The Analysis of Test-Taking Anxiety from a Sample of Chinese Students Studying Abroad and in the Home Country

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Abstract: In light of the high prevalence of anxiety among students and severe test-taking anxiety among Chinese students, one of our main purposes is to discuss whether studying abroad in the United States could relieve test-taking anxiety, and we thus merely recruited participants who were Chinese to test hypotheses. Participants in our experiment were $N = 44$ Chinese students (age range: 16-24 years, 33 females and 11 males) recruited from multiple high schools and universities across China and the United States. After a comprehensive and comparative analysis, we found that Chinese students studying abroad had less test-taking anxiety than those studying in their home country China. Test forms (test with or without rewards) had no relationship with test-taking anxiety and no interaction with countries for study. The relationship between test-taking anxiety and test scores was largely negative. According to our findings, however, there was no relationship between gender and test-taking anxiety.

1 INTRODUCTION

Mental illness, as a prevalent issue among students, has a negative relationship with academic performance. Of college students, 25 % have been diagnosed with or been treated for mental health illnesses (Posselt, & Lipson, 2016). Posselt and Lipson (2016) also claimed that anxiety, a form of mental illness, is one of the top factors that impair the academic achievements of college students. Similarly, of middle and high school students in Shanghai, 28.3% were tested as abnormally anxious (Gu, Gong, & Zhang, 2009). Taking tests is a process every student will experience in their school lives, but what is its relationship with anxiety needs to be explored. Contemplating multiple causes that give rise to anxiety is imprudent and complicated, thus focusing on test-taking concerning anxiety is our aim.

China and the United States, because of their different cultural and educational patterns, bring about discrepant influences on students. However, the students in both countries might have more or less pressure and anxiety caused by tests in common. Test-taking anxiety of Chinese students has been a hot issue in Chinese society for many years and even attracted the attention of the world because of the severe pressure of study and examination brought by the exam-oriented education system. The prevalence of anxiety symptoms among middle and high school students in China reaches 9.89% (Xu, Mao, Wei, Liu, Fan, Wang, Wang, Lou, Lin, Wang, & Wu, 2021). One of our main purposes is to discuss whether studying abroad in the United States could relieve test-taking anxiety, and we thus merely recruited participants who were Chinese to test hypotheses.

Owing to the deficiency of research on test-taking anxiety, we list a bunch of hypotheses and try to discover the potential factor connected to test-taking anxiety, including gender, test forms, test scores, and the goal of the test. Our main method for

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measurement was Form Y-1 from State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). Our participants in the experiment were all Chinese students, recruited from multiple high schools and universities across China and the United States, aged 16-24.

2 LITERATURE REVIEW

Stowell and Bennett (2010) found that test-taking anxiety could be reflected by its "affective (physical arousal, emotionality), cognitive (worry), and behavioral (procrastination, avoidance) components", together impairing the academic achievement of college students. Zeidner (1998) also referred to test-taking anxiety as "the set of phenomenological, physiological, and behavioral responses that accompany concern about possible negative consequences of failure on an exam or similar evaluative situation". We conceptualize the reason for test-taking anxiety among Chinese students in terms of the contemporary goal classification theory (Elliot, 1999; Pintrich, 2000) and make hypotheses based on prior research findings.

2.1 Contemporary Goal Classification Theory

According to the contemporary goal classification theory proposed by Elliot (1999) and Pintrich (2000), learning goals can be divided into 4 major types: mastery approach goal -- the purpose of personal participation in activities is seeing their progress and improvement; mastery avoidance goal -- the purpose of personal participation is to avoid their shortcomings actively; performance-approach goal -- the purpose of personal participation in activities is to expect a positive evaluation of the outside world; performance-avoidance goal -- the purpose of personal participation in activities is to avoid the negative evaluation of the outside world. Concluded from their later findings, Linnenbrink and Pintrich (2000) associated learning goals with anxiety as follows: mastery approach goal is associated with low anxiety, mastery avoidance goal and performance-approach goal are related to moderate anxiety, and the performance-avoidance goal is correlated with high anxiety.

