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ABSTRACT

This study investigates the relationship between psychological factors—stress, anxiety, depression, and optimism—and COVID-19 test outcomes. Correlation analyses identified significant associations among the psychological variables, though their correlations with testing positive for COVID-19 were weak. Stress, anxiety and depression exhibited minimal negative associations, while optimism demonstrated a positive correlation with positive test results. Normality tests revealed deviations from normality, and Mann-Whitney U tests indicated significant group differences in stress, depression, and optimism, while anxiety showed no statistically significant difference. These findings highlight nuanced links between psychological health and COVID-19 testing outcomes.

Keywords: Psychological factors, stress, anxiety, depression, optimism, COVID-19.

1 INTRODUCTION

The COVID-19 pandemic has had a profound impact on both physical and mental health worldwide. While the physical health consequences are well-documented, the psychological effects have also been significant, with heightened levels of depression, anxiety, and stress reported across the globe. Social isolation, economic uncertainty, and ongoing health fears have all contributed to a marked increase in mental health challenges, exacerbating existing vulnerabilities (Brooks et al. (2020)). The pandemic disrupted daily routines, created widespread financial and social stress, and fostered an environment of uncertainty, leading to substantial deterioration in psychological well-being for many individuals.

Depression emerged as one of the most prevalent psychological effects of the pandemic (Brooks and Dunn (2021)). Social isolation, coupled with uncertainty surrounding the virus, intensified feelings of helplessness and loneliness. Economic challenges, such as job losses and financial insecurity, further contributed to the surge in depressive symptoms. The necessary social distancing measures, though essential for preventing virus spread, left many without the support systems that might have helped mitigate feelings of isolation, leading to a global rise in depression during the pandemic.

Anxiety also became a major issue, driven by the constant flow of information about the virus and the fear of its unpredictable impact on health. The concern about personal and familial well-being, along with economic instability, led to heightened anxiety levels. Unlike transient anxiety, the persistent nature of the pandemic resulted in chronic distress, affecting individuals' ability to cope with daily life and function normally. These prolonged periods of anxiety added to the overall mental health burden of the crisis.

Dispositional optimism, or the general expectation that good things will happen, emerged as a key protective factor against the mental health challenges of the pandemic (Carver and Scheier (2010)). Optimistic individuals tend to cope with adversity in more adaptive ways, maintaining a sense of hope and agency during difficult times. Research has shown that optimism is associated with better psychological outcomes, including lower stress levels and greater resilience. During the pandemic, optimism allowed individuals to manage uncertainty more effectively, promoting healthier behaviors

and improving overall well-being.

Stress, an inevitable response to perceived challenges, has been another significant consequence of the pandemic. The disruption of daily life, fear of illness, and uncertainty about the future combined to create a chronic state of stress for many (Cohen et al. (2007)). Prolonged stress has been linked to various physical and mental health issues, including cardiovascular problems and weakened immune systems, further exacerbating the psychological toll of the pandemic. The persistent nature of stress during this period has contributed to a rise in stress-related disorders globally.

The intersection of COVID-19 with mental health issues like depression, anxiety, and stress highlights the need for psychological resilience. While the pandemic has undeniably worsened global mental health, optimism has proven to be a key factor in mitigating its effects (Conversano et al. (2020)). Further research into how optimism influences mental health could offer valuable strategies to strengthen resilience and better equip individuals to cope with the ongoing challenges posed by global crises.

2 METHODS

2.1 Theoretical Framework

This was a descriptive observational study utilizing an existing dataset of 193 COVID-19 individuals. The dataset included a range of demographic, behavioral, and psychological variables. The primary objective of the study was to investigate the relationship between psychological factors — depression, anxiety, stress, and optimism — and COVID-19 test outcomes.

2.2 Research Methodology

This study will employ a descriptive observational design to analyze the relationship between COVID-19 test status (positive vs. negative) and psychological factors, including stress, anxiety, depression, and optimism.

