The Causal Effect of Happiness and Fear on Test Scores*

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Abstract: While emotional states are widely correlated with academic performance, causal evidence remains limited. We investigate the causal effect of incidental emotions on verbal test performance using a laboratory experiment with undergraduate students. Participants were randomly assigned to either a Fear, Happiness, or Neutral condition induced through immersive virtual-reality videos immediately prior to completing a timed SAT-style verbal test. While the Happiness manipulation did not significantly alter emotional state, Fear was successfully induced. Fear induction increased verbal test scores overall, with effects concentrated among non-native English speakers and male participants. We do not observe performance gains for native speakers or female participants despite successful Fear induction within these groups. Personality traits do not predict test scores. These findings contrast with prior evidence from an SAT-style mathematics test, suggesting that emotions interact with academic performance in domain-specific ways. Moreover, it appears that emotional effects differ sharply between advantaged and disadvantaged test takers, which highlights the importance of context and heterogeneity in understanding the psychology of academic performance.

1. Introduction

Academic performance is subject to many influences, some quite proximate in nature. A good night's sleep (Curcio and De Gennaro, 2006; Dewald, J. F., et al. 2010), good weather (Goodman et al. 2018; Park et al. 2020), and a nutritious breakfast (Hoyland and Lawton, 2009; Adolphus and Dye, 2013) all correlate with test performance. One factor that has been shown to correlate with test scores is the emotional state of the test taker. Studies have found a negative correlation between anxiety and test score (Steinmeyr et al. 2016; Von der Embse et al. 2015; Foley et al. 2017). Subjective well-being, or life satisfaction, is correlated with better scholastic performance (Valiente et al., 2012; Gilman and Huebner, 2006; Quinn and Duckworth, 2007; Verkuyten and Thijs, 2002; Proctor et al., 2010: Crede et al., 2015). However, these relationships are endogenous, limiting a causal interpretation in the absence of credible exogenous variation. The test-taking

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situation may induce, on average, greater fear among individuals already likely to perform poorly and greater happiness may be present among those already likely to perform well.

Noussair and Seaback (2023) report the first causal evidence of the effect of emotional state on test scores. They observe that inducing a happy emotional state immediately before a SAT-style *mathematics* test improves test performance. The estimated effect size is 0.46 standard deviations overall and 0.75 standard deviations for women. Inducing fear, in contrast, does not significantly affect test scores. However, there are reasons to suspect that the effect of emotions on verbal tests may differ from that on mathematics. Neuroimaging evidence shows that mathematical and verbal problem-solving recruit partially distinct brain regions, reflecting differences in underlying cognitive processes (Dehaene et al. 1999; Dehaene et al. 2003; Fedorenko et al. 2011). Overall, the correlation between mathematical and verbal SAT scores is moderate, typically ranging between 0.4 and 0.7 (Lubinski et al., 2001; Park et al., 2001, 2007), indicating that the two types of test measure related but distinct types of proficiency. The verbal test is characterized by large performance differences by mother tongue, placing non-native speakers at a considerable disadvantage, whereas mathematics tests do not have this feature.

In this paper, we examine whether a quick intervention to alter emotional state lasting a few minutes can improve performance on SAT-style verbal test. The strategy we adopt is similar to Noussair and Seaback (2023). Our data show that inducing fear improves the performance of non-native speakers, but not that of native speakers. Taken together with the results of Noussair and Seaback (2023), these findings suggest that (1) emotions interact with test performance in different ways depending on the type of test, and (2) the impact of emotions differ sharply between disadvantaged and advantaged test takers.

2. Material and Methods

2.1. Experimental Design

The experiment was conducted at the Economic Science Laboratory (ESL) at the University of Arizona, located in Tucson, Arizona, USA. It consisted of several sessions held between 2023 and 2025. All participants were undergraduate students enrolled at the University. Of the 171 participants, 85 self-identified as male and 81 as female. 68 indicated that they did not speak

English at home before they started at the university.[1] Students were assigned to one of three treatments: Happiness (59 participants), Neutrality (53 participants) or Fear (59 participants). Between two and eight subject participated in each session and no subjects participated more than once. Participants could not communicate with each other during the session. There were no other tasks conducted in the session, either before or after those described here.

At the beginning of a session, subjects viewed a video through a wireless Oculus Quest virtual reality headset for approximately 5 – 6 minutes.[2] The videos were intended to induce either a state of Happiness, Fear or Neutrality (no change in emotional state). The videos are filmed from the perspective of a person inside the video and displayed in 360 degrees to immerse the viewer. Participants were informed that they would be receiving a base pay of $5 just for participating in the experiment, which took approximately an hour.

