Accepting Test-Anxiety-Related Thoughts Increases Academic Performance Among Undergraduate Students

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Given that unwanted thoughts are enhanced when suppressed, we tested among college freshmen who were about to take an academic exam if an acceptance strategy consisting of not suppressing intrusive thoughts will improve test performance. This strategy proved superior to students’ own default strategies as much as a modified, alternative strategy, avoiding the antecedents of intrusive thoughts. Moreover, the combination of the two strategies counteracted a stronger, negative effect of test anxiety on test performance as compared with each strategy used alone. The results suggest that not only intrusive thoughts per se but also the suppression of these thoughts can disrupt test performance, and hint that approaching such thoughts with acceptance may not interfere with simultaneously working toward avoiding the antecedents of these thoughts.

Key words: Test anxiety, academic performance, psychological acceptance, self-regulation, multiple goal pursuit

BOOSTING ACADEMIC PERFORMANCE BY ACCEPTING INTRUSIVE THOUGHTS

The contemporary human life is fraught with performance evaluations, which are used as a proxy for skills and knowledge. Unfortunately, however, skills and knowledge are not the only determinants of performance as many studies have shown decreases in test performance due to performance or test anxiety (for a review see, Bodas & Ollendick, 2005; Hembree, 1988). It is test anxiety especially in the form of a preoccupation with worrisome thoughts (e.g., “I will fail the test”) or cognitive distortions related to the consequences or the sources of failure (“I am not smart”, “No one will like me if I fail”) that are responsible for its disruptive effects on test performance (Hembree, 1988;
The present study focuses on boosting test performance by adopting either or both of two alternative coping strategies for controlling the disruptive effects of such thoughts on test performance: Accepting vs. avoiding the antecedents of intrusive thoughts.

Given the negative association between intrusive thoughts and test performance, preventing such thoughts from arising such as avoiding their antecedents or challenging their logic may at first seem to be the most intuitive way to improve test performance. In fact, approaches like these have dominated the prior research on cognitive strategies for reducing test anxiety and improving academic performance (D’Elia, 1998; D’Alelio & Murray, 1981; Fields, 2006; Holroyd, 1976; Leal et al., 1981; Sapp, 1994; Thyer, et al. 1981; Wessel & Mersch, 1994; Wise & Haynes, 1983). However, it is possible that not only intrusive thoughts themselves, but also the suppression of these thoughts will disrupt test performance. Thought suppression increases the frequency and the intensity of the thoughts suppressed (for a review see, Abramowitz, Tolin, & Street, 2001), in turn, likely disrupting the performance further. Therefore, as will be discussed below in more detail, it is possible that accepting intrusive thoughts such as paying attention to while not acting on or suppressing them might also prove effective in preventing performance disruptions.

