The Effects of Right/Left brain Dominance and Two Pre-writing Strategies of Clustering and Looping on Iranian EFL Learners' Writing Performance

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Abstract

The present study investigated the effects of right/left-brain dominance and two pre-writing strategies of clustering and looping on Iranian lower-intermediate EFL learners' writing performance. The participants of this study were 39 male and female English major students participating in two different Advanced Writing classes at Islamic Azad University, North Tehran branch. Students in both classes sat for a placement test and then for a brain dominance test. Two essay writing tests were administered to evaluate the students' writing performance, one as the pre-test and the other as the post-test. The statistical analysis of the data indicated that the right brain dominant group significantly outperformed the left-brain dominant group on the post-test of writing irrespective of types of pre-writing strategies. The clustering group significantly outperformed the looping group on the post-test of writing irrespective of the types of brain dominance. There was a significant interaction between the types of pre-writing strategies and brain dominance. After receiving the clustering strategy, there was not any significant difference between the right and left-brain dominant groups' means. However, the right brain dominant group significantly outperformed the left-brain dominant group after receiving looping as the pre-writing strategy.

Keywords: brain dominance, pre-writing, clustering, looping, writing performance

INTRODUCTION

Brain dominance can be defined as the natural tendency of individuals for processing information on one side of their brains. The right hemisphere is known to be intuitive and spontaneous, while our logic is believed to reside on the left side. Different studies have shown that the left hemisphere adopts a more analytic approach; the right hemisphere, in contrast, is mostly involved in holistic and spatial processing. We can say that the left hemisphere is analytical, abstract, verbal, digital, logical, sequential, and rational. On the other hand, the right hemisphere is holistic, concrete, non-verbal, visual-spatial, intuitive, simultaneous, and analogical (Mc Carthy, Germain & Lippitt, 2006). However, according to Dülger (2012), "Although individuals are either left or right brain dominant in processing a piece of information, some can be dependent equally on both hemispheres: whole-brain dominant or bilateral".

Writing ability is also considered an essential skill in today's world in which communication is immensely important. In the process of writing, pre-writing is the start point and it is the phase that most of the EFL learners find the most problematic. According to Brodney, Reeves & Kazelski (1999), pre-writing has been proved to ease the process of all sorts of writing; it is a very valuable phase of the process because it comes to the aid of the writers in establishing their goals, brainstorming, arranging thoughts and ideas, and choosing the structure of the text.

Accordingly, since writing is considered as a sequential process these days and not just a product, more emphasis has been put on providing the learners with more assistance during different phases of writing activities, namely pre-writing, writing, and post-writing. According to Brodney et al. (1999), most of the difficulties the students run into arise in the pre-writing stage of the writing process where the writing is somehow formulated. A variety of techniques and strategies are used in order to prepare students to write without facing those obstacles; clustering and looping are two of them.

Clustering has proven to be correlated to Schema Hypotheses or the idea that human being's brain stores data in the form of networks very similar to what happens in clustering (Rico, 1976). Rico (2000) states that while clustering both hemispheres of the brain are involved, and using two heads while writing is preferred to using just one. Looping, on the other hand, is a free-writing technique in which the writer loops one 5-10-minute free-writing after another, and in the end, he or she will have a sequence of free-writings. A bunch of pertinent points is produced during this process and the topic of writing is tightened.

Ultimately, due to the major influence of writing on learners' success in learning a second language in general, the importance of individuals' brain dominance in the language learning process, and the significance of pre-writing phase and the pre-writing strategies in preparing the learners to write successfully, the present study aimed to investigate how brain dominance and the two pre-writing strategies of clustering and looping can affect the writing performance of Iranian lower-intermediate EFL learners.

Considering writing as one of the four macro language skills, it is justifiable that EFL teachers and researchers show great interest in exploring the factors that can lead to improvement of this skill or the ones which correlate with it in some ways. Students also usually view writing an arduous task and they mostly display a negative attitude about it; it is a chore they want to get done and be rid of. The problem gets even worse when it comes to writing in a second or foreign language. According to White and Arndt (1991), it is not always about language proficiency; even the native writers often are faced with the problems that non-native writers run into which shows the complex nature of writing. However, writing becomes even more laborious when the individuals are not native speakers and lack a perfect command of the language. In such situations, the pre-writing activities can come to the learners' aid. Mogahed (2013) believes that the problem of many inexperienced writers is that they do not know how to start writing. According to Tomkins (2001), pre-writing is the phase in process-writing that is mostly neglected. Thorne (1993) also emphasized the importance of the pre-writing stage as the

fundamental phase of the writing process. Therefore, since many writers experience the "writer's block" in the very beginning of the writing process, pre-writing and its strategies like clustering and looping which help overcome the block and keep going are worthy of a great deal of time and consideration.

