

## Evaluating the Concurrent Validity of the Future Teacher Anxiety Questionnaire

## Valutazione della validità concorrente del Future Teacher Anxiety Questionnaire

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## OPEN ACCESS

## Double blind peer review

**Citation:** Mercer, S. O., Falzone, Y. (2025). Evaluating the Concurrent Validity of the Future Teacher Anxiety Questionnaire. *Italian Journal of Educational Research*, 34, 164-174  
<https://doi.org/10.7346/sird-012025-p164>

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**Received:** March 25, 2025**Accepted:** May 17, 2025**Published:** June 30, 2025**Pensa MultiMedia / ISSN 2038-9744****<https://doi.org/10.7346/sird-012025-p164>**

## Abstract

Teacher anxiety is a topic of increasing interest due to its impact on classroom dynamics and student learning outcomes. However, there is a lack of research assessing the anxieties and stressors faced specifically by pre-service teachers. Despite training programmes knowingly being a time of increased stress, the unique demands and pressures experienced by future teachers during their training remain largely understudied, with a lack of self-report measures existing to assess these experiences. The present study was conducted to evaluate the concurrent validity of the newly developed Future Teacher Anxiety Questionnaire (FTAQ; Mercer et al., 2024) by comparing it with the established Teaching Anxiety Scale (TCHAS; Parsons, 1973). A sample of 224 third-year student teachers enrolled in the Primary Education Sciences degree course at the University of Palermo were administered both measures. The results demonstrated strong concurrent validity, with a Spearman's correlation of  $r = .70$ ,  $p < .001$ , indicating the FTAQ as a valid tool for assessing teaching anxiety in pre-service educators. Beyond its validity, the FTAQ offers a practical baseline measure for anxiety research in teacher education, particularly in research incorporating innovative technologies. Given the increasing use of wearable devices to monitor physiological signals, the FTAQ provides a standardised self-report measure that can be used alongside such biometric data to enhance the understanding of teaching-related anxiety. These findings support the FTAQ's potential within future research and practical applications in teacher training, interventions, and the development of technology-assisted approaches in educational settings.

**Keywords:** future teacher anxiety, questionnaire, concurrent validity, data triangulation.

## Riassunto

L'ansia degli insegnanti è un argomento di crescente interesse per il suo impatto sulle dinamiche di classe e sui risultati di apprendimento degli studenti. Tuttavia, mancano ricerche che valutino le ansie e i fattori di stress affrontati specificamente dagli insegnanti in formazione. Nonostante i programmi di formazione siano consapevolmente un momento di maggiore stress, le richieste e le pressioni uniche sperimentate dai futuri insegnanti durante la loro formazione rimangono largamente sottostimate, con una mancanza di misure self-report esistenti per valutare queste esperienze. Il presente studio è stato condotto per valutare la validità concorrente del Future Teacher Anxiety Questionnaire (FTAQ; Mercer et al., 2024), sviluppato di recente, confrontandolo con la consolidata Teaching Anxiety Scale (TCHAS; Parsons, 1973). Entrambe le misure sono state somministrate a un campione di 224 futuri insegnanti del terzo anno iscritti al Corso di Laurea Magistrale a Ciclo Unico in Scienze della Formazione Primaria dell'Università di Palermo. I risultati hanno dimostrato una forte validità concorrente, con una correlazione di Spearman di  $r = .70$ ,  $p < .001$  che indica la FTAQ come uno strumento valido per valutare l'ansia da insegnamento negli insegnanti in formazione. Oltre alla sua validità, l'FTAQ offre una misura di base pratica per la ricerca sull'ansia nella formazione degli insegnanti, in particolare nella ricerca che incorpora tecnologie innovative. Dato il crescente utilizzo di dispositivi indossabili per monitorare i segnali fisiologici, l'FTAQ fornisce una misura standardizzata self-report che può essere utilizzata insieme a tali dati biometrici per migliorare la comprensione dell'ansia legata all'insegnamento. Questi risultati supportano il potenziale dell'FTAQ nell'ambito della ricerca futura e delle applicazioni pratiche nella formazione degli insegnanti, negli interventi e nello sviluppo di approcci assistiti dalla tecnologia nei contesti educativi.

