

Research Articles

The Effects of Doodling on Recall Ability

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Abstract

Previous research has documented a positive effect of doodling on individuals' ability to recall information. However, previous research is limited to structured doodling tasks, such as shading in basic shapes. The present study extends the extant research, and increases the external validity of the previous findings, by considering the effects of multiple forms of doodling on recall. In this experimental study, ninety-three undergraduate participants were randomly assigned to one of 4 conditions (control, structured doodling, unstructured doodling, or note-taking). Participants listened to a fictional dialogue between 2 friends discussing a recent earthquake and then completed a fill-in the blank quiz to test their recall of the conversational information. The results indicated that participants in the unstructured doodling condition performed significantly worse than those in the structured doodling and note-taking condition.

Keywords: doodling, cognition, attention

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You are in class trying to listen to a classmate's presentation but continually catch yourself daydreaming about what you will eat for lunch, why this class is required to graduate, why your friend has yet to return your text messages, etc. All the sudden the teacher asks the class a question about the presentation and you realize that not only were you not aware that the presentation had ended, but also that you cannot recall what the presentation was about in the first place. This or a similar scenario has most likely happened to all of us at one point or another whether we were purposefully trying to daydream or whether we indeed were trying to attend to the lecture/presentation. Engaging in task unrelated thoughts (TUTs), such as daydreaming, commonly happens when we are bored and/or disengaged from the stimuli whether a business, academic, or social setting (Smallwood & Schooler, 2006). We do many things to combat boredom including playing with our phones, chatting with neighbors, doodling, or taking notes (Harris, 2000; London, Schubert, & Washburn, 1972). There is no shortage of literature showing the positive effects and correct way to take notes for acquiring and storing information (Di Vesta & Gray, 1972; Kiewra, 1985; Kobayashi, 2005), but there are times when we simply want to listen to the lecture or presentation without taking notes while still being able to tend to the information being delivered.

Jackie Andrade published a study in 2010 that examined the effects of doodling on recall ability. In her study, she showed that, compared to students who did not doodle, students who doodled while listening to a two-minute audio recording were able to recall significantly more information that they were told to attend to, as well as information that they were told they did not have to attend to. The researcher attributed this effect to a reduction in daydreaming that occurred in those who were doodling. This conclusion is supported by several studies showing that performance on information processing and/or recall tasks (e.g., memory tasks, listening to a lecture or video) can be increased when one engages in low attention-demanding tasks simultaneously, such as doodling, in situations where the learner experiences boredom (Roche et al., 2007; Smallwood, O'Connor, Sudbery, & Obonsawin, 2007). This occurs because doodling maintains arousal while consuming a limited amount of available cognitive resources compared to daydreaming, which consumes a high amount of cognitive resources (Teasdale, Proctor, Lloyd, & Baddeley, 1993). There were, as the researcher mentions in the study, a few limitations in her study, as well as opportunities to extend her findings, and this is the purpose of the current research study.

The main limitation of the Andrade (2010) study was the way that participants doodled. Participants were given sheets of paper with objects to shade in (squares and circles) while they listened to the audio recording. Although this is certainly a form of doodling, this method certainly lacks ecological validity. It is reasonable to assume that those who doodle, whether students in class or workers in a business meeting, would be engaged in more of a freestyle form of doodling. It is also reasonable to assume that those who doodle would exert various amounts of their attention and other cognitive resources into their doodling activities. For example, a detailed drawing of another classmate or person would most likely require more cognitive resources than doodling random shapes or squiggly lines, and thus it is possible that the type of doodling may moderate the relationship between doodling and increased recall ability.

An additional limitation of Andrade's (2010) study, which the author mentioned in the article, is that there were no measures of daydreaming that could confirm the hypothesis that students who doodled engaged in daydreaming less than students who listened and took notes. The present study was designed to address some of the limitations of the existing work on doodling. First, we focused on whether different types of doodling would yield the same effect on recall ability. Our second question centered on a more practical issue: How does doodling compare to other proven tools such as note-taking? In Andrade's study, participants in the "control" group took notes but only on part of the information on which they were to be assessed. Finally, we sought to compare different types of doodling to note-taking.