One of the factors that might influence learners while they are engaged in writing is the way the brain processes information. Furthermore, one of the essential issues in developing a theory of L2 acquisition is brain dominance. As Brown (1994) suggests, the left hemisphere correlates to logical, analytical thought, and mathematical and linear processing of information. On the other hand, visual, tactical, and auditory images are perceived and remembered by the right brain which is more adept at processing holistic, integrative, and emotional information (Brown, 1994). Based on previous research, clustering, as one of the pre-writing strategies used in the present study, is linked to schema hypotheses. It utilizes both brain hemispheres according to Rico (2000), and the way the brain stores information somehow resembles what is done while clustering. On the other hand, according to Mckinney (1976), freewriting, which looping is a form of, is an effective remedy for anxiety, conflicts, and tensions, and for lots of college students, it can moderate the periods of confusion too.

Consequently, the issue under investigation in this study was whether the characteristics connected to individuals' brain dominance were associated with their ability in writing in English or not in general. Then the researcher studied the effect of brain dominance and the two pre-writing strategies of clustering and looping on Iranian lower-intermediate EFL learners' writing performance in particular.

SIGNIFICANCE OF THE STUDY

The left-brain/right-brain distinction can be considered as a bedrock for examining our education system, and for trying to assist our students in learning. The fact that each hemisphere is in charge of a certain type of thinking and learning is not the issue. The issue is that individuals' thinking and learning styles vary greatly, and one of the determining factors regarding learning styles is brain hemisphericity. Studies of this kind can help classroom teachers to create an atmosphere which encourages students and maximizes their learning (Williams, 1983), by being aware of the concept of brain dominance. As Williams (1983) has argued: "the brain has two hemispheres, but too often the education system operates as though there were only one" (Williams, 1983, p.7).

In general, schools usually ignore the right-brained people and stick to the left-brained ones, but in order to encourage whole-brain thinking stressing the importance of the talents and skills of both right and left brains is required. This study can help teachers and tutors gain enough information about their students, and use the information in order to choose activities, methods, and techniques that can help them improve their learning, especially their writing ability. It might also be appealing to the teachers to know if they are left- or right-brained and to see whether or not they have a tendency toward their own dominance.

Considering the importance of hemisphericity on the learning styles of EFL learners, and the significance of the pre-writing strategies like clustering and looping on EFL learners' writing performance, the results of the present study will have implications for L2 writing instruction. Having information about the variables that contribute to L2 writing and the degree of their importance as well as the effectiveness of different writing strategies during the writing process would be beneficial to teachers, researchers, writing experts, and even the students; for this study highlights the importance of writing and especially the pre-writing phase which is usually ignored in the process of writing by both teachers and students in EFL environments. The majority of EFL students know very little about the pre-writing strategies, their advantages, and the way to use them. The findings are also beneficial for teachers who find teaching writing challenging, so they devote little or no time to going through the process of writing, especially the pre-writing stage, in the classroom, and consider it as a piece of homework that has to be done without any preparation. In like manner, this study reveals the value of making use of different strategies at the pre-writing phase and leads teachers and curriculum planners to including pre-writing activities and tasks more and more with the aim of helping students foster positive attitudes to writing and boosting their writing performance.

The results can also be used in designing the curriculums and planning the lessons by the teachers bearing in mind the importance of learners' brain dominance. Being aware of the learners' lateral preferences, teachers will have the opportunity to utilize and mix techniques and strategies in the classroom which are favorable to both right-brainers and left-brainers; activities which both groups can benefit from and enjoy, not the ones that satisfy one group and leave the other bored and idle. The results can also be used by educators in order to develop a "whole-brain" approach to teaching through designing courses based on general and dominant-specific methods (Hughes, 2007). As Rico (2000) once stated: "two heads are better than one especially when it comes to writing".

RESEARCH QUESTIONS AND HYPOTHESES

In accordance with the purpose of this study, the following research questions were raised:

Major Research Question 1

Is there any difference between right- and left-brained Iranian lower-intermediate EFL learners' writing performances with regard to two different pre-writing strategies of clustering and looping?

In order to avoid any ambiguities regarding the first major research question, it was broken into the 3 following minor research questions:

Minor Research Question 1-1

Is there any difference between right- and left-brained Iranian lower-intermediate EFL learners' writing performances?

Minor Research Question 1-2

Do types of pre-writing strategies, namely clustering and looping, have different effects on the improvement of the writing ability of Iranian lower-intermediate EFL learners?

Minor Research Question 1-3

Is there any interaction between types of pre-writing strategies and brain dominance?

Major Research Question 2

Is there any difference between right-brained and left-brained Iranian lower-intermediate EFL learners' writing performance considering clustering as the pre-writing strategy?