Because the educational system in China is exam-oriented, every test is highly valued by Chinese students as an assessment of their self-esteem. As a result, test-taking anxiety escalates in the preparation of the test. Given the previous investigation in high schools, test-taking anxiety was a common problem among Chinese students. Of the students who were anxious about tests, 74.8% had moderate or severe test-taking anxiety, and showed strong performance-avoidance goals and performance-approach goals; the rest (25.2%) with mild anxiety mostly showed mastery avoidance goals, and a small number of them showed the other three goals (Cui, Liu, & Gao, 2008). In addition, a study on Chinese college students revealed that the anxiety level of college students was concentrated in the low and middle levels, lower than that of middle school students. Their learning goals were mainly embodied as mastery approach goal, mastery avoidance goal, and performance-approach goal, which are associated with low and moderate anxiety (Wang, 2013).

There are some similarities and differences in test-taking anxiety between Chinese and American students, as evidenced by previous studies. For both Chinese and American students, taking the foreign language test in Chinese and American colleges students, for example, the learning goals leading to their test-taking anxiety are comparable. In terms of learning goals, American students experience test-taking anxiety because they are concerned about the failure of the application of examinations to life and the negative evaluation from others, whereas the test-taking anxiety of Chinese students is only reflected in the fear of negative evaluation from others (Tang, 2012). However, as per one research on test-taking anxiety of high school students in China and the United States, the learning goals leading to test-taking anxiety among students in the two countries are different. Chinese students are more worried about the negative evaluation from peers, parents, teachers, and people from the outside world if they fail the exam, while American students are merely concerned about their test performance not being able to be employed in real life pragmatically and the test failure may harm their chance of further study (Huang, Huang, Xing, Sanche, & Ye, 2005).

2.2 Competition

Posselt and Lipson (2016) argued the sense of competition highly increases the incidence of test-taking anxiety among students. They are afraid of bad test performance and its subsequent negative outcome, which brings about tremendous anxiety.

2.3 Gender

In terms of gender, female students had higher anxiety levels than male students because of greater

emotional fluctuations (Li, & Liu, 1999). According to a survey of high school students (Huang, 2003), the degree of test-taking anxiety of girls was significantly higher than that of boys, and the number of girls who had severe and moderate anxiety is much more than boys. Surprisingly, in another middle school, the degree of anxiety of female students is almost the same as (slightly higher than) that of male students. The anxiety of boys comes primarily from parents' high expectations, while that of the girls is produced mostly from the negative self-cognition caused by examinations and the pressure from school and society (Wang, Lu, Chen, & Xia, 2005).

2.4 Test Performance

Many research findings have demonstrated that test-taking anxiety greatly lowers test performance (Chapell, Blanding, Silverstein, Takahashi, Newman, Gubi, & McCann, 2005; Barrows, Dunn, & Lloyd, 2013; Posselt, & Lipson, 2016; Gharib, Phillips, & Mathew, 2012; Stowell, & Bennett, 2010; Cassady, & Johnson, 2002; Zeidner, 1998). In a study with 5551 participants who completed STAI (Spielberger et al., 1983) and reported their cumulative GPA and grades, there was "a one-third letter grade difference between undergraduates with high test anxiety and lower test anxiety" (Chapell et al., 2005). Likewise, Barrows et al. (2013) pointed out that 10 million primary and secondary students performed badly in tests due to their test-taking anxiety.

2.5 Psychopathology

Anxiety disorder increasingly happens to students. In the study at Uludag University, among 4850 students, 29.6% and 36.7% obtained the anxiety scores from the evaluations of STAI Form Y-1 (state anxiety) and Y-2 (trait anxiety), respectively (Spielberger et al., 1983), higher than the cut-off point of psychopathology, which means they might have an anxiety disorder (Ozen, Ercan, Irgil, & Sigirli, 2010).