The Current Study

In the current study we sought to further assess the potential benefits of doodling on recall ability. We wanted to look specifically at whether allowing participants to doodle whatever they choose would yield a comparable effect to Andrade's doodling condition (i.e., shading in shapes). This, as stated previously, was done to increase external validity since most people who doodle in the "real world" would be doing so in an unstructured manner. An additional difference between the current study and Andrade's is that we added a note-taking condition whereas Andrade permitted both the control and doodling groups to take notes. Although taking notes and reviewing then going over them at a later point in time has been shown to be more beneficial than not doing so, the act of taking notes itself has also been shown to yield significant encoding effects compared to simply listening to or watching incoming stimuli (Di Vesta & Gray, 1972). We chose not to allow participants in the note-

taking condition to use their notes for the recall task so that we could compare the process of note-taking to the process of doodling rather than the participants' note-taking quality.

Our assessment was guided by three hypotheses. First, we hypothesized that both the structured and unstructured doodling groups as well as the note-taking group would perform significantly better on the recall test than the control group. Second, we hypothesized that the type of doodling would not have a significant effect so that those in the unstructured doodling condition would perform as well as those in the structured doodling condition on the recall test. Our third hypothesis was that those in the doodling conditions would perform as well as those in the note-taking condition on the recall task. These hypotheses are consistent with the previous literature and would serve as a replication and extension of [Andrade's study \(2010\)](#). Specifically our hypotheses were designed to replicate [Andrade's \(2010\)](#) results and extend them by showing that: 1) doodling can be a beneficial tool for staying engaged during lectures and other similar settings, 2) the effects of doodling can be achieved with unstructured doodling in addition to the structured doodling that Andrade assessed, and 3) doodling can be as effective as the process of note-taking on recall ability.

Methods

Participants and Design

There were 93 participants who signed up and completed the study. Of those, 20 were male and the ages ranged from 18-50 years with the mean age being 22. The vast majority of students who participated were studying elementary education and this was due to the requirement for participants to sign up for the study through the college of education online research participation system. As for ethnicity, the majority of participants were Caucasian (55%) and Latino (21%). Participants were randomly assigned to one of the four conditions (control, structured doodling, unstructured doodling, and note-taking) with each group having 23 people except for the note-taking group with 24. All participants monitored a conversation between two people and then attempted to recall information from the recording.

A mock conversation between two friends was recorded at a relaxed conversational pace and played for participants at a comfortable volume (see [Appendix](#) for a copy of the conversation transcript). We chose to use an audio conversation rather than a lecture, song, or video-taped conversation to be consistent with [Andrade's \(2010\)](#) design. In addition, we wanted to assess recall on fictitious information to control for previous knowledge that participants may have on specific subject areas. The fictional conversation was about a couples' vacation to Hawaii and lasted approximately 5 minutes. Participants in the control condition just listened to the conversation. Those in the structured doodling condition used a pencil or pen to shade in 42 shapes (squares, circles, stars, crosses, and triangles) approximately 1 inch in diameter. Those in the unstructured doodling condition were provided with a white 8 by 11 inch sheet of blank paper and instructed to doodle anything they wanted, with the exception of inappropriate material or notes, during the audio recording. Those assigned to the note-taking condition were provided with a blank sheet of 8 by 11 inch white paper to take notes while listening to the recording (copies of all instruments are in the [Appendix](#)). All participants completed the recall quiz which consisted of 13 short-answer items (see the [Appendix](#) for the quiz).

Procedure

Participants signed up through the university's online research system under the department of education to fulfill research requirements for various courses in the education department. The study description informed participants that they would "listen to an audio recording while either doodling, taking notes, or just listening, and then be given a quiz assessing how much information you are able to recall. This study will take approximately 40 minutes of your time". Participants were then randomly assigned to the control, structured doodle, unstructured doodle, or note-taking groups. After allowing participants time to complete a demographic questionnaire, participants were instructed as to what they would be doing during the audio recording depending on their group assignment (taking notes, doodling, or just listening) until the audio recording started. Participants were observed during the 5-minute audio recording to ensure that they were on task by a member of the research team. Following the audio recording the participants were told to turn over their notes or doodling sheets and all participants were given a copy of the quiz and told to try their best to answer all items from memory and that those who took notes were not to use them.

Results

We first verified that there were no significant differences according to age ($F(8,69) = 1.51, p = .169$) or gender ($F(1,70) = 0.24, p = .626$), and there were none. We then analyzed the data using a standard ANOVA and found significant group differences ($F(3,65) = 6.21, p = .001, \eta^2 = .22$). Using Tukey HSD tests for post-hoc analyses, we found significant differences in test performance between those in the unstructured doodling group and those in the structured doodling and note-taking groups. Specifically, those in the unstructured doodling condition scored significantly lower on the recall quiz compared to those in the structured doodling (*Mean diff.* = 2.24, *Std. error* = 0.81, $p = .04$), and those in the note-taking condition (*Mean diff.* = 3.12, *Std. error* = 0.77, $p = .001$). We also found a significant difference between those in the note-taking group and those in the control group (*Mean diff.* = 1.99, *Std. error* = 0.72, $p = .04$) (see [Table 1](#) below for all means and standard deviations).