There have been many successful applications of cognitive therapy techniques that focus on avoiding or changing intrusive thoughts as part of interventions toward reducing test anxiety and increasing test and academic performance. In one of the early studies, Holroyd (1976) systematically tested the impact of a cognitive and a behavioral therapy technique as well as their combination on test anxiety and academic performance of test-anxious college freshmen in a 7-week intervention. The two cognitive therapy techniques used in that study, cognitive restructuring and attentional skills training, focused on either changing or avoiding intrusive thoughts. Cognitive restructuring involved helping students identify intrusive thoughts, and subsequently challenge the logic of these thoughts. In the attentional skills training, students were encouraged to pay attention to test-relevant cues, while ignoring cues that will invoke intrusive thoughts. They were, for example, asked to skip difficult questions and to come back to them later after working on simpler ones. Behavioral technique was systematic desensitization that exposes individuals to graduated test-anxiety-provoking imagery while they are in a deeply relaxed state. Follow-up assessments showed reductions in test anxiety and increases in academic performance as compared with a control group for only those students who received the stand-alone cognitive therapy. Later, numerous studies have replicated the efficacy of cognitive restructuring and the attentional skills training, either in combination or each by itself, toward reducing test anxiety and improving academic and test performance (D’Elia, 1998; D’Alelio & Murray, 1981; Fields, 2006; Leal, Baxter, Martin, & Marx, 1981; Sapp, 1994; Thyer, Papsdorf, Himle, McCann, Caldwell, & Wickert, 1981; Wessel & Mersch, 1994; Wise & Haynes, 1983).
However, there are relatively few studies investigating the efficacy or the effectiveness of an alternative approach to intrusive thoughts: Acceptance (see e.g., Brown, Forman, Herbert, Hoffman, Yuen, & Goetter, 2011; Zettle, 2003). Acceptance of unwanted thoughts or emotions is a subcomponent of a larger concept of mindfulness, an effective approach in managing maladaptive thoughts and emotions (Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2008). Based on their extensive literature review and factor analysis as well as the internal and the external validation of empirical data from both clinical and non-clinical samples, Cardaciotto and colleagues (2008) have proposed that mindfulness can be best conceptualized as composed of two dimensions: Present-moment awareness and acceptance. Present-moment awareness is characterized by “continuous monitoring of the totality of experience” (Cardaciotto, et al., 2008, p. 205), and can be measured by the level of agreement with items such as “I am aware of what thoughts are passing through my mind” and “When I walk outside, I am aware of smells or how the air feels against my face”. Acceptance is defined as “experiencing events fully and without defense, as they are” (Hayes, 1994, p. 30), and can be measured by the degree of disagreement with items such as “I try to distract myself when I feel unpleasant emotions” and “I tell myself that I shouldn’t have certain thoughts”. Many mindfulness-based approaches have proved effective in treating negative emotional reactions and worrisome thoughts in psychotherapy settings such as those found in generalized anxiety disorder and depression (for a review see, Baer, 2003; Bishop, Lau, Shapiro et al., 2004; Fruzetti & Erikson, 2010; Herbert, Forman & England, 2008).

Adopting an acceptance strategy in response to intrusive thoughts is likely to have a positive impact on test performance. The suppression, which is the opposite of acceptance, of intrusive thoughts enhances the suppressed thoughts (Abramowitz et al., 2001). Increase in suppressed thoughts in turn can disrupt test performance (Hembree, 1988; Owens et al., 2008; Putwein et al., 2010; Seip, 1991). Therefore, adopting an acceptance strategy in response to intrusive thoughts is likely to create a positive impact on test performance. Evidence is extremely limited, however, on the efficacy or the effectiveness of an acceptance approach for controlling the disruptive effects of intrusive thoughts on test performance.

A pilot study investigated the effects of the present-moment awareness dimension of mindfulness on test anxiety (Paterniti, 2007). This study mainly focused on teaching present-moment awareness skills including mindful eating, yoga, sitting meditation, and body scan to college students. Compared to their pre-intervention state, participants' test anxiety and worry decreased significantly at the end of the intervention. However, in terms of reducing test anxiety the mindfulness intervention did not surpass another type of intervention that taught students note-taking skills and time management, a program that did not specifically target test anxiety. This study also did not assess test performance, and did not have an appropriate control group.

As for the efficacy of an acceptance approach, Zettle (2003) compared the effectiveness of acceptance and commitment therapy to that of systematic
desensitization and found both to be equally effective in reducing state test anxiety for math. Brown and colleagues (2011) further showed that acceptance-based behavior therapy (ABBT) was more effective than a traditional cognitive therapy (Beckian cognitive therapy) in increasing exam performance. None of these studies had a no-treatment control group.