Major Research Question 3

Is there any difference between right-brained and left-brained Iranian lower-intermediate EFL learners' writing performance considering looping as the pre-writing strategy?

Research hypotheses

The following major and minor null-hypotheses were explored in this research study:

There is no statistically significant difference between right- and left-brained Iranian lower-intermediate EFL learners' writing performances with regard to two different pre-writing strategies of clustering and looping.

Minor Null-Hypothesis 1-1

There is no statistically significant difference between right- and left-brained Iranian lower-intermediate EFL learners' writing performances.

Minor Null-Hypothesis 1-2

Types of pre-writing strategies, namely clustering and looping, have no significantly different effects on the improvement of the writing ability of Iranian lower-intermediate EFL learners.

Minor Null-Hypothesis 1-3

There is no statistically significant interaction between types of pre-writing strategies and brain dominance.

Major Null-Hypothesis 2

There is no statistically significant difference between right-brained and left-brained Iranian lower-intermediate EFL learners' writing performance considering clustering as the pre-writing strategy.

Major Null-Hypothesis 3

There is no statistically significant difference between right-brained and left-brained Iranian lower-intermediate EFL learners' writing performance considering looping as the pre-writing strategy.

REVIEW OF LITERATURE

Hemispheric dominance and writing

Studies on the issue of the relationship between brain dominance and language began in the early part of the 19th century when Frantz Joseph Gall stated his theories of location. He also suggested that we cannot think of the brain as a uniform mass, and each linguistic capacity resides in one localized area of the brain. He believed that language was located in the frontal lobes of the brain. Johann Spurzheim, a follower of Gall, located language exactly under the eye in all his maps and models of the brain. 25 years later in 1864, Dr. Paul Broca firmly stated that language was a property of the left-brain hemisphere. Therefore, it was Broca who drew scientists' attention to the issue in 1864. He proposed his hypothesis that the left hemisphere was the place for language, and in right-handed people, the left hemisphere is the dominant one. He also claimed that there was a kind of link between left hemispheric dominance for language and manual preference and that in left-handed people cerebral dominance for the language would be in reverse (Genesee, 1988; Steinberg, 1993).

Subsequently, until 1962, the accepted view was that human beings were half-brained thinking creatures (Levy, 1985). But by 1970 or sooner, as Levy (1985) has reported, the dynasty of left-brainers came to an end. That was the time when researchers came to the conclusion that each brain hemisphere was an extremely specialized organ of thought, and that in a series of functions it is the right hemisphere that is predominant and complements the left. Brandwein and Ornstein (1977) also found out that some facilities for language are located in the right hemisphere, and that the right brain can accept functions of the left brain.

Accordingly, the results of the study done by Breien-Pierson (1988) on the role of hemisphericity in the area of student writing have shown that right-brained learners are better at creative and freewriting, whereas left-brained ones preferred to write book reports and research papers. Weisi and Khaksar (2015) also stated that once they studied the effect of hemispheric dominance on Iranian EFL learners' creativity in writing, students who were right-brained wrote more creatively in writing tests.

Prewriting strategies and the brain

In the pre-writing stage, one can come up with ideas relevant to the topic and organize them meaningfully before starting to write a composition. Based on the previous research, anxiety and the writer's block _ the state at which the writer does not know how to begin writing _ mostly occurs at the pre-writing phase.

Clustering, as a pre-writing activity, was developed and named by Gabriele Rico (1983). She believes that clustering can activate both the right and left-brain hemisphere, which she calls respectively "design mind" and "sign mind". Folit (2009) also states that clustering activates the right brain, the place where non-linear images and patterns are produced. According to Schole and Comley (1989), writers that think spatially can benefit more from clustering or grouping ideas. Adriati (2013) conducted a research study in which she investigated the use of clustering techniques in teaching writing narrative

texts. She found clustering very effective in improving students' scores in writing narrative text. İNAL (2014) sought the impact of clustering as a pre-writing strategy on writing achievement and writing attitudes of Turkish students. The results showed a significant difference in favor of the experimental group. Clustering also worked well with adult students in terms of improving their attitude. Ghufron (2018) also carried out a study on how the clustering technique could enhance students' writing skills regarding descriptive texts in eighth-graders. The results of his study showed that using clustering techniques can lead to the enhancement of students' writing skills in descriptive texts.

Looping is considered a free-writing strategy. Mogahed (2013) believes that "looping is a free-writing activity that allows the writer to focus his ideas in trying to discover a writing topic" (p. 65). Since free-writing is a non-linear activity, it activates the right brain hemisphere which is the one in charge of dealing with abstractions and concepts. In a study conducted by Nosrati and Jahandar (2016), the impact of looping on the writing performance of Iranian upper-intermediate EFL learners was investigated. The results showed that the participants that received looping as the treatment had a better performance on the writing post-test compared to the control group.

