Thinking about thinking: Lessening high test anxiety through metacognitive study strategies

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Abstract: Throughout education, a common issue that students face is test anxiety. Students spend a lot of their time concerning themselves with the consequences of failure and hours of rereading textbooks, all because of test anxiety. Test anxiety is the condition where students have a negative physical or emotional reaction to assessment. All of this time spent worrying and rereading could be spent on more productive processes, such as interacting with the material and planning time effectively. This study aimed to see how implementing more effective study strategies into the Spanish classroom could affect students' abilities to perform well on tests and cope with test anxiety. This was done over a 15 day period, with the results showing no statistically significant success when it comes to lowering test anxiety. However, other factors such as how students perceived the strategies and their performance on assessments demonstrated the potential of similar studies in the future.

Introduction and Justification

Imagine yourself in a high school classroom, sitting at a standard steel and wood desk. The teacher appears and puts a stapled packet of papers in front of you. The paper reads in big, bold letters "TEST." Suddenly, you begin to shiver and your breathing becomes heavy. While you are trying to keep your body still, you cannot remember any of the material that this test covers. The shivering you experienced, as well as your inability to recall the material, are common symptoms of test anxiety (Cassady & Johnson, 2002; Hembree, 1988; Wass et al., 2020). Many students suffer from some form of test anxiety throughout their academic career, and this anxiety has the potential to adversely affect their academic performance (McLeod & Boyes, 2021; Von der Embse, 2013). Scholars have amply documented the association between high test anxiety and low achievement in schools, but the research on practices that mitigate maladaptive anxiety has been inconclusive or focused on tackling anxiety in general (Hembree, 1988; McLeod & Boyes, 2005). Furthermore, previous studies have primarily explored test anxiety in psychology classrooms; however the phenomenon in the context of foreign language learning is a field that could benefit from this type of research. The focus of this research is to determine how different learning strategies can assist students with lessening the effects of test anxiety in a foreign language classroom. Such research is needed if teachers and administrators wish to reduce students' anxiety during testing and more accurately gauge their understanding of the material.

Defining Test Anxiety

Test anxiety has been defined in various ways and using different theoretical approaches. It can be broadly defined as a negative cognitive, behavioral, or emotional response to tests and performance. Some researchers have distinguished between two elements of test anxiety: emotionality and worry. Emotionality refers to the emotional responses students have when experiencing test anxiety, such as feelings of dizziness or

nausea. Worry, on the other hand, refers to the cognitive-behavioral responses students have to test anxiety, such as focusing on the consequences of failure and comparing their work to their peers (Cassady et al. 2002; Hembree, 1988; Von der Embse et al., 2018).

Common signs of test anxiety include difficulty recalling information, sweating, shaking, nausea, hyperventilating, and nervous breakdowns (Hembree, 1988; Wass et. al., 2020). The symptoms can have an impact on the process of test-taking, whether subtle (e.g., shaking, problems with recall) or immediately distracting and debilitating (e.g., nausea and hyperventilating). Girls and students of color tend to report higher levels of test anxiety (Chapell et al., 2005; Von der Embse, 2013; Von der Embse et al., 2018). Higher levels of test anxiety among these populations can exacerbate inequalities and interfere with student's abilities to demonstrate their knowledge. This can be seen since these individuals who had higher levels of anxiety had poorer performance on testing (Chapell et al., 2005; Hembree, 1988; Von der Embse et al., 2018).

Test anxiety may take many forms, including fear of negative feedback, fear of failing a class, and language anxiety (Hembree, 1988; Horwitz et. al, 1986). Language anxiety is specific to the context of foreign language speaking and involves speaking apprehension and fear of negative assessment (Aida, 1994; Horwitz et al., 1986; MacIntyre & Gardner, 1989). Horwitz et. al describes that with language anxiety, there are subcomponents, which include communication apprehension, fear of negative assessment, and test anxiety (1986). The component of test anxiety is what will be the main focus, especially considering that the other two factors can be compounded onto the fear of a test, such as if a student was given a speaking assessment.

