I wondered why you chose to analyze/report only one of the 16-word lists? Also, I was concerned that the source of the TCE with intentional encoding (in Experiments 1 and 2) was that some subjects may have written down some words during encoding (in the online experiment); I didn't see any kind of attempt to deal with this possibility.

The bottom line here is that the manuscript generated interesting reviews, and I hope they will be helpful to you, but all 3 reviewers felt that Psychological Science is not the right outlet for this work. As a result, I am declining the manuscript for publication in the journal.

I regret that the outcome was not positive, but we have to be extraordinarily selective due to the large number of manuscripts that are submitted to the journal (roughly 2,000 new submissions are expected this year). I wish you well with this project and I hope the reviews are useful as you revise the manuscript for a specialty journal. Finally, I encourage you to continue to consider Psychological Science as an outlet for your work.

Sincerely,

Kathleen McDermott
Associate Editor, Psychological Science
psci@psychologicalscience.org

REVIEWER(S)' COMMENTS:

Reviewer: 1

Comments to the Author
Review of "Temporal contiguity in incidentally encoded memories"

Summary: The author presents a study examining under what conditions a temporal contiguity effect will occur for incidentally encoded words. Replicating prior work by Nairne et al. (2017) Experiments 1 and 2 showed no temporal contiguity effects for incidental items. However, in Experiment 3 temporal contiguity effects were found in five different incidental encoding conditions. These results suggest that control processes likely account for a large portion of temporal contiguity effects, but that also automatic encoding processing account for some portion of temporal contiguity effects. The author suggests that models that incorporate both are needed for a fuller account of the data.

This is an interesting paper that provides novel evidence that temporal contiguity effects can be found with some incidentally encoding conditions. The writing and results are generally clear and the large sample sizes are a nice plus. Despite these obvious strengths a few problems remain.

First, although I think this is a really nice paper that deserves to be published, I do not think it is appropriate for Psychological Science. Two of the experiments replicate and extend prior research by Nairne et al. (2017). The third experiment provides more novel evidence, but it is not clear that this meets the high standards for this journal. In particular, it is not clear that the paper changes the way psychologist think about the issue. As noted by the author Hintzman (2016) has already argued that control processes are important and Nairne et al. demonstrated flat temporal contiguity effects for incidentally encoded items. Thus, although the paper is very good, it is not appropriate for the current journal. I think it would be a perfect fit for Psychonomic Bulletin & Review or JEP:LMC

very good, it is not appropriate for the current journal. I think it would be a perfect fit for Psychonomic Bulletin & Review or JEP:LMC, however.

Second, I realize that word limits likely influenced the writing, but it would be nice if differences in the two accounts (controlled vs. automatic) of the temporal contiguity effect were more fleshed out. I understand the general idea, but in the current paper the differences seem rather vague.

Third, one interesting finding in all the experiments was how small the temporal contiguity effect was. Is this because only one list was used? The author and other work by Kahana and collegues has typically found much larger contiguity effects where the lag +1 conditional response probability is closer to .30. Similarly, typically contiguity effects are asymmetrical, but most of the current effects look pretty symmetrical. I'm aware that there are some studies that have found symmetrical effects, but it is not clear what is going on in the current data.

Finally, are serial position and probability of first recall curves similar across the different conditions? Examining these other patterns of performance may give some insight into the current results.

Reviewer: 2

Comments to the Author
PSCI-17-0511 is an interesting manuscript investigating temporal contiguity in incidentally encoded memories. The topic is important because many theorists assume that free recall of word lists is largely guided by item-to-item associations that are established during list presentation. Item t is associated to item t+1during presentation and at test recall of t guides the subsequent retrieval of t+1. Relevant empirical evidence comes from the temporal contiguity or clustering effect (TCE) in which recalling the word studied in, say, the 5th serial position means that the next recall is more likely to be from the 6th or 4th position than from more distant positions. There is a lot of evidence for this pattern, but the evidence has come largely from intentional learning experiments that collapse across the learning of many lists. Thus, it's possible that the TCE is strategic rather than automatic. A recent paper from our lab (Nairne et al., 2017) found no evidence for temporal contiguity effects in an incidental learning context—hence, the current experiments are an attempt to replicate and investigate temporal effects in a similar context.

