Author’s response to reviews

Title: Attentional bias modification in reducing test anxiety vulnerability: A randomized controlled trial

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Version: 3 Date: 29 Aug 2017

Dear Editor and Reviewers,

Thank you for your letter and for the reviewers’ comments concerning our manuscript entitled “Attentional bias modification in reducing test anxiety vulnerability: A randomized controlled trial” (ID: BPSY-D-17-00445R2). These comments are all valuable and very helpful for revising and improving our paper, as well as the important guiding significant to our researches. We have studied comments carefully and tried our best to make corrections which we hope meet with approval. Especially, we have our paper edited by the professional English language editing service from American Journal Experts (AJE, Certificate Verification Key: B3A5-7FF3-E02C-0D2B-A6F2) . Revised portions are marked by yellow highlighting in the paper. The main corrections in the paper and responses to the reviewer’s comments are as following:

Respond to Editor:

1. The inclusion of additional details regarding the power analysis would be helpful.
Response: Thanks for your instructive advice. Power analysis was carried out by G*Power 3.1.9.2. For an effect size of 0.4, an alpha probability of 0.05 and a beta probability of 0.8, the sample size required to detect a statistically significant difference is 20 participants per group. Given loss of samples, ten more people are needed in two intervention groups. These additional details have been added at the beginning of Participant recruitment and allocation Section.

2. It would be helpful to include a flowchart of the participants throughout the study.

Response: Thanks for your valuable suggestion. Refer to your paper, a flowchart of the participants throughout the study has been added as Fig 1.

3. It would be helpful to have an illustration of the paradigms used in the present study.

Response: Thanks for your valuable suggestion. The sequences of events in the eStroop task and dot-probe task have been added as Fig 3 & 4.

4. In the same vein, the discussion section might benefit from a greater commentary on the limitations of the attention bias modification procedure based on the dot-probe task (for recent meta-analyses, see Heeren, Mogoașe, Philippot, & McNally, 2015; Mogoașe, David, Koster, 2014). Particularly, because the results of recent meta-analyses have prompted a dismissive appraisal of ABM’s prospects as a viable clinical intervention, the clinical implications that can be derived from the present study are highly critical. Consequently, I do believe that this point should be further developed.

Response: Thank you very much for this comment. Your papers made an excellent work on the systematic analysis about the influence of ABM on SAD, drawing many critical results. We have cited some of them to develop our discussion and support our findings (Line 2-4, 1st paragraph; line 2-6 2nd paragraph; line 9-13, 6th paragraph).

5. In the procedure section, the authors should explain how they generate the random assignment (that is, more details regarding the random generation is required) as well as how they concealed the allocation. This is particularly important given the presence of concerns vis-à-vis the quality of ABM studies (see, Heeren, Mogoașe, Philippot, & McNally, 2015). Please, update your manuscript accordingly.

Response: Thanks very much for your careful work. We are sorry that we failed to explain the Blinding and Random Assignment clearly in the original manuscript, especially after reading
your paper. “Participants were assigned randomly into three groups (a: ABM group, b: placebo group and c: blank group) through the use of a computer-based random assigned program with a 3:3:2 allocation ratio. After the first day when they provided the baseline data, participants were informed via e-mails about their assigned group and the following programs. Then, WC assigned participants to intervention based on random allocation sequence in opaque, sealed, and stapled envelopes. Actually, the participants remained blind to their treatment hypotheses and the content of other treatment groups through. Also the treatment allocation was concealed from the outcome assessor HC.” These details have been added in the Participant recruitment and allocation Section.

6. Likewise, several recent studies among other anxious populations (including some of my studies) have indicated that noncontingency-based training ABM task could be as anxiolytic as the usual contingency-based ABM training task (e.g. Heeren, Coussenem, & McNally, 2016). Consequently, I do believe that this point should be further developed in the discussion section, including links to these previous studies. I really believe that such a discussion could broaden the significance of the present paper.

