

The Effect of Somatosensory Interactive Movement on Emotion and Emotion-related Attention Bias in Sedentary College Students

Zhengwei Mao

School of Physical Education, Southwest University, Chongqing 4000700, China

Abstract: In order to explore whether sedentary college students can get more and better emotional benefits from motion-sensory interactive exercise compared with traditional aerobic exercise. In this study, 18 sedentary college students were selected in a cross-controlled experiment to receive 2 times of exercise in a random balanced order. 1) In the somatosensory interactive exercise group, subjects were asked to perform somatosensory dance for 30 minutes; 2) Power bicycle group: Subjects were required to do 30 minutes of power bicycle; Each subject completed the mood scale, emotion regulation strategy scale, self-efficacy scale, exercise enjoyment questionnaire and emotional attention bias tasks before and after the intervention. The results showed that: 1) Compared with power cycling exercise, the positive emotion was significantly improved and the negative emotion was decreased after the intervention ($p < 0.05$); In addition, somatosensory interactive exercise made college students gain greater self-efficacy ($p < 0.05$); In addition, motion-sensing interactive exercise obtained better sports enjoyment ($p < 0.05$). 2) The results of the attention bias task test of emotion showed that compared with the power bicycle exercise, the subjects who participated in the somatosensory interactive exercise could disengage from the negative emotion-related cues more quickly ($p < 0.05$). However, no difference was found in positive emotion-related cues between the two forms of exercise ($p > 0.05$). Somatosensory interactive movement can be used as a potential tool to improve negative emotions and mobilize positive emotions, and is a very effective way of emotion regulation.

Keywords: Somatosensory Interactive Movement, Sedentary College Students, Attention Bias, Negative Emotions, Sports Enjoyment, Self-efficacy.

1. Introduction

Sedentary lifestyles, such as looking at screens, driving, and sitting in the office, are becoming increasingly common, and the age trend is getting younger. Prolonged sedentary behavior can induce various chronic diseases [1-4] and is listed as the fourth - leading global risk factor for death by the World Health Organization (WHO) [5]. Among them, college students are one of the high - risk groups for sedentary behavior. They need to spend 75% of their day in sedentary activities to complete screen - based academic tasks and for entertainment and relaxation[6, 7]. Research has confirmed that long - term sedentary behavior may lead to muscle weakness and pain in the body, and these effects may result in negative emotions such as depression, frustration, or anxiety[8]. Staying in a negative emotional state for a long time makes individuals more likely to focus on negative stimuli. The emotional regulation neural network in the brain will be activated, occupying more attention resources, thus causing an attentional bias towards negative emotions[9]. Since an individual's attention is limited, when an individual prioritizes focusing on negative stimuli and processing the information, it will also increase negative emotions, putting the individual in a vicious cycle of negative emotions. Therefore, in interventions to improve negative emotions, it is equally important to consider regulating an individual's attentional bias

It has been confirmed that exercise can enhance positive emotions and weaken negative emotions, such as pain, anxiety, and depression[10-14]. Exercise also has an impact on the attentional bias towards specific emotional stimuli (positive or negative). Studies have found that after

completing moderate - intensity aerobic exercise, college students' attentional bias towards negative faces is significantly reduced, and their attention is redirected from unpleasant emotional stimuli to pleasant ones[15]. For example, Tartar et al.[16] found that the brain reduces the processing of negative pictures after exercise. Subsequently, Schmitt et al.[17] also confirmed this and supported the view that exercise increases the processing of positive emotions. At the same time, it regulates the brain's response to fearful faces in the brain regions that process emotional information, reducing the brain activation pattern when facing fearful faces. These evidences suggest that the attentional bias related to emotion regulation by exercise may be related to brain regions associated with emotion and visual processing[18], and exercise can be used as an effective means to regulate emotional attentional bias.

As a new type of exercise, somatosensory interactive exercise not only enables individuals to effectively achieve the goal of physical exercise without being restricted by external factors such as venue, weather, and the number of people but also allows individuals to receive multi - dimensional and timely feedback in hearing, vision, and touch during the exercise, increasing the fun of exercise and having potential benefits for emotions[19, 20]. Several comparative studies on the emotional effects of somatosensory interactive exercise and traditional exercise methods have found that somatosensory interactive exercise seems to be more effective in improving negative emotions and enhancing positive emotions than traditional exercise. For instance, McDonough et al.[21] found that combining VR devices with traditional stationary bikes may be more effective in enhancing people's interest and pleasure in exercise and

