What does doodling do?

Jackie Andrade

School of Psychology, University of Plymouth, U.K.

Address for correspondence: Jackie Andrade
School of Psychology
University of Plymouth
Plymouth
PL4 8AA
U.K.

email: j.andrade@plymouth.ac.uk
tel: +44 (0)1752 584807
Acknowledgements

Thanks to Tim Perfect, Michael Verde, Jon May, Amanda Fother, Henry Government for their comments.
Abstract
Doodling is a way of passing the time when bored by a lecture or telephone call. Does it improve or hinder attention to a primary task? To answer this question, 40 participants monitored a monotonous mock telephone message for the names of people coming to a party. Half of the group was randomly assigned to a ‘doodling’ condition where they shaded printed shapes while listening to the telephone call. The doodling group performed over 23% better on a surprise memory test than on a control condition. Unlike many dual task situations, doodling while working can be beneficial. Future research could test whether doodling aids cognitive performance by reducing daydreaming or helping maintain optimal levels of arousal.
What does doodling do?

The call centre has put you on hold yet again and you start thinking about how good it would be to have a holiday, where you would like to visit … then you realize that the person you have been waiting to speak to has already started talking and you haven’t taken in anything they’ve said. This scenario demonstrates the tendency for daydreaming to start in moments of boredom and, once started, to distract attention from the task in hand. In such a situation some people resort to doodling, aimlessly sketching patterns and figures unrelated to the primary task. It is not known whether doodling improves performance by allowing resources from the primary task to be reallocated to the secondary task, or whether it improves performance by taking resources from the primary task (Dunlosky & Korn, 2007). This question ties into more general issues in cognitive and applied psychology. Boredom is a very common experience (Harris, 2000) and daydreaming is a common response, even in the laboratory (Smallwood & Schooler, 2006). A way of aiding concentration would have implications for psychological research methods as well as practical applications. Dual task designs are currently used to probe specific cognitive resources and performance states, but they fail to take into account the effect of boredom. Performance decrements through competition for task-specific resources may be moderated by engaging the secondary task in a way that reduces the mind wandering or elevated arousal levels that can be a hidden feature of single task control conditions (Smallwood, O’Connor, Sudbery & Obonsawin, 2007). This study is the first experimental test known to the author of the prediction that doodling aids concentration.

Participants listened to a monotonous mock telephone message. An auditory task was chosen so that doodling would compete minimally for modality-specific resources. Participants listened to a monotonous mock telephone message. In order to reduce boredom, the words were repeated in a random ordering. The order of each block followed that of single task control conditions (Smallwood, O’Connor, Sudbery & Obonsawin, 2007).
afterwards attempted a surprise recall test for that information and for incidental information. Performance was measured in terms of monitoring accuracy and memory, which were assumed to reflect the depth of processing of the monitored material. Rather than being asked to doodle freely, participants were asked to shade in printed shapes on the response sheet, without worrying about the spontaneity of their shading. This hope was that the simplicity of the shading task would encourage a degree of absent-mindedness in participants, akin to that seen in naturalistic doodling. Participants were not asked to doodle freely in case they felt self-conscious about their drawings or suspected that the content of their doodles was the real focus of the study. In this case, their shading would not have been spontaneous, automatic, or unrelated to monitoring.

Method

Participants and design
Participants were 40 members of the MRC Applied Psychology Unit participant panel recruited from the general population and aged between 18 and 55 years. They were paid £10 for taking part. Participants were randomly assigned to the control (N = 20; 2 male) or doodling group (N = 20; 3 male). All participants monitored a telephone message and then attempted to recall monitored and incidental information. Recall order was counterbalanced across participants.

Participants

Participants were 40 members of the MRC Applied Psychology Unit participant panel recruited from the general population and aged between 18 and 55 years. They were paid £10 for taking part. Participants were randomly assigned to the control (N = 20; 2 male) or doodling group (N = 20; 3 male). All participants monitored a telephone message and then attempted to recall monitored and incidental information. Recall order was counterbalanced across participants.
people and one cat who could not attend (see Appendix). Eight place names were mentioned, along with much irrelevant material.

