

# What Does Doodling do in Chinese tasks: measuring the difference between Chinese and English with expected outcomes

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**Abstract.** Previous studies have demonstrated that different types of doodling, a way of passing time to release boredom, have either positive or negative influences on one's ability to concentrate and memory. However, previous studies are limited to alphabetic languages, such as English, whereas character-based languages, such as Chinese, are underrepresented to a great extent. Therefore, the current study attempts to extend the extant research by considering the effects of two types of doodling on attention and recall during Chinese tasks and their difference between Chinese and English. In the present experiment, a total of 200 participants, including 100 individuals whose mother language is Chinese and English respectively, are randomly allocated to one of three conditions (structured doodling, unstructured doodling, and control). The concentration and recall performance of participants are measured by writing down the names and places during and after listening to a mundane telephone message. The results suggest that although structured doodling aids concentration in Chinese, the assistance is less than that in English.

**Keywords:** Doodling; Attention; Concentration.

## 1. Introduction

Taken a personal experience that you are having an online lesson as an example, trying to listen to the teacher over the other side of the screen who is writing lots of bewildering formulae, but you start thinking about what time the class will be finished, what games you are going to play after school, why you are taking this course, when your cat came into your room, then you hear your teacher calling your name and wanting you to answer the question, and you realize you have not taken in anything the teacher has said, even the question he asks. A similar scenario, which people call 'daydreaming', certainly happens to every person in daily life, documented by a study in which participants spend 47% of their waking time daydreaming. In such a situation, people normally try to do something to deal with their boredom, including doodling. Doodling, defined as aimless scrawling made by a person while his or her mind is more or less otherwise applied, during listening is dual tasking [1, 2]. It has been debated and researched whether doodling has an effect on performance by reducing attention to the primary task or improves performance by assisting concentration [3]. Jackie Andrade's study is the first experimental test of the prediction that doodling improves concentration [3]. Andrade examined the effects of doodling on recall ability using a dual task design and concluded that individuals who doodled while listening to a recording recall significantly more information on average than students who did not doodle, while Jason Bruce Boggs et al [1, 4] suggests that unstructured doodling participants performed significantly worse than structured doodling, control, and note-taking participants.

Parents with children will have experienced such a process, the child to about three years old, often pick up the home pen everywhere, some parents do not understand, may stop the child, do not let him draw [5]. This time to stop will only do more harm than good, figure out the laws of child growth, to better help children grow. A study of children's sensitive periods has used metaphorical explanations for that. It was found that when bees are first born, each female larva has the potential to become a queen, but only one female larva per colony can become a queen. The male bee prepares a special diet for this female larva, and when the larva eats this "tasty" diet, it becomes the queen of the colony. However, if the larva is already past the larval stage when it is selected, it cannot become the queen.

It is only during the larval stage that the female larva has a voracious appetite for food and can grow to the size of a queen bee, which is not possible after the larval stage. This is true for animals, and it is also true for people. Most of a child's sensitive periods occur in the first six years of life, and each period is different, short, and fickle. Therefore, for a child to develop well, it is necessary to seize every sensitive period of the child [6]. Children can learn to self-regulate during sensitive periods and through this self-regulation master certain skills [7, 8]. During sensitive periods, children are enthusiastic and motivated about everything, so they can easily master various skills, and every effort they make makes them much more capable, and only when they reach a goal do they lose interest and energy [9]. Children in sensitive periods can repeat that one thing tirelessly.

Then most people would be curious about the question what is the psychological impact on a sensitive child who suffers from parental blockage. Some studies have observed that when a child's sensitivity is interfered with or hindered by external interference, they may become depressed or angry, and the child's psychological development may be disturbed or even distorted as a result [10]. The following question would be how can parents help their children to develop their potential when their children's sensitivity to drawing has arrived? Parents are advised to start with the following steps. Provide your child with the necessary materials and space for drawing, starting with free drawing. For example, prepare a special drawing wall, drawing board, paint, brushes, books, or paper for your child to paint at any time. In the beginning, children are sure to draw randomly, they draw things without any shape and the picture is very confusing. At this point, parents can ask the child what he or she wants to draw and then instruct him or her on how to draw, and slowly the child's drawings will become clearer and clearer. As the child draws as he or she pleases, through communication, the parent will find that the things the child draws most often are usually the ones that attract the child's attention the most, and the drawings also reflect the child's careful observation of the shapes of objects.

## 2. Literature review

Jackie Andrade's article "What Does Doodling Do?" seeks to investigate how doodling affects attention to the primary task. The research question being addressed is whether doodling improves or degrades performance on a tedious listening task.

Andrade recruited 40 members of the MRC Applied Psychology Unit from the general population to answer the question. They were randomly assigned to either the control or doodling groups and were asked to listen to a boring mock telephone message for the names of partygoers while shading printed shapes on paper. After listening, they were given an unexpected test to recall the names and locations mentioned in the tape. The doodling group performed better in monitored performance and outperformed the control group on the memory test, recalling 29% more information. Andrade concluded that doodling improves concentration during mundane tasks.