Response: Thank you very much for this instructive suggestion. Indeed, we found the similar results as yours that there were no significant differences between groups in anxious mood and physiological indicators (sAA in our study) at the post-training section. Based on previous studies, we set a blank group in current study to control the potential placebo effects, positive expectations and demand effects. Consequently, participants in placebo group failed to improve their attentional bias, and the attentional bias scores of individuals in blank group tended to increase (p=0.07) at the post-training section. These findings provided initial evidence that repeated concreteness training, not placebo, could have positive effects on attentional bias and naturally occurring symptoms in test anxiety sample. Above statement has been added in the last but two paragraph of discussion section.

To Reviewer:

Brage Kraft (Reviewer 1): Whole document:

The paper assesses whether attention bias for threat can be changed using ABM. The study applies a RCT double-blind design which seems well suited to answer this question. A sham ABM and no-training condition provide control for placebo effects and the general effect of doing a dot-probe task. Another strength is the use of a different measure of attention bias than the one used in the intervention, which can illuminate whether the ABM effect is detectable using a methodologically different paradigm.
However, the presentation of the rationale for this study is too vague. Notably, the title emphasizes the use of ABM to reduce vulnerability for test anxiety, and an assessment of test anxiety is described (TAS), but not included in the results. Whether the sample is a population with test anxiety or not is also unclear. Also, why is salivary amylase measured? The relevance of this to test anxiety and ABM is not clearly presented. Further, the language needs major revision, both regarding rationale, structure, clarity of arguments, and grammar.

Response: Thank you very much for your comments. They are all valuable and very helpful for revising and improving our paper, as well as the important guiding significant to our researches. We have studied comments carefully and tried our best to make corrections which we hope meet with approval. Especially, we have our paper edited by the professional English language editing service from American Journal Experts (AJE, Certificate Verification Key: B3A5-7FF3-E02C-0D2B-A6F2).

Introduction:
- need introduction to the phenomenon of test anxiety

Response: Thanks for your instructive advice. The brief introduction of test anxiety (cognitive, physiological, and behavioral symptoms) has been added (Introduction section, 4th paragraph).

- there is no clear rationale why salivary amylase is measured

Response: We are sorry that we do not provide sufficient evidence to answer why salivary amylase is measured. Salivary α-amylase (sAA) is a powerful tool to indicate stress-reactive bodily changes, especially the autonomic nervous system (ANS). This enzyme can be increased rapidly in response to physiological and psychosocial stress. The secretion of salivary amylase is directly stimulated by innervation followed by hormonal regulation in response to changes in serum noradrenalin levels. Therefore, the salivary gland acts more quickly and sensitively responds to the psychological stress. Above have been added to support the necessary of the measurement(Introduction section, 5th paragraph).

- presentation of previous studies using ABM in test anxiety is needed

Response: Thanks for your suggestion. Since there are only a few studies focusing on ABM and test anxiety, two current studies addressing this issue have been added after literature review (Introduction section, 4th paragraph).
Methods:

- please present the power calculations more clearly

Response: Thanks for your instructive advice. Power analysis was carried out by G*Power 3.1.9.2. For an effect size of 0.4, an alpha probability of 0.05 and a beta probability of 0.8, the sample size required to detect a statistically significant difference is 20 participants per group. Given loss of samples, ten more people are needed in two intervention groups. These additional details have been added at the beginning of Participant recruitment and allocation Section.

- it's stated that this is a double-blind study, but at the same time that "participants were asked not to reveal the treatment allocation" - if so, the participants weren't blinded

Response: Thanks very much for your careful work. We are sorry for our fault statements on Blinding in the original manuscript. Actually, “Participants were assigned randomly into three groups (a: ABM group, b: placebo group and c: blank group) through the use of a computer-based random assigned program with a 3:3:2 allocation ratio. After the first day when they provided the baseline data, participants were informed via e-mails about their assigned group and the following programs. Then, WC assigned participants to intervention based on random allocation sequence in opaque, sealed, and stapled envelopes. Actually, the participants remained blind to their treatment hypotheses and the content of other treatment groups through. Also the treatment allocation was concealed from the outcome assessor HC.” These details have been added in the Participant recruitment and allocation Section, instead of former inappropriate statements.