Models of Test Anxiety

Researchers have developed two main models of test anxiety known as the interference model and the deficit model. The interference model focuses on how test anxiety affects students' ability to recall information within a test setting. As previously noted, researchers have shown that there is a strong association between test anxiety and difficulty recalling information (Cassady et al., 2002; Naveh-Benjamin et al., 1981; Tobias, 1985). Cassady et al. (2002) provided evidence for the interference model with findings of students who were fixating on the results of the test, not feeling prepared for the test, and comparisons they made with their classmates. These three patterns of thought are examples of off-task thoughts that can interfere with recalling information related to the test. The thought processes associated with the interference model are consistent with the construct of worry. Additionally, the feeling of being ill-prepared for the test is a feeling that is seen in the deficit model of test anxiety. The deficit model focuses on the cause of test anxiety, which may be attributed to a lack of test-taking skills or study strategies (Naveh-Benjamin et al., 1981; Tobias, 1985). If such a deficit exists, it might be addressed through well-designed interventions.

Test Anxiety and Academic Performance

Test anxiety is a subject of academic scrutiny not only because of its debilitating influence on student's self-efficacy, but also because of its effects on academic performance. Many researchers have found a strong negative correlation between academic performance and levels of test anxiety in students (Chappell et al., 2005; Hembree, 1988; Von der Embse et al., 2018). This correlation between test anxiety and academic performance raises a concern about how learning is generally assessed in schools; testing is often used to determine students' academic success, with some tests being a good portion of a student's

overall grade in a class. Within this particular school system, tests and projects, referred to as product grades, account for 70% of a student's grade for the academic quarter. Von der Embse (2013) demonstrated that students who perform poorly on tests and perceive the test as a threat to their performance had negative outlooks that reinforced their test anxiety. This reinforcement can compound previously mentioned aspects of test anxiety, such as worrying about one's classmates' performance in relation to others' or intervening thoughts during testing.

Common Study Strategies

Study strategies are the ways in which students attempt to reinforce information that is described and demonstrated in the classroom. There are multiple strategies that students can implement, such as rereading material, retesting material, creating flashcards, and creating questions (Broekkamp et al., 2007; Karpicke et al., 2009). However, whereas some of these strategies are common amongst students, not all of these strategies reinforce long-term retention of information (Broekkamp et al., 2007; Karpicke et. al., 2009). Karpicke et al. (2009) found that students rarely took part in strategies that involved retrieval, such as answering questions related to the content in the texts or coming up with their own questions. This lack of retrieval-based strategies could be related to the interference model, since if students do not practice using their recall skills, they will likely have more difficulty recalling information for a test. This deficit in recall strategies connects to the deficit model, since the deficit in retrieval strategies affected their performance during test taking. Broekkamp et al. (2007) found strategies that focused on task demands, such as focusing on key concepts and questions related to those concepts, tended to help students with retaining the knowledge. This focus on task demands is a good example of how students can reduce their own anxieties when they can think critically about what they are being asked. Tobias (1985) described how students with higher levels of test anxiety compensated for their lack of study strategies by spending more time studying overall. This suggests that teaching more effective study strategies could lower students' test anxiety while improving their achievement.

Social Emotional and Metacognitive Strategies

In order to answer the question of how to combat the negative effects of test anxiety, researchers have examined multiple methods of studying. Social-emotional strategies are examples of strategies that have had some beneficial effects in schools and are associated with less test anxiety (Bingham et al., 2021; Hembree, 1988; McLeod & Boyes, 2021). These strategies focus on how students can control their emotions through methods such as relaxation and mindful breathing while also implementing efficient strategies of study such as setting goals and managing their time effectively. These strategies focus on the idea that students who can control their own emotions and thinking can counteract the negative effects of high test anxiety. However, another way to counteract high test anxiety may be for students to have control of the way they think.

Metacognitive strategies are based on the idea of metacognition, which is thinking reflectively on how a person thinks. Metacognitive strategies are strategies that allow students to assess their own thinking and thus plan accordingly to best prepare for a situation, which in this context is taking a test. Examples of metacognitive strategies would

be graphic organizers, use of a planner, reflections on daily learning, or notes about points of personal confusion. Researchers who have explored test anxiety through a metacognitive lens have found that some metacognitive strategies can be helpful in relieving test anxiety (Bingham et al., 2021; Hembree, 1988; Von der Embse, 2013). In Horwitz et. al's (1986) study on foreign language anxiety, they found that multiple people had a mental block when discussing the learning of a foreign language, even if they were good students. They attributed this mental block to anxiety that impedes their performance. With this idea in mind, having metacognitive strategies that would allow students to think about what makes them anxious about language learning in particular would help them to succeed.

