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Doodling Effects on Junior High School Students' Learning

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ABSTRACT

The main purpose of this study was to assess the effects of doodling on the learning performance of high school female students in Tehran. The design of this research was a pre-test–post-test with a control group. A group of 169 junior high school 12–13 year-old students was chosen for this study. After being taught a section of the Natural Science course, the students were asked to answer questions related to the lessons. After that, their grades were used as the pre-test scores. The post-test was carried out after the devised treatment. During ten sessions of the same course and teacher, the students were each given a blank sheet of paper and were asked for doodling if they felt like doing it. After each session, a couple of relevant written questions were asked to evaluate how well students had learned the lessons. The experiment and control group both consisted of 27 randomly selected students; participants in the experiment group were doodlers and those in the control group did not doodle. To evaluate the doodling effect a t-test analysis was performed. Comparison of the grades showed that the experiment group outperformed the control group significantly.

KEYWORDS

doodling, learning, educational performance, female adolescent, student

Introduction

When we talk about education we mean not only the transfer of knowledge, but also how well this is accomplished using various techniques (Winters 2011). Varieties of techniques from different fields of art (e.g. drawing, music, theatre) can improve learning (Eisner 1998). The educational implications of art have been investigated by a number of researchers (Burkitt *et al.* 2005; Cox 2005; Anning 1999; Warren 2003; Eisner 1998). Doodling, unconscious scribbling, one of the most common habits among students, is one of the practical methods in the field of art. Recently, there have been a few studies suggesting that doodling can improve academic retention (Andrade 2010; Brown 2011; Chan 2012).

Doodling usually happens through unconscious drawing of patterns and shapes when people are bored with something. It may be observed as a common practice by students on their books or in marginal notes. Some teachers consider it a matter of losing attention and concentration. The term 'doodle' was first used in 1930 with the meaning which we know today: that is, absentmindedly drawing nonsense symbols, designs, figures and patterns, but in a more comprehensive definition it can be said that doodling is an unconscious designing while no attention is paid by the person (Gonzalez 2010).

Doodling usually occurs whilst a person is day-dreaming or is experiencing mental wandering. It hardly ever happens when one is fully concentrating (Singer 1966). Both these two situations are states in which the default mood of the mind is active (Schott 2011). Researchers observed that effective learning requires the involvement of both brain hemispheres (Kerry 2005). Studies show that there is a strong positive correlation between the dominance of the right side of the brain and educational failure or behavioural disorders in schools (Warren 2003; Stellern *et al.*1986). To involve both brain hemispheres, the brain should be trained. That training includes a number of activities to strengthen mental skills like concentration, attention and

problem solving. In this regard, the variety of activities might be accentuated. It is noted that drawing and music are the most important comprehensive activities that involve both hemispheres (Caine & Caine 1990). So we may observe doodling as an innovative activity that could affect both the right and the left brain hemispheres.

Doodling decreases the level of autonomous arousal, accompanied by day-dreaming and tiredness, and keeps the person conscious by increasing concentration (London *et al.* 1972). A simple activity like doodling needs a low level of resources in the brain and is also helpful to prevent day-dreaming without affecting concentration (Andrade 2010; Chan 2012). Day-dreaming is associated with the generally high arousal level seen in boring situations through increased activity in default cortical networks (Mason *et al.* 2007; Smallwood *et al.* 2007b). Doodling focuses the brain and stops it from the day-dreaming which leads to a decrease in concentration (Andrade 2010).

There have been a number of studies on the role of doodling in preventing day-dreaming and mental wandering (Andrade 2010; Aellig *et al.* 2009; Chan 2012). In one study, doodling is requested while an auditory task is given. The results show that doodlers are unexpectedly more successful in remembering than the non-doodlers (Andrade 2010). In another study, doodling is asked while a video task is given. It is demonstrated that there is not a significant correlation between doodling measures and the number of correct video content items (Aellig *et al.* 2009). Recently, Chan (2012) has shown that doodling negatively affects performance on a visual recall task. This may show that doodling can only be helpful if it shares no common cognitive resource with the main activity. Doodling generally increases concentration: that is, an ability to keep and remember information, especially in the case of boring and complicated subjects (Andrade 2010). It activates the mental eye using a part of the visual cortex, resulting in the ability to make mental images, to solve problems in an innovative way, and to activate the unconscious part of the mind through keeping the conscious part activated. It integrates the visual, audience and kinetic senses, all of which lead to a better learning process (Brown 2011).