Participants in the doodling condition used a pencil to shade shapes of approximately 1 cm diameter printed on a piece of A4 paper, with 10 shapes per row alternating rows of squares and circles. A 4.5 cm wide margin on the left hand side allowed space for writing the target information. Control participants wrote the target information on a lined piece of paper.

Procedure
Participants were recruited just after finishing an unrelated experiment on ways of giving directions to different locations for another researcher, and asked if they would mind spending another five minutes helping with research. The intention was to enhance the boredom of the task by testing people who were already thinking about going home.

Participants were tested individually in a quiet and visually dull room. They were told:

“I am going to play you a tape. I want you to pretend that the speaker is a friend who has telephoned you to invite you to a party. The tap is rather dull but that’s okay, because I don’t want you to remember any of it. Just write down the names of people who will definitely or probably be coming to the party. Ignore the names of those who can’t come. Do not write anything else.”

Participants in the doodling condition were also asked to shade in the squares and circles while listening to the tape. They were told “It doesn’t matter how neatly or how quickly you do this – it is just something to help relieve the boredom.”

Participants listened to the tape, which lasted two and a half minutes, and wrote down the names as instructed. When the tape finished, the experimenter collected the response sheets, and engaged participants in conversation for 1 minute including an apology for misleading
them about the memory test. Half the participants were then asked to recall the names of party-goers and, when they had done that, of the places mentioned. The other half recalled the places first followed by the names. During debriefing, participants were asked if they had suspected a memory test.

Results
Participants in the doodling group shaded a mean of 36.3 of the printed shapes on their response sheet (range 3 to 110). One participant did not doodle and was replaced. Participants in the control condition did not doodle. Three doodlers and four controls suspected a memory test. None said they actively tried to remember information.

Control participants correctly wrote down a mean of 7.1 (SD = 1.1) of the eight names of party-goers during the tape. Two people made one mistake each. Doodling participants correctly wrote down a mean of 7.8 (SD = 0.4) names of party-goers on their response sheet; one person made one mistake.

Non-parametric analysis was used because scores were not normally distributed. Meaningful differences between conditions were found for the number of correct names mentioned. To compare the number of correct names mentioned, the non-parametric Mann-Whitney U test was used.

Recall performance was scored separately for names and places using the definitions of correct responses and false alarms above. There were no differences in the number of false alarms between conditions. Overall, participants in the doodling group recalled significantly more names than the control group (U = 124, p = 0.01, one-tailed).
doodling condition recalled a mean of 7.5 pieces of information (names and places). This exceeded the mean of 5.8 recalled by the control group. Memory scores increased for doodling, compared to control participants, such that the monitored names were recalled better than the incidental places (F(1,38) = 5.1, p < 0.05). Recall was better for monitored names (8.0 ± 1.3 pieces) than for incidental ones (5.8 ± 1.3 pieces, F(1,38) = 5.1, p < 0.05). A mixed measures ANOVA confirmed that the monitored name recall was significantly better than the incidental places (F(1,38) = 5.1, p < 0.05). Removing data from participants who suspected the test did not alter the pattern of results (main effect of group: F(1, 31) = 6.9, p = 0.01). Entering monitoring performance as a covariate made the group effect marginally significant, F(1,37) = 3.8, p = 0.058.

Discussion

Participants who performed a shape-shading task, intended as an analogue of spontaneous doodling, concentrate better on a mock telephone message that participants who listened to the message without concurrent task. The benefit was not due to increased processing but to a concurrent task. When no concurrent task was used, the group difference was not significant. So it is not clear whether doodling assisted memory, because monitoring performance was related to both groups, or whether it was adapted by increased shallow processing of the material on the tape.

Two methodological features may have contributed to the beneficial effect of doodling by making the primary task less boring. Participants were not informed that the tape would be dull, to discourage them from searching for something interesting. The information was not relevant to the participants, and they were told that the doodling task was not relevant to the experiment but might help them relax. Although we do not know how effective these elements were, it is possible that these features contributed to the beneficial effect of doodling.