2.6 Hypotheses

Given the contemporary goal classification theory and previous literature, we make the following hypotheses:

H1: There would be some differences in test-taking anxiety between Chinese students studying abroad in the United States and the home country when taking a test with or without rewards (the reward might somehow provoke a sense of competition).

H2: Female students would have higher test-taking anxiety than male students.

H3: There would be some differences in test scores between Chinese students studying abroad in the United States and the home country when taking a test with or without rewards.

H4: Test-taking anxiety would have a negative relationship with test scores.

Besides, we would not only analyze the relationship between the goal of the test and test-taking anxiety but compare the incidence of anxiety disorder before and after the awareness of the existence of a test. We only focus on Chinese students as our participants to control variables and observe whether studying abroad in the United States could alleviate test-taking anxiety, thus further proving the success of the American educational pattern in terms of the alleviation of test-taking anxiety.

3 METHOD

3.1 Participants and procedure

Participants in our experiment were $N = 44$ Chinese students (age range: 16-24 years, 33 females and 11 males) recruited from multiple high schools and universities across China and the United States. Of them, $N = 24$ had been studying abroad in the United States for at least 2 years and $N = 20$ studied in their home country China (they had never been to foreign countries including the United States). They all signed a consent form before being asked to participate. To ensure those Chinese students who studied abroad had assimilated American cultural and educational patterns, we set the threshold 2 years in the United States; likewise, Chinese students who studied in the home country were set the threshold as having never been to foreign countries to prevent them from contacting foreign cultural and educational patterns. While they were found fit for the requirements, we contacted them through either email or WeChat (a Chinese social media) in favor of their preference. Then the participants were divided into four groups: students who studied abroad took a test with a reward; students who studied abroad took a test without a reward; students who studied in the home country took a test with a reward; students who studied in the home country took a test without reward. To simulate a real test environment, we arrange all participants in each group within one setting.

Our experiment consists of two STAI (Form Y-1) (Spielberger et al., 1983) questionnaires, one in the

very beginning (without knowing the existence of a test) and the other one just before taking the test (knowing the existence of a test), a test asking basic questions (the difficulty is set the same as that of middle school in China) that costs 7 minutes, and a questionnaire for debriefing. The experiment was conducted on Zoom, an online meeting app, thus it was conducted in a video-conferencing format. All participants attended the meeting punctually and opened cameras throughout the whole experiment. *N* = 8 participants wore a mask in the process. The experiment on average lasted for 25 minutes for each group.

3.2 Instruments

Two STAI questionnaires (created on Qualtrics) were assessed using the same but randomized 20 items from Form Y-1 to measure state anxiety (Spielberger et al., 1983). To avoid the language barrier, a Chinese-version STAI was utilized by attaching the Chinese translation to each item and prompt (Wang, Wang, & Ma, 1999). The items were administrated with a four-point rating scale, ranging from *not at all* (1) to *very much so* (4) for the negative term (e.g., I feel tense). The order of points for each item was reversed for the positive term (e.g., I feel secure). We subtracted the first state anxiety score (one in the very beginning) from the second one (one just before taking the test) to measure how much anxiety induced by a test (i.e., test-taking anxiety equaled the second state anxiety score minus the first state anxiety score). The rewards for the test were random delicate gifts.

The test (created by Wenjuanxing, a Chinese survey maker) in the experiment included 13 questions with the full marks as 100 -- 10 multiple-choice questions (each was worth 6 points), 2 multiple-answer questions (each was worth 13 points, and partial credits, 6 points, were allowed only if getting one choice wrong), and 1 short-answer question that was worth 14 points. Questions were interdisciplinary, given from tests of middle school (age 14) in China. There were four test papers for four groups of participants and participants in each group would do the same test paper.

Test Examples:

- Multiple-choice question: In a hexagon, the sum of degrees of interior angles is …
  a. 360
  b. 720
  c. 860
  d. 1080
- Multiple-answer question: Which of the following is not able to conduct electricity?
  a. Iron
  b. Pure water
  c. Graphite
  d. Human bodies
  e. Silicon
  f. Air
- Short-answer question: Why do women annually earn less money than men on average?

