

Student Work

12-13-2022

Production Effect and Recall

Lexi Long

Kayla Zevenbergen

Follow this and additional works at: https://digitalcollections.dordt.edu/student_work



Part of the [Psychology Commons](#)

Recommended Citation

Long, L., & Zevenbergen, K. (2022). Production Effect and Recall. Retrieved from https://digitalcollections.dordt.edu/student_work/84

This Article is brought to you for free and open access by Dordt Digital Collections. It has been accepted for inclusion in Student Work by an authorized administrator of Dordt Digital Collections. For more information, please contact ingrid.mulder@dordt.edu.

Production Effect and Recall

Lexi Long and Kayla Zevenbergen

Dordt University

Abstract

The production effect, that producing words by saying them aloud can yield strong memory improvements relative to silent reading, was tested by presenting two short word lists read silently or aloud by college student participants with testing free recall. The results were not significant, possibly as a result of pure-list design, where a whole list was either read silently or aloud rather than some words read silently and some aloud on a single list, and too short of a distraction between study and recall.

Keywords: production effect, college students, pure-list, silent, aloud

Production Effect and Recall

Being able to remember and recall details is an important skill that is seen in many areas of life, particularly in an academic setting. When taking tests, many students struggle to recall information (Bors & MacLead, 1996). In order for the brain to remember or recall something better, it needs to use an active encoding process (Bodner & Taikh, 2012). Without any reinforcement or connections to prior knowledge, information is quickly forgotten (Murre & Dros, 2015). One of the more well-known ways to learn more efficiently and effectively is through the production effect. The production effect supports that words read aloud are better recalled than words read silently (Bodner & Taikh, 2012; Icht et al., 2014; Jones & Pyc, 2013). Not only are more words recalled, they are also comprehended better (Hale et al., 2007). The production effect allows for alternative modes of encoding to occur which makes information stand out (MacLeod & Bodner, 2017). One example of a modality to do this is speaking the words aloud. Her et al. (2018) found that groups reading words aloud recalled more words than groups who either listened to an audio recording or read the words silently. In another study, Jones and Pyc (2013) found in two different experiments that reading words aloud led to better recall than silent lists. A similar study found that with a word list of 50% silent and 50% read aloud, 15 of 20 participants showed that they would recall 27% of the words they said aloud and only 19% of the words read silently (Icht et al., 2014).

The production effect is not only shown through speaking modalities. Forrin et al. (2012) did a study where they tested many types of encoding processes including writing, spelling, typing, and even whispering. They found that although speaking was the group that had the most words recalled, each type of modality had more words recalled than when participants only read the words silently. Overall, reading aloud has indicated the highest level of recollection due to the fact there are two elements in the recall process, both articulation and audition (Hassall et al., 2016).

The distinctiveness effect has also been found to be related to the production effect. Distinctiveness helps recall words that you spoke aloud specifically because you remember saying it aloud. Ichet et al. (2014) compared a list that was 20% said aloud and 80% studied silently, and because of distinctiveness, 19 of 20 participants recalled more words studied aloud than studied silently. When studying, silently rereading is known as a low utility assessment (Niroula & Niroula 2020). A low utility assessment means it does not take much effort to perform, and it does not yield extensive mental encoding. The majority of students use the strategy of silent reading in comparison to a cognitively effortful one that would lead to better encoding (Karpicke et al., 2009; Walck-Shannon et al., 2021). This is partly due to the idea that participants can recall saying a word aloud which uses another process to encode the information (Ozubko & MacLeod, 2010). In addition to reading the word aloud, when it comes to recall, the participant is able to recall whether the word was said aloud or silently.

The production effect clearly demonstrates that recall is better performed when information is encoded by reading it aloud. Further implications can be seen through students studying aloud and therefore increasing their recall in a classroom setting. This study will test the production effect in two ways to show if reading aloud will lead to a greater recall than reading silently. First, can a list of words be recalled more easily when read silently or aloud? Second, does the order of the independent variable (silent or aloud reading) experienced first have an effect on words recalled?

Methods

Participants

The study included 87 participants (36 males, 51 females) who were recruited from Dordt University ranging from first-year students to four-year and beyond students (aged 18-25, $M = 20.33$) with more participants being upperclassmen than underclassmen.

Materials and Procedures

The study occurred in two very similar Dordt University classrooms. First, the participants were randomly assigned to room one or room two. After receiving the room assignment, participants were randomly assigned a number and corresponding seat in the classroom. Then participants were presented with a consent form (see Appendix) and a demographic survey.