The present study extends the evidence base for the efficacy of an acceptance approach for controlling test anxiety in two important ways. First, it compares its efficacy with that of an often-used, alternative strategy, avoiding the antecedents of these thoughts, as well as a no-treatment control condition. Second, it further tests the possibility of combining two seemingly incompatible strategies of managing intrusive thoughts, acceptance vs. avoidance. Although it is incompatible to accept (i.e., not to suppress) and to avoid (i.e., divert attention away from) intrusive thoughts at the same time, it may be possible to accept intrusive thoughts while also avoiding the environmental antecedents of these thoughts such as difficult questions (rather than the intrusive thoughts per se) that can invoke them. In fact, there is evidence to suggest that resisting environmental distractions activating task-interfering thoughts rely on different self-regulation processes from those involved in resisting the task-interfering thoughts per se – which are experienced internally (Friedman & Miyaki, 2004). For example, not being able to resist unwanted thoughts such as agreeing with statements like “I wish I could stop thinking of certain things” were shown to be independent of the ability/ inability to resist distractions from the environment. In one task that measures the resistance to distractions from the environment (Eriksen & Eriksen, 1974), for example, people are presented with a string of letters such as SSSHSSS and are required to ignore the letters flanking the central letter (Ss) and respond according to the central letter (H) as fast as possible. Performance on this task as well as on a number of similar ones was shown to be functionally independent of the ability to resist unwanted intrusive thoughts. Therefore, we expected that combining two presumably non-interfering strategies, the acceptance of intrusive thoughts, which is targeted at an internal psychological state (i.e., having intrusive thoughts) and the avoidance of the environmental antecedents of these thoughts, which is directed at relatively more external targets (i.e., difficult questions), should not be less, and may perhaps be, more efficacious than using the either strategy alone. Thus, it may be possible to incorporate acceptance techniques into treatment and intervention programs together with other, often-used techniques such as those that focus on attentional avoidance.

Briefly, in this study college freshmen who were about to take a multiple-choice, academic exam were randomly assigned to one of four groups to receive instructions on managing test anxiety. Three of those groups were instructed to either use an avoidance strategy when they encounter a difficult question (the avoidance group), use an acceptance strategy when they have intrusive thoughts (the acceptance group), or use an avoidance strategy in response to difficult questions and an acceptance strategy in response to intrusive thoughts (the combination group). The fourth group was not taught any new strategies
and was simply asked to use their own usual strategies to cope with intrusive thoughts, constituting the control condition.

To model the effects of using different strategies on test performance, we considered the prior evidence showing that the effect of test anxiety on test performance is mediated by whether people rely on a strategy to counteract the disruptive effects of test anxiety on test performance. Specifically, evidence suggests that test anxiety leads to both intrusive thoughts, which disrupt test performance, and the reliance on a strategy to minimize the disruptive effects of such thoughts on performance at the same time (Eysenck & Calvo, 1992; Calvo & Eysenck, 1996). For example, when people with relatively higher levels of test anxiety were prevented from relying on a compensatory strategy such as overtly articulating the items on a test, test anxiety disrupted test performance, but did not produce any such effect when people were not prevented from relying on compensatory strategies. Therefore, the more often the people with relatively higher levels of test anxiety rely on an effective strategy, the more the performance disruptions will be compensated for. To test such a mediation, therefore, before the exam we asked participants to complete a scale of test anxiety, and at the end of the exam to answer a question asking how much they relied on a strategy to control intrusive thoughts during the exam.

As strategy use is expected to counteract the disruptive effects of test anxiety on test performance, we, first, predicted that the more often people use an acceptance strategy, the more the performance disruptions that may be caused by the reliance on usual strategies in the control group will be compensated for. Second, using the avoidance together with the acceptance strategy should increase performance more than using the either strategy alone. Third, using either or both of the strategies as opposed to the usual strategies used by the control group should weaken the negative association between test anxiety and test performance.

**Method**

*Participants.* Participants were 87 college freshmen (59.6% female) with a mean age of 19.1 (SD = 1.8), who were enrolled in an introduction-to-psychology class. The participants were awarded a course credit for their participation.