promoting direct and good psychological and social effects among participants. Daniel et al.[22] proposed that commercial immersive VR bikes can trigger greater physical activity and cause less fatigue compared to traditional bikes. They believe that virtual reality technology can stimulate the body's enthusiasm for active participation in exercise, which helps to improve the atmosphere and fun of exercise and also promotes the improvement of physical exercise effects and psychological cognition. Lawrence et al.[23]'s research confirmed that somatosensory interactive exercise contributes to improving participants' self - efficacy. Built - in comments like "perfect" and "super" in games such as Just Dance help participants gain more motivation and enthusiasm when completing certain tasks or achieving certain goals during exercise, which is beneficial for improving negative emotions. Hassan et al.[24] found in a recent study that somatosensory dance causes less fatigue. Compared with traditional aerobic dance, it has a more positive emotional impact on young people. When people feel less effort and fatigue, young people are more likely to engage in game - like exercises.

Although previous studies support the potential benefits of somatosensory interactive exercise for emotions, there are still some gaps that are unclear, which limits the current understanding of this field. There has been no research on the impact of somatosensory interactive exercise on emotion - related attentional bias, resulting in a lack of in - depth understanding of this area. Especially in response to the current sedentary lifestyle of college students, a more in - depth understanding of the impact of somatosensory interactive exercise may become an effective means to improve their sedentary behavior. This study aims to explore the impact of somatosensory interactive exercise on emotional attentional bias based on previous research and provide a more relaxed form of exercise to relieve people's emotional stress.

2. RESEARCH OBJECT and METHOD

2.1. Research Object

Table 1. Demographic table

Variable	Data
Gender	11 women; 7 men
Age (y)	24.17±2.24
Height (cm)	Women: 165.86±6.10; men: 174.07±2.46
Weight (kg)	Women: 57.08±9.13; men: 67.64±9.26
Body Mass Index (kg/m ²)	Women: 20.65±1.47; men: 22.33±2.57
Sedentary Time (hr/ day)	8.92±2.25

Eighteen sedentary college students were recruited as subjects through the internet, posters, etc. The demographic characteristics are detailed in Table 1. The inclusion criteria for the subjects were as follows: (1) Full - time college students aged between 18 and 35; (2) Having a sedentary time of at least 8 hours per day in the past week; (3) Without self - reported diagnosed physical and/or mental disabilities; (4) Without contraindications for exercise; (5) Having no regular exercise within a week. All subjects were required to avoid exercise, alcohol consumption, and caffeine intake for at least

24 hours before the experiment to control external factors that might affect emotions. The subjects were asked to participate in a short meeting one week before the formal experiment to introduce the experimental procedure and sign the informed consent form. Subsequently, the 18 subjects were numbered and randomly grouped by computer. This experiment was approved by the Ethics Committee of the School of Physical Education, Southwest University.

2.2. Research Method

2.2.1. Experimental Method

The method of random cross experiment was adopted. There was no blinding because the participants were well aware of which exercise condition they were assigned.

2.2.2. Test Tool

(1) Emotional scale

A. Profile of Mood States Questionnaire

In this study, the Profile of Mood States Questionnaire (POMS)^[25] was used to assess emotional states, including 7 subscales and 40 adjectives. The scale has high reliability and validity, and is a good tool to study emotional state and the relationship between emotion and exercise performance. The scale is rated on the following scale: "Almost none" is 0, "a little" is 1, "moderate" is 2, "quite a lot" is 3, and "very much" is 4. The original scores of the 7 subscales are accumulated separately, and the T-score of each subscale is calculated by consulting the norm. TMD (Total emotional disturbance) = Sum of 5 negative emotion scores minus sum of 2 positive emotion scores (energy, self-esteem) +100. A high TMD score usually means that the subject feels relatively nervous and anxious in his mental state, while a low score usually means that the subject feels relatively relaxed and relaxed in his mental state.

B. Emotion Regulation Questionnaire

In this study, Emotion Regulation Questionnaire (ERQ)^[26] was used to evaluate emotion regulation strategies. Six items were used to assess cognitive reassessment and four items were used to assess expressive inhibition. The scoring scale was as follows: Each item was rated on a scale of 1 (strongly disagree) to 7 (strongly agree), with cognitive reassessment ranging from 6 to 42 and expressive inhibition ranging from 4 to 28. A higher score indicates more frequent use of reassessment or suppression.

C. General Self-Efficacy Scale

This study adopts General Self-Efficacy Scale (GSES)^[27], which is composed of 10 items. Respondents express their position by marking selected answers from 1 (completely incorrect) to 4 (completely correct) on 10 items. A 4-level scoring method is adopted. Each item is scored on a scale of 1-4, excluding negative points, and the total scale is 10-40 points. The higher the score, the better the subjects' self-efficacy.