**Parole chiave:** ansia del futuro insegnante, questionario, validità concorrente, triangolazione dei dati.

## Credit author statement

This article was the joint work of two authors. S.O. Mercer wrote sections 3.2, 3.4, 4, 5, and 6. Y. Falzone wrote sections 1, 2, 3.1, 3.3, and 7.

## 1. Introduction

Teaching is recognized as a highly demanding profession that in recent years has evolved to require not only content knowledge and pedagogical expertise but also strong emotional resilience. From lesson planning and classroom management to student outcomes and wellbeing, teachers face numerous challenges that can lead to heightened anxiety levels. Pre-service teachers, in particular, are vulnerable to experiencing anxiety due to specific stressors including balancing performance assessments with training schedules, the uncertainties of future careers, concerns about their teaching abilities, and the pressure of meeting institutional and administrative expectations. Understanding and addressing this anxiety is crucial, as prolonged or unaddressed stress can negatively impact both teaching effectiveness and overall mental health.

To evaluate the extent and nature of anxiety among teachers, various psychological instruments have been developed. While effective, many of these measures either do not specifically account for the diverse stressors that pre-service teachers experience or are outdated and thus cannot successfully capture the nuances of training to be a teacher in the present day. Recognising this gap, the Future Teacher Anxiety Questionnaire (FTAQ; Mercer et al., 2024) was developed as a more targeted instrument for measuring the unique dimensions of anxiety faced by pre-service teachers. The FTAQ aims to provide a comprehensive framework for assessing anxiety levels in future teachers by addressing specific factors such as comparison to other student teachers, professional preparedness, and physical manifestations of anxiety. Unlike generalised anxiety measures, the FTAQ is designed to capture concerns that arise during teacher training experiences. By offering a specialised assessment tool, the FTAQ contributes to a deeper understanding of the psychological barriers that may affect pre-service teachers' confidence and performance. The FTAQ helps lay the groundwork for evidence-based strategies that can foster emotionally regulated, resilient educators capable of creating inclusive, supportive learning environments for all students.

This study seeks to establish the validity and reliability of the FTAQ by comparing it to the widely used Teaching Anxiety Scale (TCHAS; Parsons, 1973). Through statistical analysis, the study will examine whether the FTAQ accurately measures pre-service teacher anxiety. The findings of this study have significant implications for teacher education programmes. By identifying specific anxiety triggers among pre-service teachers, institutions can develop targeted interventions such as the promotion of stress awareness initiatives, mindful practices within teaching, and mentorship programmes to better support future educators. Additionally, the study discusses the potential integration of the FTAQ with physiological data from wearable devices, offering an innovative approach to understanding anxiety through both self-reported and physiological indicators. Eventually, the validation of the FTAQ could lead to its adoption as a standard tool for assessing and addressing anxiety in teacher preparation programmes globally. By enhancing understanding of pre-service teacher anxiety, this research contributes to the broader goal of fostering a well-prepared, confident, and emotionally regulated workforce.

## 2. Theoretical framework

### 2.1 Teacher anxiety

In recent years, numerous studies have focused on student anxiety in relation to different school subjects (Alamri, 2020; England et al., 2017), however, a less studied area concerns the anxiety of pre-service teachers. Anxiety affects teacher performance by manifesting itself, in the long term, in demotivation, distraction, lack of preparation and teaching inability (Novious & Yawe, 2021). Teaching anxiety is, in fact, an emotional state that can profoundly affect the learning and teaching process. This phenomenon can appear in different ways, including fear of being judged, insecurity in one's teaching abilities and stress related to classroom management (Aydin, 2021). Teaching anxiety can affect both novice and experienced teachers, affecting their teaching effectiveness (Buri et al., 2020) and general well-being (Dreer, 2024). For these reasons, teaching anxiety represents a significant problem for teachers' well-being, which, if preventively identified through appropriate diagnostic tools, could lead to the creation of interventions aimed at mitigating risk factors.

In 2021, Aydin conducted a systematic review to examine anxiety in teaching, assessing the existing

literature and associated variables. The review included 108 studies, published in 93 journals, with a publication period ranging from 1973 to 2019. These studies included a variety of research designs, including qualitative, descriptive, correlational, and experimental. The results showed that teacher anxiety has negative effects on teaching effectiveness and the working environment, leading to inappropriate teaching behaviour and problems in planning and time management. It was found that teaching experience, content knowledge and effective teaching styles reduce anxiety levels. Furthermore, it was observed that anxiety can be transmitted from teachers to students, also negatively affecting their performance. The finding that teaching experience can reduce anxiety levels also makes the present study's research particularly pertinent, because pre-service teachers inherently have less, or none at all, in comparison to in-service teachers.

