

Experimental Study on the Changes of Handwriting Characteristics after Exercise

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Keywords: Handwriting after Exercise; Writing Habits; Changes in Handwriting Characteristics;

Abstract: Today, with the improvement of people's living standards, more and more people are actively participating in outdoor sports or gymnastics. The specific people in the sports group may encounter an urgent file after strenuous exercise. At this time, the handwriting is checked out. There may be differences from normal handwriting, so that a contract or document signed can easily lead to disputes. At present, most of the current domestic and international researches are on the relationship between handwriting characteristics and physiological characteristics, and no research on the changes of handwriting characteristics after exercise. Therefore, the author collects the experimental samples of the handwriting before and after the exercise to statistically analyze the changes in handwriting characteristics, which will help the handwriting inspection and identification in the future.

1. Introduction

With the rapid development of China's economy, people are paying more and more attention to physical exercise while actively participating in the development cause. People choose to use the outdoor or gym to strengthen their body. Usually, running, push-ups, pull-ups and other sports will be the first choice for exercise. Some specific people in the sports crowd will encounter an emergency document or an owe after the exercise. If the exercise intensity is too large and exceeds its own tolerance, the arm muscles will unconsciously shake. Then the handwritten sign is different from the normal handwriting. In this way, the handwriting after the movement appears on the contract or the document is easy to cause disputes, which will inevitably bring certain difficulties to the handwriting identification work. However, at present, most of the current domestic and international research is on the relationship between the change of handwriting characteristics and physiological characteristics. The special regular phenomena exhibited by handwriting under different physiological conditions, such as the handwriting of the elderly, the handwriting after drunkenness, the handwriting of the mental patient, by consulting a large number of documents, no research has been found on the changes in handwriting characteristics after exercise. Nowadays, the popularity of fitness for all people is getting higher and higher, and the possibility of writing after exercise is also increasing. Therefore, it is especially important to study the handwriting characteristics after exercise. Therefore, the author collects the experimental samples of the handwriting before and after the movement to calculate the changes of the handwriting characteristics, systematically analyzes and studies the changing rules of the handwriting features, and provides assistance for the future handwriting inspection and identification.

2. The Experimental Design

2.1 Experimental Location.

This experiment is related to sports, so the experimental site is chosen outdoors.

2.2 Experimental Subjects.

In order to ensure the authenticity of the experimental conclusions, the author selected 50 college students (non-sports students) who were in the formalization stage.

2.3 Experimental Handwriting Samples.

In order to reflect the experimenter's writing habits in a true and accurate way, the experimental samples are information such as signature, date, student number, department, etc. (including Chinese characters and Arabic numerals).

2.4 Experimental Steps

Collect 50 normal subjects before exercise. The experiment is divided into three groups: running, push-ups, and pull-ups. The running is based on the standard test. The push-ups and pull-ups are based on the limits of the experimenter. Write the experimental sample information immediately after the exercise. Compare the pre- and post-exercise handwriting and summarize the similarities and differences of features.

3. The Experimental Results of Handwriting Characteristics before and after Exercise

According to the experimental samples of the experimenter, we quantified the changes in the handwriting characteristics before and after the exercise. As shown in Table 1.

Table 1

Handwriting features	Running handwriting feature change percentage(%)	Percentage change in handwriting features(%)	Centroid upstroke feature change percentage(%)
Change in writing level	2	3	5
Larger writing	10	12	20
Significant change in word spacing	0	0	1
Proportional imbalance	4	5	5
Fast writing speed	32	48	50
Thin strokes	16	30	36
Stroke bending jitter	14	24	28
Increase the number of consecutive strokes	12	46	49
Lifting pen change	23	20	25
Pen force change	16	25	28
Virtual pen	20	24	22

4. Analysis and Discussion on the Changes of Handwriting Characteristics before and after Exercise

Handwriting is formed through writing activities. Writing activities must pass through the various organs of the human body, and under the unified command and coordination of the brain and nervous system, the whole process of writing movement can be realized. The writing movement is a complex and skillful movement. It requires almost all the coordination of the nerve center and speech organs related to speech movement, and is concentrated in the process of writing and writing. Commands are issued by the cortical writing exercise zone, which is supervised by the efferent nerves as the order, moderate, and rhythmic stretching, while relying on the information obtained by

the visual, the proprioceptors in the tendon muscles and the touch pressure of the fingers. Adjust the position, direction, strength, etc. of the pen down, and complete the writing activity under the temptation of internal speech. In simple terms, the writing movement is supported by bones and tendons as the driving force, and relies on the coordinated movement of the arms. Therefore, the changes in the handwriting characteristics before and after the movement of the experimenter are mostly related to the arm coordination ability after a certain exercise intensity [1]. .

Based on the experimental results in Table 1-1 and the experimental samples before and after the handwriting movement, we analyze the changes in handwriting characteristics in the running group and the push-ups and pull-ups.

In the running group, we tested according to the standard of 800 meters for girls and 1000 meters for boys. After running, the experimenter immediately wrote down the contents of the experimental sample and compared it with the handwriting before the exercise. Of the 50 people tested, not all of them had changes in handwriting characteristics after running the standard. The experimenters who showed no significant changes in the handwriting characteristics before and after the exercise said that they would exercise regularly. When the test ended, the arm muscles would be a little shaken, but the arm movements could be easily coordinated during the writing process, and according to their own Writing habits complete the experimental handwriting. In other parts of the experiment, people with more obvious changes in handwriting characteristics before and after exercise, because they usually have less exercise, they are weak after running, and some even have dizziness, local body muscle stiffness, numbness lasts longer, especially holding pen When preparing to write, the muscles of the arm are shaking sharply, and I don't want to hear it. I always hope to complete the writing movement quickly. Therefore, the writing speed is obviously accelerated, the writing force is lighter, and the pen will increase. A small number of the experimenter's arm muscles are too sore and shaking, which leads to aggravation of the pen. Individual strokes have changes in handwriting characteristics such as bending jitter. Before and after the movement of the writer, the writing speed is obviously increased, and the strength of the pen is also reduced. The three writers have a virtual pen and a continuous number of pens. Among them, the handwriting features of the word have changed after the movement, and the pens of each stroke have omitted the small back groove. Not smooth, even bending and shaking, the shape of the pen has changed.