D. Perceived Enjoyment Scale

This study adopts the Perceived Enjoyment Scale^[28] to evaluate the enjoyment of each exercise, which adopts the 5-point Likert scale (1= "strongly disagree", 5 = "strongly agree"). Sample questions include: "I have more fun playing practice games/traditional practice than doing other things"; "Playing practice games/traditional practice is my favorite thing"; And "I usually prefer watching to playing." The higher the score of the sports enjoyment scale, the higher the degree of pleasure and fun the individual feels when participating in sports activities, and the stronger the positive emotional experience of sports activities.

(2) Emotional attention bias task

Picture stimuli were selected from the Chinese Facial Affective Picture System (CFAPS). Thirty - seven college students aged 18 - 35 without mental illnesses rated the valence, pleasantness, and arousal of the pictures on a scale of 1 - 9. Facial pictures with 85% consistent valence and pleasantness within the range of the mean plus or minus one standard deviation were selected as experimental pictures, and the arousal levels were matched. Finally, 25 pictures each of disgusted and pleasant faces and 100 pictures of calm faces were selected as a set for the pre - test and post - test (the same set was used for both). There were significant differences between the two types of facial pictures in terms of pleasantness ($M_{\text{disgust}} = 2.34 \pm 0.52$, $M_{\text{calm}} = 5.29 \pm 0.48$) and arousal ($M_{\text{disgust}} = 7.59 \pm 0.51$, $M_{\text{calm}} = 3.63 \pm 0.77$), with $t_{\text{pleasantness}} = 22.230$ and $p_{\text{pleasantness}} < 0.05$. The experimental procedure was programmed using E - Prime 1.1 software, and the stimulus materials were presented on a 15 - inch computer monitor. The subjects sat 60 cm away from the monitor, with their eyes level with the center of the monitor. The horizontal visual angle of each picture was approximately 6.4° , and the vertical visual angle was approximately 8.2° .

A modified dot - probe task was adopted. A black fixation cross “+” was presented in the center of the computer's white screen. After 500 ms, two facial pictures appeared on the left and right sides of the fixation cross and disappeared after another 500 ms. Then, a black dot “.” was presented as the probe stimulus on the left or right side of the fixation cross (where the facial pictures had previously appeared). The subjects were required to judge the position of the dot. If the dot was on the left side of the fixation cross, they were to press the “F” key on the keyboard with their left - hand index finger; if it was on the right side, they were to press the “J” key with

their right - hand index finger. Subsequently, the probe stimulus and the fixation cross disappeared, ending one trial. After a 500 - ms blank screen, the next trial began. The computer program automatically recorded the reaction time and accuracy.

There were a total of 100 pairs of disgusted - calm and 100 pairs of pleasant - calm facial pictures. The size of each picture was $10.9 \text{ cm} \times 9.1 \text{ cm}$, and the distance between the two pictures was 2.5 cm, with equal distances from the fixation cross. The probe stimulus was a black dot presented at the position where the original picture stimulus had appeared (left or right). Practice sessions were arranged before the formal experiment, with no limit on the number of practice times. Subjects could practice according to their own situations. After practicing, they could press any key on the keyboard to enter the formal experiment. Figure 1 shows the event sequence of each trial. There were 200 trials in each of the pre - test and post - test assessment tasks. The pairs of facial stimulus pictures were presented randomly. Subjects took a break after 100 trials and could continue the experiment by pressing any key on the keyboard after the break. There was one break in total

The Incongruent Reaction Time (ICRT) is an index for evaluating emotional attentional bias. In the neutral - negative task, when a negative - emotion face appears, if an individual's reaction speed is slower than when a neutral - emotion face appears, it indicates that the individual pays more attention to negative - emotion stimuli. In the neutral - positive task, the ICRT means that when a positive - emotion face appears, the individual's reaction speed is slower than when a neutral - emotion face appears, suggesting that the individual pays more attention to positive - emotion faces and is more inclined to focus on positive - emotion stimuli.