Participants completed an abbreviated PANAS-X (Watson et al., 1988) questionnaire immediately after watching the video, allowing us to measure their emotional state. They were then given a timed SAT-style verbal test displayed on the computers at their desks. They had 30 minutes to answer 24 SAT questions, by writing down their responses on a sheet of paper. It was explained that they would receive $1 for each correct answer, with no penalty for incorrect answers. The questions were taken from old SAT tests published in a SAT preparation book. There were two versions of the test, each used in different sessions. 69 and 102 participants took tests 1 and 2, respectively. The average score was 18.07/24 on Test 1 and 12.36/24 on Test 2. Earnings averaged $19.67 US for a 60-minute session (including the $5 payment for participating in the experiment).

After 30 minutes, the exams were then collected by the experimenters and graded. During the time that the tests were being graded, participants completed the Big-5 personality questionnaire (Goldberg, 1990) and a demographic survey. They were then paid privately and asked to leave the laboratory. The questionnaire and survey can be found in online appendix A.

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[1] We use the language spoken at home to classify individuals as native or non-native speakers. We also gathered two other highly correlated measures, the language of instruction in their high school and whether or not they were born in the United States. Conducting the analysis with these measures of language proficiency yields nearly identical results to those we present in Section 3. These analyses are included in the online appendix.

[2] The videos inducing Happiness and Fear were roughly three minutes long and subjects viewed them twice. The video inducing Neutrality was roughly six minutes in length and was shown once. The video inducing Happiness can be found at https://www.youtube.com/watch?v=MKWWhf8RAV8, the one for Fear at https://www.youtube.com/watch?v=JtAzMFcUQ90, and the video for the Neutral treatment at https://www.youtube.com/watch?v=SmhuzTzUKQY.

The treatment groups differed from each other only in the emotion that was induced at the beginning of the session. The video shown in the Neutral treatment (control group) was a simple video of a tulip field on a sunny day. The video inducing a state of Happiness showed the participant as a surfer in the South Pacific. Fear was induced with a video taken from the viewpoint of an individual walking a tightrope over a canyon several hundred feet deep. The same videos have previously been successfully employed to induce the same emotions in the studies of Medai and Noussair (2021), Nguyen and Noussair (2022) and Noussair and Seaback (2023).

2.2. Manipulation and Balance checks

The purpose of the manipulation check is twofold. The first is to determine whether our attempted induction of the emotional states of Happiness and Fear was successful. Second, an equally important identification concern is whether the treatments altered emotional states other than the intended emotional states of Happiness and Fear. If so, these changes would confound the estimated treatment effect.

The data from the PANAS-X survey, administered right after the videos were shown, indicate that only the Fear video was successful in creating the intended emotions, whereas the Happiness video was not. The average values of the five emotional states measured in the survey is given in Table 1. The feasible range of each measure is from 1 – 5. Each individual participant constitutes one independent observation. The p-values of the two pooled variance *t*-tests of interest are reported in the final two columns. The key tests are whether the Happiness video induced greater expressed Joviality than the Neutral condition and whether the Fear video induced greater expressed Fear than Neutral condition. The data show that the Happiness video led to greater Joviality, although the effect is not statistically significant ($p = 0.153$). The Fear video did create significantly greater expressed Fear ($p < 0.001$). There are no significant differences between the Happiness and Neutral conditions for any of the other emotion indices measured in the survey: Sadness, Attentiveness, and Hostility. In contrast, Hostility is higher in the Fear treatment, and as a robustness check, we account for this in the supplemental analysis reported in Appendix B.

Table 1: Manipulation and Balance Checks

	Treatment		
Emotions	**Neutral**	**Happiness**	**Fear**
Joviality	2.755 (.119)	2.934 (.131), p = .153	2.398 (.137), p = .054
Fear	1.347 (.075)	1.549 (.080), p = .070	**2.041 (.118), p < .0000**
Hostility	1.193 (.057)	1.263 (.063), p = .422	**1.419 (.080), p = .026**
Sadness	1.495 (.096)	1.487 (.085), p = .950	1.576 (.101), p = .563
Attentiveness	2.878 (.123)	3.165 (.123), p = .118	3.157 (.127), p = .102
Demographic			
Male	0.396 (.067)	0.559 (.065), p = .086	0.525 (.066), p = .174
Female	0.585 (.068)	0.389 (.064), p = .394	0.458 (.065), p = .182
Not English School (%)	0.358 (.067)	0.356 (.068), p = .978	0.475 (.063), p = .218
Personality			
Openness	3.309 (.079)	3.559 (.075), p = .215	**3.493 (.088), p = .023**
Extraversion	3.281 (.117)	3.360 (.097), p = .411	3.157 (.096), p = .600
Neuroticism	2.936 (.098)	2.945 (.113), p = .954	2.847 (.095), p = .517
Agreeableness	3.813 (.077)	3.706 (.079), p = .334	3.678 (.065). p = .176
Conscientiousness	3.407 (.089)	3.580 (.082), p = .156	3.618 (.075), p = .071
N	**53**	**59**	**59**

Note: Data are means of the variables. Parentheses indicate the standard error of the mean. Comparisons are between the values in the Neutral treatment and either the Happiness or Fear treatments. Comparisons significant at $p < .05$ are indicated in bold. Definitions of the variables are provided in Table B1 in the Appendix.