This is nice work, with well-done experiments, but I'm not sure PS is the right outlet. More work needs to be done. My specific comments follow:

1. The author is missing one of the main points of the Nairne et al. study. Yes, we failed to find any evidence for the TCE, but this was in an experimental context that produced very large and consistent condition differences in recall. This led us to question the role that temporal/contextual factors actually play in free recall experiments. Almost all of the work done on TCE has been used to explain temporal-based effects in recall (e.g., serial position effects, spacing, etc.). But our work suggests that TCEs, even if they exist in incidental contexts, cannot easily account for big condition effects like levels of processing or survival processing. Of course, this is true in the present work as well…e.g., there were overall recall differences between Experiments 1 and 2 but no evidence for TCE.

2. Small point: In discussion of the results of Experiment 1 (page 11), it is worth pointing out that Nairne et al. (2017) found no evidence for a TCE across several conditions in a couple of experiments, so the null effect isn't based on only a single experiment.

3. I had the most concerns about Experiment 3. First, it is not clear exactly how the tasks used in Experiment 3, which produced significant TCEs, differ from those used in Experiments 1 and 2. Second, the moving scenario task, which produced a significant TCE, is exactly the same task used by Nairne et al. in their Experiment 1 which, of course, produced no evidence for a TCE. This is a failure to replicate which remains unexplained. Finally, the conclusion reached—that the TCE is due to automatic encoding processes that are independent of the judgment task—doesn't account for the null effects in Experiments 1 and 2, the enhanced TCE for explicit encoding, or the Nairne et al. findings. The author suggests an interesting hypothesis on page 14—maintaining a constant referent for the encoding task promotes cross-item similarity—but it isn't clear how and if this dimension is actually manipulated across the Experiment 3 encoding tasks. The fact that all of the orienting tasks produced roughly the same TCE rules out the hypothesis, I guess, but none of this is discussed.

Bottom line: I appreciate that Experiment 3 does demonstrate a TCE in an incidental context, but I'm not convinced that this "existence proof" is enough to merit publication at this point. The reader is left with more questions than answers. The author fails to gain any control over the question of interest—when do you get TCEs in an incidental context?—and, I think, he fails to appreciate the major failings of TCE accounts as vehicles for explaining free recall (although there is a hint of recognition in the general discussion).

Jim Nairne

Reviewer: 3

Comments to the Author
Temporal Contiguity in Incidentally Encoded Memories
Psychological Science
Karl Healy

Synopsis of the Paper. Are episodic memories organized by time, independent of their content? Are events near to each other in time intrinsically more similar to one another, by virtue of sharing a temporal context? Does this shared contextual representation make

their retrieval interdependent above and beyond any directed attempt to inter-relate adjacent memories semantically? Many models of memory have been built around this notion of temporal context, and the intrinsic similarities of temporally adjacent events due to time alone. A robust finding supporting this claim is the Temporal Contiguity Effect (TCE) in free recall studies, wherein the recall of a studied item is more likely to be followed by items that appeared adjacent to it during encoding. Indeed, there is a temporal gradient, such that the farther an item is away from another item at encoding, the lower the probability that that item will be recalled following the recalled item.

Recently, however, Hintzman (2016) offered a thorough critique of the interpretation of this phenomenon as evidence for the automatic temporal ordering of events in memory. He concluded that there is very little persuasive evidence that events occurring near in time are encoded more similarly simply by virtue of their proximity in time. Rather, he argued that nearly all evidence can be interpreted in one of two ways. First, during explicit free recall learning, people develop encoding strategies for the later free recall test that organize the list in a temporal way, and render it likely that temporally adjacent events will be recalled together. Second, even absent such strategies, there is a tendency for participants to note similarities between items, even if not intended by experimenters, and these encodings lead to semantically-based integration that increases the odds that nearby items are retrieved together. Neither of these processes is correctly interpreted as automatically fluctuating temporal context that gets attached to items directly.