Both the push-ups and the pull-ups are both exercises that help strengthen the muscles of the upper limbs, so the test results are analyzed. According to the different body muscle endurance, 50 people have reached the limit of exercise, immediately write down the contents of the experimental sample, and compare it with the handwriting before exercise. It was found that not all people had changes in handwriting characteristics. The general experimenters reflected the extreme movement of the upper limbs, and the arms showed jitter. However, because of the difference in muscle endurance, the degree of jitter varies from person to person, so the experimenter holds when writing, the coordination ability of the arm is different. Some people have little change in the handwriting characteristics before and after the exercise, while some people's handwriting features change obviously. The following is an example of Chen's handwriting.

Compared with Chen's handwriting before the movement, the writing speed of the word and the strength of the pen movement did not change much, but many strokes of the handwriting after the movement showed bending and shaking, such as the vertical and "minute" characters of "ten" and "clock". It is difficult to grasp the matching relationship between the knives of the knives, the "2" creases, the matching of the "cross" strokes, and the length of the final stencil. Most of the experimental subjects have upper body muscle congestion and swelling after extreme exercise, and the arm is in a tight state, and is unconsciously in a state of tremor. In this case, due to the influence of the tendon expansion and contraction adjustment, it is difficult to coordinate the direction of the pen when writing, and the strength and angle of the pen. The direction of the pen, the distance of the pen, etc., so the above-mentioned changes in the handwriting characteristics have appeared.

From the three sets of experimental data and handwriting samples, the proportion of changes in handwriting characteristics among the 50 experimental subjects was different. The changes in handwriting characteristics before and after exercise are not the existence of every person after

exercise, which has a lot to do with personal physical fitness, exercise intensity and sports. Running exercise has little effect on the change of handwriting characteristics. Most people can coordinate the movement of the arm after exercise. According to their own writing habits, the writing activity can be successfully completed. Only a few people have difficulty coordinating the arm movement, so the writing speed is increased and the company is increased. The push-ups and pull-ups for upper-limb muscle movements are different. The change of handwriting characteristics is more than that of running. According to the daily exercise volume of each person, after most of the experimenters reach the limit, the arm muscles will have transient jitter. Exceeding the intensity of exercise, there will be stiff muscles in the arms, unconscious tremors, and long durations, which will greatly affect the smooth flow of writing activities, especially in vertical painting, folding pens, and pens. Calling, not completing the handwriting according to the writing habits, so there are changes in the handwriting characteristics before and after the movement.

5. The Distinction between Handwriting after Exercise and Imitation Handwriting and the Main Points of Inspection

5.1 The Distinction between Handwriting after Exercise Features and Imitation Handwriting Features.

After the movement of the arm muscles, the handwriting characteristics will inevitably be different from the normal handwriting features, and even easy to be confused with the imitation handwriting. The imitation handwriting will be slow and slow, the pen is gentle, the re-drawing, the pause, and the jitter. After the experiment, it is found that the handwriting features after exercise is similar to the gentleness and jitter of the imitation handwriting. The difference between them is that the imitation handwriting is not their own writing habits, the whole handwriting will appear stiff, and several imitated feature points will appear on handwriting at the same time. After the movement, the handwriting feature changes are mostly one word with one feature point, such as individual the pen strokes are slow and the strokes of individual strokes are dithered.

5.2 Checking the Main Points of Handwriting after Exercise.

In the handwriting test, a comprehensive and detailed understanding of the circumstances, facts, circumstances, and circumstances of the case should be carried out. Only when the case is fully grasped can the reasonable analysis of the suspected points in the sample be conducted, and some unnecessary tests can be excluded to confirm the test. For example, the characteristics of suspected imitation handwriting appearing after exercise can be analyzed according to the case to prevent errors in the inspection direction.

The original documents must be used in the case identification of the handwriting identification in order to understand the conditions for the formation of handwriting of the sample and the sample. If a copy or photo is provided, there is a possibility of forgery, and the microscopic features such as the stylus and the pen force of the handwriting in these non-original materials may disappear or be deformed, which directly affects the accuracy of the identification conclusion. If you have to use a copy or photo for inspection for special reasons, you should also pay attention to the combination of the case and evidence, and repeatedly [2].

“Reading through” samples is a crucial step in the handwriting identification process. For whether the handwriting of the sample is formed after exercise, we have to combine it with the case. Because of the limited feature points of the handwriting after exercise, we have to “get through” the sample and take into account every possibility of handwriting formation. Don’t die. Staring at a feature point of a imitation handwriting, it is necessary to combine other strokes to analyze, what is the reason for the imitation of the handwriting characteristics, whether it is formed after the excessive movement or the imitation, only the various details are closely linked, comprehensive Judging and verifying each other can guarantee the correctness of the identification and ensure the correctness of the appraisal opinion. [3]

Acknowledgements

Fund Project: Jiangxi Provincial Department of Education Science and Technology Research Project "Experimental Study on the Change Law of Handwriting Characteristics after Exercise", Question No.: GJJ151189

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