

Investigating the Effects of Expressive Writing and Mediation on Exam Anxiety and Exam Performance among Chinese High School Students

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Abstract: As the development of society, more Chinese high school students suffered from anxiety, especially anxiety related to exams. Expressive writing and mediation can ease anxiety symptoms. The aims of this investigate were to examine the effects of expressive writing and meditation on relieving high school students exam anxiety and improving their maths exam performance. Twenty-eight high school students were recruited and assigned to three conditions including expressive writing condition, meditation condition and control condition. Students in different groups received different instructions for interventions respectively including expressive writing, mediation or non-intervention. Test anxiety and Maths performances were measured and compared before and after receiving the interventions. We found that in our study, expressive writing and meditation did not have significant impacts on relieving test anxiety or improving maths performance. Potential reasons were further discussed in the discussion and the limitation section.

Keywords: high school students; Expressive writing; Exam anxiety

Introduction

Nowadays, with the development of society, people are more likely to have mental health problems due to the stressful competition, fast living speed and so on. As high school students entering the period of puberty, their bodies changed significantly and lead to fluctuations of physiological changes in adolescence, it always accompanied with the sexual motivation, restlessness and hyper vigilance towards other's opinions (Buchanan et al., 1992). In addition, because of the high pressure of getting into a college or a university, high school students experience heavy burden of academic studies and high level of stress from exams, and they do not have enough time to release their pressure (Deb et al., 2015). As adolescents begin to develop a sense of independence, they are more likely to have their own thinking, which may increase the conflicts with their parents. This disharmony atmosphere in family can easily affect the mental health and personality building of teenagers (By Jean M. Twenge Generation Me: Why Today's Young Americans Are More Confident, Assertive, Entitled--and More Miserable, 2021). All the factors mentioned above lead to a high prevalence of mental disorder. The mental health problems of high school students are not only related to their own personal growth, but also to the future development of the whole society. Therefore, people should raise the awareness of the psychological development and mental health of high school students.

Anxiety is classified as a pattern of frequent, persistent worry and apprehension about a perceived threat in the environment. Everyone occasionally experiences anxiety as a normal response to a dangerous and unusual situation. It appears to high school students with a very high incidence and brings great impact on adolescents. It involves feeling nervous, having an increase heart rate, sweating, trembling, and trouble concentrating or sleeping (Anxiety Disorders, 2018). Because of the constant psychological stress of high anxiety, it can also lead to other psychological problems such as depression. Test anxiety is a characteristic psychological reaction caused by examination. It is a state of psychological reaction mainly characterized by anxiety about the success or failure of examination and emotional tension caused by personal cognition, evaluation, personality and characteristics under the stimulation of exam-oriented situations. As high school students are facing a large number of exams, test anxiety is an inevitable problem and has potential impact on the future development and both psychological and physiological health for adolescents.

In order to alleviate the symptoms of anxiety, traditional treatment such as medications and consultation can be applied to patients. However, they both have some drawbacks that can't be fixed, and they are both too strong for high school students who are not diagnosed with anxiety disorder but only experienced moderate anxiety to exam conditions (Harmer et al., 2006). So in the dissertation, meditation and expressive writing are used to improve the test anxiety symptoms as the alternative treatment for high school students.

This dissertation aims to study the effects of meditation and expressive writing on test anxiety among high school students using experimental methods. The detailed design and results of the experiment were presented in the Methods and Results sections. An in-depth literature review was discussed with the general situation of mental health problem in high school in Chapter 1. Followed by chapter 2, high factors associated with mental health problems such as hormones, interpersonal relationships and stressful environment were discussed. Among those highly related risk factors, as high school students experience high level of academic stress, test anxiety and its negative impacts were highlighted. In Chapter 3, the advantages and disadvantages of traditional interventions were mentioned where alternative treatments such as meditation as well as expressive writing were emphasized. Finally a discussion section as well as limitation of this study were discussion.

