

Impacts on Resilience in Medical Students

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*On my honor, I have not given, nor received, nor witnessed any unauthorized assistance on this work. –Callahan Katrak*

**Objective:**

Resilience is an important trait for anyone; however, for medical students it is even more important because it takes a large amount of resilience to succeed in medical school. It is important to understand other factors that could impact resilience, because these factors could be used in medical school admissions or taught to medical students to make them better medical students and doctors. As such, the study “Relationship among Medical Student Resilience, Educational Environment and Quality of Life” by Tempuski and colleagues sought to determine if there were factors associated with resilience. Specifically, they wanted to know if one gender had on average in the population a higher resilience score. They were also interested in if resilience scores were different in the populations of students in different years of medical school. They also wanted to know if anxiety was correlated to resilience.

## **Literature Review:**

Resilience is important because it defines how well one is able to overcome adversities in life. The study by Tempiski and colleagues examined the trait of resilience in Brazilian medical students. The goal was to see what impacted the ability of these students to overcome difficulties and also to see what effect this had on their outlook on medical school and life. By examining the association of gender, level of medical school, and trait anxiety with resilience, it might be possible to determine factors that make a medical student more or less likely to have high resilience.

Gender and level in medical school data was received by the participating schools and used to cluster the students so there could be equal participation from the following categories. They broke the six different years of medical school into three subdivided categories; basic sciences (Years 1&2), clinical sciences (Years 3&4), and clerkship (Years 5&6). They then split each of these sections in two by gender. They hoped to collect data from 60 potential participants at each of the 22 medical schools that had agreed to partake in the research, but randomly selected 75 based on their clusters so that if some students did not respond within the 10 allotted days they would still have enough data. This meant there was some non-response bias as 274 students did not respond.

In order to determine the resilience of those in the study the researchers utilized Wagnild and Yong's resilience scale and its associated questionnaire (which was translated into the native Brazilian Portuguese). The test determines resilience based on self-assessment for 14 different questions ranked from 1-7 leading to the lowest possible score being 14 and the highest being 98. The 14 questions fall into 5 domains which reflect on resilience; self-reliance, meaning,

equanimity, perseverance, and existential aloneness. This test is commonly used to determine resilience.

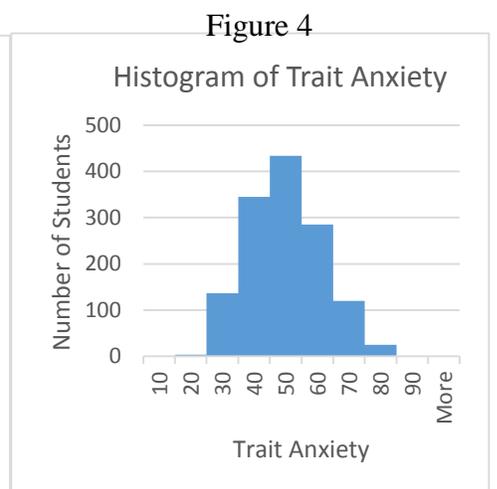
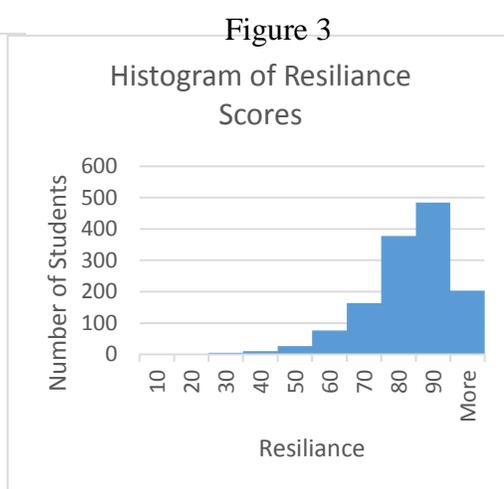
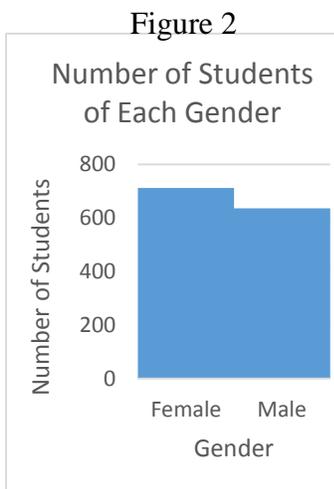
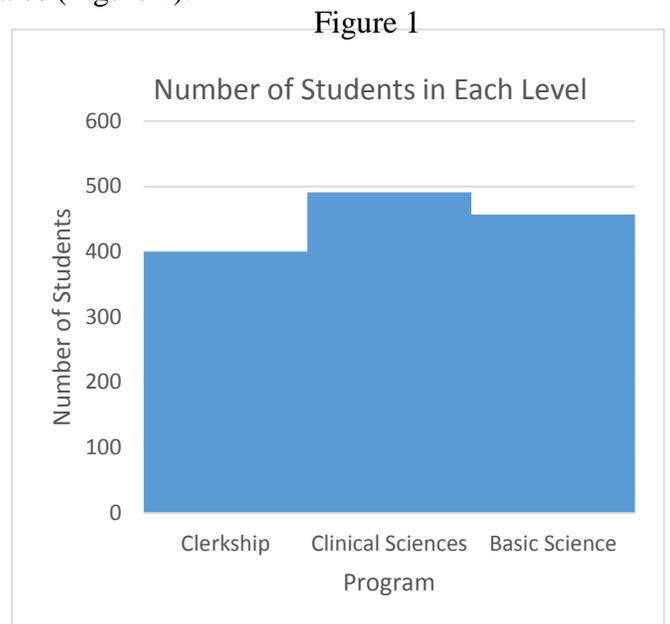
In order to determine anxiety levels, the State Trait Anxiety Inventory (STAI) was administered. This inventory asked students 40 questions, 20 to determine state and 20 to determine trait anxiety. The state anxiety questions determine the amount of temporary anxiety one would experience in an uncomfortable situation that would then dissipate quickly afterwards. Conversely, the trait anxiety is the anxiety that is innate to one's personality and is maintained regardless of situation. Both forms of anxiety had potential to impact the ability of a student to be resilient and adjust to an adverse situation.