*Materials.* Before the exam, participants completed the short-version of Spielberger, Gonzales, Taylor and colleagues’ (1980) Test Anxiety Inventory (Taylor & Deane, 2002), which was translated into Turkish by two Turkish native-speaker experts in agreement. There were five items relating to the emotionality (e.g., “During tests, I feel very tense”) and the worry aspects of test anxiety (e.g., “I seem to defeat myself while working on important tests”). The participants indicated their level of agreement with the items on a scale of 1 to 7, 1 indicating a lack of any, and 7 indicating very much agreement. The items had acceptable internal-reliability in the study sample (α = 0.80).

*Procedure.* The students were told that they could participate in a study investigating the efficacy of using different strategies for coping with test anxiety. Later, when they came to take the test, those who agreed to participate were given an informed consent form and a baseline questionnaire measuring demographics and test anxiety. After the completion of the baseline questionnaire, students were randomly assigned to one of four groups. The three
of those groups were experimental groups. The remaining group of participants constituted the control group. Each group was taken to a separate room one group at a time to receive instructions.

The experimental group receiving instructions on the avoidance strategy (i.e., the avoidance group) was told that intrusive thoughts during a test such as “I will fail the test”, “I am not smart”, or “No one will like me if I fail” can disrupt their test performance. They were further told that sometimes working on difficult questions can inadvertently bring such intrusive thoughts to mind. Therefore, regardless of whether or not a question invokes these thoughts in them, they were advised to skip a question if it is difficult and to come back to it later after working on simpler ones.

The group receiving instructions on an acceptance strategy (i.e., the acceptance group) was also told that intrusive thoughts can disrupt their test performance. Then, they were instructed to do the following any time they find themselves having intrusive thoughts during the test. First, they were asked not to suppress these thoughts such as trying to think something else or pretending that these thoughts do not exist because doing so they were told would further enhance these thoughts. To illustrate this point, they were asked not to think of a white bear and witness the difficulty of suppressing this thought. They were also asked to focus their attention on how the image of a white bear becomes even more vivid and frequent the harder they try not to think of such a thing.

Second, they were instructed not to pass any judgments about the truth or the falsity of intrusive thoughts. By way of demonstration, they were asked not to think of a white bear while also assuming that failing to do so indicates that they are not smart. The participants, then, tried to convince themselves that failing to suppress the thought of a white bear is not due to a flaw of intelligence. However, they all confirmed that the thought of their not being smart as well as a white bear did not dwindle as a result.

Third, they were encouraged to see intrusive thoughts as fleeting and non-essential, and realize that they do not have to do anything about them. To demonstrate this point, they were, first, asked not to think of a white bear, and a few seconds later, were asked not to think of a dark bear. The objective of this exercise was to show that any thought can be invoked and then replaced by others without a person’s own involvement. In the discussion, the participants all agreed that unwanted thoughts can be triggered without their own involvement, are not essentially theirs, and will automatically get replaced by other thoughts and images in time without them necessarily doing anything.

A third group of students received both the avoidance and the acceptance instructions (i.e., combination group), and were asked to use the avoidance strategy for difficult questions and the acceptance strategy for intrusive thoughts during the exam. Finally, the control group was also told that intrusive thoughts can disrupt their performance but was not taught any strategy on how to control their disruptive effects. They were simply asked to rely on whatever strategy they usually use to curtail the negative effects of intrusive thoughts on their performance.

Instructions took about 5 to 10 minutes to administer (about 40 minutes in total). In the next hour, the participants worked on the exam consisting of 25 multiple-choice questions, each with 5 alternative answers. After completing the exam, they answered a single question asking how often they relied on a strategy during the exam to control intrusive thoughts such as “I will fail the test, I am not smart, No one will like me if I fail” on a 1-to–7 scale ranging from not-at-all to very much.