The methodology will focus on a comprehensive descriptive analysis, normality testing, and appropriate non-parametric statistical methods to address the research aims. The analysis will begin with a descriptive statistical examination of each variable. Measures such as means, medians, standard deviations, and interquartile ranges will be calculated to summarize the psychological factors and COVID-19 test outcomes. To determine the distribution of the data, normality tests such as the Kolmogorov-Smirnov test will be applied.

Given the expected non-normal distribution of the data, Spearman's rank correlation coefficient will be used to assess the relationships between psychological variables (stress, anxiety, depression, and optimism) and their association with COVID-19 test status. Spearman's method is well-suited for identifying monotonic relationships in non-normally distributed data.

To further analyze differences between COVID-19 test groups (positive vs. negative), the Mann-Whitney U test will be performed. This non-parametric test will evaluate whether there are significant differences in psychological factors between the two groups. Statistical significance will be set at $p < 0.05$, and all analyses will be conducted using appropriate statistical software, such as SPSS.

By combining descriptive analysis, normality testing, correlation analysis, and group comparisons, this methodology ensures a robust examination of the relationship between COVID-19 status and psychological factors, addressing the research question effectively within the constraints of the data.

2.3 Statistical Analysis

The analysis of the dataset in relation to the psychological factors—stress, anxiety, depression, and optimism—reveals interesting insights into their potential influence on COVID-19 test status. The Spearman correlation results suggest significant associations between various psychological variables, but the relationship with COVID-19 status is relatively weak, especially when considering the null hypothesis that psychological factors do not influence the likelihood of testing positive or negative for COVID-19.

The descriptive statistics reveal key insights into the sample (*Figure 1*). The mean stress level is 5.40 with moderate variability, and the distribution is slightly right-skewed.

Anxiety, with a mean of 2.85, shows a highly right-skewed distribution and a heavy peak, indicating most participants reported low anxiety but some had very high levels.

Depression, with a mean of 4.77, also shows a right-skewed distribution but less extreme than anxiety. Optimism has a mean of 19.52 and a nearly normal distribution, suggesting consistent optimism levels among participants.

For gender, the mean is 0.65, indicating that 65% of participants are likely female. The mean age is 29.15 years, with a slight right skew, reflecting a younger sample. Only 28% of participants tested positive for COVID-19, with a skewed distribution toward negative cases.

In summary, while stress, anxiety, and depression show moderate variability with skewed distributions, optimism appears more consistent and normally distributed. The sample is primarily younger and mostly tested negative for COVID-19. These characteristics will help guide further analysis of psychological factors and COVID-19 test status.

Figure 1: Descriptive Statistics and Normality Tests

	Descriptive Statistics										
	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Stress	193	21	0	21	5,40	4,755	22,606	1,012	,175	,668	,348
Anxiety	193	21	0	21	2,85	3,724	13,868	2,151	,175	5,432	,348
Depression	193	21,0	,0	21,0	4,772	4,7324	22,396	1,152	,175	,854	,348
Optimism	193	22,00	8,00	30,00	19,5181	3,72365	13,866	,022	,175	,698	,348
Gender	193	1	0	1	,65	,477	,228	-,647	,175	-1,598	,348
Age	193	61	15	76	29,15	13,261	175,843	1,196	,175	,464	,348
Tested positive for Covid	193	1	0	1	,28	,453	,205	,960	,175	-1,089	,348
Valid N (listwise)	193										

The normality test results assess whether the distributions of stress, anxiety, depression, and optimism are normally distributed, separately for participants who tested positive and those who tested negative for COVID-19. Two tests were applied: the Kolmogorov-Smirnov test (*Figure 2*).

For stress, the results of both tests show significant p-values (***allp* < 0.001**) for participants who tested both positive and negative for COVID-19, indicating that stress scores deviate significantly from normality in both groups.