In their analysis Tempiski and colleagues divided up resilience level into six levels (Very High, High, Moderately High, Moderately Low, Low, and Very Low). This means they analyzed resilience as categorical rather than continuous variable. With this form of analysis, they determined that resilience was not associated with gender nor level of medical school. They did observe significant association between resilience scores and anxiety scores (both trait and state). They also noted that as this is an observational study the causality of this association is unknown. High anxiety could lead to low resilience or low resilience could lead to high anxiety or there could be an alternate factor which causes both. Overall, this study was able to successfully investigate several potential variables which could impact the resilience of medical students.

**Descriptive Statistics:**

Trait anxiety is fairly normally distributed as indicated by the approximately equal mean and median (Table 1). There are a couple outliers which are higher than the high outlier cut off of 77 (Table 1). While the resilience’s mean and median are also about the same, there are far more outliers below the low outlier cutoff of 50.5 (Table 1). The histogram of trait anxiety supports is normal distribution (Figure 4). The histogram for resilience has its peak between 80-90 and trails off lower (Figure 3). The number of students in each level of the program is approximately equal (Figure 1); however, there are 76 more females than males (Figure 2).

<b>Table 1</b>	Descriptive Statistics for Resilience	Descriptive Statistics for Trait anxiety
Min	16	20
Q1	73	37
Median	81	45
Q3	88	53
Max	98	80
Mean	78.66222	45.48519
Standard deviation	12.39987	11.66518
IQR	15	16
Low Outlier Cutoff	50.5	13
High Outlier Cutoff	110.5	77



**Statistical Tests:**

Is the mean population resilience score different for those in basic science, clinical science, and clerkship portions of medical school? The null hypothesis is that level in medical school has no effect on mean population resilience score ( $\mu_{bs}=\mu_{cs}=\mu_c$ ). The alternative hypothesis is that the different levels in medical school have different mean population resilience scores ( $\mu_{bs}\neq\mu_{cs}\neq\mu_c$ ).

Source	DF	Anova SS	Mean Square	F Value	Pr > F
Level	2	304.5391088	152.2695544	0.99	0.3717

The P value of 0.37 is greater than the  $\alpha$  value of 0.05 so there is no evidence to reject the null hypothesis that level in medical school has no effect on mean population resilience score.

Is the mean population resilience score different for females and males? The null hypothesis is that gender has no effect on mean population resilience score ( $\mu_m=\mu_f$ ). The alternative hypothesis is that the different genders have different mean population resilience scores ( $\mu_m\neq\mu_f$ ).

Source	DF	Anova SS	Mean Square	F Value	Pr > F
Gender	1	406.6070340	406.6070340	2.65	0.1039

The p-value of 0.10 is greater than the  $\alpha$  value of 0.05 so there is no evidence to reject the null hypothesis that gender has no effect on mean population resilience score.

Is there a correlation between resilience score and trait anxiety score? The null hypothesis is that there is correlation between resilience score and trait anxiety score ( $r=0$ ). The alternative hypothesis is that there is a correlation between resilience score and trait anxiety score ( $r\neq 0$ ).