Table 1 also reports balance tests for the proportions of men and women, those who attended a high school with English as a principal language of instruction, as well as the mean score on each personality dimensions. The only statistically significant difference between the Neutral condition and either of other two treatments is a higher level of Openness among participants in the Fear treatment. We provide estimates controlling for this potential confound in Appendix B. However, after applying a Bonferroni correction of 1/28 to account for multiple tests, the only difference that remains statistically significant is the effect of the Fear Treatment on Fear, which is the intended effect of the video. Because Joviality was not successfully induced, we report results only for the effect of fear.

2.3. Empirical Strategies and Models

To estimate the causal effect of emotional induction on verbal test performance, we exploit the randomized assignment of participants to the Fear, Happiness, or Neutral treatment conditions.

Because treatment assignment is random, differences in the test performance scores across groups can be interpreted as causal under standard assumptions of experimental balance and compliance. Our primary empirical specification estimates the effect of the emotion treatments on test performance using ordinary least squares (OLS):

$$Score_i = \alpha + \beta_1 Fear_i + \beta_2 Happy_i + \gamma X_i + \varepsilon_i$$

where $Score_i$ denotes the number of correct answers obtained by participant i on the SAT-style verbal test. $Fear_i$ and $Happy_i$ are indicator variables for assignment to the Fear and Happiness treatments respectively, with the Neutral condition serving as the omitted reference category. The vector X_i contains control variables included to improve precision and account for any residual imbalance across treatment groups. All specifications are estimated using OLS with heteroskedasticity-robust standard errors. Each participant constitutes one independent observation.

We report specifications both with and without additional controls. The extended specifications include gender, whether English is spoken at their family home (native-language indicator), and Big-Five personality measures (openness, extraversion, agreeableness, neuroticism, conscientiousness). These controls are not required for identification because treatment is randomly assigned, but they improve precision and account for small observable differences across groups.

To examine heterogeneity in treatment effects, we estimate the same regression model on subsamples defined by language background and gender. Specifically, separate regressions are estimated for Native English speakers, Non-native English speakers, Female participants, and Male participants. This approach allows treatment effects to vary freely across groups without imposing functional-form assumptions about interactions.

The causal interpretation of the treatment coefficients relies on the randomized design and is supported by the balance tests reported in Table 1. Manipulation checks using PANAS-X responses confirm that the Fear treatment successfully induced fear without systematically altering most other emotional dimensions. Because the Happiness manipulation did not significantly increase joviality relative to the Neutral condition, the empirical analysis focuses on the causal effect of fear.

The Online Appendix provides additional analyses. First, we estimate Poisson count regression models corresponding to the OLS specifications reported in Table 2, reflecting the discrete nature of the test score outcome. Second, we present specifications that include Hostility and Openness as additional controls, since these variables differ slightly between treatments in unadjusted comparisons. These alternative specifications do not alter the substantive results reported here. Third, we include two alternative measures of background in the English language, whether the high school the participant attended used English as the language of instruction, and whether the participant was born in the United States. Finally, we include OLS specifications in which a dummy variable is included for the second version of the test. In all cases, the results with regard to treatment effects and the subgroups affected by the Fear treatment are highly similar.

3. Results

Table 2 displays our results regarding the treatment effects on test scores. The specification is OLS with estimated standard errors corrected for heteroscedasticity. Several prominent patterns appear in the table. First, the Fear Treatment tends to raise test scores. Subsample estimates show that the effect is statistically significant for those who do not speak English at home and for males. Second, the Happiness Treatment had no effect on test score, which may reflect the treatment's failure to induce Joviality relative to the Neutral condition. Third, personality characteristics are uncorrelated with test performance. Fourth, as expected, participants who speak English at home perform substantially better on the test.

There are two possible interpretations of the results in Table 2. The first is that inducing fear improves test scores for all individuals, but that fear was successfully induced only among males and non-native speakers. The second is that fear increases test scores only for males and non-native speakers. Table 3 shows that the latter is the case. The fear manipulation was successful across all subgroups and was, in fact, relatively more successful for women and native speakers. However, despite the successful induction of fear, test scores did not increase for women or for native English speakers.