Similarly, anxiety scores show significant deviations from normality for both groups, with ***p* < 0.001** across both tests, indicating a non-normal distribution.

Depression scores also fail the normality tests for both groups, as evidenced by ***p* < 0.001** for all comparisons.

This suggests that depression scores are not normally distributed regardless of COVID-19 status. Optimism, however, shows a difference in normality between groups. Suggesting no significant deviation from normality, though the Kolmogorov-Smirnov test shows significance (***p* = 0.005**).

In contrast, for participants who tested positive for COVID-19, optimism scores are non-significant in

the Kolmogorov-Smirnov test ($p = 0.200$), indicating no significant deviation from normality. Overall, the normality tests reveal that stress, anxiety, and depression scores deviate significantly from a normal distribution across groups, while optimism appears closer to normal, particularly for participants who tested positive for COVID-19. These findings justify the use of non-parametric statistical methods, such as Spearman correlations and Mann-Whitney U tests, for further analysis.

Figure 2: Normality Tests

Tests of Normality							
		Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Tested positive for Covid	Statistic	df	Sig.	Statistic	df	Sig.
Stress	No	,116	138	<,001	,919	138	<,001
	Yes	,191	55	<,001	,834	55	<,001
Anxiety	No	,209	138	<,001	,765	138	<,001
	Yes	,265	55	<,001	,679	55	<,001
Depression	No	,139	138	<,001	,906	138	<,001
	Yes	,228	55	<,001	,751	55	<,001
Optimism	No	,093	138	,005	,983	138	,089
	Yes	,093	55	,200 [*]	,969	55	,163

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

With the psychological variables, stress is significantly correlated with both anxiety and depression ($r = 0.774, p < 0.001$ and $r = 0.807, p < 0.001$, respectively), as assessed using the Spearman's rho correlation test (Figure 3).

This indicates that individuals experiencing higher levels of stress are more likely to report higher levels of anxiety and depression. Additionally, optimism shows negative correlations with stress, anxiety, and depression ($r = -0.375, r = -0.392$, and $r = -0.496$, respectively), suggesting that individuals with lower levels of optimism tend to experience higher levels of stress, anxiety, and depression.

These correlations, however, are not entirely surprising given the established links between these psychological factors in the broader literature.

When considering the influence of these psychological factors on COVID-19 test results, the correlations with the variable Tested positive for Covid are relatively weak.

Stress shows a small negative correlation ($r = -0.148, p = 0.041$), which suggests a very modest inverse relationship between stress levels and testing positive for COVID-19. However, this correlation is far from strong and does not provide evidence to support a significant psychological influence on COVID-19 status.

Similarly, anxiety ($r = -0.108, p = 0.134$) and depression ($r = -0.201, p = 0.005$) also show weak negative correlations with COVID-19 test results, indicating that higher levels of anxiety and depression may be slightly more common in individuals who test negative, though these relationships are still modest in size.

On the other hand, optimism is positively correlated with testing positive for COVID-19 ($r = 0.237, p < 0.001$), suggesting a small but significant relationship between higher optimism and a higher likelihood of testing positive for the virus.

This finding suggests an intriguing, though modest, pattern, but it's important to note that it doesn't establish a cause-and-effect relationship.

Therefore, while significant correlations between psychological variables themselves exist, the relationship between these variables and the likelihood of testing positive for COVID-19 remains weak. The correlation between optimism and testing positive for COVID-19 is the only significant finding, although it is small in magnitude.

This analysis suggests that while psychological factors are undeniably interconnected, their influence on COVID-19 test outcomes is **minimal**, supporting the **null hypothesis** that stress, anxiety, depression, and optimism do **not significantly affect** the likelihood of testing positive for the virus.