As is clear, so far, numerous studies have been conducted on brain dominance, pre-writing strategies and writing performance, but to date, virtually no research has studied the effect of brain dominance and two pre-writing strategies of clustering and looping on Iranian EFL learners' writing performance. Therefore, this study set out with the aim of investigating the hypothetical effect of brain dominance and two pre-writing strategies of clustering and looping on the writing performance of lower-intermediate Iranian EFL learners.

METHOD

Participants

Participants of this study were selected from among 61 male and female English major students participating in two different Advanced Writing classes at Islamic Azad University, North Tehran Branch in the first semester of the academic year ٢٠١٨-٢٠١٩. However, after administering the Oxford Quick Placement Test for the purpose of homogenizing the students and the Brain Dominance Test to determine individuals' hemispheric preferences, this number was decreased to 39. Due to the fact that the researcher only had access to a few available (intact) classes and as far as randomization was not possible, convenience sampling was done for the purpose of forming the population of the study. However, in order to control the extraneous variables of the subject and the number of students in each group as much as possible, the number of the students in the two classes were nearly the same, and both were studying the same subject.

Instrumentation

Homogeneity Test (Oxford Placement Test)

To make sure that all the subjects were at a lower-intermediate level and in order to have homogeneous groups, the researcher used the second version of the Quick Placement Test which was composed of 60 multiple-choice items. The test had been designed in 2001 by Oxford University Press and the University of Cambridge Local Examination Syndicate. The test entailed two sections, namely parts one and two, which included respectively questions 1_40 and 41_60. The students were asked to take the test in 50 minutes in the classroom; they had to choose the correct answer for each item from among 3 or 4 alternatives available for each.

Regarding scoring, the original test was accompanied by an answer key and criteria for assigning students to different groups based on their proficiency levels which ranged from beginner (0_17), elementary (18_29), lower-intermediate (30_39), and upper-intermediate (40_47) to advanced (48_54) and very advanced (54_60). As far as the researcher wanted to have lower-intermediate level participants, individuals with total scores between 30 and 39 were chosen as the participants for the study. Students who were labeled as beginner, elementary, upper-intermediate, advanced, and very advanced were excluded from the population and data analysis.

The Brain Dominance Test

To determine the hemispheric dominance of the participants, the researcher used The Brain Dominance Inventory (BDI) which was composed of 39 items. The test was first developed by an unknown author and then revised by Davis (1994). Each test item was followed by three alternatives. The participants' total of a's, b's, and c's had to be 39, otherwise, the score would be incorrect.

It is also worth mentioning that BDI suggests a continuum for individuals' hemispheric dominance. Based on the results, people are assigned to one of the categories of very strong left/right brain dominant, left/right brain dominant, with a moderate preference toward the left/right, with a slight preference toward the left/right, or whole-brain dominant (bilateral). Therefore, following in the previous researchers' footsteps mentioned above, individuals' Hemispheric Preference is what is called brain dominance in this study.

Writing Tests

The researcher used two different but similar writing tests, one as the pre-test and another as the post-test. Two writing topics that were appropriate for lower-intermediate levels were then selected through consultations between the researcher and the teachers of the two classes. For the pre-test students in both classes were required to write about the same topic, namely "Air pollution". For the post-test, on the other hand, both classes were asked to write about another identical topic similar to the pre-test, namely "Noise pollution". However, in the post-test writing, each comparison group was asked to write about "Noise pollution" with regard to the pre-writing strategy

(clustering or looping) it received treatment for. Although the topics of pre- and post-tests were not the same in an attempt to minimize the pre-testing effect as much as possible, they were selected from among similar topics. Following the teaching of each strategy for three sessions by the teacher in the class, and after the learners went through the pre-writing stage with regard to the same strategy, the learners were asked to write at least 200 words on the pre-determined topic in about 60 minutes in the last session.

Since in this research the researcher aimed to study the possible effects of brain dominance and two pre-writing strategies of clustering and looping on the learners' writing performance, we were after assessing proficiency components: organization (introduction, body, and conclusion), logical development of ideas (content), grammar, punctuation, spelling and mechanics, and style and quality of expression (Brown and Bailey, 1984). The writing papers were assessed by two experienced language teachers. In each category, a score between 20 and 18 was labeled as excellent to good, 17 and 15 as good to adequate, 14 and 12 as adequate to fair, 11 and 6 as unacceptable, and 5 and 1 as not college-level work.