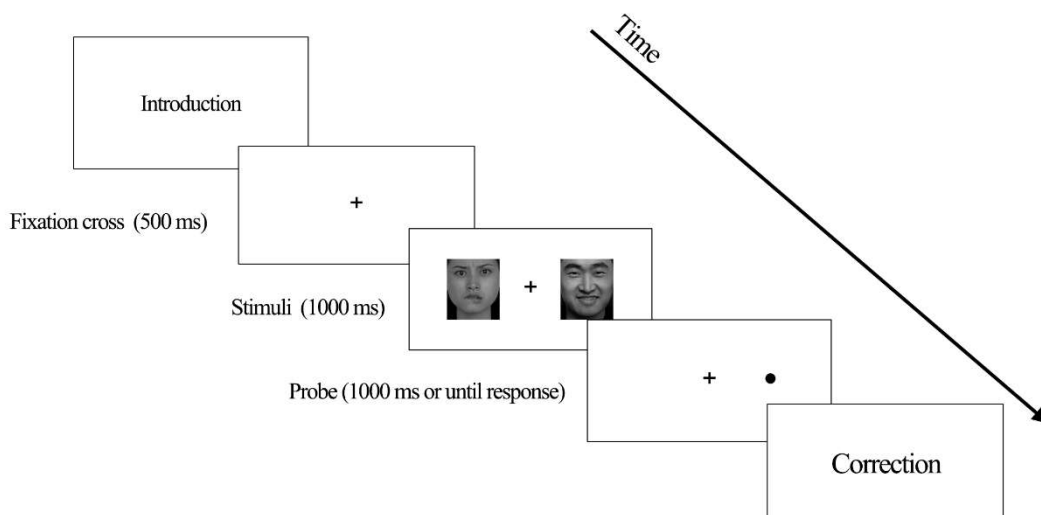


Fig. 1 The sequence of stimuli of emotional attention biased tasks

2.2.3. Sports Equipment

The motion-sensing motion device uses JUST DANCE

2023, a dance revolution game from Nintendo Wii® in Japan. The game requires subjects to wear a gamepad on both wrists

and follow the dance movements displayed on the electronic screen to make the same movements to achieve interaction and feedback.

The traditional exercise equipment uses a power bike, numbered LODE B.V., which requires the participant to output the ride for a certain amount of time by setting different resistance, so that it reaches 60% of its maximum heart rate.

2.2.4. Exercise Intervention Program

In view of the emotional changes triggered by social interaction, irrelevant conversations were minimized during all interventions^[29].

Somatosensory Interactive Exercise Group: The researcher demonstrated the dance - revolution game "JUST DANCE 2023" in the Japanese Nintendo Wii® somatosensory interactive game project (Redmond, Washington, USA) to the subjects. This game required the subjects to wear game controllers on both wrists and follow the dance movements shown on the electronic screen to achieve interaction and feedback effects. Before the somatosensory dance exercise, the subjects were asked to wear the game controllers and start dancing. The subjects needed to complete 30 minutes of dance exercise. The researcher did not give specific instructions on how to play the game. This approach was to prompt the subjects to simulate their normal state during sports and reduce the bias of the test researcher.

Power Bicycle Group: After a brief introduction by the researcher, the subjects were required to perform aerobic cycling. To ensure moderate - intensity exercise, the laboratory staff adjusted the resistance according to the participants' real - time heart rate and monitored it through a portable heart - rate recorder. The acute exercise started with a resistance of 80 W.

Exercise Load Control: For acute moderate - intensity

exercise, a duration of 20 - 40 minutes is necessary for cognitive or emotional improvement^[30, 31]. According to the guidelines of the American College of Sports Medicine, moderate intensity is set at 60% - 69% of the maximum heart rate (HR max). The maximum heart rate = 220 - age (in years). To maintain the performance at a moderate intensity, each participant wearing a heart - rate watch reported their Rating of Perceived Exertion (RPE) level every 5 minutes. When the participant's heart rate or RPE level exceeded the moderate - intensity range, the rhythm of the somatosensory interactive dance or the resistance of the power bicycle was moderately reduced.

2.2.5. Experimental Process

All experiments were conducted between 2 p.m. and 5 p.m. The interval between the two experiments was at least 48 hours, the interval between meals and the experiment was at least 90 minutes, and the subjects were instructed not to do any exercise before each experiment. The subjects took a short rest after entering the laboratory. After rest, the subjects' resting heart rate was recorded using a portable heart rate recording device, followed by the completion of the questionnaire and the pre-test portion of the cognitive task. Each subject completed one 30-minute motion-sensory interactive exercise and power bicycle exercise in the laboratory. After each activity, subjects were allowed to rest until the end of the rest period was reached^[32]. After the exercise, the subjects returned to their resting heart rate ($\pm 10\%$ of resting heart rate) and were required to complete the post-test part of the questionnaire and cognitive tasks. The two experiments were conducted in the sports rehabilitation Laboratory of Southwest University. See Figure 2 for the specific flow of the cross experiment.