Results

We used the SPSS statistics 17.0 package to analyze data. First, we checked the success of the randomization procedure. The groups did not differ from each other on their previous test performance and test anxiety, $F(3, 83) = .656, ns$; and, $F(3, 82) = .216, ns$, respectively.
Effect of strategy use. To see if different strategies affected test performance differently, we first ran a customized univariate ANCOVA on final exam scores that were converted to range from 0 to 100 with two independent variables: Strategy use, and group. Strategy use was the participants’ reported frequency of using a strategy to control intrusive thoughts during the test, a continuous variable ranging from 1 to 7, with higher values indicating more frequent strategy use. Strategy use was completely crossed with group that had four levels: The acceptance, the avoidance, the combination and the control group. However, we should also note here the analysis procedure was not the usual ANCOVA procedure which assumes that the covariate (i.e., strategy use) changes the same way across different groups. As there was a priori reason to expect that the effect of a strategy taught to a group is contingent upon how much people in this group rely on the strategy (Eysenck & Calvo, 1992; Calvo & Eysenck, 1996), we completely crossed the covariate (i.e., strategy use) with the independent variable (i.e., group), allowing for an interaction between two factors.

First, we checked the raw means. All the experimental groups had numerically greater exam scores (the avoidance: \( M = 61.84, SD = 26.88 \); the acceptance: \( M = 58.19, SD = 20.85 \); the combination: \( M = 62.5, SD = 20.48 \)) than the control group \( (M = 57.40, SD = 30.3) \). The overall ANCOVA revealed a significant effect for group, \( F(3, 79) = 3.75, p = .011 \). As shown in Figure 1 and confirmed by special contrasts, at the average level of strategy use \( (M = 4.7, SD = 1.73) \), the exam scores of the avoidance \( (M = 61.19, SE = 4.64) \), the acceptance \( (M = 57.94, SE = 4.35) \) and the combination group \( (M = 61.74, SE = 4.53) \) were significantly, greater than those of the control group \( (M = 31.56, SE = 10.36) \), \( F(1, 79) = 5.527, p = .021, \eta^2 = .07; F(1, 79) = 7.784, p = .007, \eta^2 = .09 \); and, \( F(1, 79) = 8.779, p = .004, \eta^2 = .10 \), respectively. None of the comparisons between the pairs of three experimental groups yielded statistically significant results. These results show that the same level of strategy use in each group resulted in a greater performance advantage for each experimental group as compared with the control.

![Figure 1. Exam scores at the average level of strategy use with error bars as a function of group](image-url)
There was a significant interaction between group and strategy use indicating that the performance of the groups with respect to each other changed differently depending on how often they relied on a strategy during the exam, \( F(3, 79) = 5.13, p = .003, \eta^2 = .15 \). To better understand this interaction, we ran three separate ANCOVAs on exam scores with the same factors (i.e., group and strategy use) by modifying the variable group this time to have two levels: The control group vs. each of the three experimental groups. The interaction between strategy use and group explained a significant proportion of variance in exam scores in each analysis, \( F(1, 31) = 8.49, p = .007, \eta^2 = .17 \); \( F(1, 33) = 14.811, p = .001, \eta^2 = .22 \); and \( F(1, 31) = 18.193, p < .001, \eta^2 = .28 \), for the models comparing the acceptance, the avoidance, and the combination with the control group, respectively. As shown in Figure 2, the more often the people in each of the experimental— including the acceptance— group relied on a strategy the more the simultaneous decrease in performance observed in the control group was compensated for. For demonstration purposes, we can split the data into two at the median score on strategy use for each group (avoidance: \( \text{Median} = 5, SD = 1.72 \); acceptance: \( \text{Median} = 5, SD = 1.76 \); combination: \( \text{Median} = 5, SD = 1.78 \); control: \( \text{Median} = 3, SD = 1.7 \)). The exam scores of those who relied on a strategy relatively more often than the others in a certain group had higher exam scores in each of the experimental groups (the avoidance: \( Ms = 56.58 \) vs. \( 67.64, SDs = 21.8 \) vs. \( 31.46 \); the acceptance: \( Ms = 52.93 \) vs. \( 64.75, SDs = 19.22 \) vs. \( 21.74 \); the combination: \( Ms = 60.82 \) vs. \( 66.06, SDs = 22.54 \) vs. \( 22 \) while having lower scores in the control group (\( Ms = 76.83 \) vs. \( 37.25, SDs = 15.43 \) vs. \( 7.73 \).