Figure 3: Correlatuib Spearman's rho Test

Correlations						
			Stress	Anxiety	Depression	Optimism
Spearman's rho	Stress	Correlation Coefficient	1,000	,774**	,807**	-,375**
		Sig. (2-tailed)	.	<,001	<,001	<,001
		N	193	193	193	193
	Anxiety	Correlation Coefficient	,774**	1,000	,709**	-,392**
		Sig. (2-tailed)	<,001	.	<,001	<,001
		N	193	193	193	193
	Depression	Correlation Coefficient	,807**	,709**	1,000	-,496**
		Sig. (2-tailed)	<,001	<,001	.	<,001
		N	193	193	193	193
	Optimism	Correlation Coefficient	-,375**	-,392**	-,496**	1,000
		Sig. (2-tailed)	<,001	<,001	<,001	.
		N	193	193	193	193
	Tested positive for Covid	Correlation Coefficient	-,148*	-,108	-,201**	,237**
		Sig. (2-tailed)	,041	,134	,005	<,001
		N	193	193	193	193

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

The Mann-Whitney U test (*Figure 4*) evaluates differences between participants who tested positive for COVID-19 and those who tested negative. This non-parametric test is appropriate as the data do not meet the assumptions of normality.

For stress, the Mann-Whitney U statistic is 3082.000, with a Z value of -2.045 and a p-value of 0.041. This indicates a statistically significant difference between groups at the $\alpha = 0.05$ level, suggesting that participants who tested negative for COVID-19 report slightly higher stress levels.

Anxiety, however, shows no significant difference, with a Mann-Whitney U statistic of **3279.500**, a Z value of **-1.501**, and a p-value of **0.133**, indicating no meaningful variation between the two groups. Depression presents a Mann-Whitney U statistic of **2825.000**, a Z value of **-2.788**, and a p-value of **0.005**, revealing a statistically significant difference. This suggests that participants who tested negative for COVID-19 experience higher levels of depression.

Optimism, with a Mann-Whitney U statistic of **2648.500**, a Z value of **-3.288**, and a p-value of **0.001**, also shows a significant difference. Here, participants who tested positive for COVID-19 report higher levels of optimism.

In summary, while stress, depression, and optimism show significant differences between groups, the effect sizes appear modest. Anxiety does not differ significantly between those who tested positive and negative for COVID-19.

Figure 4: Mann-Whitney U Test

Test Statistics^a				
	Stress	Anxiety	Depression	Optimism
Mann-Whitney U	3082,000	3279,500	2825,000	2648,500
Wilcoxon W	4622,000	4819,500	4365,000	12239,500
Z	-2,045	-1,501	-2,788	-3,288
Asymp. Sig. (2-tailed)	,041	,133	,005	,001

a. Grouping Variable: Tested positive for Covid

3 CONCLUSION

This study aimed to explore the relationship between psychological factors like stress, anxiety, depression, and optimism and COVID-19 test outcomes in a sample of 193 individuals. The results offer insights into the interconnectedness of these psychological variables and their potential influence on COVID-19 status, though the overall findings point to minimal effects.

While stress, anxiety, and depression showed significant correlations with each other, indicating a strong interrelationship, the correlations with COVID-19 test outcomes were weak. Notably, optimism was the only psychological variable that showed a significant positive correlation with testing positive for COVID-19.

However, the relationship between optimism and COVID-19 test status was small, suggesting that individuals with higher optimism were slightly more likely to test positive. This finding, though statistically significant, does not imply a causal relationship, as the effect size remains modest.

The normality tests confirmed that most psychological variables, including stress, anxiety, and depression, deviated significantly from normal distribution, justifying the use of non-parametric statistical methods such as Spearman's rho correlation and the Mann-Whitney U test. The Mann-Whitney U test results indicated that participants who tested negative for COVID-19 reported slightly higher levels of stress and depression, while those who tested positive for the virus reported higher levels of optimism.

In summary, while there are significant correlations between psychological variables, their impact on COVID-19 test outcomes is limited. The study supports the null hypothesis, indicating that psychological factors such as stress, anxiety, depression, and optimism do not significantly affect the likelihood of testing positive for COVID-19.

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