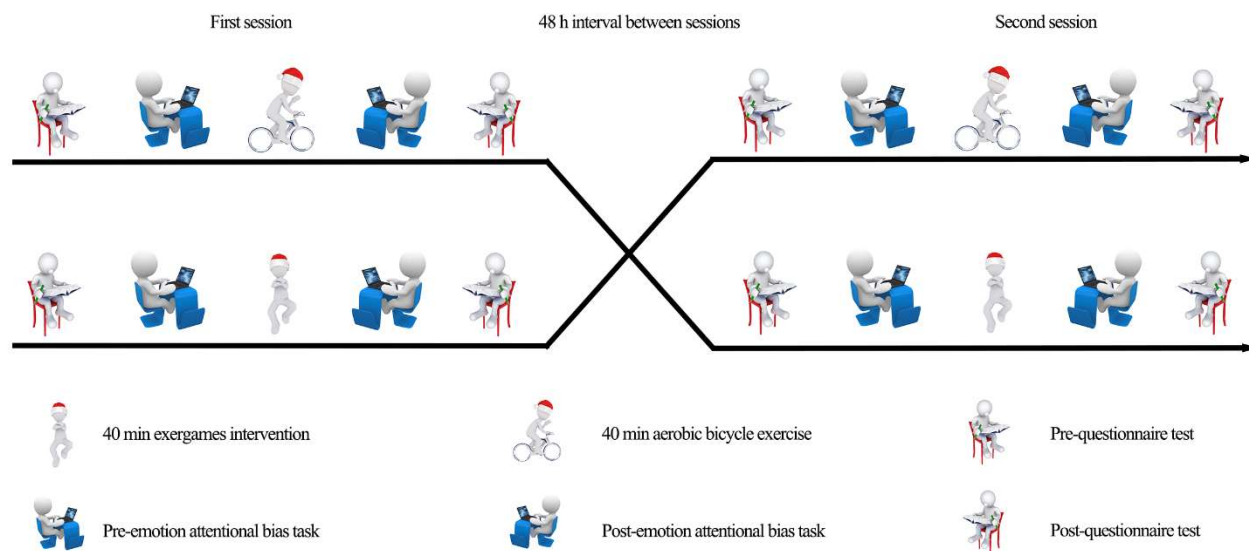


Fig. 2 Cross experiment flow chart

2.2.6. Mathematical Statistics

Statistical analysis was performed in SPSS for Windows, Version 22.0 (SPSS Inc., Chicago, IL, USA). Continuous data are expressed as mean \pm standard error. Disaggregated data are expressed as percentages as frequencies. Independent sample T test was used to compare the difference of maximum heart rate, average heart rate and exercise enjoyment score between the two groups. Repeated measure ANOVA was used to examine the differences between mood scale scores, mood regulation scale scores, self-efficacy scale scores and

attention bias tasks. The Greenhouse-Geisser correction method was used, and the Bonferroni correction was performed for the postfacto pair comparison for multiple comparisons. A Person correlation analysis was conducted on the difference data between the motion-sensing interactive exercise group and the power bicycle group to explore the correlation between emotion-related variables and emotional attention bias. $p < 0.05$ (two-tail test) was considered statistically significant.

3. Research Result

3.1. Maximum and Average Heart Rate During Exercise

The results showed that the maximum heart rate and average heart rate of the interactive exercise group were 159.11 ± 17.89 and 131.08 ± 17.32 beats/min, respectively. The maximum heart rate and average heart rate of the power cycling group were 136.69 ± 31.14 and 114.31 ± 30.03 beats/min, respectively. The exercise load is controlled in the heart rate range of moderate intensity exercise. There was no significant difference between the power cycling exercise group and the motion-sensory interactive exercise group in the maximum heart rate and average heart rate ($p > 0.5$).

Table 2. Maximum heart rate and mean heart rate of the power cycling group and the interactive motion group

Intervention mode	Maximum heart rate	Mean heart rate
The power cycling group	136.69 ± 31.14	114.31 ± 30.03
The interactive motion group	159.11 ± 17.89	131.08 ± 17.32

3.2. The Influence of Somatosensory Interactive Movement on Emotion

The study found that interactive motion ($\Delta = -11.78$) produced more positive mood changes than the power cycling group ($\delta = -1.44$) ($p < 0.05$), and more positive mood changes than the power cycling group ($\delta = -0.23$; $\Delta = 2.78$), interactive exercise improved more self-efficacy ($\Delta = 4.5$) and improved exercise enjoyment ($\Delta = 3.34$). However, the emotional regulation questionnaire did not find significant differences between the two groups.