![Figure 2. Best-fit exam scores as a function of strategy use in each of the avoidance, the acceptance, the combination and the control, group, combined into one graph](image-url)
models comparing the avoidance, the acceptance and the combination with the control group, respectively. This finding shows that the increased reliance on a strategy in the control group was not successful in counteracting the simultaneous increase in performance disruptions. The lower-level effect of strategy use was not significant in the avoidance, the acceptance, and the combination group, $F(1, 31) = .286; ns; F(1, 33) = .945, ns$; and, $F(1, 31) = 1.09, ns$, respectively. Overall, the lower-level-effects analyses show that the more often people relied on a strategy in each of the experimental groups the more the simultaneous decrease in performance observed in the control group is counteracted by becoming non-significant. Similar comparisons between the pairs of experimental groups did not yield any significant interaction between strategy use and group, indicating that the performance in the combination group was not greater than the performance in the groups using the either strategy alone.

**Moderated-mediation of anxiety-performance link.** To analyze more comprehensively how much the strategies used in an experimental, as opposed to the control, group were useful in weakening the disruptive effects of test anxiety on test performance, we conducted a moderated-mediation analysis testing whether the disruptive effect of test anxiety on test performance is counteracted via strategy use differently depending on which strategy it was that people used. As test anxiety leads to performance disruptions and the strategy use to counteract these disruptions at the same time (Eysenck & Calvo, 1992; Calvo & Eysenck, 1996), the net, overall effect of test anxiety on test performance was not expected to be necessarily significant. In such cases it is still possible to conduct what is in the literature referred to as an *inconsistent mediation* analysis, which does not require that the overall effect of the independent variable, test anxiety in our case, on the dependent variable (i.e., exam scores) be significant (MacKinnon, Fairchild & Fritz, 2007; Paulhus, Robins, Trzesniewski & Tracy, 2004).

![Diagram](image.png)

*Figure 3. The moderation of the effect of anxiety via strategy use on exam scores in the combination group. The combination group was coded as 1 and the control group as 0. *: $p < .1; **: p < .05; ***: p < .01; ****: p < .001.*
We used Preacher and colleagues’ (Preacher, Rucker, & Hayes, 2007) moderated-mediation analysis (macros and scripts for common statistical packages are available at A. F. Haye’s http://www.afhayes.com/spss-sas-and-mplus-macros-and-code.html). The moderated-mediation analysis allows one to calculate and test the indirect effect of an independent variable (e.g., anxiety) via a mediator (e.g., strategy use) on a dependent variable (e.g., exam scores) at different levels of a moderator (e.g., group). Anxiety was the participants’ scores on the short form of Test Anxiety Inventory (Taylor & Deane, 2002). Group, coded as binary (each experimental vs. the control group), was hypothesized to be moderating the effect of anxiety on strategy use as well as the effect of strategy use on test performance. We tested three separate moderated-mediation models, comparing each experimental, with the control, group. The results showed that anxiety had a marginal, indirect effect, which was negative, via strategy use on test performance in the control group in the models comparing the avoidance and the acceptance with the control group, and a significant and negative, indirect effect in the model comparing the combination, with the control, group,

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\text{Conditional Indirect Effect} = -0.52, SE = .22, z = 1.736, p = .083; \text{ Conditional Indirect Effect} = -0.52, SE = .29, z = 1.725, p = .084; \text{ and, Conditional Indirect Effect} = -0.52, SE = .22, z = 2.337, p = .019, \text{ respectively.}
\]