Table 1

Means and Standard Deviations for each condition on the 13 point recall quiz

Group	<i>M</i>	<i>SD</i>
Control	6.56	1.72
Structured Doodling	7.67	2.00
Unstructured Doodling	5.43	2.14
Note-taking	8.55	2.84

Discussion

As an extension of [Andrade's \(2010\)](#) study, we expected to find that both the unstructured and structured forms of doodling would be beneficial to recall ability, but this was not the case in our study. We also predicted that the type of doodling, whether structured (as Andrade examined) or unstructured, would not make a significant difference on performance, but this was again shown to be an erroneous prediction. Lastly, we predicted that both types of doodling conditions would perform as well as those in the note-taking condition on the quiz, and

this was partly confirmed. We found no support that doodling improved participants' recall ability beyond just listening although we did find a significant effect for note-taking.

The significant results we did find showed that there was a drop in recall performance for those who were in the unstructured doodling condition compared to those in the note-taking and structured doodling conditions. We believe that this may be due to participants putting more attention, thought, and/or effort into their doodles compared to those who were just shading in shapes (those in the structured doodling condition). This hypothesis is consistent with previous studies that have shown a "bottleneck" effect (de Jong, 1993; McCann & Johnston, 1992) where tasks requiring different competing cognitive resources (e.g., attention, short-term memory, decision making) can only be completed one at a time. For example, with the unstructured doodling task participants must actively decide what to doodle, reproduce a mental image on the paper, and attend to the audio recording. In contrast, participants in the structured doodling need only to attend to shading shapes and the audio recording. We conducted a post-hoc analysis of the participants' unstructured doodles to see if those who put more effort into them did poorer on the recall exam. We separated the doodles in half and placed those which appeared to have more effort put into them in one group and the other half in another. We compared the groups and found that they were not significantly different, but with our limited sample of 8 participants in each group this was expected. Although non-significant, those who put less effort into their doodles had an average recall test score of 6.14 ($SD = 1.95$) compared to the recall test average of 4.71 ($SD = 2.22$) of those who put more effort into their doodles.

It is significant that a structured doodling had a statistically similar effect on recall ability compared to a thoroughly documented encoding aid such as note-taking. We were not surprised that participants in the note-taking group performed the best on the recall quiz since the activity of taking notes would serve, just as doodling, as a form of arousal to prevent mind wandering. In addition, through dual-coding, the act of taking notes would help the encoding process.

Conclusion

It is important to point out that this was not a direct replication of Andrade's procedure. Participants in her study were told to attend to only part of the information that they were later asked to recall, and both the doodling and control participants were allowed to take notes on the information that they were expecting to be asked to recall. In our study, we only permitted participants in the note-taking condition to take notes, and we did not employ and form of deception about what participants would be asked to recall. These differences could possibly affect our inability to replicate Andrade's findings, but mind wandering, as the mechanism postulated as disrupting attention, was indirectly assessed using the same design in both the current and Andrade's (2010) study. This being said, our data suggest that there may not be an advantage for doodling as a tool for increasing recall performance even if daydreaming is avoided. Even if one avoids the attentional drain of daydreaming, the concurrent task needs to detract as little attention as possible to be beneficial.

There were several limitations in our study. First, we did not measure participants' doodling and/or drawing habits. It is possible that those who already doodle during classes or in similar environments would perform differently than those who do not. The second limitation applies to both Andrade's (2010) and the current study; in neither study was there a direct measure of boredom and/or mind wandering. Andrade (2010) used an audio recording that lasted less than 3 minutes, and in the current study we utilized an audio recording that lasted approximately 5 minutes, but the question remains whether this is sufficient time for participants to cognitively

disengage from the task. The third limitation was sample size. There were between 20 and 25 participants in each of the 4 conditions, but to detect additional group differences it would have helped to increase the sample size. Future studies could provide further insight into the possible benefits of doodling by increasing the duration of the stimulus (e.g., recording or lecture) so that there would be a greater probability of mind wandering. Future studies could also further measure the effort placed into participants' doodles to assess whether effort moderates the effects of unstructured doodling on preserving attention.

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Competing Interests

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Appendix

Audio Script

Jake: Kira, good news.....I found out that we will earn double miles for this flight.