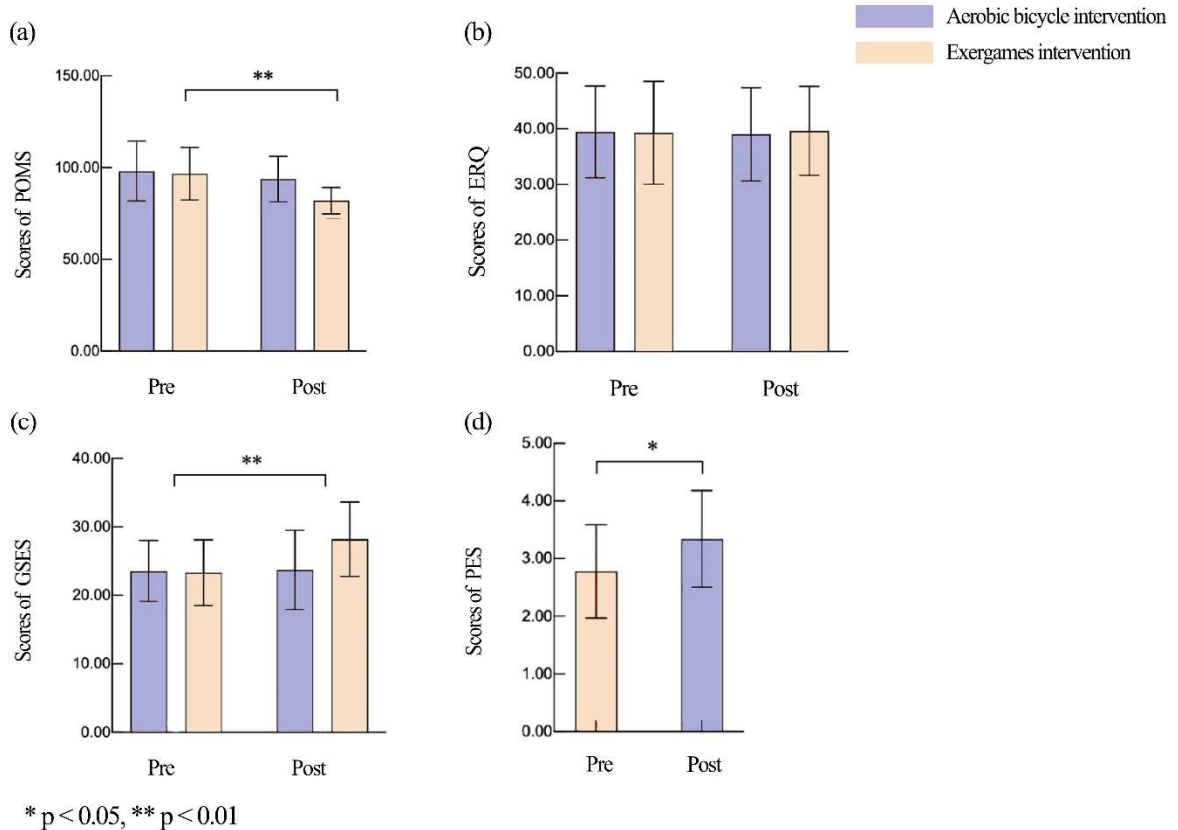


Fig. 3 The effect of power cycling and interactive motion on mood

3.3. The influence of somatosensory interactive movement on emotional attention bias

Comparing the response time difference between the two groups under inconsistent and consistent conditions, the study found that compared with the power bicycle group ($\Delta = -5.16$; $\Delta = 1.27$), the response time of the motion-motion group was

shorter in the neutral-negative condition and the neutral-positive condition under the inconsistent condition ($\Delta = -8.6$; $\Delta = -3.6$), but only a statistically significant difference between groups was found in the reduction of neutral-negative time under inconsistent conditions ($p < 0.05$), a finding that implies that college students engaged in somosensory interaction were able to disengage from negative emotion-related cues more quickly.