These negative effects of anxiety via strategy use on performance were reduced, becoming non-significant in the avoidance, the acceptance, and the combination group,

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\text{Conditional Indirect Effect} = .01, SE = .08, z = .146, ns; \text{ Conditional Indirect Effect} = .05, SE = .06, z = .906, ns; \text{ and, Conditional Indirect Effect} = -.06, SE = .07, z = .822, ns, \text{ respectively.}
\]

In other words, the strategy use in each experimental group counteracted the negative effect of anxiety on performance in the control group. As shown in Figure 3 for the comparison of the combination with the control group, in the control group (i.e., at group = 0), anxiety led to greater strategy use, \( \beta = .781, t(31) = 3.068, p = .005, R^2 = .24. \) The strategy use in that group, in turn, did not counteract the parallel, negative effect of test anxiety on test performance, producing an overall, negative effect on exam scores, \( \beta = -.884, t(31) = 4.608, p < .001, R^2 = .41. \) In the combination group (i.e., at group = 1), anxiety significantly decreased the overall strategy use in that group most probably due to decreasing the use of inefficient strategies such as those used by the control group, \( \beta = -1.423, t(31) = 3.162, p = .004, R^2 = .25. \) As a result of this decrease in the inefficient strategy use, the use of efficient strategies in the combination group increased exam scores, \( \beta = 2.157, t(31) = 4.76, p < .001, R^2 = .42. \) In sum, anxiety in the combination group decreased the reliance on strategies that do not counteract performance disruptions, leading to a positive relationship between strategy use and exam scores in that group. As a result, the negative effect of anxiety on test performance observed in the control group was reduced in the combination group by becoming non-significant. The avoidance strategy by itself and the acceptance strategy by itself, as shown in Figure 4 and 5, counteracted only a marginal, negative effect of anxiety on test performance, showing that the combination of the two strategies was effective in counteracting a stronger effect of anxiety on performance as compared with the either strategy used alone.
DISCUSSION

The prior research has shown that the detrimental effects of test anxiety on test performance can be successfully minimized by changing or avoiding intrusive thoughts as undertaken by cognitive-restructuring and attentional-skills-training programs (D’Elia, 1998; D’Alelio & Murray, 1981; Fields, 2006; Holroyd, 1976; Leal et al., 1981; Sapp, 1994; Thyer, et al. 1981; Wessel &
The results from this study show that an alternative strategy, accepting intrusive thoughts, can also be effective in counteracting the disruptive effects of test anxiety on test performance.

**Efficacy of acceptance.** The more often the participants in this study relied on a strategy to control intrusive thoughts in an experimental—in the acceptance—group, the more the simultaneous increase in performance disruptions observed in the control group were compensated for. The same level of strategy use in each experimental—including the acceptance—group, as opposed to the control, also led to a better performance. These results suggest that the acceptance of intrusive thoughts can be as efficacious toward restoring performance as avoiding the antecedents of these thoughts. Therefore, it is not solely intrusive thoughts *per se* that disrupt test performance, and therefore, need to be changed or avoided to boost performance. Intrusive thoughts can also disrupt test performance when people suppress, or do not accept, them.

From a cognitive-processes viewpoint, worrisome thoughts caused by test anxiety reduce the limited capacity of working-memory, which would normally be allocated to remembering and making judgments about the relevant facts assessed on a test (Ashcraft & Kirk, 2001; Beilock & Carr, 2005; Owens et al., 2008). This, in turn, may decrease test performance if people are prevented from using compensatory strategies that will reduce the impact of such thoughts on test performance (Eysenck & Calvo, 1992; Calvo & Eysenck, 1996). Our results confirmed this account. Test anxiety increased the use of strategies to control intrusive thoughts in the control group in general in all the models testing the moderated, indirect effect of test anxiety on test performance. Relying on a strategy in an experimental, as opposed to the control, group, in turn, increased the performance either marginally or significantly in all the models.