I. High School Students are Susceptible to Mental Health Problems

With the development of society leading to fast speed living, stressful working environment, polluted surrounding and so on, people are more likely to have mental health problems. In the 21st century, various mental diseases have brought serious psychological crisis to high school students' mental health. In the World Adolescent Health Report of 2014 (https://apps.who.int/iris/bitstream/handle/10665/112750/WHO_FWC_MCA_14.05_eng.pdf;sequence=1), the World Health Organization (WHO) pointed out that about 1.3 million adolescents died worldwide in the year of 2012, among all the decedent, suicide is the third leading cause of death, and depression is one of the major suicidal cause as an illness and disability among 15-19 years old adolescents whose in a high-risk stage. According to the China Youth Research Center, the "China Youth Development Report" shows that about 30 million children around the age of 17 in China suffer from various mental health problems. About 30% of the adolescents had depressive symptoms, and about 10% shared different types of anxiety disorder. In addition, learning difficulties, school bullying, ADHD, and ICD are also common mental health problems of adolescents in high school stage.

The potential impact of adolescents' mental health problems can seriously affect individual, families and even peers around them. Mental health problems will cause damage to people's brain and lead to self-injury, which will brings both psychological and physiological harm to individual. It makes individual fail to function adequately, deviate from social norms and ideal mental health. It also lead to conflict with interpersonal relationship and cause harm to people who are close to them or surround them.

II. Changes in Adolescence as a trigger of mental health problems

As high school students entering the period of puberty and sexual maturity, their bodies begin to appear secondary sexual characteristics and their hormone levels change significantly accompanied with changes in sexual motivation, restlessness, aggression and impulsivity. Changes in hormones level such as adrenal androgens, gonadotropins, and sex steroids influences adolescents on both moods and behavior (Buchanan et al., 1992). In previous article, they explored adolescent behavioral changes and neurodevelopment processes that might contribute to stress sensitivity and vulnerability for the emergence of the mental disorders. Hormones play an important role for psychopathology to express genetic vulnerabilities (Walker et al., 2004). There are findings from clinical research and behavioral neuroscience shows that the ways in post pubertal hormones might alter brain function and behaviour. The results support that there are both activational and organization effects of hormones on the adolescent brain. Additionally, pubertal development involves an increase in body fat as body shape changes. This increase in body fat which is often misconstrued as a weight problem and is then associated with increases in dieting and other unhealthy behaviors related to weight gain. And this may lead to a distorted or poor body image and other mental health problems(Petersen et al., 1994).

1. The awareness of independence and conflicts in Interpersonal relationships

These physiological changes are directly influencing one's interpersonal sensitivity. Interpersonal sensitivity (emotional and social) is the ability to accurately assess others' abilities, states, and traits from nonverbal cues (Carney and Harrigan, 2003). As people entering adolescence, they begin to become sensitive, especially in interpersonal communication, they will pay more attention to their image and evaluation from others. People with high interpersonal sensitivity might not be able to accurately assess other's emotional and social cues (Editorial staff, 2020). Due to fluctuations of physiological changes in adolescence, adolescents are more sensitive to other's opinions. For example, in the relationships with parents, teachers or peers, adolescents are susceptible to the influences from others and the conflicts involved. Therefore, teenagers are prone to anxiety and frustration when facing the difficulties for maintaining the balance of interpersonal pressure and psychological conflicts.

At the same time, adolescents begin to develop a sense of independence and are more likely to have their own thinking (By Jean M. Twenge Generation Me: Why Today's Young Americans Are More Confident, Assertive, Entitled--and More Miserab, 2021). For example, adolescents are more likely to have different ideas from their parents, which may lead to conflicts and disharmony of family atmosphere, this can easily affect the mental health and personality building of teenagers. which is also an important cause of psychological problems.

2. Academic stress and mental health problems in High School Students

Because of the high pressure of getting into a college or a university, students experienced heavy burden of academic studies and high level of stress from exams. Although an increasing number of schools has begun to realise students' stress and to reduce students' burden, the pressure of entering a college or a university still exists. Due to the lack of enough rests or entertainment, high school students do not have enough time to release their pressure. In Deb's investigation, despite the difference in gender, age, grade level, and several other personal factors. Nearly 63.5% of students reported stress due to academic pressure, and about 66 % of students said they felt pressure from their parents' academic expectations. 32.6% of the students had symptoms of mental illness and 81.6% reported test-related anxiety. Academic stress was positively correlated with parental stress and mental problems, and test-related anxiety was positively correlated with mental problems. All the results above provide a strong evidence of academic stress as a serious problem, affecting nearly two-thirds of Kolkata's high school students (Deb et al., 2015).