Table 2: Treatment Effects on Test Scores

	Dependent Variable: Test Score						
	Full Sample	Full Sample	English at Home	No English at Home	No English at Home	Female	Male
Happy Treatment	0.552 (0.864)	0.409 (0.900)	0.104 (0.200)	1.194 (1.263)	0.883 (1.361)	-0.210 (1.237)	1.396 (1.480)
Fear Treatment	1.640^{+} (0.882)	1.564^{+} (0.899)	0.469 (1.207)	3.252* (1.330)	2.967* (1.289)	-0.014 (1.184)	3.684* (1.501)
Female	-0.545 (0.710)	-0.802 (0.755)	-0.803 (1.062)	-0.611 (1.107)	-1.025 (1.134)		
English at home	5.28*** (0.697)	5.47*** (0.714)				5.10*** (1.047)	6.290*** (1.024)
Openness		0.874 (0.611)	0.755 (0.754)		0.704 (1.094)	-0.194 (0.833)	1.923* (0.934)
Extraversion		-0.434 (0.440)	-0.271 (0.509)		-0.904 (0.852)	-0.232 (0.628)	-0.826 (0.607)
Agreeableness		0.530 (0.677)	-0.206 (0.790)		1.715 (1.183)	0.078 (0.998)	0.833 (1.017)
Neuroticism		0.355 (0.498)	0.380 (0.645)		0.508 (.840)	0.352 (0.719)	-0.182 (0.862)
Conscientiousness		-0.216 (0.626)	-0.480 (0.780)		0.247 (1.088)	-0.020 (0.878)	-1.073 (1.033)
Constant	10.98*** (0.855)	7.22^{+} (4.05)	16.62*** (5.354)	10.15*** (1.013)	2.253 (6.425)	11.43^{+} (5.96)	6.395 (7.313)
R^2	0.253	0.252	0.035	0.093	0.144	0.245	0.377
N	171	171	103	68	68	81	85

Note: + denotes $p < 0.1$, * signifies $p < 0.05$, *** is $p < 0.005$.

Table 3: Treatment Effect of Fear Induction on Subgroups of Participants

	Females only	Males only	Speak English at Home	No English at Home
Fear treatment	2.378 (.192)	1.710 (.123)	2.006 (.144)	2.079 (.193)
Neutral treatment	1.342 (,105)	1.343 (.111)	1.229 (.075)	1.558 (.152)
Fear (F) – Neutral (N)	1.036	0.267	0.777	0.521
t-test (F ≤ N)	p < .0001	p = .021	p < .0001	p = .028

Note: Data in first two rows are means of the variables. Parentheses indicate the standard error of the mean. The third row if the difference in the mean between the Fear and Neutral treatments. The fourth row of data contains the results of t-tests of treatment differences.

4. Discussion

This study provides causal evidence that incidental emotions affect verbal test performance in ways that are both task-specific and group-specific. We find that inducing fear immediately prior to a verbal test increases performance overall, with statistically significant effects concentrated among those who do not speak English at home and male participants. These effects emerge despite successful fear induction across all subgroups, indicating that emotional experience alone does not determine outcomes. Rather, performance depends on how individuals cognitively and behaviorally respond to the emotion.

4.1. Emotion, Arousal, and Cognitive Performance

A large literature in psychology links emotional states to cognitive performance through mechanisms such as arousal, attentional focus, and working memory capacity. Negative emotional states, particularly anxiety and fear, are often associated with poorer academic outcomes when they disrupt executive control or working memory processes (Steinmayr et al., 2016; Von der Embse et al., 2017). However, this relationship is not monotonic. Moderate arousal may enhance vigilance, persistence, and task engagement, especially in demanding or time-pressured contexts, while excessive arousal impairs performance.

Our findings are consistent with this perspective. Fear induction appears to have raised arousal toward a performance-enhancing range for some participants rather than impairing cognition. This interpretation aligns with evidence that stress and anxiety can either hinder or facilitate performance depending on task demands, motivation, and baseline difficulty (Wang et al., 2015). The results underscore the importance of distinguishing between debilitating anxiety and functional arousal that enhances focus and effort.

4.2. Fear versus Test Anxiety

Much of the existing literature documents a negative correlation between test anxiety and academic performance (Foley et al., 2017; Von der Embse et al., 2017). Similarly, subjective well-being and life satisfaction are positively correlated with scholastic achievement (Valiente et al., 2012; Crede et al., 2015). However, these relationships may be endogenous: students who anticipate poor performance may experience greater anxiety, while those who expect to perform well may report greater well-being.