The consent and demographic forms were completed and then collected. Fifteen neutral words were then shown on a projector screen at a rate of one slide per three seconds. Room one recited list one silently first, then recited list two aloud. Room two recited list one aloud, then recited list two silently. Immediately after seeing list one, a short clip from the Disney movie Finding Nemo was shown; it was approximately 15 seconds. After the clip ended, pre-numbered papers that correspond to participants' seats were passed out, and the participants were instructed to write down as many words as they could remember in three minutes. The papers were then collected. List two, consisting of 15 words, was then read aloud in unison by room one and read silently by room two, again at a rate of one word per three seconds. Another 15 second clip from the Disney movie Emperor's New Groove was shown, and immediately following, participants were instructed to write down as many words they could remember on a new sheet of paper in three minutes. After collecting all the papers, we debriefed our participants on what happened and the effect being tested.

Data Analysis Plan

We plan to run a paired t-test to compare the number correct between the aloud and silent lists. We will run an independent t-test to look at the differences between the aloud list first and the silent list first.

Results

We assessed if reading a list of words silently or aloud permitted easier recall. The average number of correctly answered words from the silent list ($M = 7.35$, $SD = 2.20$) did not

significantly differ from the number of correctly answered words from the aloud list ($M = 7.71$, $SD = 2.11$), $t(86) = -1.63$, $p > .05$.

The participants who received the aloud list first ($M = 7.64$, $SD = 2.29$) had no significant difference in the number correct from participants who received the silent list first ($M = 7.42$, $SD = 2.08$); $t(83) = -0.47$, $p > .05$.

Discussion

This study was intended to demonstrate the effects of dual-encoding through the production effect. The results demonstrated that saying words aloud produced marginally better recall, but it was not significant. The results were not statistically significant for the effect of receiving the aloud list or silent list first.

In previous studies, the production effect was very successful and effective (Bodner & Taikh, 2012; Icht et al., 2014; Jones & Pyc, 2013). However, we tested recall rather than recognition, compensating with shorter length word lists and a shorter distractor task. Our study included 15 words in each word list. Other studies incorporated lists of 80 to 120 words (Icht et al., 2014; Pritchard et al., 2020). Our participants viewed a short 15 second video clip before recalling words. Other studies utilized more extensive distractor tasks. For instance, one study had their participants complete a two minute distractor task before recalling words (Jones & Pyc, 2014). The production effect for free recall might have been more successful with more time in the distractor task as the dual encoding would be beneficial after words are out of short term memory.

The production effect has been supported with a mixed-list design and recognition tests. We furthered the area of research by testing a free recall design with pure-lists. Although our results were not significant, we expanded further research testing the production effect with free recall and pure-lists.

References

- Bodner, G. E., & Taikh, A. (2012). Reassessing the basis of the production effect in memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 38(6), 1711-1719. <https://doi.org/10.1037/a0028466>
- Bors, D. A., & MacLeod, C. M. (1996). Individual differences in memory. In E. L. Bjork and R. A. Bjork (Eds.), *Handbook of perception and cognition, Vol. 10: Memory* (pp. 411-441). San Diego, CA: Academic Press
- Forrin, N. D., MacLeod, C. M., & Ozubko, J. D. (2012). Widening the boundaries of the production effect. *Memory & Cognition*, 40(7), 1046-1055. <https://doi.org/10.3758/s13421-012-0210-8>
- Hale, A., Skinner, C., Williams, J., Hawkins, R., Neddenriep, C. & Dizerpo, J. (2007). Comparing comprehension following silent and aloud reading across elementary and secondary students: Implication for curriculum-based measurement. *The Behavior Analyst Today*, 8(1), 9-23
- Hassall, C. D., Quinlan, C. K., Turk, D. J., Taylor, T. L., & Krigolson, O. E. (2016). A preliminary investigation into the neural basis of the production effect. *Canadian Journal of Experimental Psychology*, 70(2), 139-146. <https://doi.org/10.1037/cep0000093>
- Her, J., Vang, K., & Vang, X. (2018). *Testing the production effect in memory for words testing the production effect in memory for words testing the production effect in memory for words*. https://digitalcommons.csbsju.edu/cgi/viewcontent.cgi?article=1018&context=ur_cscday
- Icht, M., Mama, Y., & Algom, D. (2014). The production effect in memory: Multiple species of distinctiveness. *Frontiers in Psychology*, 5. <https://doi.org/10.3389/fpsyg.2014.00886>