3. Test/exam anxiety in high school students

Anxiety disorders are the most common mental problem among adolescents. The overall prevalence of anxiety disorders among adolescents is about 11 %, which means that 11 out of every 100 adolescents may suffer from anxiety disorder. And for the adolescents

who do not meet the diagnostic criteria, they also occasionally experienced moderate level of test anxiety, which affects students' academic performance, social communication and their happiness. Test anxiety is defined as an exam situation of individual cognitive reaction, physiological arousal and behavior in the interaction of complex emotional responses. It is under the stimulus takes an exam the situation, the individual cognition, evaluation and individual character characteristic to the success or failure of the exam as a result of the concern and emotional tension as the main characteristics of the reaction condition of body and mind.

Previous study has proved that there's negative correlation between anxiety level and academic performance (McDonald, 2001). In Cassady's study, 168 undergraduate students recruited as participants, shows the higher levels of cognitive test anxiety were associated with significantly lower test scores on each of the three course examinations. High levels of cognitive test anxiety also were associated with significantly lower Scholastic Aptitude Test scores (Cassady and Johnson, 2002). For high school students, Kyriacou and Butcher constructed a 30-item questionnaire to assess the sources of stress in 15-and-16-year-olds. The item 'exams' was the most frequently reported source of stress in both boys and girls (Kyriacou and Butcher, 1993). Gallagher and Miller administered the 138-item 'Things I Worry About' scale to almost 4000 15 to 18 year olds in Northern Ireland. Of the 13 areas of concern identified from this scale, 'schoolwork' was the major source of worry. An analysis of individual items revealed that six of the top ten were related to schoolwork or exams, including the most prevalent worry 'will I pass my exams?' (Gallagher and Millar, 1996). Additionally, Test anxiety and related factors were measured and investigated in 5 high schools in China. A total of 1405 valid samples were statistically analyzed. The results showed that the students with severe test anxiety accounted for 20.1% of the total. Shows the high prevalence in both urban areas and countryside (□ and □, 2000).

III. Traditional interventions

Anxiety and depression have a similar physiological basis, inseparable from the secretion of 5-hydroxytryptamine, dopamine, norepinephrine and other neurotransmitters disorders, so some antidepressants are usually also suitable for the treatment of anxiety. At present, antidepressants commonly used in clinic include fluoxetine, paroxetine, sertraline, fluvoxamine and citalopram. There is no best/most effective medicine, the effect of different people is not the same, usually with different side effects as well, such as Nausea, loss of appetite, headache, dizziness, blurred vision, muscle relaxation (Harmer et al., 2006). Once the drug is taken, it cannot be stopped without the doctor's advice, because it is necessary to maintain a certain blood concentration for the efficacy to appear, and sufficient treatment must be sufficient to effectively reduce the relapse rate. If patients stopped intake medicine without authorization, the relapse rate will increase, sometimes may even require lifelong medication.

Taking medicine has a quick effect, but the effect lasts only a short time and patients may develop a resistant to the drug. The reason for the somatization of anxiety is the long-term accumulation of psychological anxiety reflected in the physical performance. Taking medicine can only temporarily relieve the discomfort of the body, but if the psychological problem is not solved, keep taking medicine is just way of treating symptoms rather than the root cause. The adjustment of cognition and false fixed beliefs often requires professional guidance and help. In the meantime, the consultants also need long-term repeated in order to consolidate the effect.

Psychological counseling can effectively reduce patients' dependence on drugs (Psychological Approaches to Drug and Alcohol Addictions, 2014), and there are increasing number of studies on the effect of psychological counseling for treating anxiety. Psychotherapy has less obvious side effects than medication and is milder for patients. However, there's still a doubts about the effect of psychological therapy, it effects takes long time to appear, and the long cycle of psychological therapy is extremely expansive.