This study overcomes this limitation by experimentally inducing emotion immediately prior to testing, independent of beliefs about ability or expected outcomes. The fear induced in our design is incidental and short-lived rather than anticipatory or evaluative. As a result, the observed performance effects can be interpreted causally. The finding that fear improves performance for certain groups highlights the limitations of relying solely on correlational evidence when studying emotion–performance relationships and the importance of context (e.g., mathematics vs. verbal tests) and heterogeneity in understanding the psychology of academic performance.

4.3. Why Emotional Effects Differ Between Verbal and Mathematical Tests

The contrast between the present findings and prior results for mathematics testing highlights the domain specificity of emotional effects. Noussair and Seaback (2023) find that happiness improves scores on a SAT-style mathematics test, while fear has no effect. In the current study, fear improves scores on SAT-style verbal test, whereas happiness has no significant effect. These divergent patterns suggest that emotions interact with task-specific cognitive processes rather than producing uniform effects.

Neurocognitive evidence indicates that verbal and mathematical reasoning rely on partially distinct brain systems and cognitive mechanisms (Dehaene et al., 1999; Dehaene et al., 2003; Fedorenko et al., 2011). Verbal tests place heavier demands on language comprehension, semantic processing, and sustained attention, while mathematical tests emphasize abstraction and problem-solving strategies less dependent on linguistic fluency. Therefore, emotional arousal may enhance performance in verbal tasks by increasing focus and persistence, while mathematical performance may benefit more from positive affect through increased cognitive flexibility.

4.4. Emotional Arousal and Linguistic Disadvantage

One of the main contributions of this study is the identification of strong heterogeneity by language background. Participants who did not speak English at home performed substantially worse on the verbal test, reflecting the additional cognitive demands of second-language processing. For this group, fear induction led to significant performance improvements. The effect was robust to considering whether the participant had English as their language of instruction in high school. However, the effect was not significant based on whether one was born in the US, indicating that

the improvement in performance from fear induction did not have to do with being a foreign student per se, but rather with the level of background in the English language.

One interpretation is that fear-induced arousal increases attentional control or effort, partially compensating for the additional cognitive load imposed by language comprehension. Prior research suggests that emotional states can differentially affect performance depending on baseline difficulty and motivation (Steinmayr et al., 2016; Wang et al., 2015). In contrast, native English speakers, who face fewer linguistic constraints, may already operate near an optimal level of engagement, leaving limited scope for fear-induced gains. These findings indicate that emotional arousal interacts with structural disadvantage rather than having uniform effects across individuals.

4.5. Gender Differences in Emotional Effects on Performance

Although the fear induction was successful for both men and women, performance gains were observed only for male participants. This pattern highlights the distinction between emotional experience and performance outcomes. Prior studies suggest that stress and evaluative pressure may more strongly disrupt working memory and test performance among women, particularly in academic settings (Foley et al., 2017; Von der Embse et al., 2017).

Importantly, our results indicate that gender differences do not arise from differential emotional states but from how fear translates into cognitive or behavioral responses during testing. This distinction reinforces the need to examine downstream mechanisms, such as strategy selection, attentional control, or effort, rather than emotional intensity alone when interpreting gender differences in academic performance.

4.6. Methodological Considerations and Limitations

The use of immersive virtual-reality (VR) videos to induce emotion is a methodological strength of our study. VR allows for standardized, emotionally evocative stimuli with high validity while maintaining experimental control. The short duration of the intervention enables isolation of immediate emotional effects on performance, minimizing confounds associated with longer-term mood or personality traits.

However, there are at least two limitations that we must acknowledge here. First, the happiness manipulation did not significantly increase Joviality relative to the neutral condition as

intended, limiting conclusions about the effects of positive emotion on verbal performance. Second, the emotion manipulation was short-lived, and longer-lasting emotional states may operate through different channels. One of the future areas of research is to examine whether emotional regulation strategies can replicate the beneficial aspects of arousal without its potential costs.

5. Conclusion

This study provides causal evidence that incidental emotions can influence verbal test performance, but these effects are neither uniform nor symmetric across individuals. Using an experimental design with immersive virtual-reality emotion induction, we find that fear, when induced immediately prior to testing, raises verbal test scores. Crucially, this effect is concentrated among non-native English speakers and male participants, while no performance gains are observed for native speakers or female participants, despite successful emotional induction across all groups.

These findings highlight two broader conclusions. First, the impact of emotions on cognitive performance is domain-specific: fear improves verbal performance but contrasts sharply with earlier evidence showing no effect of fear on mathematics performance. Second, emotional effects are highly heterogeneous, interacting with individual disadvantage and task demands. Emotional states commonly viewed as detrimental may, under certain conditions, enhance performance for groups facing greater cognitive or contextual constraints.