The purpose of this study is to determine if metacognitive strategies lower high school student's levels of test anxiety at a high school in Maryland. The research questions that guided this investigation were as follows:

1. How do metacognitive strategies affect student's levels of test anxiety?
2. To what extent do metacognitive strategies influence test performance?
3. Which strategies did students report using to handle their anxiety before and during the tests?

Methods

Sample & Context

This research was conducted in a high school Spanish classroom in southern Maryland. The sample size was 64 high school students of varying grade levels. The classes were composed of 33 boys and 31 girls, seven of whom had a 504 plan, and five of them had an IEP plan.

Intervention

For this study, I employed multiple metacognitive study strategies into a high school Spanish language class to see if students would adapt the strategies to deal with their test anxiety. Over the course of three weeks, I employed three different strategies. These strategies were taken from past research on the topic, specifically McLeod's focus on conscious breathing and Lawson et. al.'s planner and study guide strategy (2021, 2021). The first strategy was focused on emotional regulation through conscious breathing and relaxation. The second strategy that was implemented was a series of short questions that were designed to have students test themselves (e.g., "¿Qué hiciste este fin de semana?"; "¿Por qué necesitaste ayuda ayer?"). Self-testing improves student's understanding of the gaps in their own knowledge and plan accordingly. The final strategy that I implemented was a calendar to have students plan out when they needed to review feedback and better plan out their studying. This strategy allows students to gain some time management skills, engage in the feedback, and reevaluate their learning. I demonstrated these strategies to students at the beginning of class after I went over daily objectives. Additionally, students would be encouraged to utilize the strategies at the end of class, such as a class-wide breathing exercise or reminding students how they could track what needed to be done with their calendars.

Types of Methods

This study used a mixed methods approach. My quantitative data provided evidence of changes in students' scores and anxiety. My qualitative data provided rich details regarding students' reasoning about which methods they used or avoided. Their data helped me to gauge whether there was improvement due to my study strategies and or if another factor may have been at play. Additionally, the question of which strategies they used could help with future studies of effectiveness of strategies. Finally, the qualitative data allowed me to look deeper into student's thinking and emotional responses to tests, beyond what a Likert scale can provide.

Data Collection

I collected students' quiz scores on [X] throughout the study and their test scores prior to the study to assess changes in their performance during the intervention. My other source of quantitative data was a 5-point Likert scale of students' test anxiety that was collected before and after the study to gauge how much the strategies helped to mitigate extreme test anxiety, based on Horwitz Foreign Language Anxiety Scale (see Appendix A; Horwitz et al. 1986). For my qualitative data, the students responded to open-ended survey items regarding what strategies they utilized, how effective they were, how well they believe they have improved, and other similar questions (see Appendix B).

Data Analysis

The data for my study needed to be analyzed in many different ways. I used paired *t*-tests to examine changes in students' anxiety and test scores. Effect sizes were calculated using Cohen's *d.* For open-ended responses, I coded the themes found in the survey based on commonality of statements, unexpected statements, and expected themes within student responses. I analyzed this data by hand so I can ensure that student responses are collected appropriately.

Validity Concerns

There were some measures taken to counter my own potential biases. First, my Likert scale was previously validated and has been used in other studies as well (Aida, 1994; Horwitz et al., 1986). My mentor and fellow interns reviewed my questions to see if they understood what was asked. They also looked at my survey to ensure I was clear with my language and that my questions were not leading. For the test scores, I worked with my teacher to ensure that the tests did not have misleading components, such as trick questions and confusing language, to ensure that the results reflected the student's comprehension of the content as much as possible.

Findings

How do metacognitive strategies affect student's levels of test anxiety?