Overall, both medications and consultations have the inevitable drawbacks. There's strong needs for alternative treatment. The following chapters will focus on meditation and expressive writing as alternative treatment for mental health problems especially for anxiety.

1. Mindfulness Meditation

In the past research, mindfulness meditation has been found to ease anxiety effectively. Meditation is a form of changing consciousness that enhances self-knowledge and well-being by gaining a deep state of tranquility. It is a self-disciplined act of mind that stops all external activities of consciousness and achieves self-forgetfulness. There are two different modes of meditation: receptive and active. In receptive mode, people can just relax and allow the image or impression to enter their mind without making any choice about the details. In the positive model, people consciously choose and create what they want to see or imagine. Both modes are important parts of meditation. Additionally, many studies have shown that exercise and meditation can help reduce stress and strengthen the hippocampus, improving the memory and learning ability. According to Harvard professor John Ratey, exercise can be as effective as taking a small dose of Prozac and Ritalin. Exercise and meditation have one thing in common. They both require more intense breathing and allow people to focus more on the present and less on their thoughts (Hillman and Ratey, 2013).

The study found that biologically, not only did the amygdala shrink after eight weeks of meditation, but the prefrontal cortex, which is the part of the brain responsible for focus, arousal and decision-making grew thicker. Functional connections between different brain regions also changed, with weaker connections between the amygdala and the rest of the brain, and stronger connections between areas associated with attention. The longer the meditation practice, the more of these changes occurred in the brain.

Meditation as a Treatment for Anxiety.

In general, many studies have shown that meditation can reduce anxiety and stress in people, and even change cortisol levels.

Meditation can reduce anxiety and it also has a lot to do with activity in the amygdala. The area of the brain that first responds to environmental stress is the amygdala. The amygdala is responsible for responding to negative emotions especially fear. Activity in this area

is particularly intense in people with anxiety disorders, when people with anxiety disorders face the external pressure, the amygdala response will be particularly sensitive and intense, a little changes from external world is easy to arouse their anxiety and tension (Strauss et al., 2014). And a smaller amygdala is often associated with a lower level of anxiety, which can be reduced effectively by meditation in previous study (Hofmann et al., 2010). Laura Niss has found that positive effects of extended mindfulness interventions can reduce anxiety of the math examination in high school students and improve the test performance (Niss, 2012). In the study, Laura Niss worked with two groups of people: a control group and an experimental group. Each participant in meditation group was given a brief guide towards mindfulness meditation directly before math exams were administered, and the control group answered similar questionnaires to the mindfulness group before exams without any intervention. As a result, participants in the Mindfulness Intervention showed significant within-group reductions in anxiety from before to after the meditation with improvements in math scores from before to after the intervention, whereas the Control groups did not.

2. Expressive Writing

Expressive writing has been proved to alleviate anxiety effectively (Berman, 2003). Expressive writing is personal writing. It expresses and explores the personal feelings of the writer. The piece may attempt to answer a question, state an opinion or recount the writer's personal experiences. The main expectation of expressive writing is to express feelings and observations personally, people can write about all the emotional events happened in their life, such as "Things that linger on their mind; things that people worry about excessively; things that people have been avoiding for years, weeks or days" The writing must be directly about the writer. It's often reflective of life-shaping experiences. The topic can be anything as long as the writing expresses personal thoughts and feelings.

Expressive writing therapy was proposed by Pennebaker and Beall, and has been extensively studied by many researchers (Pennebaker and Beall, 1986). In the initial treatment process, individuals described a traumatic or stressful event for 20 minutes on three separate occasions. The way of writing each day is slightly different. The first stage of writing focuses on describing the event, thoughts and feelings that occurred at the time and immediately after the event. The second stage is to continue to describe the details of the event, and then describe the subsequent impact of the event on the life of the parties involved; The third writing session encourages the author to "summarize" his/her feelings of the event and how he/she thinks the event will affect the future.