So previous studies show that, except for situations in which the resources needed for the main activity and those for doodling are the same, doodling is indeed helpful (Andrade 2010; Chan 2012). This may be because mental wandering requires more resources than doodling (Aellig *et al.* 2009; Smallwood *et al.* 2007a)

In fact, day-dreaming and mental wandering are considered to be barriers in the way of educational development, especially for adolescents (Smallwood *et al.* 2007a). Basically, one of the important factors in educational performance is the functionality of working memory (Gathercole & Alloway 2008; Gathercole *et al.* 2008; Gathercole *et al.* 2006). Since working memory depends on concentration (Gathercole & Alloway 2004), it can be said that improving concentration indeed affects the learning process positively (Holmes *et al.* 2010).

Since the teenage and adolescent years are the period in which growth in mental experience and learning flexibility takes place (Jacob 2002; Charles & Luoh 2003; Dubas *et al.* 1991; Graber *et al.* 1997; Stattin & David 1990), students in this age group are experiencing physical and mental changes. They are subject to day-dreaming and mental wandering more than the others. This may lead to educational failure. Therefore, it is important to study ways to decrease day-dreaming and mental wandering, to help students to focus and achieve a better educational performance (Smallwood *et al.* 2007a). Therefore, on the basis of the frequency of doodling amongst students (Chan 2012), here we are to study the effects of doodling on learning/education performance.

Furthermore, one of the successful methods which has gained a lot of attention in the past few years is the VAK learning method (University of Pennsylvania 2009). This method is based on the idea that the subject connects with the data being gathered through one or more ways: visual, audience and kinetic. Since people normally lack enough knowledge about their abilities to know the best way of learning, invention and use of a method which covers the three ways while respecting the teaching process seems beneficial

(University of Pennsylvania 2009). In this regard, it may be said that doodling as a visual and kinetic task, concurrently with an audio task (as used in this study), can improve learning and be a useful auxiliary device for teaching.

Method

Participants

As there are different changes in growth for males and females (Jacob 2002; Charles & Luoh 2003; Dubas *et al.* 1991) and a difference between the educational performance of male and female students (Graber *et al.* 1997; Cavanagh *et al.* 2007; Sttatin & David 1990), the gender was controlled. Participants of this study were 54 females ranging from 12 to 13 years of age, with the mean age being 12.5, in a high school in Tehran. Experiment and control groups were respectively among doodlers and non-doodlers.

Material

Throughout the term, students completed a test after each unit. They completed ten tests, consisting of five questions each. It is worth noting that questions were not graded equally because the content of each lesson was different from others and each question had a different grade having a total score of nine.

1. Nine score tests made up of five questions: to assess the level of students' learning from the taught lesson in each session, students sat tests having five questions lasting ten minutes and each was designed by the teacher. The maximum and minimum scores in these tests were 9 and 0, respectively. The scores were used as the educational performance.
2. White sheets for doodling: students were provided with A4-size paper for doodling. Drawing tool, subject and pattern were freely chosen.

Procedure

After coordinating with the school dean and the science teacher in carrying out this research, it was decided to have ten session Science classes for the junior students in the same place and under the same circumstances. It is worth mentioning that the set up here matched the typical set up for these students as much as possible.

In the pre-test, all 169 students sat a quiz according to the routine classroom schedule after one session of teaching Natural Science. Lessons typically contained general concepts on experimental sciences, including basic notions about the biology of animals, plants, chemicals, the human body, the physics of fluids, and electricity. The students were then provided with a definition of doodling: doodling is an unconscious drawing which happens when situations get boring. In order to avoid any interruption in the flow of the class, no instruction was given and no limitation was set. All participants were assured that there was no obligation to doodle. The duration of teaching lessons was 40 minutes in order to have enough time to assess the impact of day-dreaming and mental wandering on the students. Although the total time for each session was normally 90 minutes, in this study we set the time so that the first 40 minutes were devoted to teaching new lessons, 10 minutes for the exam, and the final 40 minutes were for other classroom activities. So apart from the 10 minutes spent on the exam in each session, the rest of the class schedule matched the normal set up.

To assess the effect of doodling, ten sessions were provided for the students and they were asked to doodle when they felt the need or desire to do so. A minimum amount of doodling – if more than 50 per cent of the paper was filled with doodles – had to be presented in order for a student to be considered as a doodler.

After each session students were given a test that included five questions compiled by the teacher herself, based on the lesson that had been taught. As mentioned before, the quiz scores of the first session of the

class, that is, before describing doodling for participants, was used as the pre-test and the average of ten quiz scores taken afterwards was the score for the post-test. All the students wrote their names on the doodle sheets. After the tenth session, 27 students were randomly chosen from those who had doodled and were assigned to the experiment group and 27 students randomly selected from those who had not doodled were assigned to the control group.

Results

The aim of this study was to investigate the doodling effects on junior high-school students' learning.