The current study is a response to this critique. It represents an attempt to show TCE under conditions of incidental encoding, in which participants are not attempting to organize the list serially. After the first two studies—which failed to find evidence for the TCE under incidental encoding—supporting Hintzman's contention—a third study provided evidence. It is claimed that the initial failures to find evidence or the TCE effect arose because the incidental encoding task had encouraged subjects to encode all items relative to a common semantic reference (e.g. is the item bigger than a breadbox), rendering all items more similar, irrespective of temporal distance. The final study is proposed to have rectified this problem, unmasking the TCE effect. It is concluded that Hintzman's claim that the TCE effect is due to encoding strategies is incorrect, and that there is evidence for temporal contiguity. However, it is also noted that the effect is bigger under explicit encoding, which is not explained by existing models.

Comments. The idea that experiences are organized in memory according to their time of occurrence is a powerful intuition, and an important hypothesis in memory. The current experiments represent a serious effort to address a recent—and very well supported—criticism of this idea and to test whether TCEs occur when incidental encoding is used and explicit organization of items is ruled out. The experiments are simple and well conducted, the sample sizes impressive, and the reporting of analysis methods used represent a model of clarity and explicitness. Moreover, the insights that led to Experiment 3 represent careful cognitive analysis that one comes to expect of high quality cognitive psychology.

Despite these highly positive remarks about this work, I am not persuaded that the current study provides a clear and compelling conclusion about the nature of TCE effects that allows one to believe in the notion that time per se is an organizing principle, and that this arises due to spontaneously varying episodic context. The conclusion that Hintzman's alternative hypothesis about TCE is not supported (at the end of the article) is clearly not correct. Indeed, if anything, the current data only add fuel to Hintzman's criticisms, providing strong apparent support. The demonstration of TCE in Experiment 3—while they appear to show TCE effects on incidental tasks—do not rule reasonable alternatives that Hintzman also mentioned, but that are neglected in the manuscript. Given this, the theoretical interpretation of these data, and how well they support the temporal context notion—is far from clear. Thus, while I see this as high quality, respectable work, addressing an important issue, the theoretical lesson of the study is not sufficiently crisp for Psychological Science, and really belongs in a specialist journal, where more space can be devoted to discussion. I provide support for this assessment below.

I. Characterization of Hintzman's Critique is Incomplete. The manuscript characterizes Hintzman's critique as being solely about encoding intention. Hintzman did spend a lot of time in his review arguing that (a) most free recall studies that address TCE effects use explicit recall, and (b) many of them present multiple lists—i.e. conditions that promote the development of organizational strategies that would be expected to lead to TCE, even if temporal context notions are broadly incorrect. Critically, however, Hintzman also proposed other processes that could produce TCE, even when explicit encoding is not present. For example, one process that he has studied and built into his models is that of study phase retrieval—or simply "reminding". When someone incidentally encodes an item, they will tend to be reminded of other similar items that occur in the list, and think about them together, forming a configural encoding. He suggested that the odds of noticing such relationships are higher for adjacent items. Critically, this type of process would be expected to occur even under incidental encoding conditions. A complete and fair characterization of Hintzman's position would also address this dynamic, not just the incidental/intentional distinction.

Equally critical—Hintzman's critique was not about the intentional/incidental distinction per se. It was about organization of the study list, whether intentional or incidental. Explicit encoding, especially when done in service of free recall and repeatedly, will lead people to organize the study list and inter-relate items, which will lead to TCEs. However, incidental encoding operations can also generate the same effect. For instance, the Relational encoding condition in Experiment 3 encourages subjects to inter-relate study items together, even though encoding intention is absent. This is clearly consistent with what Hintzman had in mind. This is further reason why depicting his view as being about encoding intention is incorrect.

II. Evidence for TCE on Incidental Tasks Does Not Imply the Existence of Time Varying Context Encoding. The paper implicitly assumes that if TCE can be shown on incidental encoding tasks, it confirms the existence of continuously varying temporal context effects in memory. It does not. Whereas this demonstration may rule out intentional organization effects, it doesn't rule out Hinztman's other critique, made in point I.

