



# Disentangling State-Trait Anxiety's Effects on Neurocognitive Performance and Mental Health in Adolescents

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## ABSTRACT:

**Introduction:** Recent evidence suggests that anxiety may play a causative role in impairing neurocognitive functions and the well-being of adolescents.

**Objectives:** This study aims to explore, distinguish and analyze state-trait anxiety profiles among adolescents and young adults aged 14 to 24 in the northern central region of Morocco.

**Methods:** Seventy-nine adolescents and young adults from various residential cares in the Fez-Meknes region were recruited. The "State and Trait Anxiety Inventory" (STAI), developed by Spielberger, was utilized to assess levels of state and trait anxiety.

**Results:** The findings indicate that 43.04% of the adolescents exhibited a high level of state anxiety, while 24.05% demonstrated high levels of trait anxiety. Furthermore, a significant correlation between the two forms of anxiety ( $r=+0.8$ ;  $p<0.000$ ) was observed, indicating a strong association.

**Conclusions:** The study underscores the importance of distinguishing between trait and state anxiety to evaluate the influence of gender and age on anxiety levels. It also highlights the need for a comprehensive approach to support the mental health and well-being of adolescents in northern central Morocco.

## 1. Introduction

The adolescent phase is quintessentially pivotal for establishing social and emotional habits that profoundly influence mental well-being. Notwithstanding, ensuring adolescents are shielded from adverse experiences, robustly supported in their psychological and socio-emotional learning, and have unequivocal access to mental health care is paramount for their sustained health and well-being into adulthood [1]. During this transformative period, adolescents begin to develop social skills and independence, alongside behaviors that are foundational to their future health [2-4]. This evolution necessitates a concerted effort from parents, communities, and schools to cultivate a nurturing environment [5]. Furthermore, anxiety emerges as a significant and multifaceted factor critically impacting adolescent well-being. The distinct socio-cultural context of Morocco demands an in-depth exploration of

the anxiety experiences among its youth, given the intricate interplay of cultural, societal, and individual factors. Situated at the juncture of tradition and modernity, Moroccan adolescents navigate a complex matrix of expectations, societal norms, and personal ambitions. Anxiety profoundly influences the cognitive, emotional, and behavioral patterns of Moroccan adolescents, markedly affecting their overall mental health. Despite its significant impact, the recognition of anxiety disorders in adolescents has been historically overlooked by professionals [6]. Nonetheless, these disorders gained acknowledgment only with the publication of the DSM-III [7-8]. Anxiety, a pervasive mental disorder, is characterized by persistent and profound levels of distress, alongside marked impairment in functional ability [9]. In both clinical practice and research, anxiety disorders represent a spectrum of diagnostic categories, each contingent upon



the nuanced focus of anxiety-related concerns. As meticulously outlined in the DSM-5 (Diagnostic and Statistical Manual of Mental Disorders, 5th edition), this spectrum encompasses a variety of disorders, including post-traumatic stress disorder (PTSD), panic disorder, school refusal anxiety, social anxiety, specific phobia, generalized anxiety disorder (GAD), and separation anxiety [6]. Notably, alternative assessments of anxiety, predicated on distinct criteria and dimensions, have been proposed. Among these, the utilization of Spielberger's State-Trait Anxiety Inventory (STAI) scale stands out as a significant contribution to the nuanced understanding of anxiety [10]. To elucidate, the present study is meticulously designed to evaluate the prevalence of anxiety among adolescents by delving into two pivotal notions: state and trait anxiety. Furthermore, it aims to cultivate an in-depth understanding of the intricate dynamics between trait and state anxiety. Charles Spielberger, a renowned psychologist, delineated trait anxiety as an individual's inherent predisposition to respond to perceived threats, and state anxiety as a transient emotional state marked by physiological arousal alongside consciously perceived feelings of apprehension, dread, and tension [11]. Spielberger posits that state anxiety and trait anxiety represent distinct facets of anxiety, each quantifiable through the STAI [10-12]. Conversely, striving for well-being is a life objective, an aspiration shared by individuals and entire nations [13]. Within the field of adolescent studies, there's a burgeoning emphasis on well-being, a topic that has garnered interest owing to the critical importance ascribed to the adolescent phase. This stage is recognized as pivotal in developmental psychology, laying the groundwork for future well-being across a spectrum of dimensions including cognitive, social, economic, physical, and emotional aspects.

## 2. Objectives

This study aims to dissect the nuances of state and trait anxiety among Moroccan youths aged 14 to 24, distinguishing between temporary and enduring forms of anxiety. By focusing on a specific demographic and region, it seeks to uncover culturally influenced patterns of anxiety, providing insights essential for tailored interventions. This approach highlights the critical interplay between individual psychology and cultural context in understanding and addressing anxiety.