Procedure

The following procedure was followed to carry out this study:

Pre-test

In the first session, the researcher administered the second version of the Quick Placement Test by Oxford University Press and University of Cambridge Local Examination Syndicate (2001) for the purpose of homogenizing and having real lower-intermediate level students in both experimental groups. Students were asked to answer 60 multiple-choice items in 50 minutes. Based on the test's scoring procedure, students with scores between 30 and 39 were known as the lower-intermediate level participants, whereas the individuals who scored below 30 and above 39 were excluded from the study. However, their physical presence in the classes might have affected the results of the study in some ways.

As the second step, the researcher took the original non-copyrighted version of the Brain Dominance Inventory (1994) by Davis. Students answered 39 multiple-choice items of the test in 40 minutes. Based on the number of A's, B's, and C's they chose, and through the before-mentioned scoring procedure, participants with scores below and above zero were respectively called left- and right-brainers. Individuals who scored zero were labeled as whole-brainers or bi-laterals.

As the final step of pre-testing, "Air Pollution" was chosen as the topic for writing after consultation with the two professors, and the students were asked to write about "Air Pollution" in at least 200 words with no regard to any specific pre-writing strategy in the 3rd session. This was done for the purpose of comparing the learners' writing performances on pre- and post-test to make sure that their post-test scores would only be pertinent to the treatment they received, and to minimize the effect of other compounding variables on the results of the study. The writings were then rated by two different raters, the researcher and an experienced EFL teacher, based on Brown and

Bailey's (1984) Analytical Scale for Rating Composition Tasks, and the inter-rater reliability was also computed.

Treatment

Since in this study the researcher looked for the effect of left/right brain dominance and two pre-writing strategies of clustering and looping on Iranian EFL learners' writing performance, the teachers taught each of the pre-writing strategies in one of the classes for three successive sessions. Each session lasted approximately 30 minutes. The students were also asked to practice the learned pre-writing strategies at home while doing their writing assignments. It is good to mention that the researcher chose which strategy to be taught in which class randomly and before entering the classes for the first time.

Post-test

Finally, the teacher asked the participants to write about 200 words on a topic similar to the pre-test. The students wrote on "Noise pollution", but this time each group wrote with regard to one class-specific pre-writing strategy. Since in the present study we were going to measure the effect of learners' brain dominance and the two pre-writing strategies of clustering and looping on Iranian EFL learners' writing performance, the comparison group who got treatment on clustering was asked to write about "Noise pollution" while using clustering as the pre-writing strategy; for the comparison group who received treatment in looping, the writing test included looping as the pre-writing strategy.

The scoring was done based on the scoring rubric taken from Brown and Bailey (1984), the same criteria as in the pre-test. In Brown and Bailey's (1984) Analytical Scale for Rating Composition Tasks, each criterion of organization, content, grammar, punctuation, spelling and mechanics, and style and quality of expression could get a score between 0 and 20. For giving each of these categories a mark between 0 and 20 there was also another division ranging from Excellent to good (20_18), good to adequate (17_15), and adequate to fair (14_12), to unacceptable (11_6) and not-college-level work (5_1). Each writing was then rated by two different raters, the researcher and an experienced EFL teacher, and the inter-rater reliability was also computed.

RESULTS AND DISCUSSIONS

The null-hypotheses formulated in this study were analyzed using two-way ANOVA and two-way ANCOVA. These statistical techniques, besides their own specific assumptions, require the normality of the data. The absolute values of the ratios of skewness and kurtosis over their standard errors were lower than 1.96. Thus, it can be concluded that the data did not show any significant deviation from a normal distribution.

Pearson correlations were computed in order to probe the inter-rater reliability of the two raters who rated the participants' performance on the pre-test and post-test of writing. The results indicated that there were significant agreements between the two

raters on; pre-test (r (37) = .804, representing a large effect size, p < .05), and post-test of writing (r (74) = .863, representing a large effect size, p < .05).

Table 1 displays the descriptive statistics and KR-21 reliability of the placement test. The KR-21 reliability index for the placement test was .78.

Table 1. Descriptive statistics and KR-21 reliability of placement test

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Placement	61	12	43	30.08	7.093	50.310
KR-21	.78					

A two-way analysis of variances (two-way ANOVA) was run to compare the looping, clustering, left and right brain dominant groups' means on the placement test in order to prove that they were homogenous in terms of their general language proficiency prior to the administration of the treatments. The assumption of homogeneity of variances was met. The results of the Levene's test (F (3, 35) = .683, p > .05) indicated that there were no significant differences between the groups' variances.

A two-way analysis of covariance (two-way ANCOVA) was run to compare the looping, clustering, left and right brain dominant groups' means on the post-test of writing while controlling for the possible carry-over effects of prior ability in writing as measured through the pre-test in order to probe the null-hypotheses raised in this study. Before discussing the results, it should be noted that ANCOVA has four main assumptions; normality of the data, homogeneity of variances, linear relationship between post-test and pre-test, and homogeneity of regression slopes.