- Jones, A. C., & Pyc, M. A. (2014). The production effect: Costs and benefits in free recall. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *40*(1), 300-305. <https://doi.org/10.1037/a0033337>
- Karpicke, J. D., Butler, A. C., & Roediger III, H. L. (2009). Metacognitive strategies in student learning: Do students practice retrieval when they study on their own? *Memory*, *17*(4), 471–479. <https://doi.org/10.1080/09658210802647009>
- MacLeod, C. M., & Bodner, G. E. (2017). The production effect in memory. *Current Directions in Psychological Science*, *26*(4), 390-395. <https://doi.org/10.1177/0963721417691356>
- Murre, J., & Dros, J. (2015) Replication and analysis of Ebbinghaus' forgetting curve. *PLoS ONE* *10*(7): e0120644. <https://doi.org/10.1371/journal.pone.0120644>
- Niroula, S., & Niroula, A. (2020). Effective way of studying and learning in medical school. *Journal of Nepal Medical Association*, *58*(231). <https://doi.org/10.31729/jnma.5258>
- Ozubko, J. D., Gopie, N., & MacLeod, C. M. (2012). Production benefits both recollection and familiarity. *Memory & Cognition*, *40*(3), 326-338. <https://doi.org/10.3758/s13421-011-0165-1>
- Ozubko J. D., & Macleod C. M. (2010). The production effect in memory: Evidence that distinctiveness underlies the benefit. *Journal of Experimental Psychology Learning, Memory, and Cognition*; *36*(6) 1543-7. <https://doi.org/10.1037/a0020604>
- Pritchard, V. E., Heron-Delaney, M., Malone, S. A., & MacLeod, C. M. (2020). The production effect improves memory in 7- to 10-year-old children. *Child Development*, *91*(3), 901–913. <https://doi.org/10.1111/cdev.13247>
- Terada, Y., (2017). Why students forget—and what you can do about it. *Edutopia*. <https://www.edutopia.org/article/why-students-forget-and-what-you-can-do-about-it>
- Walck-Shannon, E. M., Rowell, S. F., & Frey, R. F. (2021). To what extent do study habits relate to performance?. *CBE Life Sciences Education*, *20*(1), <https://doi.org/10.1187/cbe.20-05-0091>

Appendix

Dordt University IRB
IRB #: 202230003
IRB Approval effective from: Oct 5, 2022
Number of pages in consent: 2

Informed Consent Production and Recall

We are asking you to participate in a research study titled "Word Production and Recall". We will describe this study to you and answer any of your questions. This study is being led by Kayla Zevenbergen and Lexi Long, undergraduate psychology students at Dordt University. The Faculty Advisor for this study is Dr. Luralyn Helming, Psychology Department at Dordt University.

What the study is about

The purpose of this research is to look at the difference in recall between reading a word aloud and reading a word silently.

What we will ask you to do

You were randomly assigned a number to maintain anonymity of your responses. After arriving in the room, a demographics survey will be handed out and completed. Then one list of words will be displayed on the screen, and you will read them silently or aloud as instructed when they appear, then a short video clip will be played. You will then recall the words by writing them down on the provided piece of paper. The next list will then be shown, and you will read them silently or aloud as instructed when they appear. Again, a short video will be played. Then you will recall as many words as possible on a second provided sheet. The study should take no longer than 20 minutes.

Risks and discomforts

We do not anticipate any risks from participating in this research.

Benefits

You will not experience any direct benefits from participating in the study. We hope to learn more about the influence of reading aloud and reading silently.

Compensation for participation

Participants may receive compensation in the form of extra credit at the discretion of their instructor.

Privacy/Confidentiality/Data Security

To protect your privacy, we collected no identifiers with your data, the consent forms will be stored separately from the data. The data forms will be kept locked in filing cabinets. The researchers and Dr. Helming will be the only people who have access to this information. Your information will not be used or distributed for future research studies

Although email communication should only be used for recruitment, please note that email communication is neither private nor secure. Though we are taking precautions to protect your privacy, you should be aware that information sent through e-mail could be read by a third party.

Taking part is voluntary

Participation is voluntary and you may refuse to participate before the study begins, discontinue at any time, or skip any part of the procedure that may make you feel uncomfortable with no penalty.

If you have questions

If you have questions, please contact Kayla Zevenbergen at 712-578-1506 or kylznvnb@dordt.edu , or Lexi Long at 402-202-9077 or lxing19@dordt.edu. If you have any additional questions about the study, feel free to contact our faculty sponsor and chair of the Institutional Review Board, Dr. Luralyn Helming at Luralyn.Helming@dordt.edu or 712-722-6038. If you have questions in general about your participation as a research participant in studies at Dordt University, please contact the Acting Chair of the Institutional Review Board Dr. Melanie Wynja, at Melanie.Wynja@dordt.edu or 712-722-6248.

Statement of Consent

I have read the above information and have received answers to any questions I asked. I consent to take part in the study.

Your Signature _____ Date _____

Your Name (printed) _____

Signature of person obtaining consent _____ Date _____

Printed name of person obtaining consent _____

This consent form will be kept by the researcher for five years beyond the end of the study.