While people in therapy were allowed to write about the same event or a different one each time they wrote, Sloan found that writing about the same traumatic event each time resulted in a more significant reduction in PTSD symptoms (Sloan et al., 2015). And they were even more effective than traditional supportive counseling, psychoeducation, and Stress Inoculation Therapy. This type of writing can be healing in many circumstances, such as for cancer patients. Dr Pennebaker explains that one of the brain's functions is to help people understand events in our lives. When people faced with an anxious or painful problem that is difficult to solve, their brains will replay similar unconstructed thought patterns over and over again, leaving patients stuck with difficulties to heal (Pennebaker and Chung, 2011). What writing can provide is to help people construct a narrative that places the trauma in a relevant cognitive context to organize thoughts. Writing about sadness and trauma can help achieve a kind of "closure," telling the brain that its work is done. This relief give people a chance to step back and reassess the problems in their lives and helps them to move forward. Additionally, expressive writing also reduces intrusive thinking and avoidance, promotes emotional expression and self-distancing, transforms chaotic emotions into organized thinking, integrates emotions and ideas to form coherent narratives, creates meaning, and benefits from experience. However, there's no explanation of the physiological mechanism of adrenal hormone and inflammation, it may be a direction of investigation in the future study.

Expressive Writing in Treating Anxiety.

Professor Ramirez published a paper in Science on coping with test anxiety. Research shows that writing about test anxiety before the exam can significantly improve test performance and reduce anxiety (Ramirez and Beilock, 2011). This method is significantly effective for those habitual test anxiety students. When students feel anxious a few days or a few minutes before a revision or an exam, they can write all the worries or anxious thoughts in their mind on a piece of paper, such as "I'm afraid I won't remember the knowledge points", "I'm afraid I won't do well on the exam", "I feel very anxious", etc. Students were told to express all thoughts in the expressive writing. Suppressing anxiety and worry is often counterproductive. The message students should be telling themselves is not "don't be afraid," but to acknowledge and express their feelings.

IV. The current research purposes and study hypotheses

As I mentioned above, there's high prevalence of test Anxiety among high school students, the alternative treatment meditation and expressive writing have been proved to be efficient and useful for reducing anxiety. The current investigation aims is to compare the effect of meditation and the effect of writing on modulating test anxiety in high school students and their test performance.

We hypothesised that students with high level of test anxiety tend to have lower test performance. Both meditation and Expressive writing will reduce test anxiety and improve test performance. As very few studies have compared the degree of effectiveness of mindfulness meditation and expressive writing respectively on anxiety and academic performance, the current investigation also aims to explore this question.

1. Participants

Thirty high school examinees (6 boys, 24 girls) were recruited into the study through public announcement on school email which regulate by students union at RDFZ Chaoyang branch school. Only 2 recruits did not complete the entire study. All participants were paid 20

yuan or an cup of milk tea at the end of the study. There's variety age distribution of participants who are studying in high school; 57% were from grade 1, 30% were from grade 2, and 12% were grade 3 students. Most of the participants were studying AS math (61%); a part of students were studying IGCSE math, a minority of the participants were studying A2 math.

2. Materials

Participants completed the Impact of Events Scale (Horowitz et al.) which used to measures and evaluates the participants' catastrophic experience of a examination, and intrusive thoughts related to test anxiety (e.g., "I thought about it when I didn't mean to."). The scaled contained 22 items divided into three subscales of aggressive symptoms, avoidance symptoms and high arousal symptoms, where participants rated each item on a 5-point scale, from 1 (not at all) to 5 (always).

3. Procedure

This study was a 2 (before and after intervention) x 3 (intervention: expressive writing, meditation and control group) design. At the beginning of the experiment, participants completed an Impact of Events Scale (Horowitz et al., 1979) and hand in their mock math exam scores without intervention. Following on, participants were randomly assigned to complete the given task in either the expressive writing condition, mindfulness meditation condition or control group. Meditation group of experimental subjects practiced meditation according to the instruction video for 10 days until the day before the test, while expressive writing group wrote dairy about their most profound thoughts and feelings about the test. The control group participants had no exposure to any intervention and were only asked to fill out the questionnaires in the generalization situation. Once the given task ended, participants then enter the math CAIE exam. After the score was established, they were asked to refill the IES-R and hand in their final scores. To conclude the study, participants were fully debriefed and asked if they had any problem with the study.