First, the results of the Levene's test (F (3, 35) = .503, p > .05) indicated that there were no significant differences between the groups' variances on the post-test. Thus, it can be claimed that the assumption of homogeneity of variances was retained. Second, ANCOVA assumes that there is a linear relationship between the post-test and the covariate (pre-test). The significant results of the test of linearity (F (1, 16) = 140.06, p < .05, partial eta squared = .907 representing a large effect size) indicated that the statistical null-hypothesis that the relationship between the post-test and covariate was not a linear one was rejected. That is to say; there was a linear relationship between the two variables. Third, the analysis of covariance also assumes the linear relationship between the post-test and covariate holds true across all groups (homogeneity of regression slopes). The non-significant interaction between the post-test and covariate (pre-test) (F (1, 35) = .426, p > .05, partial eta squared = .012 representing a weak effect size), indicated that the statistical assumption was retained as there were not any significant differences among the relationships between post-test and pre-test across the groups. In other words, the assumption of homogeneity of regression slopes was met too.

Table 2 displays the results of the two-way ANCOVA. The results (F (1, 34) = 91.90, p < .05, partial η^2 = .730 representing a large effect size) indicated that there was a significant difference between the right and left-brain dominance groups' means on the post-test of writing after controlling for the possible effects of the pre-test. Thus, the minor null-hypothesis 1-1 as "there was not any statistically significant difference between right-

and left-brained Iranian low intermediate EFL learners' writing performances" **was rejected**.

Table 2. Tests of between-subjects effects; posttest by groups by brain dominance with pretest

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Group	121.391	1	121.391	45.342	.000	.571
Dominance	246.051	1	246.051	91.904	.000	.730
Group * Dominance	174.441	1	174.441	65.157	.000	.657
Error	91.026	34	2.677			
Total	195230.750	39				

Table 3 displays the right and left-brain dominant groups' means on the post-test of writing. The results indicated that the right brain dominant group (M = 72.83, SE = .409) significantly outperformed the left-brain dominant group (M = 67.70, SE = .344) on the post-test of writing after controlling for the effects of the pre-test.

Table 3. Descriptive statistics; posttest of writing by brain dominance with pretest

Dominance	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Right	72.831[a]	.409	72.000	73.663
Left	67.706[a]	.344	67.007	68.406

a. Covariates appearing in the model are evaluated at the following values: Pretest = 62.15.

The results of one-way ANCOVA (F (1, 34) = 45.34, p < .05, partial η^2 = .571 representing a large effect size) indicated that there was a significant difference between the looping and clustering groups' means on the post-test of writing after controlling for the possible effects of the pre-test. As displayed in Table 4, the clustering group (M = 72.06, SE = .368) significantly outperformed the looping group (M = 68.46, SE = .388) on the post-test of writing after controlling for the effects of pre-test. Thus, the minor null-hypothesis 1-2 as "types of pre-writing strategies, namely clustering and looping, did not have any significantly different effects on the improvement of the writing ability of Iranian lower-intermediate EFL learners" **was rejected**.

Table 4. Descriptive statistics; posttest of writing by groups with pretest

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Looping	68.469[a]	.388	67.680	69.258
Clustering	72.068[a]	.368	71.321	72.816

a. Covariates appearing in the model are evaluated at the following values: Pretest = 62.15.

The results displayed in Table 2 also indicated that there was a significant interaction between types of treatments and brain dominance (F (1, 36) = 65.15, p > .05, partial η^2 = .657 representing a large effect size). Thus, the minor null-hypothesis 1-3 as "there was

not any statistically significant interaction between types of pre-writing strategy and brain dominance" **was rejected**. As displayed in Table 5 and Figure 1; the looping right-brain dominant group (M = 73.21) had a higher mean than the left-brain dominant group (M = 63.73), while the means of the two brain dominant groups under clustering method were fairly close (i.e. 72.44 for right vs. 7.69 for the left group).

Table 5. Descriptive statistics; posttest by group by brain dominance

| Group | Dominance | Mean | Std. Error | 95% Confidence Interval | |
				Lower Bound	Upper Bound
Looping	Right	73.218[a]	.580	72.039	74.397
	Left	63.720[a]	.520	62.663	64.777
Clustering	Right	72.445[a]	.580	71.266	73.623
	Left	71.692[a]	.455	70.767	72.618