The questionnaire (also created on Wenjuanxing) for debriefing asked participants to be debriefed on their feelings before and after the test. In addition, they were requested to indicate their goal of the test. Questions were all set open-ended.

3.3 Analyses

Regarding the first and third hypotheses, we computed a 2×2 Between-Subjects ANOVA for each. Concerning the second hypothesis, we computed an independent-samples t-test. While for the fourth hypothesis, we made a correlation analysis. To reach coherence and consistency in analyses, we set the critical region in all tests $\alpha = .05$. Then for the fifth hypothesis, we compared the descriptive statistics, based on test-taking anxiety scores and debriefings, and made an analysis. Lastly, for the sixth hypothesis, we computed the anxiety scores of Chinese students before and after knowing the existence of the test and then compared them with the cut-off point of 40 to find the probable number of Chinese students who could be diagnosed with anxiety disorder arising from the test (Womble, Jennings, Schatz, & Elbin, 2021).

Our data was all collected in Microsoft Excel and evaluated in JASP.

4 RESULTS

4.1 Test-Taking Anxiety VS Countries for Study VS Test Forms

Descriptive Statistics are shown in Table 1. A 2×2 Between-Subjects ANOVA revealed a statistically significant main effect of countries for study. Chinese students who study abroad ($N = 24$) experienced less test-taking anxiety ($M = -.42$, $SD = 8.36$) than those who study in the home country ($N = 20$, $M = 10.05$, $SD = 15.93$), $F_{(1, 40)} = 7.63$, $p < .01$, $\eta^2_p = .16$. Regarding test forms, analyses revealed that the main effect was not statistically significant, $F_{(1, 40)} < .01$, $p = .97$, $\eta^2_p < .01$. With respect to the interaction between countries for study and test forms, analyses revealed a not significant interaction effect, $F_{(1, 40)} = 1.03$, $p = .32$, $\eta^2_p = .32$. For further analyses of the

relationship between countries for study and test-taking anxiety among Chinese students, an independent-samples t-test indicated that Chinese students who study abroad had lower test-taking anxiety than those who study in the home country, $t_{(42)} = -2.79$, $p = .01$ (see Figure 1).

Table 1. Descriptive statistics of test-taking anxiety for four groups of Chinese students

Countries for study	Test Forms	*M*	*SD*	*N*
Studying abroad	Test with reward	1.583	5.282	12
	Test without reward	-2.417	10.457	12
Studying in the home country	Test with reward	8.200	14.748	10
	Test without reward	11.900	17.629	10

Note. Descriptive statistics of test-taking anxiety based on STAI (Form Y-1) index for four groups of Chinese students aged 16-24.

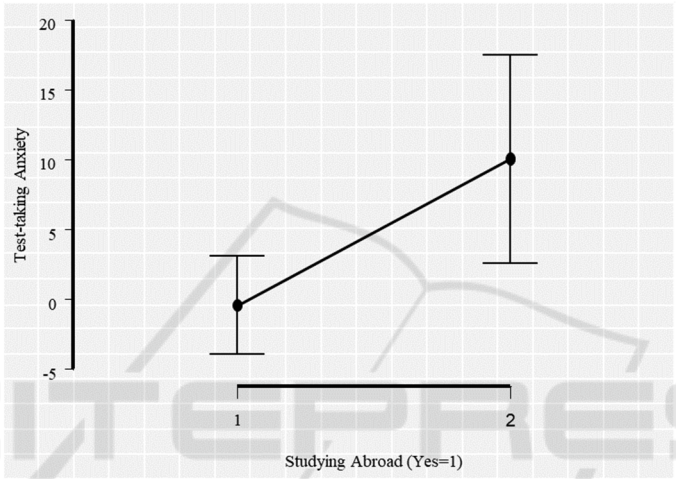

Figure 1. The relationship between countries for study and test-taking anxiety among Chinese students aged 16-24 was established by an independent-samples t-test. The horizontal axis indicated countries for study, which used "number 1" to denote Chinese students who study abroad and "number 2" to denote those who study in the home country.