- please describe the VAS

Response: Thanks for your advice. “A 10cm line was divided into 10 equal partitions with terminal labels “relaxed” and “anxious”. Participants could circle the mark on the scale that most accurately reflected their current mood state. Scores ranged from 1 to 10 where higher scores reflected a more anxious mood. ” This much more specific description of VAS has been added in the first paragraph of Procedure Section.

- should use "Threat block" as opposed to "Negative block", as in Taake et al. (2009)

Response: Thank you very much for your careful work. We are sorry for the misuse in preview manuscript. At this time, we tried our best to change them one by one in the entire manuscript.
- as in Taake et al (2009), where words matched according to frequency of use and length?

Response: We did match the words for frequency of use in the material selection section. And they are all Two-syllable word, which means the same length in Chinese. The statement has been added in line 4, second paragraph of Procedure eStroop section. Thank you very much for your careful work.

- Did you exclude high or low reaction times?

Response: Yes, we did. RTs < 300ms or > 1200ms were excluded (added in line 4, Methods Data analysis section). We are sorry for the ignorance in the original manuscript.

- eStroop bias scores: you should calculate individual test scores which represent changes in attention bias from pre to post (pre minus post), and check if there is a significant difference between the groups.

Response: Thank you very much for this comment. We discussed the statistics methods of eStroop bias scores when we were writing the original manuscript. As you pointed out, we should exam the differences of eStroop bias scores changes between groups. Calculating individual test scores you recommended is optional. Actually, it turned out same results (F=3.323, p=0.042, η²=0.082) as the repeated measurement of variance analysis we used in the manuscript. Therefore, we decided to the repeated measurement of variance analysis here, followed by exploratory analyses (paired sample t-test) to examine with group changes in attentional bias.

- There is very little description of the salivary amylase measures

Response: Thank you for your advice. The description of the salivary amylase measures has been added in the second paragraph of Procedure section.

- ethical considerations are not described

Response: Thank you for careful work. Ethical review of this project was carried out and approved by Ethics Committee of the Second Military Medical University (20152049), which was stated in the Declarations section of original manuscript. If necessary, I would describe it in Methods in the following revised version.
Results:

- whether there is a significant difference between the groups on the eStroop at pre ABM should also be assessed

Response: Thank you very much for your valuable suggestion. An ANOVA was carried out to compare the difference between the groups on the attentional bias scores before the 5-day training, which showed there was no significant difference. This analysis has been added in line 3 “Change in attentional bias measured with eStroop task” section.

- a full ANOVA table for the main effect should be presented

Response: Thanks very much for your instructive advice. The full ANOVA table has been added as Table 3. Hope it could make the results more clear.

- Tables are lacking clear descriptions (what is Vulnerability?)

Response: Thanks very much for your careful work. We are sorry that we fail to declare it clear in the original manuscript. The concept and calculation method of vulnerability have been added in the third paragraph of Procedure sections. To make the table easy to understand, subscripts of VAS and sAA have been modified, and table notes have been added.

- Measure of test anxiety is lacking

Response: Thanks very much for your comment. The measurement of test anxiety was carried out at the beginning of the experiment, but not conducted again after the intervention. That’s because we aimed to examine whether there was a possibility of using attentional bias modification (ABM) to modify high test-anxiety individuals’ attention to emotional information, and whether this change was related to anxiety vulnerability which was based on salivary amylase and visual analogue scale. But we have to admit it might be a limitation of our study that we lost a chance to compare the differences between pre- and post-training test anxiety. This shortage have been added in the Limitation Section.