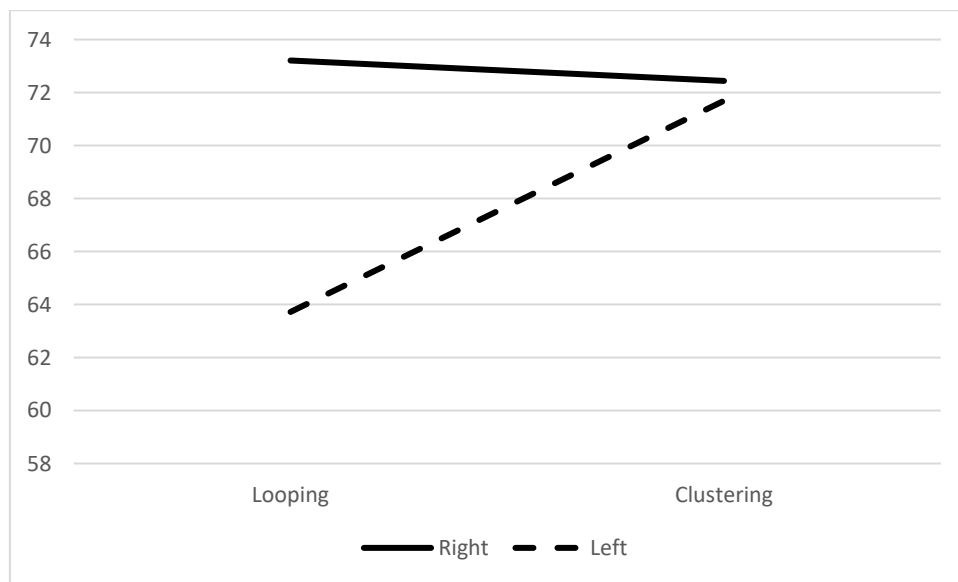a. Covariates appearing in the model are evaluated at the following values: Pretest = 62.15.

Figure 1. Interaction between group and brain dominance on posttest line graph

The significant interaction between the types of pre-writing strategies and brain dominance enabled the researcher to run simple effect analysis. Field (2013, p 556) defined simple effect analysis as a technique that "… can be used to break down interaction effects. This analysis basically looks at the effect of one independent variable at individual levels of the other independent variable". The results of the simple effect analysis can be used to answer the second and third major null-hypotheses.

Based on the results displayed in Table 6 it can be concluded that; There was not any significant difference between the right (M = 72.44) and left (M = 71.69) brain dominant groups' means on the post-test of writing after controlling for the effects of pre-test considering clustering as the pre-writing strategy (Mean Difference = .753, p > .05). Thus, the major null-hypothesis 2 as "There is not any statistically significant difference

between right-brained and left-brained Iranian lower-intermediate EFL learners' writing performance considering clustering as the pre-writing strategy" **was supported**.

The right brain dominance group (M = 73.21) after receiving looping pre-writing strategy significantly outperformed the left-brain dominance group (M = 63.72) on the post-test of writing after controlling for the effects of pre-test (Mean Difference = 9.49, p < .05). Thus, the major null-hypothesis 3 as "There was not any statistically significant difference between right-brained and left-brained Iranian lower-intermediate EFL learners' writing performance considering looping as the pre-writing strategy" **was rejected**.

Table 6. Simple effect analysis; posttest of writing by groups by brain dominance with pretest

Group	(I) Dominance	(J) Dominance	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
Looping	Right	Left	9.498*	.782	.000	7.908	11.088
Clustering	Right	Left	.753	.739	.316	-.750	2.255

*. The mean difference is significant at the .05 level.

CONCLUSION

The results of this study revealed that irrespective of the type of pre-writing strategy, the right brain dominant group outperformed the left-brain dominant group on the post-test of writing. However, clustering proved to have a better impact on the improvement of Iranian lower-intermediate EFL learners' performance on the post-test of writing irrespective of brain dominance. Furthermore, a significant interaction between the types of treatments and brain dominance seemed to exist. A comparison between the right and left-brain dominant groups' means on the writing pre- and post-tests showed that the two groups had almost equally benefitted from clustering. However, the looping right-brain dominant group benefitted more from looping compared to the left-brain dominant group.

The findings can be in line with the findings of the study conducted by Breien-Pierson (1988) who stated that right-brained learners were better at creative and freewriting, while left-brained ones preferred writing book reports and research papers. As far as looping is considered a free-writing strategy, the fact that right-brainers of this research had a better performance while using looping is in complete accordance with the findings of Breien-Pierson's (1988) study. The answer also to some extent agreed with the results of the research study done by Tendero (2000), which claimed that hemispheric dominance was positively, but not significantly, correlated with writing skills. However, the findings are in contradiction with the results of the study by Bakhshi, Rashvandi, and Alirezaeian (2014), who reported no significant relationship between brain hemisphericity and the writing ability of Iranian EFL learners.