4. Results

(1) Question1: comparing the effects of expressive writing and meditation on maths exam anxiety

Our results showed that there were no significant differences in scores of IES among control group ($M = 5.5$, $SD = 22.42$), expressive writing group ($M = 5.4$, $SD = 13.89$) and mediation group ($M = 13.10$, $SD = 27.24$; $F(2, 25) = 0.40$, $p = .678$). Although in the results of a paired t-test, IES scores before ($M = 38.61$, $SD = 12.15$) and after ($M = 30.43$, $SD = 17.75$) maths exams were significantly increased ($t(27) = 2.03$, $p = .026$), this improvement was not due to the effect of expressive writing or meditation.

(2) Question2: comparing the effects of expressive writing and meditation on maths performance

The results showed that there were no significant differences of scores between the mock test and the CIE test among control group ($M = 13.18$, $SD = 10.91$), expressive writing group ($M = 11.55$, $SD = 16.01$) and mediation group ($M = 11.00$, $SD = 9.55$; $F(2, 25) = 0.12$, $p = .890$).

5. Discussion

In this study, we found that expressive writing and mediation did not have effects on relieving before and after maths exams anxiety, or improving maths exam performance. These results are not consistent with the existing literature. For example, previous research suggested that expressive writing can alleviate anxiety effectively (Berman, 2003). Likewise, evidence also indicates mediation can reduce anxiety and stress (Niss, 2012). Regardless of these robust evidence from previous research, we did not find any of these results.

There are a few potential reasons that could influence our results. The first one could be the large variation among participants in each group. For example, as you can see from the Methods section, participants are all from different grade so they have different level of math skill and difficulties in exam. Large variations within participants could obscure the true effects that we were expecting. The second could be the time that the IES-R was distributed. In our study, the before anxiety scores were collected after the mock test, whereas the after anxiety scores were gathered after the CIE test. These anxiety score might not truly reflecting participants' test anxiety. The third reason could be that the methods applied to instruct the practice of expressive writing and meditation. In this study, participants were sent instructions and videos respectively and were asked to practice everyday on their own. In this case, the practice of expressive writing or mediation was highly relied on participants' commitment and discipline. We cannot be sure that every participant followed the instruction or did the practice as required, which might affect the final results.

V. Conclusion and Limitations of This Investigation

The current study examined the effects of interventions (meditation vs. expressive writing) on easing exam anxiety as well as maths performance. Our findings suggested that expressive writing and meditation did not have significant impacts on relieving test anxiety or improving maths performance. Thus, our hypotheses were not supported in this experiment, although these findings were not consistent with the existing literature. However, the results we found still raised concerns about the impacts of test anxiety on high school students' mental health. A strength of this study includes building on existing literature.

However, a limitation is that large variation among participants. Participants from different grade learned different knowledge, and have the different intellectual level on understanding of math. Although all the participants were asked to hand in their math scores as one of the dependent variables, they actually did the completely different test for each grade. The most importantly, they have the different level of anxiety before the study started. This lead to second limitation, the collection of the data. Both IES-R and the score of the test was collected after the exam, so the anxiety level may be significantly reduced compared to normal situation, and the before anxiety scores was actually a measurement of CAIE test. The third limitation is the misunderstanding of instructions and problems of the self-report. As participants

were sent instructions with videos respectively and were asked to practice every day on their own, there might be misunderstood of the instruction, and it's also hard to know if they really finished the task or not. This may reduce the reliability of the study and affect the final results.

VI. Ideas for future research

In order to make an improvement and adjustment in the future research, several changes should be applied. Participants may do the anxiety questionnaire beforehand, and people with low anxiety level should be screened out, only people with high anxiety level participate in the study so that the improvement can be significantly noticed. For the time of IES-R test, it should be collected before the exam so it can make sure that both anxiety level of mock test and CAIE test are measured carefully without alleviation of anxiety due to finishing exams. For instructions and practice part, one qualified instructor needed to make sure that every participant understands the instructions of the procedure. All the participants can be gathered in specific rooms after school and do the task together, this not only can make sure participants finished task, but also eliminate environment variable such as the quietness of the room or number of people around them.

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