Overall, the results underscore the importance of moving beyond average treatment effects when studying emotions and performance. Understanding when, how, and for whom emotions matter is essential for both theory and the design of interventions aimed at improving academic outcomes.

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Online Appendix

We include two Appendices. Appendix A contains some of the materials used in the experiment. In Appendix A1, we reprint the abbreviated PANAS-X survey that we used in the experiment to verify that our emotion induction was successful. Appendices A2 and A3 are the personality questionnaire, and the demographic survey administered at the end of the experimental sessions. Appendix B consists of a number of supplementary tables reporting regression specifications mentioned in the text.

Appendix A1. The Abbreviated PANAS-X survey

Treatment:_____ **ID # _____**

This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way right now. Use the following scale to record your answers:

1	2	3	4	5
Very Slightly	A Little	Moderately	Quite a Bit	Extremely
Afraid __	Angry __	Shaky __	Nervous __	Attentive __
Calm __	Determined__	Alert __	Excited __	Concentrating __
Frightened __	Irritable __	Downhearted __	Enthusiastic __	Hostile __
Cheerful __	Disgusted __	Happy __	Energetic __	Scared __
Lonely __	Joyful __	Sad __	Alone__	Relaxed __

Appendix A2. Personality Questionnaire

Treatment:_____ **ID#**_____

Instructions: Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who *likes to spend time with others*? Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement.

1 Disagree strongly	2 Disagree a little	3 Neither agree nor disagree	4 Agree a little	5 Agree strongly

I see myself as someone who ..

1. ____ Is talkative
2. ____ Tends to find fault with others
3. ____ Does a thorough job
4. ____ Is depressed, blue
5. ____ Is original, comes up with new ideas
6. ____ Is reserved
7. ____ Is helpful and unselfish with others
8. ____ Can be somewhat careless
9. ____ Is relaxed, handles stress well
10. ____ Is curious about many different things
11. ____ Is full of energy
12. ____ Starts quarrels with others
13. ____ Is a reliable worker
14. ____ Can be tense
15. ____ Is ingenious, a deep thinker
16. ____ Generates a lot of enthusiasm
17. ____ Has a forgiving nature
18. ____ Tends to be disorganized
19. ____ Worries a lot
20. ____ Has an active imagination
21. ____ Tends to be quiet
22. ____ Is generally trusting
23. ____ Tends to be lazy
24. ____ Is emotionally stable, not easily upset
25. ____ Is inventive
26. ____ Has an assertive personality
27. ____ Can be cold and aloof
28. ____ Perseveres until the task is finished
29. ____ Can be moody
30. ____ Values artistic, aesthetic experiences
31. ____ Is sometimes shy, inhibited
32. ____ Is considerate and kind to almost everyone
33. ____ Does things efficiently
34. ____ Remains calm in tense situations
35. ____ Prefers work that is routine
36. ____ Is outgoing, sociable
37. ____ Is sometimes rude to others
38. ____ Makes plans and follows through with them
39. ____ Gets nervous easily
40. ____ Likes to reflect, play with ideas
41. ____ Has few artistic interests
42. ____ Likes to cooperate with others
43. ____ Is easily distracted
44. ____ Is sophisticated in art, music, or literature

Please check: Did you write a number in front of each statement?

Appendix A3. Demographic Questionnaire

Treatment:_____ **ID #** _____

Please answer all of the following questions:

1. What is your major?
2. What is your gender?

   Female _____ Male _____ Other _____ Do not wish to answer _____

3. In which country were you born?
4. Which language(s) do you speak at home with your parents?
5. What was the principal language of your high school?
6. What is your status at the university?