Variances were not proved to be the same based on a level test in order to be used in the covariance method in doing this descriptive analysis, so the effect of intervention based on the meaningfulness of the mean of the pre-test and the post-test was tested using a t-test.

Based on Table 1, the mean of the pre-test and the post-test of the experimental group was 6.833 and 7.280 respectively. The standard deviation of the given data in pre-test and post-test was 2.219 and 1.227 respectively. Based on the same table, it is clearly seen that the mean of the post-test is more than that of the pre-test.

Based on Table 2, the t-test results of independent groups about having the same levels of variances (F=6.6, sig: 0.013) is less than 0.05, so the variances are not equal. In this regard, paying careful attention to the rows of Table 2 indicates that the t size equals 2.194, which is a meaningful amount of 0.034 and which is less than 0.05; hence, the t index is meaningful and there is a meaningful difference between the mean scores of the t-test of the pre-test and post-test. It is concluded then that the doodling effect on students' learning is meaningful.

Discussion

In this study the effect of doodling on learning amongst 12–13 year-old female students was investigated, with the mean age being 12.5. The results showed that doodler students were more successful in educational performance than those who did not doodle: that is, doodlers outperformed non-doodlers in terms of educational performance. These findings were consistent with other research in the literature (Andrade 2010).

Table 1. Measures of Central Tendency in pre-test and post-test of experimental group

	Group	Pre-test	Post-test
Number	54	54	54
Mean	1.500	6.833	7.280
Median	1.500	7.500	7.650
SD	0.505	2.219	1.227
Variation	0.255	4.925	1.504

Table 2. Results of applying t-test scores as to findings of post-test in experiment group

Post-test	F	Sig	T	Degrees of freedom	Significance level (bidirectional)	Mean differences	Difference of error SD
Accepted equalization of variances	6.600	0.013	2.194	52	0.033	0.707	0.322
Rejected equalization of variances	0	0	2.194	40.653	0.034	0.707	0.322

In Andrade's (2010) research, 40 participants aged between 18 and 55 were randomly assigned to the experiment or doodling group. People in the 'doodling' condition were asked to shade printed shapes while listening to a telephone call. The doodlers performed better on the monitoring task and recalled about 30 per cent more information on a memory test. As can be seen, Andrade used an auditory task, structured doodle and recall test. But in the current study, the effect of a free doodle on the learning of lessons that included auditory and visual tasks was investigated. Although there were some differences in methods between the current and Andrade (2010) researches, the results supported the benefits of doodling as an artistic element in educational performance. It is also to be said that in case of possible interference of doodling in the process of learning/recalling, it seems that by creating a relaxing condition, doodling can improve unconscious drawing by means of activating kinetic, auditory and visual activities which result in the improvement of the psychological extroversion function, which both decreases day-dreaming and increases concentration.

In another study, Aellig *et. al.* (2009) studied the correlation between free doodling and the ability to learn contents from an educational video for a group of 34 undergraduate students. They found no significant relationship. In Chan (2012), 14 undergraduate students were randomly assigned to either 'doodling' or 'non-doodling' conditions. In the doodling group, participants were asked to draw flowers at the same time as they were viewing a slideshow. Chan found that the mean number of recalled images by the doodlers was significantly lower than that of the non-doodlers.

In the last two studies mentione, in which the task for learning/recalling is a visual one, doodling has no or a negative effect on performance, but when the task is auditory (Andrade 2010) or a mix of both visual and auditory (the current study), doodling is an effective factor in learning. That might be because doodlers' visual processing resources are divided into two visual tasks (Chan 2012). However, auditory tasks do not require many executive resources and they may even help to prevent mind wandering and day-dreaming without decreasing attention on the main task (Andrade 2010). Since this study is the first one in the field of education in Iran, and there has been no similar research or administrative method available considering the strengths and weaknesses of previous studies as well as taking the theory of doodling into account, applying doodling method has been in a way to provide a suitable base for measuring unconscious extroversion. In this regard, the method of selecting a suitable subject such as Science in order to apply auditory and visual resources, free doodling, and having a base for unconscious doodling can be noted. It should also be noted that students of this research were at the age of both puberty and change of school level which by themselves can result in a failure in educational achievement (Smallwood *et al.* 2007a).

A noticeable point related to doodling in all researches is that doodling can result in increased concentration by reducing day-dreaming (Andrade 2010; Aellig *et al.* 2009; Chan 2012).