Discussion:

- Authors claim the participants are "test anxiety individuals", but I don't see how this is the case, as no measure of test anxiety is provided
Authors also conclude that ABM is effective in reducing anxiety vulnerability in people preparing for an exam, but how is it ensured that the participants were actually preparing for an exam?

Response: Thank you very much for careful work. Taking part in the following College English Test 6 is one of the inclusion criteria, which was announced in our advertisement poster. Also, we confirmed that all the participants were preparing the CET-6 through telephone interview before the experiments. This English test is national examine held twice one year. If the college students failed to pass it, it would bring much troubles for their achieving final degree and seeking jobs after graduation. Therefore, we proposed there were different levels of test anxiety in our participants who were preparing the examine. These statements have been added in third paragraph of Discussion Section.

- The rest of the discussion is not reviewed because of the above limitations, which must be addressed first

Response: We deeply appreciate your above comments. They are all valuable and very helpful for revising and improving our paper. We have studied these comments carefully and tried our best to make corrections which we hope meet with approval. And we look forward to receiving new comments from you.

Tables:
- 1: no citation for DASS, and not described in Methods

Response: We are sorry that we forgot describing DASS in Methods. This scale was used to assess the individuals’ depression, anxiety and stress state and to indicate whether randomization had been successful. In current revised manuscript, the citation and description have been added in line 4, second paragraph in Procedure eStroop section. Thank you very much for careful work.

- 2: not clear
Response: We are sorry that we failed to clarify table 2 clearly. It showed the mean reaction time (standard deviations) for pre- and post-training in each group. And the attentional bias scores were calculated by subtracting the mean RT for Positive block from mean RT for Threat block. In addition to descriptive results in table 2, the multivariate analysis was presented in table 3. We hope it can help to make it easy to understand.

- 3 & 4: what is Vulnerability 1 and 2?

Response: We are sorry that we failed to clarify these two tables clearly. In order to examine differences in emotional vulnerability during a task, stress vulnerability and anxiety vulnerability were assessed for each eStroop task (i.e., pre-training, post-training). Scores were calculated by subtracting the pre-task state from the post-task state. For example, the pre-training stress vulnerability score for the first eStroop task (Vulnerability 1) was calculated by subtracting the salivary amylase before the first eStroop task (sAA1-1) from the salivary amylase after the first eStroop task (sAA1-2). Similarly, anxiety vulnerability before ABM was calculated by subtracting the anxiety visual analogue scales given before the first eStroop task (VAS1-1) from the anxiety visual analogue scales given after the first eStroop task (VAS1-2). Vulnerability scores after ABM (Vulnerability 2) used salivary amylase and anxiety visual analogue scales from before and after the post-training eStroop task.

Above statements have been added in the third paragraph of Procedure section, and some notes have also added below these two tables.

Lauren Hallion (Reviewer 2): General comments

The present study (BPSY-D-0045R2) describes the effects of a five-day course of attention bias modification (ABM) on test anxiety. The article has several strengths, such as the use of different tasks for training versus testing. In light of ongoing debates about possible independent effects of ABM placebo conditions (e.g., Heeren et al., 2015), the inclusion of a wait list control group in addition to the standard experimental and placebo groups is a strength. However, this issue is not addressed in the manuscript. The authors may wish to discuss whether, and to what extent, the present findings inform those debates. At a minimum, the authors’ rationale for including a wait list control group should be stated.

Response: Thanks very much for your comments and valuable suggestions. Including a waiting list control group (blank group in manuscript) is one of the special ideas to investigate whether the repeated concreteness ABM training, not placebo, could have positive effects on attentional bias and naturally occurring symptoms in test anxiety sample, after controlling the possible the placebo effects, positive expectations and demand effects. These statements have been added in
the end of third paragraph of Introduction Section and the last but two paragraph of Discussion Section.

The abstract states that the aim of the study is to "modify high test-anxiety individuals' attention." However, the Method does not indicate whether participants were selected on the basis of test anxiety. This is a central issue and should be clarified throughout the manuscript.