Table 2. Descriptive statistics of test scores for four groups of Chinese students

Countries for Study	Test Forms	*M*	*SD*	*N*
Studying abroad	Test with reward	48.000	16.564	12
	Test without reward	48.083	16.714	12
Studying in the home country	Test with reward	40.900	15.242	10
	Test without reward	42.000	15.362	10

Note. Descriptive statistics of test scores based on four test papers, with interdisciplinary questions within the time limit of 7 minutes for each one, for four groups of Chinese students aged 16-24.

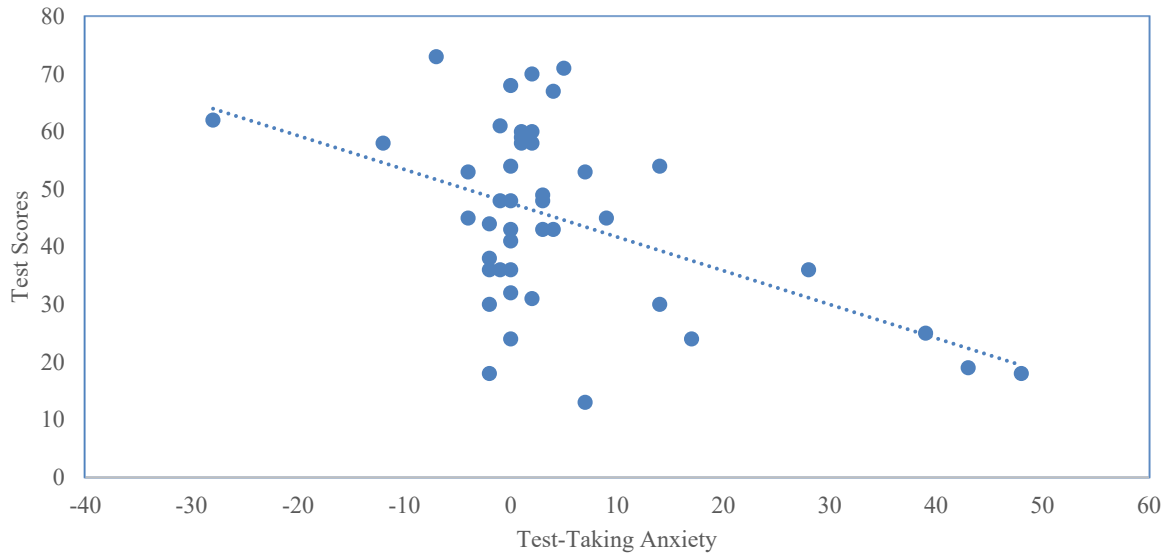

Figure 2. Correlation between test-taking anxiety and test scores among Chinese students aged 16-24 (N = 44).

4.2 Test-Taking Anxiety VS Gender

An independent-samples t-test revealed that there was no relationship between gender (33 females and 11 males) and test-taking anxiety, $t_{(42)} = -.55$, $p = .58$. The effect size was relatively small, Cohen's $d = -.19$.

4.3 Test Scores VS Countries for Study VS Test Forms

Table 2 shows the descriptive statistics mainly focused on test scores. A 2×2 Between-Subjects ANOVA revealed that in regard to countries for study, there was no statistically significant main effect, $F_{(1,40)} = 1.84$, $p = .18$, $\eta^2_p = .04$. Likewise, the main effect of test forms was not statistically significant, $F_{(1,40)} = .02$, $p = .90$, $\eta^2_p < .01$. There was also no significant interaction between countries for study and test forms, $F_{(1,40)} = .01$, $p = .92$, $\eta^2_p < .01$.