Kira: Oh yeah? How many miles do we have so far? Don't we need like 50,000 to earn a free flight?

Jake: I think it's only 20,000, but I will check when we get back. I think we have 15,000 already so maybe we will be able to go somewhere nice this Christmas instead of your parents.

Kira: Don't even start, it's only July and your already planning a way to get out of spending the holidays with my family.

Jake: I'm only joking. So what do you want to eat for dinner?

Kira: Well, we have leftovers from last night? Or we could have salads....afterall, we could both use a little bit of dieting since we're going to be wearing our bathing suits everyday.

Jake: You can have a salad...I'm gonna go pick up a pizza- I'm starting our vacation early and I never diet while I'm on vacation.

Kira: Fine...fine....just don't get hot peppers on it this time...I hate having to pick them off and it still is too spicy even if I do.

Jake: K, I'll ask them to put them on the side. Have you finished packing?

Kira: I'm just about finished...just need to figure out what I want to wear if we go anywhere fancy, have you checked the weather report?

Jake: It's Hawaii....I'm sure it will be nice.

Kira: Just check please, maybe it is supposed to rain or some freak cold front is coming.

Jake: Ok, I will- relax.

Kira: Did you borrow the suitcase from Jim?

Jake: Yes, I took care of everything, don't worry.

Kira: Ok, remember to check in online before we leave in the morning.

Jake: I still can't believe that we got such a good deal on this trip, I didn't think we would ever be able to afford to stay for two weeks.

Kira: Yeah, but you know that we're still on a budget, so don't get any crazy ideas, haha.

Jake: Kira, you only live once. I didn't save up for two years to penny-pinch.

Kira: True, I suppose you're right, I just don't want to get back and pass out when the credit card bill comes.

Jake: I promise we won't get too crazy, and the promotion I received at work does take a lot of pressure off. Are you still nervous about the flight tomorrow?

Kira: Ughh..don't bring it up- you know I hate flying.

Jake: At least you have those pills Dr. Snyder gave you this time.

Kira: True, but that doesn't make me less nervous right now. I do wish that we would've been able to leave back in January; the weather has been so nice here lately it doesn't seem as special.

Jake: Maui is special no matter what time of year you go. Trust me, you've never been there before. You know that if I didn't have my back surgery back In January I would have been miserable the entire time, so even though we had to wait it will be better for both of us since we will be able to do so much more.

Kira: It better be. We did give up Paris

Jake: We have plenty of time to see Paris Kira, plus a four hour flight is probably a little more manageable for than a ten hour one.

Kira: Ok, ok...don't remind me of flying anymore tonight.

Jake: Ok, subject change. Let's go over our itinerary before we go to sleep. Sound good?

Kira: Alright. The first place I want to visit when we land in Honolulu is Pearl Harbor.

Jake: Ok. But we only have a few hours before our flight to Maui, so we can't venture too far from the airport. So let's see the harbor and then we can grab some lunch since I'm sure we will be starving. I guess we can head back to the airport after that. We can't check in to our hotel until 4 so we may have some time to kill when we land.

Kira: Sometimes they have the rooms ready early, so we may as well go to the hotel and see since we will have all of our luggage with us. I'm sure we will be tired anyway since we have to wake up so early.

Jake: Good point, no need to rush since we will have two weeks. So what are you most excited about doing while we're there?

Kira: Seriously? You've known me for 9 years and you have to ask?

Jake: Haha, I know, I know...swimming with the turtles- I can't believe they don't scare you..they are as big as cars!

Kira: Don't be silly, they're not that big and they don't eat humans- they're gentle.

Jake: If you say so...I'm just excited to lay on the beach and do absolutely nothing...Working 10 hour days has taken its toll over the past few months. I don't even want to think about work...when I get back I have that presentation to give to the board. You will probably have to drag me to the airport in two weeks.

Kira: Well, remember you agreed to take scuba lessons with me, so you can sleep in every morning except for one day since the lessons start at 8am.

Jake: At least we were lucky enough to get a beach view in our hotel room- I've always said that I sleep best when I can hear the ocean at night. I am also really looking forward to eating fresh seafood...let's eat a light lunch so we can have a big seafood dinner tomorrow night.

Kira: I know, the hotel room seems like it will be perfect but I am still a little disappointed that they only had a queen size bed instead of a king. You know how I like to stretch out when I sleep- how can they not have a single room available with a king size bed? Can you ask them again when we get there if something has opened up? Please? For 200 dollars a night, we should at least get a king size bed.