## Methods

This investigation was meticulously conducted at two distinct residential centers, specifically dedicated to serving the youth population. The primary site was the "Bab-Khoukha Multidisciplinary Social Complex," strategically located in the city of Fez, while the secondary site was the "Children's Welfare Center" in Meknes. These centers were deliberately chosen for their profound engagement with adolescents and their unwavering commitment to youth well-being. Prior to embarking on the data collection phase, ethical approval was diligently secured from the relevant institutional review boards. This critical step not only ensures adherence to the highest ethical standards but also rigorously safeguards the confidentiality and well-being of all participants.

The study meticulously involved 79 adolescents and young adults, ranging from 14 to 24 years, meticulously selected from the "Bab-Khoukha Multidisciplinary Social Complex" and the "Children's Welfare Center." The intentional selection of these venues aimed to encapsulate a comprehensive spectrum of experiences from adolescents and young adults across the north-central region of Morocco. Furthermore, the research was structured as a cross-sectional comparative analysis, diligently conducted between August 2020 and January 2021. It unfolded across two pivotal sites: the "Bab-Khoukha Multidisciplinary Social Complex" in Fez and the "Children's Welfare Center" in Meknes, both integral to the Fez-Meknes region in northern central Morocco. The Spielberger STAI, a self-assessment questionnaire comprising 40 items, was utilized to precisely measure the two distinct dimensions of anxiety: state and trait. State anxiety is evaluated based on an individual's reaction to perceived threats in their immediate context, thereby capturing their instantaneous emotional state. In contrast, trait anxiety serves as a marker of an individual's inherent propensity towards experiencing anxiety, prompting respondents to introspect on their typical, habitual emotional state. This dimension of anxiety is meticulously evaluated through 20 dedicated items. Participants engaged in studies utilizing this inventory are required to complete it, thereby furnishing valuable insights into their respective levels of state and trait anxiety. The distribution of the STAI questionnaires to adolescents was conducted in a serene and supportive setting, designed to foster optimal focus during the



completion process. Comprehensive instructions were clearly articulated, underscoring the importance of honesty and the unfettered expression of their emotions. Prior to initiating data collection, the study was granted ethical clearance from the relevant institutional review boards, affirming adherence to ethical guidelines. Participants were thoroughly informed about the objectives of the study, and their informed consent was obtained. Following this, the STAI questionnaires were dispensed to the participants, who filled them out voluntarily and anonymously. During the entire data collection period, stringent measures were implemented to ensure the confidentiality of participant responses.

Quantitative data garnered from the meticulously completed STAI questionnaires underwent a rigorous statistical analysis process. Initially, descriptive statistics were utilized to delineate the overarching profiles of state-trait anxiety among the participants. Following this, further analyses delved into the exploration of potential correlations between demographic variables and anxiety scores. This comprehensive approach aimed to elucidate the myriad factors impacting anxiety levels within the specified demographic. To assure the utmost accuracy and reliability in data interpretation, statistical analyses were executed using SPSS (version 20.0, free version).

### 3. Results

#### Socio-demographic characteristics

The survey encompassed 79 adolescents and young adults, among whom 74.7% (n=59) were male, resulting in an imbalanced sex ratio (M/F=2.95). The average age of participants was 19.39 years, ranging from a minimum of 14 years to a maximum of 24 years. The age distribution followed a Gaussian pattern, evidenced by a skewness coefficient of 0.326 and a kurtosis value of 0.855, indicating a relatively symmetrical distribution around the mean.

#### State Anxiety

The categorization of respondents based on their levels of state anxiety (referenced in Table 1) reveals that 43.04% exhibited a high to very high level of state anxiety. Conversely, 35.44% demonstrated a low to very low level of state anxiety. Meanwhile, 18.99% were found to have a medium level of state anxiety.

Table 1. State Anxiety Category among Respondents

Category	ni	%
Very low anxiety	13	16,46%
Low anxiety	15	18,99%
Medium anxiety	15	18,99%
High anxiety	17	21,52%
Very high anxiety	17	21,52%

#### Correlation between Gender and State Anxiety

Table 2 outlines the outcomes of the Chi-square test of independence conducted to examine the relationship between gender and anxiety categories. The results indicate a significant difference (Chi-square = 5.17;  $p < 0.043$ ). Additionally, it was observed that 11 out of the 19 females exhibited severe or more severe anxiety, translating to a prevalence rate of 57.8%. In contrast, among males, 23 out of 58 were found to exhibit state anxiety, with a prevalence rate of 39.65%.