4.4 Test-Taking Anxiety VS Test Scores

In the sample of 44 Chinese students, the relationship between test-taking anxiety and test scores was Pearson's coefficient $r_{(42)} = -.49$, $p < .01$. This negative relationship was nearly large. Results showed that 24% of the variability in test scores was determined by test-taking anxiety, $r^2 = .24$ (see Figure 2).

Table 3. Descriptive statistics of goal types of the test for four groups of Chinese students

Levels of anxiety / Goal types	Studying in the home country			Studying abroad			Total		
	M	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*	*N*
Mastery approach goal	35.17	7.06	6	35.22	7.67	9	35.20	7.43	15
Mastery avoidance goal	43.57	10.94	7	41.50	7.50	4	42.82	9.88	11
Performance approach goal	58.00	12.75	4	45.25	8.93	8	49.50	11.98	12
Performance avoidance goal	69.00	4.97	3	67.00	6.38	3	68.00	5.80	6

Note. Descriptive statistics of test-taking anxiety based on STAI (Form Y-1) index and debriefings on Wenjuanxing for four groups of Chinese students aged 16-24.

4.5 Test-Taking Anxiety VS Goal of the Test

Through the comparison of research data, the analysis revealed that the mastery approach goal would cause the lowest test-taking anxiety among Chinese students ($N_{total} = 15$, $M_{total} = 35.20$, $SD_{total} = 7.43$), while the performance-avoidance goal would lead to their highest test-taking anxiety ($N_{total} = 6$, $M_{total} = 68.00$, $SD_{total} = 5.80$) (see Table 3).

4.6 Anxiety Disorder

At the beginning of the experiment (without knowing there would be a test), 18 out of 44 (40.9%) Chinese students obtained the anxiety scores from STAI (Form Y-1) above the cut-off point of psychopathology, which meant they could be diagnosed with anxiety disorder in a clinical setting (Womble et al., 2021). Yet just before taking the test (after knowing there would be a test), 6 more Chinese students (N = 24 in total, 54.5%) were tested above the cut-off point of psychopathology.

5 DISCUSSION

Given the results, our first and fourth hypotheses were validated whereas the second and third were falsified. More specifically, the first hypothesis was partly validated: the only found difference was that Chinese students studying abroad had less test-taking anxiety than those studying in their home country China. Test forms, however, had no relationship with test-taking anxiety and no interaction with countries for study. We assume one reason is our participants were somewhat immune to physical rewards because of their high socioeconomic status (Chen, & Hou, 2014). Another reason could be they were motivated by the physical rewards, contrary to our supposition, to compete more passionately, lowering test-taking anxiety (Chen, & Hou, 2014). The result might have been altered if we either enhanced the price of physical rewards or converted the form of rewards to the psychological.

There was no relationship between gender and test-taking anxiety and no difference in test scores between Chinese students studying abroad in the United States and in the home country when taking a test with or without rewards. Our findings were inconsistent with any other previous research findings. One possible reason is the size of our sample was not sufficiently large.

The relationship between test-taking anxiety and test scores was largely negative, which was consistent with other research findings and perfectly verified our fourth hypothesis.

Our result also confirmed the findings of Linnenbrink and Pintrich (2000): mastery approach goal will cause the lowest level of anxiety, mastery avoidance goal and performance-approach goal will induce moderate anxiety level, while performance-avoidance goal will lead to the highest level of anxiety among Chinese students. When Chinese students studying abroad in the United States and studying in their home country faced exams, all four types of goals were involved. Among them, the number of students with the type of mastery approach goal was the largest. The fewest number of students had the performance-avoidance goal. This was not consistent with the result of the previous study on Chinese high school students, (Cui et al., 2008) but similar to that of a previous investigation of Chinese college students (Wang, 2013). The reason might be the test in the experiment did not have a significant impact on student's personal development. Students thus would not focus too much on test scores and not worry about negative results and evaluations and would turn to improve their abilities instead.