   Freshman _____ Sophomore _____ Junior _____ Senior _____

Appendix B: Additional Estimated Specifications

Table B1. Definitions of Variables

Variables	Definition	Measurement/Scale
Emotions		
Joviality	(Happy + Joyful + Cheerful + Excited + Enthusiastic + Energetic)/6	1 - 5
Fear	(Afraid + Scared + Shaky + Frightened + Nervous)/5	1 – 5
Hostility	(Angry + Irritable + Hostile + Disgusted)/4	1 – 5
Sadness	(Lonely + Sad + Downhearted + Alone)/4	1 – 5
Attentiveness	(Alert + Attentive + Concentrating + Determined)/4	1 – 5
Demographic		
Male	Indicated Male on demographic survey	{0, 1}
Female	Indicated Female on demographic survey	{0, 1}
Born in US	Indicated that was born in the United States	{0, 1}
English at Home	Indicated that spoke English at home	{0, 1}
English at High School	Indicated that language of High School was English	{0, 1}
Personality		
Openness	Appendix A2, Items 5 + 10 + 15 + 20 + 25 + 30 – 35 + 40 – 41 + 44	1 - 5
Extraversion	Appendix A2, Items 1 – 6 + 11 + 16 – 21 + 26 – 31 + 36	1 - 5
Neuroticism	Appendix A2, Items 4 – 9 + 14 + 19 – 24 + 29 – 34 + 39	1 - 5
Agreeableness	Appendix A2, Items - 2 + 7 – 12 + 17 + 22 – 27 + 32 – 37 + 42	1 - 5
Conscientiousness	Appendix A2, Items 3 – 8 + 13 – 18 – 23 + 28 + 33 + 38 – 43	1 - 5
N	171	171

Table B2: Treatment Effects on Test Scores: Poisson estimates

	Dependent Variable: Test Score						
	Full Sample	Full Sample	English At Home	No English at Home	No-English	Female	Male
Happy Treatment	0.038 (0.059)	0.030 (0.062)	0.006 (0.070)	0.088 (0.120)	0.114 (0.118)	-0.013 (0.079)	0.117 (0.107)
Fear Treatment	0.112+ (0.060)	0.109+ (0.061)	0.029 (0.069)	0.263* (0.107)	0.284** (0.115)	-0.000 (0.077)	0.272** (0.106)
Female	-0.036 (0.048)	-0.055 (0.051)	-0.049 (0.061)	-0.086 (0.092)	0.053 (0.094)		
English at home	0.376*** (0.053)	0.390*** (0.053)				0.373*** (0.078)	0.453*** (0.069)
Openness		0.060 (0.040)	0.046 (0.044)	0.066 (0.086)		0.013 (0.052)	0.145* (0.062)
Extraversion		0.029 (0.028)	-0.016 (0.029)	0.088 (0.070)		-0.015 (0.039)	-0.063 (0.040)
Agreeableness		0.023 (0.033)	-0.012 (0.045)	0.157+ (0.094)		0.024 (0.047)	0.066 (0.072)
Neuroticism		0.037 (0.046)	0.023 (0.037)	0.046 (0.067)		0.006 (0.062)	-0.014 (0.057)
Conscientious-ness		-0.016 (0.043)	-0.029 (0.045)	0.020 (0.088)		-0.003 (0.058)	-0.078 (0.071)
Constant	2.408*** (0.066)	2.151*** (0.271)	2.808*** (0.309)	1.604*** (0.501)	2.314*** (.096)	2.431*** (0.379)	2.023*** (0.495)
Chi-Square	57.44***	70.63***	5.14	16.56*	6.68+	28.84***	72.17***
Pseudo R^2	0.074	0.079	0.007	0.045	0.028	0.067	0.120
N	171	171	103	103	68	81	85

Note: + denotes $p < 0.1$, * signifies $p < 0.05$, ** signifies $p < .01$, *** is $p < 0.005$.

Table B3. Treatment Effects on Test Scores: Language of High School Included in Specification

	Dependent Variable: Test Score						
	Full Sample	Full Sample	English in High School	High School not in English	High School not in English	Female	Male
Happy Treatment	0.852 (0.995)	0.779 (1.015)	1.028 (1.161)	0.933 (1.762)	0.569 (1.909)	-0.592 (1.348)	2.757 (1.671)
Fear Treatment	1.436 (1.029)	1.329 (1.046)	0.589 (1.173)	5.124*** (1.580)	4.708* (1.801)	-1.035 (1.372)	4.635*** (1.662)
Female	0.001 (0.807)	-0.146 (0.886)	0.078 (1.023)	-0.895 (1.125)	1.189 (1.396)		
English in High School	3.182*** (1.029)	3.201*** (0.889)				2.293+ (1.332)	4.321*** (1.186)
Openness		0.357 (0.629)	0.558 (0.715)	-0.753 (1.395)		-0.492 (0.905)	0.529 (0.881)
Extraversion		-0.498 (0.532)	-0.643 (0.580)	0.046 (1.044)		-0.382 (0.753)	-0.967 (0.723)
Agreeableness		0.196 (0.777)	-0.569 (0.847)	3.375+ (1.282)		-0.274 (1.143)	0.299 (1.139)
Neuroticism		0.296 (0.590)	-0.239 (0.673)	2.477+ (0.892)		0.173 (0.850)	-0.176 (1.009)
Conscientiousness		0.076 (0.700)	-0.801 (0.793)	0.049 (1.536)		0.415 (1.032)	-0.701 (1.116)
Constant		9.879* (4.770)	17.914*** (5.153)	-6.743 (8.250)	9.374*** (1.726)	13.673+ (7.431)	11.355 (8.243)
R^2		0.069	0.021	0.563	0.308	0.041	0.177
N		171	142	29	29	81	85

Note: + denotes $p < 0.1$, * signifies $p < 0.05$, ** signifies $p < .01$, *** is $p < 0.005$.