Table 2. Chi-square test of Independence between Anxiety and Gender

Category		Gender		Total
		F	M	
Anxiety	Very low anxiety	3	10	13
	Low anxiety	1	14	15
	Medium anxiety	4	11	15
	High anxiety	4	13	17
	Very high anxiety	7	10	17
Total		19	58	77

#### Correlation between Age and State Anxiety

Table 3 presents an ANOVA analysis of state anxiety across various age groups. This analysis did not reveal a significant relationship between age and anxiety levels (Fisher=1.84;  $p < 0.131$ ). Interestingly, individuals averaging around 17 years old showed the lowest anxiety levels, while those older than 20 years exhibited significantly higher, more severe anxiety levels.

Table 3. Description of the Relationship between Anxiety and Age



Category	Average	SD	95% Confidence Interval for the Mean		Mini	Maxi
			Lower Bound	Upper Bound		
Very low anxiety	17,62	1,805	16,52	18,71	15	21
Low anxiety	20,13	3,021	18,46	21,81	16	26
Medium anxiety	19,53	2,532	18,13	20,94	15	24
High anxiety	20,00	2,646	18,64	21,36	15	24
Very high anxiety	19,53	3,356	17,80	21,26	15	25
Total	19,43	2,821	18,79	20,07	15	26

\*Min=Minimum, Max=Maximum, SD=Standard Deviation

### Trait Anxiety

#### Correlation between Gender and Trait Anxiety

Table 4's categorization of respondents by their level of trait anxiety reveals that 24.05% exhibited a high to very high level of trait anxiety, while 36.71% demonstrated a low to very low level. Meanwhile, 30.38% were found to have a medium level of trait anxiety.

Table 4. Category of Trait Anxiety among Respondents

Category	ni	%
Very low anxiety	10	12,66%
Low anxiety	19	24,05%
Medium anxiety	24	30,38%
High anxiety	16	20,25%
Very high anxiety	3	3,80%

Table 5 details the results of the Chi-square ( $\chi^2$ ) test of independence between gender and categories of trait anxiety. The test indicated a significant difference (Chi-square = 7.87;  $p < 0.05$ ). Notably, 4 out of 15 females exhibited severe or more severe anxiety, translating to a prevalence rate of 26.67%. In comparison, among males, 15 out of 57 displayed trait anxiety, with a prevalence rate of 26.31%. Additionally, two females out of the 15 manifested low to very low levels of anxiety, as opposed to 17 out of the 57 males, resulting in a frequency of 2.82%.

Table 5. Chi-square test of Independence between Anxiety and Gender

		Frequency		
		Gender		Total
		F	M	
Trait Anxiety Score	Very low anxiety	1	9	10
	Low anxiety	1	18	19
	Medium anxiety	9	15	24
	High anxiety	3	13	16
	Very high anxiety	1	2	3
Total		15	57	72

#### Correlation between Age and Trait Anxiety

Table 6 showcases the ANOVA results for Trait Anxiety across different age groups. This analysis revealed no significant difference between the two factors (anxiety\*age) (Fisher=0.60;  $p < 0.66$ ). Interestingly, individuals with an average age near 18 years exhibited the lowest levels of anxiety, in contrast to those aged over 19 years, who showed higher levels of anxiety.

Table 6. Description of the Relationship between Anxiety and Age

Category	Average	SD	95% Confidence Interval for Mean		Mini	Maxi
			Lower Bound	Higher Bound		
Very low anxiety	18,30	3,199	16,01	20,59	16	26
Low anxiety	19,37	2,692	18,07	20,67	15	24



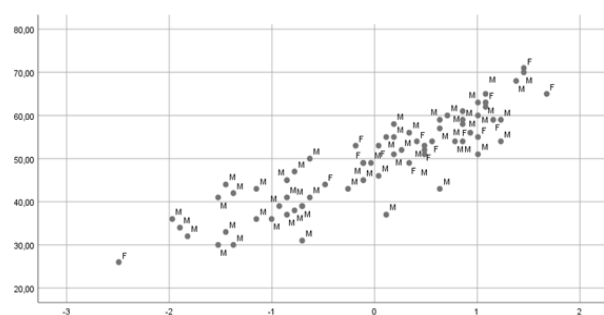
Medium anxiety	19,96	2,694	18,82	21,10	15	24
High anxiety	19,69	3,071	18,05	21,32	15	25
Very high anxiety	19,33	4,163	8,99	29,68	16	24
Total	19,49	2,873	18,81	20,16	15	26

\*Min=Minimum, Max=Maximum, SD=Standard Deviation

### Correlation between state and trait anxiety

Figure 1 illustrates the outcomes of a simple regression analysis between state anxiety scores and trait anxiety scores, indicating a positive and strong correlation between these two factors, with a correlation coefficient of 0.808. The projection of mean points on the scatter plot adheres to the linear equation  $Y = 0.714X + 11.216$ , highlighting that female respondents (F) generally exhibit higher scores than their male (M) counterparts. Furthermore, it is clearly evident that the state anxiety score is positively correlated with the trait anxiety score, as demonstrated by a correlation coefficient ( $r$ ) of 0.899 and a significance level ( $p$ ) of less than 0.000 ( $r=0.899$ ;  $p<0.000$ ).