The finding that doodling led to better memory is consistent with previous research that suggests that doodling can help improve memory. It is possible that doodling helps by engaging the right hemisphere of the brain, which is involved in spatial processing and visualization. This may help to create a mental image of the information being recalled, which can improve memory. Additionally, doodling may help to engage the left hemisphere of the brain, which is involved in verbal processing and language. This may help to encode the information in a more effective way, leading to better memory.

However, it is important to note that the benefits of doodling may not be the same for everyone. Some people may find that doodling is a helpful way to improve memory, while others may find it distracting. It is also possible that the benefits of doodling may be more pronounced in some situations than in others. For example, doodling may be more effective for improving memory when the information is new and unfamiliar, while it may be less effective for improving memory when the information is already familiar.

Further research is needed to understand the mechanisms underlying the benefits of doodling and to determine the conditions under which it is most effective. Additionally, it is important to consider the potential limitations of the findings, such as the possibility that the benefits of doodling may be more pronounced in some situations than in others. Further research is needed to understand the mechanisms underlying the benefits of doodling and to determine the conditions under which it is most effective.
participants to do it in a fairly naturalistic, automatic fashion. The instructions contained no suggestion that it would improve cognitive performance. It remains to be discovered whether the benefits of the shading task extend to naturalistic doodling.

What mechanism might underlie the effect of doodling on concentration? One possibility is that doodling simply helps to maintain arousal at an optimal level keeping people awake or reducing the high levels of autonomic arousal often associated with boredom (London, Schubert & Washburn, 1972). Future research using psychophysiological measures might pick up such effects. A more specific hypothesis is that doodling aids concentration by reducing daydreaming, in situations where daydreaming might be more detrimental to performance than doodling itself. Doodling has been shown to reduce levels of chunked and routine brain activity (Smallwood, O'Connor, et al., 2007), consistent with the idea that naturalistic doodling might be a high-level cognitive activity that might disrupt concurrent task performance. Increased brain activity contributes to the generally high arousal levels seen during boredom, and this brain activity has been associated with daydreaming and mind-wandering (Smallwood & Schooler, 2006). Functional brain imaging has confirmed that daydreaming is associated with medial prefrontal cortex activation similar to that observed during semantic processing (Binder et al., 1999), consistent with it being a high-level cognitive activity that might disrupt concurrent task performance. Doodling may reduce daydreaming simply by increasing the overall amount of cognitive resources required, leaving fewer free for daydreaming. The explanation would fit
with Smallwood et al.'s (2007) hierarchy, in which mind-wandering occurs less frequently during tasks that demand greater interaction with and retention of external stimuli. The message monitoring task would have encouraged mind-wandering because it involves tasks that are relatively simple, requiring the monitoring of specific cues without deep cognitive processing. In contrast, the basic task would have encouraged deeper processing and mind-wandering because participants were not informed about the forthcoming memory test. Because participants were not told to be vigilant about mind-wandering, they may have been less likely to report it.

A more specific hypothesis is that doodling prevents mind-wandering by increasing the overall resource load and by engaging central executive resources in situations that would otherwise free them for other mental processes. Even small self-paced tasks like doodling can engage central executive resources. Even small, self-paced tasks like doodling can engage central executive resources. These tasks can be beneficial because they can help individuals maintain focus and reduce mind-wandering. For instance, previous research has shown that engaging in self-paced tasks like doodling can reduce mind-wandering and increase concentration.

A more specific hypothesis is that doodling prevents mind-wandering not simply by increasing the overall resource load but by engaging central executive resources in situations that would otherwise free them for other mental processes. Even small self-paced tasks like doodling can engage central executive resources. These tasks can be beneficial because they can help individuals maintain focus and reduce mind-wandering. For instance, previous research has shown that engaging in self-paced tasks like doodling can reduce mind-wandering and increase concentration.

Despite these potential benefits, there are limitations to the use of doodling as a strategy for reducing mind-wandering. For example, doodling may not be effective in situations where other types of self-paced tasks, such as verbal tasks, may be more effective. Additionally, doodling may not be as effective in situations where individuals are already highly focused and not prone to mind-wandering.