The study's strengths are obvious. The primary method was a laboratory experiment. By ensuring that all participants were listening to the same mock telephone message at a comfortable volume, Andrade was able to control for extraneous variables. They would also make certain that there were no differences in stress on keywords between conditions. As a result, the validity is questioned. Furthermore, the operationalization of doodling has been standardized to reduce demand characteristics. Andrade defined doodling as the shading of circles and squares unrelated to the primary task. The experimental group's participants were not asked to doodle freely, lowering the possibility that some will suspect the true purpose of the study.

However, there are some restrictions. Participants were given sheets of paper with objects, squares, and circles to shade in, so only one way of doodling is considered. It is a common type of doodling, but it has limited ecological validity. In reality, people who doodle out of boredom prefer to draw freely with no restrictions on the form rather than shading shapes continuously, which may require more cognitive resources. As a result, the type of doodling may have varying effects on the primary task. Another weakness of the study is the absence of daydreaming measures. As a result, the

hypothesis that doodling affects concentration by Reducing the likelihood of daydreaming is not well supported.

The article "The Effects of Doodling on Recall Ability" by Jason Bruce Boggs et al. expands on previous research, the main limitation of which is the structured doodling task. The study intends to investigate the potential benefits of doodling on recall ability further. They are interested in 1) whether different types of doodling have the same effect on recall ability and 2) how doodling compares to other well-established tools such as note-taking.

There are 93 undergraduate participants between the ages of 18 and 50 who were randomly assigned to one of four conditions (control, structured doodling, unstructured doodling, and note-taking) and monitored an auditory recording. It was a spoof conversation between two friends about a trip to Hawaii. Participants in the structured program. Those in the structured doodling condition used a pencil or pen to shade in 42 shapes such as squares, circles, stars, crosses, and triangles, whereas those in the unstructured doodling condition were given a piece of white blank paper and told to doodle whatever they wanted during the audio recording. Those assigned to the note-taking condition were given a blank sheet of white paper on which to take notes, while the control group simply listened to the recording. Following the audio recording, each participant was given a copy of the quiz and instructed to answer all questions from memory. According to the findings, participants in the control group performed worse in the recall quiz than those in the note-taking and structured doodling conditions, whereas those in the unstructured doodling conditions performed better. Those in the structured doodling condition used a pencil or pen to shade in 42 shapes such as squares, circles, stars, crosses, and triangles, whereas those in the unstructured doodling condition were given a piece of white blank paper and told to doodle whatever they wanted during the audio recording. Those assigned to the note-taking condition were given a blank sheet of white paper on which to take notes, while the control group simply listened to the recording. Following the audio recording, each participant was given a copy of the quiz and instructed to answer all questions from memory. According to the findings, participants in the control group performed worse in the recall quiz than those in the note-taking and structured doodling conditions, whereas those in the unstructured doodling conditions performed better.

Overcoming the limitation of Andrade's study is one of the study's strengths. Boggs investigates not only the effect of structured doodling, as investigated by Andrade but also the effect of unstructured doodling, which is more closely related to everyday life, increasing the ecological and external validity of the previous findings. However, the limitations are worth mentioning. Both Andrade's and the current study do not include a direct measure of boredom and mind wandering. Boggs used an audio recording that lasted about five or fewer minutes, but it was unclear whether or not that was long enough for every participant to experience cognitive fatigue, or to what extent boredom leads to daydreaming.

### 3. Questions and hypothesis

A common limitation shared in both two previous types of research is that they are based on English only, while the influence of doodling in the aspect of ideographic languages, like Chinese, has not been explored. Thus, the current study is mainly designed to address this problem. First, it focuses on whether different types of doodling assist information processing, improve concentration, and enhance memory during boring tasks in Chinese for Chinese native speakers. Secondly, I plan to compare the different impacts of doodling on concentration and memory between Chinese and English. As an extension of Andrade's and Boggs's study, I expect to find that although doodling aids concentration and memory during boring Chinese tasks, the difference between doodling and not is as significant as that of the English version.

### 3.1 Proposed Methods

Participants are a total of 120 people from all educational and occupational backgrounds who are recruited from the adverts on social media. Half of them consider Chinese as their first language, belonging to the Chinese group, while the rest are English native speakers, belonging to the English group. Within each language group, participants are further assigned to one of the three groups (unstructured doodling, structured doodling, and control group), in which there are equal numbers of males and females in each condition. Every participant who comes to the experiment receives \$4.5 as a reward, no matter whether they finish the participation or not.