Response: Thanks very much for your instructive suggestion. We are sorry that we failed to give enough details in the original manuscript. Taking part in the following College English Test 6 is one of the inclusion criteria, which was announced in our advertisement poster. Also, we confirmed that all the participants were preparing the CET-6 through telephone interview before the experiments. This English test is national examine held twice one year. If the college students failed to pass it, it would bring much troubles for their achieving final degree and seeking jobs after graduation. Therefore, we proposed there were different levels of test anxiety in our participants who were preparing the examine. These statements have been added in the Participant recruitment and allocation Section and third paragraph of Discussion Section.

The Background section of the abstract focuses heavily on "test anxiety." Consequently, the use of the term "test sections" in the Method section of the abstract ("…20 of whom received no intervention between two test sections") leads the reader to believe that participants completed academic exams during the course of the study. In the body of the article it becomes clear that the term "test" is being used to describe different administrations of the cognitive task (i.e., pre-training and post-training). In light of the focus on test anxiety, the term "test" is confusing when used in this way and should be eliminated throughout the paper (consider replacing with "time point").

Response: Thank you very much for such careful work. We are very sorry for these misuses which brought confusions to reviewers and readers. Following your suggestion, we eliminated the “pre-test” and “post-test” throughout the paper. Instead, pre-training and post-training were used in current manuscript. In this way, task means the eStroop task, training means ABM training, and test means the following academic exam (CET6). We hope it could be clear for readers.

Most critically, because a) the training was not in fact administered to coincide with academic exams, b) the training task did not include test-related stimuli, and c) participants do not appear to have been selected based on test anxiety, additional justification is needed for the use of self-
reported test anxiety as the sole outcome measure. It appears that the DASS may have been administered at posttest. If this is correct, those results should also be reported.

Response: Thank you for these valuable advices. We have to admit these are obvious shortages which was stated in limitation sections. In order to use ABM to modify high test-anxiety individuals' attention, we recruited the participants who would take part in an important academic exams. Exam-related emotional words were used in the eStroop task, which was the main index of individuals’ attentional bias. But we failed to use exam-related images in the Attentional bias modification task. On one hand, we wanted to avoid practicing effects. On the other hand, we have to admit that it would be a big challenge for us to gather and evaluate enough exam-related images in current study. Therefore, the classical International Affective Picture System (IAPS) was used in ABM, and maybe standardized exam related images would be assessed and used in the following study.

Regrettably, DASS as well as TAS was just measured at the beginning of the experiment, but not conducted again after the intervention. That’s because we aimed to examine whether there was a possibility of using attentional bias modification (ABM) to modify high test-anxiety individuals’ attention to emotional information, and whether this change was related to anxiety vulnerability which was based on salivary amylase and visual analogue scale. But we have to admit it might be a limitation of our study that we lost a chance to compare the differences between pre- and post-training test anxiety. This shortage have also been added in the Limitation Section and will be overcome in the following study.

Extensive editing for word choice, syntax, and style is needed throughout. This is especially critical for the abstract, but applies to the entire manuscript.

Response: Thank you very much for your advice. We are sorry for grammatical errors in the original manuscript. And we have our paper edited by the professional English language editing service from American Journal Experts (AJE, Certificate Verification Key: B3A5-7FF3-E02C-0D2B-A6F2).

More specific comments are as follows:

Introduction

The introduction should be revised to clarify that meta-analyses do not consistently show a positive effect of ABM on symptoms. The relatively poor reliability of the dot-probe task should also be acknowledged.
Response: Thank you for this instructive comment. What you suggested have been added in the third paragraph of introduction (Line 1-3, 7, 14-17).

The introduction is very brief. A more detailed review of the literature would improve the manuscript.

Response: We are sorry that we failed to give enough introduction in our original manuscript. In this version, some more detailed review of the literature have been added, including what test anxiety is (line 4-11, 4th paragraph), the effect of ABM on test anxiety(line 21-33, 4th paragraph), the reason why sAA was measured (line 3-7, 5th paragraph), etc.