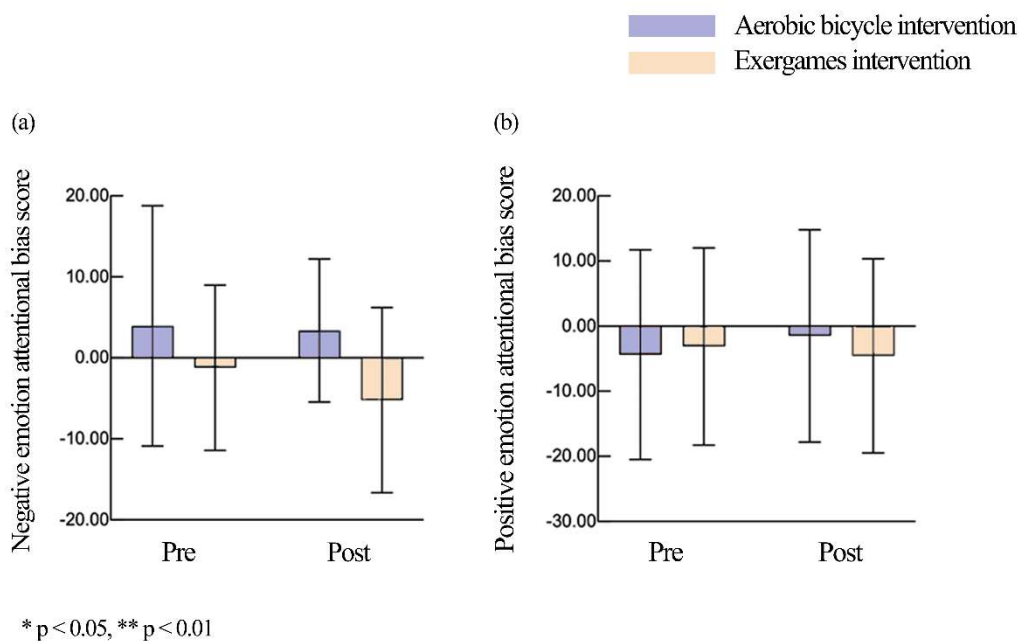


Fig. 4 The effect of power cycling and somatosensory interactive exercise on emotional attention bias

4. Discussion

This study employed a randomized crossover experiment to investigate the emotional value of somatosensory interactive exercise compared with traditional exercise. The results showed that, compared with the stationary bike group, somatosensory interactive exercise intervention could significantly enhance positive emotions and reduce negative emotions. In addition, somatosensory interactive exercise enabled college students to gain greater self - efficacy and a better exercise experience. The attention bias task revealed that after the intervention, college students could disengage from negative - emotion - related cues more quickly.

Our results indicate that after 30 minutes of somatosensory interactive exercise and stationary bike exercise, sedentary college students can better enhance positive emotions and reduce negative emotions. This is similar to the results obtained in other populations previously^[33-35]. Undoubtedly, somatosensory interactive dance is also a form of exercise. It has been widely confirmed that exercise can stimulate the activity of the endorphin system and promote the secretion of neurotransmitters such as dopamine^[33] and endorphins. The regulation of the secretion of these internal hormones plays an important role in relieving negative emotions such as stress^[34].

In addition, it should be noted that as a new type of exercise integrating auditory, visual, and tactile senses, somatosensory interactive exercise has elements that can improve emotions better than traditional exercise methods. According to the Self - determination theory^[35], when engaging in somatosensory interactive exercise, individuals may feel pleasure due to the novel, diverse, and stimulating exercise methods. This is because the rich images, sounds, music, and novel interaction methods in the game can stimulate individuals' sensory abilities and promote their internal drive. For example, Jones et al.^[36] confirmed that music and video stimulation during

and after exercise, regardless of intensity, can better enhance positive emotions. Additionally, the research results of Barnes et al.^[37] showed that video games can also provide an adaptive and personalized virtual environment for anxious individuals, affect their reward mechanism, and help individuals reduce anxiety - related behaviors. On the other hand, in somatosensory interactive technology, corresponding interactive feedback, such as information on movement direction, strength, and rhythm, is provided during the exercise task. This enables individuals to more accurately perceive and master exercise skills, simulating the external feedback mechanism during individual exercise in a natural environment, which can affect individuals' exercise performance and learning effects. According to the environmental enrichment theory, exercise in a natural environment takes into account the interaction between humans and the natural environment, providing more diverse exercise methods that can better stimulate the human body and brain. When an individual completes an exercise task, the system will give some positive feedback, which allows the individual to obtain psychological satisfaction and a sense of achievement, gain internal drive, experience and enjoy personal achievements, relax and relieve the brain, and thus improve emotions^[38]. The exercise mode of somatosensory interactive exercise creates an intuitive and immersive game experience by integrating physical movement and game elements. This interaction mode not only enables participants to have a more direct feeling during exercise but also realizes an immersive and highly - engaging game experience. Therefore, the exercise mode of somatosensory interactive exercise will provide participants with a unique experience and more fun. Although we used a limited number of subjects, the positive effects found provide preliminary evidence for somatosensory interactive exercise in improving the emotional problems of certain groups.