### 3.2 Materials

In a biochemical research paper, 'Neurotransmitter functions of mammalian tachykinins', around 6000 words are given to participants to read to enhance their boredom level. The auditory recording is a monotonous 2.5-minute mock telephone message about a party invitation played at a low volume. Its script includes the names of eight partygoers as well as three people and one cat who are unable to attend. There are eight place names mentioned, along with a lot of irrelevant information.

Participants in all groups are provided with a white piece of A4 paper and a pencil. Those pieces of paper given to the structured doodling group are printed with ten rows of shapes (squares, circles, stars, crosses, and triangles) in alternative rows, while every participant in unstructured or control groups receives a blank piece of paper.

### 3.3 Procedure

After ensuring their identities, participants are led to a quiet and visually dull room. They are informed about the listening test, which will only take about 5 minutes of their time. Participants are given copies of a neural research paper and asked to read them for 10 minutes at the start of the experiment. The goal is to make sure they are bored before listening and to lower their arousal level for the next test. They are then told:

"I'm going to play you a phone message." It's rather dull, but that's fine because I don't want you to remember any of it. Simply write down the names of those who are certain to attend the party. Ignore the names of those who are unable to attend. "Do not write anything else." Participants in the structured doodling condition are also instructed to shade the shapes while listening to the recording, whereas those in the unstructured doodling condition are instructed to doodle whatever they want at the same time. Both groups were told that it didn't matter how neatly or quickly they doodled because the goal was to relieve boredom.

When the recording is finished, the experimenter collects the response sheet and apologizes to the participants for the unexpected memory test. Half of them are asked to recall the names of the partygoers and the locations mentioned first. The remainder recalls the locations, followed by the names. Participants are asked if they suspect a memory test during debriefing.

### 3.4 Expected Results

All sets of data are average to find their means and standard deviations ready to be better compared and analyzed. To display every figure clearly, they are presented in the form of a table (see Table 1), while standard deviations are in brackets.

**Table 1.** Means and Standard Deviations for each condition of both English and Chinese groups on the monitoring and recall performances

| English                |       |           |                     |                       |
|------------------------|-------|-----------|---------------------|-----------------------|
| Test                   | Item  | Control   | Structured Doodling | Unstructured Doodling |
| Monitoring performance | Names | 4.0 (1.0) | 7.0 (1.0)           | 3.0 (1.0)             |
| Recall performance     | Names | 3.0 (1.0) | 6.0 (1.0)           | 2.0 (1.0)             |

|                        |             |                |                            |                              |
|------------------------|-------------|----------------|----------------------------|------------------------------|
|                        | Places      | 2.0 (1.0)      | 5.0 (1.0)                  | 1.0 (1.0)                    |
| <b>Chinese</b>         |             |                |                            |                              |
| <b>Test</b>            | <b>Item</b> | <b>Control</b> | <b>Structured Doodling</b> | <b>Unstructured Doodling</b> |
| Monitoring performance | Names       | 4.0 (1.0)      | 5.0 (1.0)                  | 2.0 (1.0)                    |
| Recall performance     | Names       | 3.0 (1.0)      | 4.0 (1.0)                  | 2.0 (1.0)                    |
|                        | Places      | 2.0 (1.0)      | 3.0 (1.0)                  | 1.0 (1.0)                    |

As expected, monitoring and recall performances in the structured doodling condition is significantly higher than in the other two conditions for participants in the English group. Those in the unstructured doodling condition scores even lower than the others who are in the control group. Similarly, in the Chinese group, participants in the structured doodling monitor recall the most number of names and places from the recording, whereas the performances in the unstructured doodling condition reach the minimum. In addition, the different performances between Chinese and English groups are noticeable. The difference in scores between the two doodling groups and the control group in Chinese is significantly less than that in English, as individual Chinese has a lower score in both structured doodling and unstructured doodling conditions when the scores of control groups are the same.

#### 4. Conclusion

Different types of doodling and languages have a different impacts on concentration and memory. Participants performing shape-shading tasks, as a way of structured doodling, concentrating, and recalling the best on listening, while those able to draw on paper without limitations perform the worst during both boring Chinese and English tasks. One of the mechanisms underlying these effects might be that structured doodling maintains the level of arousal by avoiding daydreaming without requiring much cognitive resource. Unstructured doodling, on the other hand, demand participants to put more attention to thinking about the content of their creations and reproducing mental images, which distracts them from the primary task. Chinese native speakers in doodling conditions perform at a lower average than those who consider English as their first language. Chinese as an ideogram language relies on more right hemisphere cortical regions during information processing and outputting than English. This is due to the square shapes of Chinese characters, requiring the brain to analyze in detail the spatial information and position of various strokes that constitute characters. As doodling is proven to result in activation of the medial prefrontal cortex, encephalic regions that are active for using Chinese and doodling have a high chance to overlap with each other, causing possible interference in processing information for Chinese characters and doodling behaviors. However, the current study is not able to identify those interacting brain regions. Future studies could investigate the coincident area of the brain during Chinese performance and doodling under the utility of neuroimaging.

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