Given that the negative effect of test anxiety on test performance is due to the working memory overload, and that our results confirmed that the use of an experimental strategy—including the acceptance strategy—reduces the negative effect of test anxiety on test performance, our results are likely to relate to the functioning of working memory. Acceptance may be preventing intrusive thoughts from increasing in intensity and frequency, thus from overloading working memory further (Abramowitz, et al., 2001). Similarly, avoiding the antecedents of intrusive thoughts might be preventing intrusive thoughts from being invoked by these antecedents, freeing up the working memory resources that would, otherwise, be engaged by these thoughts.

Regardless of the specific ways in which the tested strategies helped the working memory better function, the results are clear in showing that these strategies help improve performance, and can be incorporated into intervention programs. Given the suggestion that cognitive restructuring, an often-used strategy for reducing test anxiety, can sometimes lead to the suppression of to-be-changed thoughts (Hayes, 2008), teaching skills in test-anxiety interventions to distinguish clearly between the suppression, on one hand, and the change and the avoidance, on the other, of intrusive thoughts may be useful. More
generally, by taking into consideration that it is not only intrusive thoughts *per se* but also the suppression of these thoughts that can disrupt test performance, a myriad of new techniques can be incorporated into test-anxiety treatments and interventions.

**Combining acceptance and avoidance strategies.** Regarding the efficacy of combining an acceptance and an avoidance strategy, the results were not clear. Combining the avoidance with the acceptance strategy did not improve test performance over and above what was achieved by utilizing the either strategy by itself. However, it is possible that this observation is due to a ceiling effect such that test performance could not have been increased in the combination group any more than what was already achieved by using either the avoidance or the acceptance strategy alone. Further research is needed to systematically investigate the added effectiveness of combining acceptance and avoidance strategies.

However, combining the avoidance with the acceptance strategy did not wipe out the advantage of using either the acceptance or the avoidance strategy by itself over the default strategies used by the control group. Furthermore, the combination of the two strategies counteracted a stronger, negative effect of test anxiety on test performance. Thus, there was some evidence that the combination of an acceptance and an avoidance strategy may be possible without the two strategies interfering with each other. Specifically, using an acceptance strategy in response to intrusive thoughts together with an avoidance strategy in response to the environmental antecedents of these thoughts does not destroy the performance advantage gained from using the either type of strategy alone. Future studies can investigate if a similar combination is possible with cognitive restructuring. For example, it remains to be seen whether encouraging people to see difficult questions as a challenge for self-improvement, a strategy which was repeatedly shown to improve task performance (i.e., mastery orientation; see e.g., Dweck, 1986), as opposed to a test of intelligence (i.e., performance orientation) can be promoted together with approaching intrusive thoughts with acceptance at the same time.

**Limitations.** One limitation of the present study is that the acceptance strategy as implemented in this study did not fully capture all the essential characteristics of acceptance techniques as promoted in clinical and intervention contexts. For example, acceptance also requires that people, to a certain degree, seek contact with the *situations* that trigger unwanted thoughts and emotions (Herbert et al., 2008). Therefore, the acceptance technique can also be implemented in response to external environments, not only internal states as tested in this study. However, the results showed that even when only used in response to internal states, it can still benefit performance. Another limitation was that participants in the combination group used two strategies rather than one as in the other groups. Thus, the combination group might have been forced to use a greater number of strategies in general. More objective measures of how often people
use a strategy are needed to control for this aspect of strategy use as part of the future studies.

In concluding, the results of this study are important for the adaptation of people with high levels of test anxiety. They identify the acceptance of intrusive thoughts as one strategy with which the disruptive effects of test anxiety can be minimized in performance evaluation contexts. Furthermore, given the ubiquity of these contexts in people’s lives, brief interventions such as the one presented here may prove especially practical for such occasions.

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