The present finding that doodling aids concentration and explaining the potential mechanism for this has important implications. The extent to which secondary tasks have beneficial or detrimental effects on task performance is an important area of research. The present study suggests that doodling can have positive effects on task performance by engaging central executive resources and reducing mind-wandering.
paper by Roche et al. (2017) reports negative associations between low mood and academic performance, finding that these are not due to increased arousal. Understanding the role of boredom and mind-wandering, especially during routine tasks, could facilitate more complete empirical analysis of real-world performance in the laboratory setting and field work and in educational settings (Smallwood & Schooler, 2006; Smallwood, Fishman & Schooler, 2007). Ways of maintaining attention to task are also important in the context of depressive rumination and worry, where mind-wandering helps maintain dysphoric states (Smallwood, O'Connor et al., 2007).
References


<table>
<thead>
<tr>
<th>Group</th>
<th>Control</th>
<th>Doodling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Names (monitored information)</td>
<td>Correct</td>
<td>4.3 (1.3)</td>
</tr>
<tr>
<td></td>
<td>False alarms</td>
<td>0.4 (0.5)</td>
</tr>
<tr>
<td></td>
<td>Memory score</td>
<td>4.0 (1.5)</td>
</tr>
<tr>
<td>Places (incidental information)</td>
<td>Correct</td>
<td>2.1 (0.9)</td>
</tr>
<tr>
<td></td>
<td>False alarms</td>
<td>0.3 (0.6)</td>
</tr>
<tr>
<td></td>
<td>Memory score</td>
<td>1.8 (1.2)</td>
</tr>
</tbody>
</table>
The boring telephone message: Monitored names are shown in **bold**, incidental places in *italics*.

"Hi! Are you doing anything on Saturday? I'm having a birthday party and was hoping you could come. It's not actually my birthday, it's my sister **Jane**'s. She'll be 21. She's coming up from **London** for the weekend and I thought it would be a nice surprise for her. I've also invited her boyfriend **William** and one of her old schoolfriends, **Claire**, but she doesn't know that yet. **Claire**'s boyfriend **Nigel** was going to join us but he just found out that he has to go to a meeting in **Penzance** that day and won't be back before I thought we could dine out. He's definitely not coming. I can't believe it's got so cold already, and the cornflakes are only warming to your mouth's temperature. There is a going to be a gathering in **Gloucester** to look that I left an hour too late, and we've decided to have a little party. **Craig** and **Suzie**, who used to share a flat with me when we were both working for that bank in **Gloucester**, are both in Colchester now. **Craig** has bought a house in Colchester and he's promised to make sure she gets to her party. **Suzie** is going to be their new flatmates. She's going to join us on Saturday as well, and apparently she's got really good at making medals for her exhibitions and such events. **Will** and **Craig** will be taking some, but I'm not sure if you want to bring any food? Maybe some of your own? I'll try and do some, but **Jen**, who lives next door, is going to bring a quiche and **Nigel** is going to bring some garlic bread. I found a good recipe for punch—warm up some red wine with gin and orange juice plus cloves and cinnamon. Add some brown sugar if it's not sweet enough. She's from the house across
the road have promised to bring some of their homebrew. There are three of them sharing that
house - John, Tony and Phil. I think they were all at college together and Phil teaches at a
primary school in Ely now and the other two commute to Peterborough each day. I think they
both work in hospitals there. John has a cat which he can't take with him because the parents are coming to stay for
the weekend but Phil and Tony should be there. They have a room on the upstairs floor for the
parents to stay in. We met John and got a good look at him. He is really quite tall and friendly. The house was
certainly tidy. The rooms were clean and tidy too. We ate breakfast with the boys and they
were all very friendly. We spent most of the time in museums, trying to keep dry and then, to
make matters worse, Nicky got her handbag stolen. I was quite glad to get back to work after that. Anyway, hope you can make it on Saturday
- let me know if you want to stay over. Bye!