The findings are also to some extent in accordance with the findings of studies done by Mahnam and Nejadansari's (2012) and Jiwprasat (2012). According to Mahnam and Nejadansari, applying pre-writing strategies by students had a positive effect on writing compositions. They found out that the benefits of concept-mapping, reading, and negotiation could lead to higher writing achievement. Jiwprasat (2012) also investigated the impact of pre-writing strategies on the writing ability of grade six students in Bangkok. The results showed improvements in the writing ability and attitude of the sixth graders who were taught to use pre-writing strategies. The results showed that irrespective of individuals' brain dominance, pre-writing strategies can positively and differently influence EFL learners' writing performances on the post-test.

The fact that the two groups of right- and left-brainers did not show a significant difference in writing post-test while using clustering as the pre-writing strategy might be an affirmation of Rico's (1983) claim that clustering is a strategy which can activate both right and left-brain hemispheres. In addition, Zheng and Dai (2012) once stated that what is done in clustering is compatible with the function of both right and left hemispheres.

RECOMMENDATIONS

The results of this study revealed the significance of brain dominance as a substrate for examining our education system, and for trying to assist our students in learning. We know that individuals' thinking and learning styles vary greatly, and one of the determining factors regarding learning styles is brain hemisphericity. And as Boylan (1984) once stated, many researchers think that if learning styles are taken into account, learning will be more productive.

Therefore, the results of this study can assist classroom teachers in creating an atmosphere which encourages students and maximizes their learning (Williams, 1983), by being aware of the concept of brain dominance. As Williams (1983) has argued: "the brain has two hemispheres, but too often the education system operates as though there were only one" (Williams, 1983, P. 7). In a system that schools usually stick to left-brainers and right-brainers are most of the time ignored, in order to encourage whole-brain thinking emphasizing the significance of the talents and skills of both right and left brains is highly recommended.

Although we are aware of the fact that considering every student's needs and matching all of them with activities and instructions in the class is difficult, this study can help teachers and tutors gain enough information about their students, and use the information in order to choose activities, methods, and techniques that can help them improve their learning, especially their writing ability. At least they can use a variety of activities suitable for an average class. As a result, all the learners will get at least some activities that match their learning styles. The teachers might also be interested to recognize their hemispheric preference and to see if they show a tendency toward their own dominance while choosing planning their lessons.

Another factor is that due to the significant role of writing performance on high-stakes proficiency tests like IELTS and TOEFL, and also the importance of writing in its own

right, it is advisable to explore the factors that might contribute to the writing ability of EFL learners. According to Davis (1989), the learning efficiency of the learners can be enhanced by teaching them strategies irrespective of the style used by the teacher. This study highlights the importance of teaching strategies to students, especially at the pre-writing phase, for the purpose of improving the writing ability of the learners and to improve their writing performance. However, students usually do not have a positive attitude toward writing (Hubert, 2012). They usually complain that the time spent on practicing writing in the classroom is not sufficient and that the writing activities are not varied enough (So & Lee, 2013). Since the researcher witnessed that while using clustering and looping as pre-writing strategies students' attitude was positively changed and many of them also showed improvement in their writing performances, spending more time preparing students for writing in the classrooms is advisable.

Taking in mind the importance of hemisphericity in the learning styles of EFL learners, and the significance of the pre-writing strategies like clustering and looping on EFL learners' writing performance, the results of the present study will have implications for L2 writing instruction. This study highlights the importance of writing and especially the pre-writing phase which is usually ignored in the process of writing by both teachers and students in EFL environments. Therefore, teachers, researchers, writing experts, and even the students would benefit from information about the variables which contribute to L2 writing and the degree of their importance as well as the effectiveness of different writing strategies during the writing process. The majority of EFL students do not seem knowledgeable about the benefits and uses of pre-writing strategies. In addition, many English teachers find teaching writing challenging, and subsequently devote little or no time to going through the process of writing, especially the pre-writing stage. They usually treat it as a piece of homework that needs no preparation. In like manner, by revealing the value of making use of different strategies at the pre-writing stage, the findings of this study might lead teachers and curriculum planners to including pre-writing activities and tasks more and more with the aim of helping students foster positive attitudes to writing and boosting their writing performance.

The results can also be used for designing the curriculums and planning the lessons by the teachers bearing in mind the importance of learners' brain dominance. Knowing the learners' lateral preferences provides the teachers with the chance to use and mix techniques and strategies in the classroom which are favorable to both right-brainers and left-brainers; activities which are beneficial and interesting to both groups, not the ones that satisfy one group and leave the other bored and idle. In other words, teachers need to incorporate strategies that would meet both right and left preferences needs.

Rico (2000) once stated: "two heads are better than one especially when it comes to writing". Educators can also bear in mind the findings of this study and try to develop a "whole-brain" approach to teaching. This can be achieved by designing courses that are compatible with general and dominant-specific methods (Hughes, 2007).

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