**Pearson Correlation Coefficients, N = 1350 Prob > |r| under H0: Rho=0**

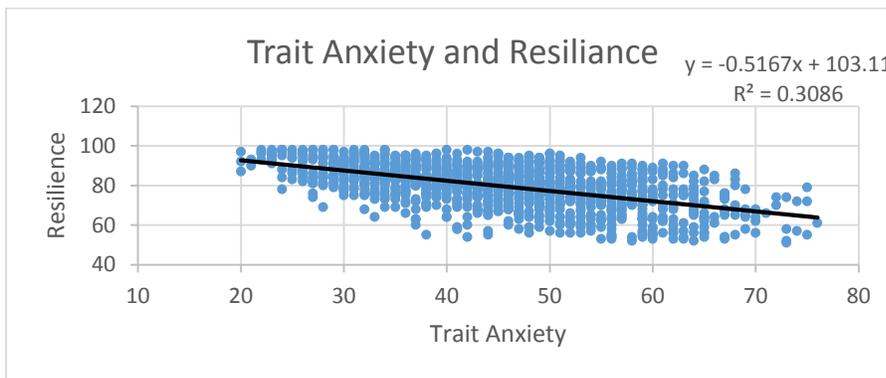
	Resilience	Trait Anxiety
Resilience	1.00000	-0.60554, <.0001
Trait Anxiety	-0.60554, <.0001	1.00000

The p-value of  $<0.0001$  is less than the  $\alpha$  value of 0.05 which means there is evidence to support the alternative hypothesis that there is a correlation between resilience score and trait anxiety score ( $r \neq 0$ ).

Is there a linear relationship between resilience score and trait anxiety score? The null hypothesis is that there is no linear relationship between resilience score and trait anxiety score ( $b_1=0$ ). The alternative hypothesis is that there is a linear relationship between resilience score and trait anxiety score ( $b_1 \neq 0$ ).

#### Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	1	107.93993	1.08190	99.77	<.0001
Trait Anxiety	1	-0.64368	0.02304	-27.94	<.0001



The p-value of  $<0.0001$  is smaller than the alpha value of 0.05 which means there is evidence to support the alternative that there is a linear relationship between resilience score and trait anxiety score ( $b_1 \neq 0$ ). The linear best fit model for trait anxiety and resilience is  $\text{Resilience} = -0.5167(\text{Trait Anxiety}) + 103.11$ . the y-intercept of 103.11 would mean that at 0 Trait anxiety there would be a resilience of 103.11; however, the trait anxiety score cannot be that low so the y-intercept is

meaningless. The slope means that for every increase of one trait anxiety point, resilience decreases by 0.5167. Finally, the  $r^2$  value of .31 means that variation in trait anxiety score explains 31% of variation in resilience score.

Is the probability of a student being female different given that the student is in basic sciences, clinical sciences, or clerkship? The null hypothesis is that the probability of a student being female does not change depending on whether it is given that she is from the basic sciences, clinical sciences, or clerkship level of students ( $P(F|BS)=P(F|CS)=P(F|C)$ ). The alternative hypothesis is that the probability of a student being female does change depending on whether it is given that she is from the basic sciences, clinical sciences, or clerkship level of students ( $P(F|BS)\neq P(F|CS)\neq P(F|C)$ ).

#### Statistics for Table of Gender by Level

<u>Statistic</u>	<u>DF</u>	<u>Value</u>	<u>Prob</u>
<u>Chi-Square</u>	2	0.4521	0.7977
<u>Likelihood Ratio Chi-Square</u>	2	0.4522	0.7976
<u>Mantel-Haenszel Chi-Square</u>	1	0.1483	0.7002
<u>Phi Coefficient</u>	-	0.0183	-
<u>Contingency Coefficient</u>	-	0.0183	-
<u>Cramer's V</u>	-	0.0183	-

The p-value of 0.80 is greater than the  $\alpha$  value of 0.05 which means there is no evidence to reject the null hypothesis that the probability of a student being female does not change depending on whether it is given that she is from the basic sciences, clinical sciences, or clerkship level of students ( $P(F|BS)=P(F|CS)=P(F|C)$ ).

**Conclusion:**

After doing statistical tests to see which Variables are associated with resilience score, it was determined that neither gender nor level in medical education had an impact on the population mean resilience score. It was also determined that trait anxiety is correlated with resilience score. Trait anxiety score and resilience score had a negative linear relationship where variation in trait anxiety accounts for 31% of the variation in resilience score.

**References:**

Tempski P, Santos IS, Mayer FB, Enns SC, Perotta B, Paro HBMS, et al. (2015) Relationship among Medical Student Resilience, Educational Environment and Quality of Life. PLoS ONE 10(6): e0131535. doi:10.1371/journal.pone.0131535