The results of the student's pre survey (M=3.24, SD=.88, n=45) and post survey (M= 3.15, SD= .88, n= 45) Likert Scales indicated that the implementation of metacognitive study strategies did not decrease student's test anxiety (p=.24; see Table 1). This also means that there was no real change in student's feelings of anxiety from the pre-test to the post-test.

Table 1

	n	*M*	*SD*	*p*	*d*
Pretest	45	3.24	.88	p =.24	0.11
Posttest	45	3.15	.73		

To what extent do metacognitive strategies influence test performance?

The results between the pre and post test for Spanish 2 indicated a statistically significant increase in student test scores (p=<.001;see Table 2). The large effect size (d=3.38) demonstrated a large change when comparing the pre and post test for Spanish 2 are compared. For Spanish 1, the pre and post test indicated a statistically significant increase in student test scores as well (p=<.001)(See Table 3). The effect size for Spanish 1 was large (3.44), which demonstrated a real change between the pre and post test. However, this change cannot be solely attributed to the use of testing strategies. During the three week period, I gave students direct instructions on the topic that was tested.

Table 2

	n	*M*	*SD*	*p*	*d*
Pretest	42	6.67	3.52	p <.001	3.38
Posttest	42	19.85	4.25		

Table 3

	n	*M*	*SD*	*p*	*d*
Pretest	9	3.11	1.49	p<.001	3.44
Posttest	9	10.14	2.48		

Which strategies did students report using to handle their anxiety before and during the tests?

Students were given a post test open-ended survey (See Appendix B). The first question on the survey asked students to cite which strategies they used for

studying and for regulating their activities. Within the 44 students who participated in the survey, of the 64 total participants, the breathing technique was mentioned the most, with 26 students, which is 59% of the survey participants, citing that they used it during their studies and even during the test. 22% (n=10) cited using the calendar and or strategies that were not the focus of the study, 14% (n=6) cited the use of the study guide, and 5% (n=2) stated they didn't use any study strategies. While going through the responses, there were some general patterns that could be seen in some of the student's responses

For example, one student noted their use of the conscious breathing technique to relieve stress and tension, "The breathing in and out strategy because I feel it calmed me all relieved and the tension and stress before, during, and after the test ". This was a common theme found for students who described using the breathing technique, either describing some form of relaxation or stress. When further reading student responses, there were multiple sub themes about the reasons why students found these strategies effective. For some students, they noted how strategies, mainly the calendar, helped them with time management and making effective use of their time, "I used the calendar to prepare for the test. It was effective because it reminded me to study ". Another consistent pattern I noticed was students discussing the effectiveness due to ability to recall information or the ability to focus on the test and materials, "Yes because I think it helped me focus and remember the things we learned about (sic)". These sorts of comments demonstrate the effectiveness of the strategies, as students described how they combated against distractors and difficulties with retention. Finally, three students noted an unexpected reason, regarding their own feelings of confidence, "The metacognitive strategy I used was breathing. I was very focused and this helped me feel confident ". This self description of confidence demonstrated a minor side effect of using metacognitive strategies, an increase of self-efficacy.

Discussion of Results

The quantitative data within my research is a mixed view. When considering the first research question "How do metacognitive strategies affect student's levels of test anxiety?", there does not appear to be an effect. For question 2, which asks "To what extent do metacognitive strategies influence test performance", the data shows a statistically significant increase in student test scores when comparing their pre and post test scores, however these findings are inconclusive due to the lack of data that can solely attribute the gain to the study strategies. While these quantitative data sets give a confusing message, the qualitative data from the post-test survey helps to demonstrate the effects of metacognitive strategies. The students who filled out my questionnaire found the strategies beneficial and saw the positive effects they bring, such as breathing techniques effect on student's emotions or utilizing time management skills with the calendar. Some students even found alternate benefits to the strategies, such as an increase in confidence, or found strategies that

worked better for them, such as reviewing vocabulary or in class strategies like gestures,

1. "I made sure I studied and talked positive. Which wer effective to me because I felt more confident (sic)"
2. "The strategies I use to prepare for a Spanish test is studying & making sure I know my words pretty well. And before going into school. I go over my vocab words again making sure I know them pretty well"
3. "I liked getting to use hand sybols to symbolize words, and the meaning of those words in Spanish, I also had a good use of the step by step process to conjugate the word (sic)"