Emotional attention bias can affect an individual's way of

perceiving and interpreting information, thus directly influencing the individual's emotional experience^[39]. The more the emotional attention bias shifts towards the negative direction, the more sensitive the individual will be to the perception and processing of negative information, and they are more likely to experience negative emotions such as depression and anxiety^[40]. That is, if a person tends to pay too much attention to negative information, they will feel down even in a positive environment^[41]. On the contrary, if a person pays more attention to positive information, they will have stronger self - regulation and stress - resistance abilities even in the face of difficulties. This largely restricts an individual's ability to regulate and cope with emotions, thereby affecting their decision - making and behavior^[42]. Therefore, it is particularly important to reasonably regulate emotional attention bias. The results of this study found that both exercise and somatosensory interactive exercise can positively regulate the attention bias related to the emotions of sedentary college students, and somatosensory interactive exercise has a better regulatory effect than traditional exercise methods. This study expands the evidence of the positive impact of exercise on attention bias. Through the attention bias task test, it was found that sedentary college students can disengage from negative - emotion - related cues more quickly during somatosensory interactive exercise, and the more positive the emotion, the shorter the time required to disengage from negative emotions. This is a virtuous cycle. Given the mutual influence between emotions and emotional attention bias mentioned earlier, exercise can regulate both aspects simultaneously. This may be related to the fact that sedentary college students are exposed to a large number of positive elements, such as pictures and music, in the videos during somatosensory interactive exercise. Scholars in the field of environmental psychology believe that a rich environment can better improve brain cognitive function compared with a poor environment. For example, Lazarov et al.^[43] proposed that music helps to divert attention from negative stimuli. Shiyi Li et al.^[44] found a significant positive correlation between media multitasking and negative information attention bias. Hutchinson et al.^[45, 46] believe that when used during physical activities, music can trigger positive emotional states and distract exercisers or athletes from unpleasant sensations related to physical exertion and fatigue. Somatosensory interactive exercise just provides individuals with rich environmental elements. These rich environmental stimuli can stimulate the brain's emotional regulation neural network, including multiple brain regions such as the prefrontal cortex, amygdala, striatum, and anterior cingulate gyrus^[47], which is beneficial for individuals to quickly shift from negative stimuli to positive stimuli in the environment. However, due to the limitations of the experimental equipment in this study, we were unable to further explore the neurophysiological and neural mechanisms in the experiment. Therefore, future research needs to conduct further exploration.

Some limitations of this study need to be noted: (1) Due to the limited sample size, although we recruited 18 subjects as much as possible, the sample size still limited the effect and generalizability of the research results to a certain extent. In the future, a larger sample size should be considered to better explore the impact of somatosensory exercise on emotional attention bias compared with traditional exercise intervention methods. (2) This study conducted an acute exercise intervention, which has short - term effects. The emotional

improvement effect brought about by acute exercise intervention is temporary, and its long - term impact cannot be fully determined. At the same time, it is also impossible to determine whether the emotional change is caused by attention bias affecting emotions or by emotions affecting attention bias. Future research can adopt a more comprehensive intervention method in this regard so that we can more accurately evaluate the research results and improve the reproducibility and stability of the experiment. (3) The control group in this study is a common limitation in this type of experiment. The control group exercised in a laboratory environment, which cannot fully reflect the real situation of the natural environment. Laboratory exercise is carried out in a monotonous and enclosed environment, making it difficult to simulate the diversity and complexity of the natural environment. This monotonous exercise method may only affect the body in certain specific aspects, ignoring the coordination and multi - dimensional potential of the whole body. Considering the current experimental conditions and the uncertain factors in the natural environment, we were unable to conduct the experiment in the natural environment. In the future, we can develop more advanced exercise simulation systems to simulate the exercise conditions in the natural environment, so that subjects can obtain a more real exercise experience in the simulated environment and make the experimental data more real and effective.

Rotary kiln is also used in the production of saloon with production capacity by burning specific clay soil that possesses adequate quantity of silica, alumina, and iron oxides. The external diameter of the kiln is.

The main purpose of a rotary kiln hydrolyser is to convert olive pits into char fated to the production of activated char. The capacity of plant is about of wet olive pit, distribution of pyrolysis products as function of the process temperature

5. Conclusion

Somatosensory interactive exercise can significantly improve the positive emotions and reduce the emotional state of people with negative emotions, and can make college students obtain greater self-efficacy and better sports experience. In the process of somatosensory interaction, visual, auditory and other stimuli together constitute a positive impact on emotions, so that college students can more quickly separate from the negative emotion-related clues. Therefore, somatosensory interactive movement is a very effective way of emotion regulation, which can provide a positive emotional experience and alleviate and prevent negative emotions.

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