Jake: Ok, I can ask but I doubt they will. I hope you won't complain the whole time if they don't have anything but the queen. If that's the only thing that we have to complain about the entire time we will be lucky.

Kira: Ok, but you still better ask. Is your brother still taking us to the airport in the morning? Why don't you call him and remind him he needs to be here by 6? You know how busy Phoenix can get and I really think we should get there at least 90 minutes before our flight.

Jake: Don't worry, Jim wakes up at 5 every morning, but I will call him anyway. And don't complain about traffic since you're the one who begged to move to Phoenix.

Kira: Just stating the facts. And you were the one who complained about the snow every year back in Vermont so don't act like you weren't content to move. By the way, did you give Jane the spare key so she can get in to feed Zack and Zoey?

Jake: Darnit! I knew I forgot something! Do you think she would still be up?

Kira: I knew you would forget. I don't know...you better call her. Did you think those two dogs were going to feed themselves?

Jake: Take it easy, I've had a lot going on and I will take care of it...even if she is asleep I can put the spare key under the rock outside and call her tomorrow. The dogs won't starve.

Kira: Just one more thing to worry about...At least we packed yesterday and can get some sleep.

Jake: No kidding, I just hope I'll be able to fall sleep. Do you think I should take an ambient?

Kira: No, I wouldn't...you know how drowsy that will make you in the morning. Maybe if you take the dogs for a walk you'll be tired by the time you get back?

Jake: Nice try, it's your turn and you know it.

Kira: Haha, it was worth a try.

Jake: I'm gonna jump in the shower while you're gone.

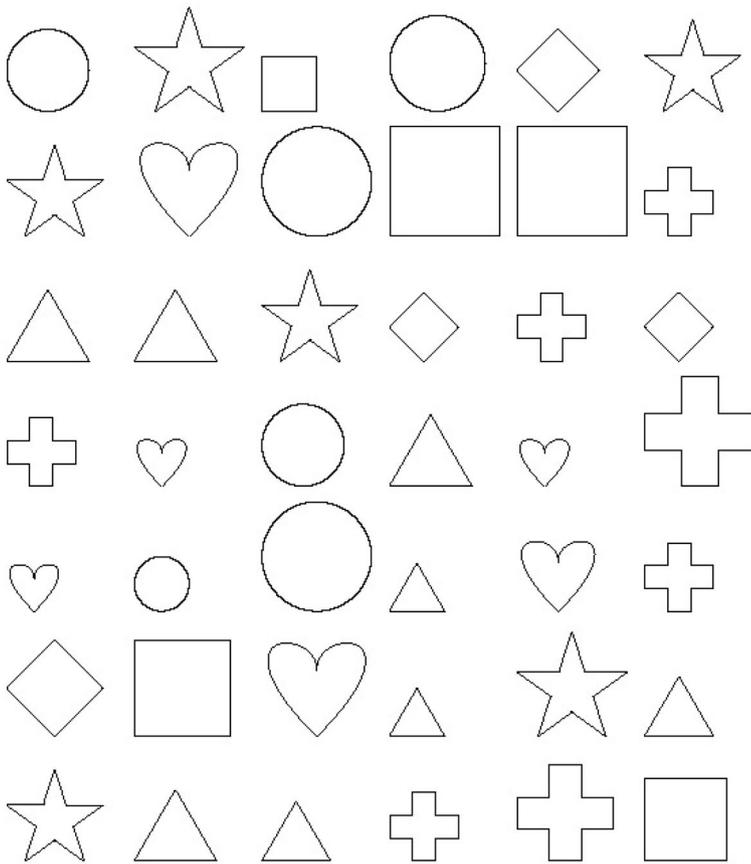
Kira: Ok, but before you do remember to call your brother and Jane.

Recall Quiz

Please answer the following questions:

1. What is the first place Kira wants to visit on their trip to the Hawaiian islands?
2. On which of the Hawaiian islands will they be staying?
3. How long did it take Jake and Kira to save for their vacation?
4. What activity did Kira say she was most excited about doing?
5. What does Kira not want on her pizza?
6. What are they borrowing from Jake's brother?
7. How long have Jake and Kira known each other?
8. Why is Jake happy about their room?
9. Why did Kira complain about the hotel room?
10. Where did Jake and Kira originally plan to go on vacation back in January?
11. Why did Jake need to wait until June to leave to go on vacation?
12. Name one of Kira and Jake's dogs.
13. What do Kira and Jake want to wake up early for while on vacation?

Structured Doodle Sheet



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