Table B4. Treatment Effects on Test Scores: US Born included in Specification

	Dependent Variable: Test Score						
	Full Sample	Full Sample	US Born	Not Born in US	Not Born in US	Female	Male
Happy Treatment	1.018 (0.991)	0.861 (1.018)	1.824 (1.261)	-0.769 (1.749)	-0.505 (1.661)	-0.155 (1.305)	2.561 (1.752)
Fear Treatment	1.469 (1.013)	1.312 (1.029)	1.329 (1.288)	1.239 (1.793)	1.232 (1.711)	-.727 (1.328)	4.190* (1.725)
Female	-0.399 (0.790)	-0.695 (0.844)	-0.243 (1.101)	-1.306 (1.254)	-0.704 (1.204)		
US Born	3.427*** (0.774)	3.750*** (0.804)				3.600*** (1.165)	4.122 (1.138)
Openness		0.827 (0.635)	0.848 (0.771)	0.091 (1.286)		0.158 (0.887)	1.274 (0.893)
Extraversion		-0.622 (0.538)	-0.767 (0.620)	-0.590 (1.157)		-0.451 (0.732)	-1.117 (0.782)
Agreeableness		0.223 (0.753)	-0.448 (0.853)	1.952 (1.415)		0.350 (1.053)	0.462 (1.096)
Neuroticism		0.482 (0.538)	0.521 (0.671)	0.549 (0.835)		0.422 (0.749)	-0.081 (0.935)
Conscientiousness		0.015 (0.678)	-0.291 (0.875)	0.430 (1.174)		0.357 (0.960)	-.953 (1.099)
Constant	11.832*** (1.075)	8.762+ (4.513)	15.882** (5.657)	4.254 (6.945)	12.615*** (1.579)	12.045+ (7.010)	10.751 (7.698)
R2	0.107	0.130	0.074	0.118	0.074	.118	.210
N	171	171	108	63	63	81	85

Note: + denotes $p < 0.1$, * signifies $p < 0.05$, ** signifies $p < .01$, *** is $p < 0.005$.

Table B5: Treatment Effects on Test Scores: Controlling for Hostility and Openness, OLS Estimates

	Dependent Variable: Test Score						
	Full Sample	Full Sample	English at Home	No English at Home	No English at Home	Female	Male
Happy Treatment	0.324 (0.905)	0.401 (0.904)	0.101 (1.205)	0.957 (1.272)	0.807 (1.359)	-0.175 (1.311)	1.396 (1.439)
Fear Treatment	1.474 (0.904)	1.549+ (0.911)	0.481 (1.231)	2.927* (1.194)	2.868* (1.258)	0.055 (1.342)	3.648* (1.477)
Female	-0.618 (0.730)	-0.798 (0.759)	-0.813 (1.076)	-0.460 (1.093)	-1.033 (1.141)		
English at home	5.447*** (0.714)	5.488*** (0.731)				5.062*** (1.121)	6.429*** (1.018)
Hostility	0.106 (0.742)	0.109 (0.774)	-0.083 (1.209)	0.111 (0.899)	0.302 (0.960)	-0.236 (1.286)	1.184 (0.998)
Openness	0.826 (0.584)	0.882 (0.609)	0.751 (0.757)	0.816 (1.041)	0.729 (1.075)	-0.223 (0.892)	1.871* (0.929)
Extraversion		-0.436 (0.440)	-0.270 (0.510)		-0.919 (0.858)	-0.210 (0.750)	-0.773 (0.616)
Agreeableness		0.546 (0.699)	-0.219 (0.809)		1.757 (1.226)	0.064 (1.069)	1.060 (1.062)
Neuroticism		0.353 (0.500)	0.381 (0.645)		0.500 (0.853)	0.378 (0.816)	-0.173 (0.851)
Conscientiousness		-0.209 (0.622)	-0.479 (0.785)		0.292 (1.079)	-0.039 (0.886)	-1.032 (0.993)
Constant	8.064*** (2.210)	6.977 (4.333)	16.779*** (5.900)		1.573 (6.627)	11.79+ (7.002)	3.765 (0.993)
R2	0.262	0.272	0.036	0.101	0.145	0.245	0.389
N	171	171	103	68	68	81	85

Note: + denotes $p < 0.1$, * signifies $p < 0.05$, *** is $p < 0.005$.