The phrase "anxiety mood" should not be used. Instead, use "anxiety" or "state anxiety." Response: Thanks for your valuable advice. Majority of the phrase "anxiety mood" have been changed to "anxiety". But some of them was changed to anxious mood, especially when it comes to the scores of VAS reflected the individuals’ anxious mood. If it is still inappropriate, we would change them in the following revised manuscript.

Method

Please clarify which tasks were administered during the 5-day training period, how often they were completed (e.g., once daily?), and whether any training sessions took place outside the lab.

Response: Thank you for this comment, which is helpful to modify our paper. “Dot probe tasks were used as attentional bias modification in the middle five training days. They (ABM group & placebo group) are asked to do the training between 12:00 p.m. and 9:30 p.m. every training day in the same laboratory. ” This statement has been added in the fourth paragraph of Procedure section.

Please explicitly state that the emotional Stroop is being used in this study as a measure of attentional bias. In the Discussion, I recommend considering possible alternative explanations for eStroop results (e.g., impaired disengagement; differences in autonomic arousal between positive and negative blocks.

Response: Thank you very much for such instructive suggestions.
1. It has been explicitly stated in the fourth paragraph of Procedure Section that Emotional Stroop tasks were used to assess the participants’ attentional bias in the first and the last days.

2. As you suggested, these findings from eStroop task could also equally attributed to a bias in either attentional engagement with, or disengagement from the content of threat stimuli. After training, the participants in ABM group showed improved ability to shift attention from the meanings of negative words to task-related color naming, but an impaired disengagement account for attentional bias appeared in placebo group and blank group. These statement have been added in the end of second paragraph of Discussion Section.

3. Emotional Stroop arises autonomic arousal theory has also used in current manuscript, but it used to explain the negative results in sAA. Since eStroop was not a novel task for participants at post-training test, so it failed to arise participants’ high cognitive loads and psychophysiological responses (fourth paragraph of Discussion Section).

All self-report measures administered as part of the study should be listed and described. Response: Thank you very much for this comment. we failed to give enough details in the original manuscript. The measure of visual analogue scale has been descripted specifically at the end of first paragraph of Procedure Section.

Results

Please include effect sizes throughout to facilitate interpretation of the results.

Response: Thank you for this comment. The effect size was reported when we did power analysis (First sentence, Participant recruitment and allocation Section), so it was not announced in the result section. In this revised manuscript, the eta square and Cohen’ d have been added to facilitate interpretation of the results.

The use of subscripts for VAS and sAA is confusing and should be clarified. The VAS vulnerability to stress results are not interpretable without a clear indication of what each subscript corresponds to.

Response: Thanks very much for your careful work. In order to make it clear, we have modified the subscripts for VAS and sAA. sAA 1-1 assessed before eStroop test at pre-training section, sAA1-2 assessed after eStroop test at pre-training section, sAA 2-1 assessed before eStroop test at post-training section, sAA2-2 assessed after eStroop test at post-training section. Stress
Vulnerability 1 = sAA 1-2 - sAA 1-1, Stress Vulnerability 2 = sAA 2-2 - sAA 2-1. So did VAS. Above has been added as Notes of table 4 & 5.

Discussion

The discussion points about laboratory effects and expressive writing need particular clarification.

Response: Thank you very much for this comment. we failed to give enough clarification in the original manuscript. Previous studies showed larger effect sizes for anxiety symptoms at post-training in the laboratory settings. Therefore, some practical indices (e.g. test scores, sleep quality) seems equally critical. For example, exam performance proved to be improved by expressive writing. It could improve high-test-anxiety individuals’ biology exam scores to write about their thoughts about the upcoming exam, which suggested us to conduct more systematic follow-up studies and pay much more attention to practical indices on the eve or just examine day. These statement about laboratory effects and expressive writing have been added at the end of limitations paragraph.

The authors' response letter has also been included as a supplementary file