The benefits that students described are also seen in the research on test anxiety and strategies related to combating it. For instance, the 59% of students who stated their use of breathing techniques and how these helped them to calm down and counteract stress aligns with McLeod and Boyes (2021) study on the positive effects of mindful breathing on students with test anxiety. However, the data does not align with these attributions, given that the overall class anxiety level did not change much. Additionally, the non significant change seen in the Likert scale when discussing overall test anxiety matched with the results that Bingham et. al. found where strategies such as use of planners and calendars did not have a significant effect on student's test anxiety. The student's attributed strategies to lessening test anxiety, however do not match with the data, where the overall anxiety of the class did not decrease in a significant way.

Conclusions and Implications

My intervention did not yield a significant change when it came to decreasing my students' test anxiety, and while there were surface level benefits, such as increased test performance, these could not be attributed to the metacognitive study strategies alone. While it did not meet the objectives that were originally set, there is some evidence that indicates other positive effects on students, such as increased feelings of confidence and honing of time management skills.

Limitations

There are several factors that could have contributed to the results of my research as they currently are. First, the sample size for this intervention was small (n=64) with their availability to participate in components like my post study survey or my pretest being affected by other factors, like school field trips and excused absences. This also includes some students who had special circumstances that did not allow for the use of their data, such as exemption from testing or cheating during the assessment. Another factor that contributed to the current results was the time allotted to perform the research. This research occurred over the course of three

weeks, however that is not a long time to completely change how students perceive tests and their consequences. Additionally, my second research question could not be fully answered due to a lack of an instrument that could account for how much my instruction influenced test performance and how much was due to the study strategies. Additionally, there was no instrument to account for whether students actually used the strategies outside of the classroom, which could make their responses to the survey questionable

Implications

      With the limitations taken into account, there is some further research that can be done to this topic. First, a longitudinal study of high school students over the course of their four years in a Spanish classroom could yield some interesting data with regards to their perceptions on test anxiety as a whole. Another potential study of interest could be a study of test anxiety levels for students in different levels of a subject to see where their anxiety levels are as they start a new level of the content and where they lie as they finish. The main difference between this and the previously mentioned longitudinal study would be looking at different groups simultaneously. As stated previously, some of my students noted strategies that I did not include in my study, such as positive self reinforcement or the use of gestures as a study tool. A study similar to this one but using some of these strategies could be worthy of investigation. Additionally, the researcher could even give a survey to students to see what forms of study strategies they use at the beginning of the study, then incorporate the most common ones as potential strategies for the class. These additional points about gestures and confidence that were brought up bring a question of the role of instruction in student's anxiety levels. Potential research could look at the role of instruction vs. study strategies, such as adding a behavioral checklist that looks into how often students may show signs of confusion in class or how often they ask questions in class. This type of research would also be intriguing since, like study strategies, some forms of instruction work better for some students and have little effect on others. Finally, another strategy that could be worth investigating is looking at the correlation with feelings of confidence and anxiety in students. There was a small number of students who stated something about a sense of confidence, but enough that it may warrant further research.

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Appendix A

Likert Scale

Nombre:_____

Fecha:_____

Direcciones: Please read each of the following questions carefully and answer them as truthfully

as possible. Circle the number that best represents your experience with regards to the question

1. I worry about making mistakes when taking a Spanish test

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

2. I am usually at ease during tests in my Spanish class

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	2	3	4	5

3. When taking tests in Spanish, I can get so nervous I forget things I know

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	2	3	4	5

4. Even if I am well-prepared for a Spanish test, I feel anxious about it

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	2	3	4	5

Appendix B

Post Study Survey

Nombre:_____

Fecha:_____

Direcciones: Please answer the following questions with as much detail as you are comfortable with. Please read the questions carefully to ensure that you understand what is being asked.

1. Which metacognitive strategies did you decide to use when preparing for a Spanish quiz/test in the last couple of weeks? Explain why you believe they were effective for you.

   _____

   _____

   _____

   _____

   _____

2. Do you believe you will use any of the strategies that you learned in the past three weeks in the future and why/why not?

   _____

   _____

   _____

   _____

   _____