Further, the result revealed that in any case from the contemporary goal classification theory, the test-taking anxiety of Chinese students studying abroad in the United States was slightly lower than that of those studying in the home country, and in the case of performance-approach goals, the test-taking anxiety of Chinese students who studied abroad to the United States (M = 45.25) was significantly lower than that of those who studied in the home country (M = 58.00). It was assumed that when both two cohorts wanted to be positively evaluated by the outside world because American culture emphasizes the cultivation of self-confidence more than Chinese culture, Chinese students who studied abroad in the United States could be more likely to draw upon self-confidence to cope with test-taking anxiety.

In previous studies, mastery avoidance goals and performance-approach goals were associated with moderate anxiety. However, these studies had not indicated the specific difference between the levels of anxiety arising from the two goals. Following our experiment, the difference between the anxiety levels triggered by these two goals was offered – the anxiety caused by performance-approach goal was higher than that caused by mastery avoidance goal. This point was rarely mentioned in previous studies. The result of our experiment could fill the gap in previous studies.

Not surprisingly, the number of students probably having anxiety disorder after the awareness of the existence of a test was more than before. However, the proportion of students diagnosed with anxiety disorder (40.9% before and 54.5% after), according to the scale of anxiety scores from STAI Form Y-1 (Spielberger et al., 1983) and the cut-off point of psychopathology as 40 (Womble et al., 2021), was much higher than our expectations and previous research findings. Our explanation for it is that the online setting and COVID-19 pandemic complicates

their mental state, which would be mentioned in the following section.

6 LIMITATIONS

There are some limitations worth taken into consideration when interpreting our results. First, the online setting might affect test-taking anxiety levels of certain students. Test-taking anxiety is not uncommon among students in online exam environment (Huang, 2014). Online learning and tests could bring students visual fatigue, mental depression, loneliness, and many other negative experiences (Li, & Fu, 2013). Stowell and Bennett (2010) found that experiencing less anxiety in one form of test entails higher anxiety in another form of test; in other words, those who feel comfortable in classroom settings would feel anxious when taking online tests and the inverse is also correct. The online setting could be one factor elevating test-taking anxiety of some students to the overestimated value, otherwise it lowered test-taking anxiety of several students who were in favor of online tests.

In the midst of the period of pandemic COVID-19, the score of acute psychological stress among international students were higher than general population. Because international students had to undergo the inconvenience of living in isolation, away from family and home, cultural differences, academic delays, and visa issues, their anxiety levels were elevated above normal amid the period of COVID-19 (Zhao, 2022). Despite these troubles, the cohort in our experiment – Chinese students studying abroad to the United States – experienced significantly less test-taking anxiety than Chinese students studying in the home country China. Whether COVID-19 was involved in the result or not was unknown and further studies should be taken into account.

Also, two years as a threshold to distinguish Chinese students studying abroad to the United States from those studying in the home country China might be arbitrary. Whether adjusting the threshold would have changed the result remains unclear. Lastly, as said, our sample size was not large enough, so some of our results might be affected.

7 CONCLUSIONS

Concluded that Chinese students studying abroad had less test-taking anxiety than those studying in the home country China; test forms (test with or without rewards) had no relationship with test-taking anxiety and no interaction with countries for study; there was no relationship between gender and test-taking anxiety; there was no difference of test scores between Chinese students studying abroad to the United States and in the home country when taking a test with or without rewards; the relationship between test-taking anxiety and test scores was largely negative. Moreover, we also found that in any case from the contemporary goal classification theory, the test-taking anxiety of Chinese students studying abroad in the United States was slightly lower than that of those studying in the home country, and in the case of performance-approach goals, the test-taking anxiety of Chinese students who studied abroad to the United States was significantly lower than that of those who studied in the home country.

By our experiment in the video-conferencing form, anxiety probably caused by COVID-19, relatively small sample size, and arbitrary selection of participants, our results might be affected. Therefore, further studies that prudently consider these conditions are highly needed and we would do some of them in the future.

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