Day-dreaming causes the brain to focus on analysing personal emotions and thoughts instead of processing the data gathered (Smallwood & Schooler 2006). It has also been shown that day-dreaming intervenes in the performance of central executive units of the brain, occupying its resources (Seibert & Ellis 1991; Smallwood *et al.* 2003; Smallwood *et al.* 2007b; Smallwood & Schooler 2006; Teasdale *et al.* 1993). In this study, because participants were not aware of how doodlers and non-doodlers were grouped through the test sessions, they were prone to day-dreaming.

Although a specific hypothesis is that doodling aids concentration by reducing day-dreaming (Andrade 2010), in this study the teaching task would also have encouraged day-dreaming because, according to research in the field of educational failure (Smallwood *et al.* 2007a; Kerry 2005; Holmes *et al.* 2010), students' attention levels start to decrease after 15–20 minutes spent in class (Matheson 2008).

On the other hand, for educational development to take place, coordination between the data gathered from the environment and internal representations is necessary (Smallwood *et al.* 2007a). But day-dreaming and the gradual decrease in concentration prevent this coordination from happening (Smallwood *et al.* 2007a) .Alternatively, here, doodling has been studied as one of the proposed methods to establish this

coordination. In some studies using laboratory procedures and retrospective methods it has been concluded that with increasing age people have less frequently unbidden task-unrelated images, thought intrusions or day-dreams (Giambra 1993; Lindquist & Maclean 2011). With regards to this negative relationship between mental wandering and age (Smallwood & Schooler 2006; Christoff *et al*. 2004), beside considering reported studies on the critical effects of mental wandering on educational failure (Giambra 1993), research about ways of preventing mental wandering in educational systems especially among youngsters is important. Unlike previous researches on participants more than 18 years old, we considered a younger group (12–13 year-old students).

Research has revealed that artistic activities can lead to academic achievement (Eisner 1998). Since an important factor in educational performance is effective function of working memory (Gathercole & Alloway 2008; Gathercole *et al*. 2008; Gathercole *et al*. 2006), and one of the properties of working memory is its relation to concentration (Gathercole & Alloway 2004), perhaps it can be concluded that artistic activities (such as doodling in this study) can drastically improve learning by improving working memory and concentration.

In some psychological approaches like art therapy and art media, the creative process and the resulting artwork are used to explore people's feelings, reconcile emotional conflicts and foster self-awareness (Rubin 2005). Nowadays to overcome many educational problems and to help dropouts, art has been considered as a form of therapy for special educational needs (SEN) students (Warren 2003). In this study we tried to apply doodling in a way in which there can be artistic plan in line with improving academic performance, and in fact, doodling was defined as a method of art therapy for students.

Alfred Adler, a founder of the school of individual psychology, sees doodling as a manifestation of a rational craving for symmetry and order. He speaks of doodling as a manifestation of the essentially rational urge with an adaptational meaning: a manifestation of 'the struggle for survival and the struggle to organize, into graspable form, the chaos of life' (Slobtseva 2006, 22). In psychoanalytical approaches, pictorial images and drawings are considered to be expressions of the unconscious emotional aspects of a person (Diem-Wille 2012). From the Freudian perspective, since doodles often include abstract elements, it is worthwhile seeing how automatic paintings can be interpreted (Slobtseva 2006). In the present study, we did not consider what students had drawn but it would be worthwhile to identify it for each student in order to obtain deeper information about a person's interior world.

On the whole, it can be said that stress and internal excitements can occupy people's minds and consequently prevent concentration. So seemingly, doodling as a drawing activity in the field of art can release excitement and increase levels of concentration.

Due to the prevalence of doodling, specifically in lower age groups, teachers always take it as a kind of negligence and lack of concentration. In such circumstances the positive effects of doodling are ignored. This study and its positive findings about doodling in educational settings could be a good reason to pay more attention to this prevalent and unconscious behavior. Considering the findings of this study, it can be said that by witnessing increasing rate of doodling (mostly in lower age groups) among students, applying doodling in the process of education can be seen as a great educational help. As a drawing process in the field of art it can control the occurrence of day-dreaming and increase concentration, which could lead students to better performance in their studies.

Not surprisingly, free doodling was investigated here. That is, an intense emphasis was put on the aspect of doodling being unconscious. However, future studies could suggest a pattern or sample for doodling. Also, regarding the fact that to this date all the results of other studies are in a modal form, it would be better for future studies to find a method to record the activities of the brain to assess the impacts more precisely. Since only female students were chosen for this study, generalising of the results is limited. Future studies could be carried out for male students as well. Here doodling is asked for by providing blank sheets of paper for students. Although the students are free to doodle or not to doodle, this is not in accordance with doodling defined as an unconscious activity. Therefore, it would be interesting to see the effects of

doodling on learning by observation. That is, no instruction and/or training would be given and only by observation would the educational performance of those students who make drawings while listening in the class be monitored.

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