Figure 1. Linear Regression between the Scores of the two anxiety behaviors



## 4. Discussion

The findings from this study reveal that adolescents in the Fez-Meknes region are experiencing significant levels of anxiety, influenced by various factors including gender, age, demographic characteristics, and educational attainment. These observations underscore the urgent necessity for support and intervention strategies that are tailored to the cultural and environmental contexts of this region. Furthermore, our analysis identified a positive correlation between age and anxiety scores, indicating that older adolescents tend to

exhibit higher levels of anxiety than their younger peers across both trait and state anxiety. Notably, the study also uncovered pronounced gender differences in anxiety levels, with female adolescents displaying higher anxiety than their male counterparts. This aligns with existing research, such as the work by McLean, C.P., and Anderson, E.R. [14], which suggests that females are more susceptible to anxiety disorders. This heightened vulnerability among females may stem from an interplay of biological, psychological, and cultural influences. However, findings previously reported by Ohannessian, C.M., Milan, S., and Vannucci, A. [15] indicate that, in the context of generalized anxiety disorder and social anxiety disorder symptoms, girls were significantly more likely than boys to fall into trajectory classes characterized by moderate or high initial symptoms that subsequently decreased over time. This tends to confirm earlier results concerning this area of research. Similarly, the study by Arcand, M., et al. [16], demonstrated that higher levels of masculinity predicted lower anxiety and depressive symptoms. Furthermore, the interactions between state anxiety and trait anxiety are dynamic and complex, representing a critical component of the psychological landscape investigated in this study. Gaining a deeper understanding of these interactions is essential for decoding the intricate patterns of anxiety experiences among adolescents aged 14 to 24 in the northern central region of Morocco. Furthermore, the findings revealed that the two types of anxiety are positively and strongly correlated, with a correlation coefficient of ( $r=0.808$ ), which aligns with the existing literature. For instance, Saviola, F., et al. [17], discovered that although there was no significant correlation between State and Trait Anxiety scores ( $r=0.2516$ ,  $p=0.1080$ ), a positive association was still observed. This suggests that while State and Trait Anxiety are related, they may manifest independently of each other and are not significantly influenced by gender or age in this study group. Similar observations were made by Li, Y., and Jiang, L. [18], who found no significant correlation between anxiety and demographic variables such as age and education. However, state and trait anxiety were significantly correlated, indicating that these two dimensions of anxiety might share some common components. Mediation analyses suggested that the relationship between depression and anxiety was mediated by state anxiety, not trait anxiety [19]. This





aligns with previous research [20], which has connected self-compassion to the mental health of non-clinical adolescents, particularly regarding anxiety, proposing that self-compassion could act as a protective factor in reducing anxiety levels. On the other hand, the study observes that significant cultural and traditional changes in the cities of Fez and Meknes may be contributing to increased stress and anxiety among adolescents. This points to a connection between the ongoing societal transitions and the mental well-being of the youth in these regions. By exploring these interactions, this study aims to deepen our understanding of anxiety in adolescents, highlighting the complex interplay between state and trait anxiety. It endeavors to lay the groundwork for tailored interventions and support systems to enhance the mental health of Moroccan youth.

### Limitations and implications for future research

The study's findings, confined to participants aged 14 to 24 in the northern central region of Morocco, caution against generalizing these results to other populations, regions, or age groups. Longitudinal research is recommended to gain a more comprehensive understanding of the dynamic interplay between state-trait anxiety and well-being over time. Additionally, the use of self-report measures like the STAI introduces the possibility of response bias, highlighting the potential benefits of incorporating multi-method approaches including observational, clinical, and physiological measures in future studies.

### Conclusion

In conclusion, this study successfully distinguished between trait anxiety and state anxiety through a comprehensive multidimensional analysis, while also uncovering the interplay between age and gender in relation to these anxiety types. By shedding light on the intricate dynamics of anxiety among adolescents, this work lays a critical foundation for the development of targeted interventions aimed at improving the emotional well-being of young individuals, especially in the northern central region of Morocco. The significance of adopting a holistic approach towards addressing not only anxiety itself but also its associated characteristics cannot be overstated. Moving forward, there is a pressing need for further research in this domain, particularly studies that are longitudinal, incorporate genetic considerations, and explore cross-cultural perspectives with clinical

populations. Hence, prioritizing the mental health of adolescents and young adults is paramount in enhancing their overall quality of life, marking a crucial step towards fostering a healthier, more resilient generation.

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### Conflict of interest

*The authors declare that they have no conflicts of interest.*

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