For example, it is very reasonable to suppose that the random selection of words for each study list will often include a subset of items that are semantically or associatively related. If those items occasionally appear adjacently, and if subjects notice them when they do, this would be sufficient to lead to a small increase in the probability of temporally adjacent items being recalled together. This effect would be expected to be much smaller than the one observed under intentional encoding—or under incidental, but relational encoding (experiment 3, relational condition)—exactly as was observed in these studies. The basis for this effect is not temporal context per se, but rather a semantically based association between similar items. Nothing in the present studies can rule out this possibility. Note that it's not impossible to test this idea—one could use existing norms and latent semantic analysis to construct lists that are maximally unrelated, rather than using random word selection. This is the kind of interpretational issue that is best addressed in a more specialized journal, like JEP:LMC.

III. Evaluation of the Implications for these Findings for the Different Theoretical Accounts is Unbalanced. At the end of the paper (next to last paragraph), the manuscript suggests that the present findings do not provide good support for Hintzman's claim. In fact, I can imagine rewriting this paper differently, claiming (quite defensibly) that the current data provide strong support for Hintzman's claim. For example, Experiments 1 and 2 clearly demonstrate that Hintzman has a point: the TCE is far larger under intentional than incidental encoding, and in fact is fully absent under incidental encoding. Moreover, in Experiment 3, the effects—relatively speaking—are far smaller than under intentional encoding. Even these small effects are compatible with the alternative mechanisms suggested by Hintzman (point II). Finally—the one condition in experiment 3 that yields clearly persuasive evidence for TCE—the "relational" condition in which subjects relationally encode temporally adjacent items (though incidentally)—is actually entirely consistent with Hintzman's hypothesis, which emphasizes semantically based inter-relationships that arise during encoding.

So, one could just as easily depict this collection of data as clear validation of Hintzman's point—that the evidence for time-based, task invariant processes as an organization principle—is weak at best. I would very much recommend that the author—in future versions of this paper—acknowledge this point, and acknowledge that the effect is indeed quite small.

IV. Experiment 3 Evidence is Not as Persuasive as it Might at First Seem. Even though I thought that the ideas that went into Experiment 3 are clever and insightful, careful reflection on the data leaves me feeling less than persuaded. Consider the following points.

a. Figure 3 (left) superimposes the data from five conditions onto a single graph, making it very hard to see the data from each individual condition. Perhaps not accidentally, the line that is foregrounded—and that captures your attention—is the RED LINE—which represents the data from the Relational Encoding condition. Critically, the relational encoding condition requires subjects to inter-related items with one another via a common organization (an imagined movie)—and is exactly the sort of relational encoding that Hintzman was raising as an alternative to the temporal context idea. Thus, evidence from this condition could not distinguish Hintzman's view from the temporal contiguity idea. Yet, because this is mixed in with the other lines and is foregrounded, it biases one's perception of the entire pattern to be clearly supportive of a temporal contiguity trend for all incidental conditions—even though the main condition driving this perception actually supports Hintzman's idea.

b. If one tries hard to see the other lines in this graph separately, the data is clearly far less persuasive. If they were plotted separately, it would look far less compelling as evidence for the TCE. Indeed, I suspect that these lines would look quite similar to the lines from Experiments 1 and 2.

c. It is nevertheless clear that the temporal factor data (right side of graph) do show a non-zero effect. So, an effect may exist, but it is simply a lot smaller than under relational encoding conditions, which typically occur in explicit encoding. Whether this effect is sufficiently impressive to justify the importance placed on it theoretical models is something for readers to judge. But the readers, at a minimum, should be able to clearly see the lines for each condition separately to get a clear view of the data.

d. The relational encoding condition should clearly not be lumped in with the others as it is, and in future graphs, should be separated. That is because evidence from this condition is actually supportive of Hintzman's hypothesis that the effect is driven by relational encoding, and so shouldn't be visually lumped with the other conditions.

Final Comment. Despite the critical remarks in this review, I would like to emphasize that the idea for these studies was very good, and the topic is important. Moreover, I respect the largely careful approach of the author and think that this is good quality work. I just think that the theoretical story remains unclear, and requires more work than comfortably fits in this journal.