According to a 2004 study (Merç), anxiety is one of the most common issues among prospective teachers and the main identified sources of such anxiety include: negative past experiences, large classes, feelings of incompetence, fear of supervision, use of new teaching techniques, time management and fear of not achieving teaching objectives. Also, the emotions experienced by teachers, in relation to their self-efficacy, their ability to balance the resources at their disposal with the demands of the environment, the perception of support received and the presence of a strong network of relationships within the school organisation, all play a fundamental role in the level of job satisfaction, job performance and the quality of relationships established with students (Baluyos et al., 2019). Most of these stressors are relevant to pre-service teachers, however pre-service teachers have added factors that either increase the impact of those stressors or exist as new stressors entirely. Pre-service teachers must balance these factors with the demands of their training, navigating new procedures, completing performance assessments with little experience, all whilst being uncertain of the career that lies ahead of them.

## 2.2 The need for self-report measures

The literature underlines the importance of constructing valid and reliable instruments to measure the level of teaching anxiety. Such measures can help identify and address potential issues that may impact a teacher's performance and well-being as well as guide interventions for supporting teachers. The research shows that teacher anxiety can affect their ability to effectively manage classrooms, build rapport with students, and impact student learning (Pi et al., 2022). Moreover, research emphasises the risks of later levels of burnout and job satisfaction in professional teaching careers (Turner & Garvis, 2023). Given these implications, the development of precise anxiety assessment tools is essential for shaping supportive teacher training programmes.

The literature demonstrates a wide variety of instruments used to assess anxiety, each reflecting a different understanding of what constitutes anxiety. Anxiety as a stable personality trait (trait anxiety) and anxiety as a reaction to specific real-life situations (situational anxiety), is usually assessed through self-assessment questionnaires. In regard to the measure of pre-service teacher anxiety, the literature is limited. Whilst Parsons' (1973) Teaching Anxiety Scale (TCHAS) is still considered a valid instrument, and can be adapted for pre-service teachers, the majority of existing scales focus solely on in-service teachers. Furthermore, the scientific literature shows a significant prevalence of studies focusing on the measurement of anxiety in relation to specific teaching disciplines, consequently creating an epistemological gap in the identification of generalisable factors associated with the occurrence of anxiety states in the teaching profession (Gannoun & Deris, 2023; Haciomeroglu, 2014). Such a focus on circumscribed disciplinary domains, although methodologically justifiable due to the specificity of contextual variables, results in a fragmentation of the body of knowledge regarding universal predictors of professional anxiety in the educational context.

Within the literature, not only is there a general lack of tools available globally to measure anxiety in pre-service teachers, but this gap is also reflected in the Italian context in which this study is situated. Whilst some existing Italian studies have used teacher stress questionnaires to measure teacher stress (Zurlo et al., 2013), these largely focus on in-service teachers and do not always contain items relating to the specific stressors associated with being a pre-service teacher. Instead of specific tools, studies have also tended to use existing validated measures for generalised anxiety (Mancini et al., 2022), such as the State-Trait Anxiety Inventory (STAI; Spielberger, 1983) or generalised burnout (Fiorilli & Pepe, 2015; Parrello et

al., 2019), which, although validated and reliable, are not specifically designed for pre-service teacher anxiety. As a result, it may not capture the nuances associated with the stressors that affect pre-service teachers. The absence of suitable, accessible measures in Italy underscores the importance of having a context-specific instrument to assess future teacher anxiety. To address this need, the Future Teacher Anxiety Questionnaire (FTAQ; Mercer et al., 2024) has been translated into Italian by a native speaker to ensure linguistic and cultural accuracy.

The literature underscores the importance of integrating anxiety reduction strategies into teacher education programmes. By focusing on both the emotional and cognitive aspects of teaching, these programmes can better prepare future teachers to manage their anxiety and improve their teaching effectiveness. Additionally, the development and use of validated measurement tools can help in identifying specific areas of concern and tailoring interventions accordingly. Furthermore, while innovative technologies continue to grow within educational settings (Gersak & Gersak, 2021), research has predominantly focused on wearable technologies for use with students, with less attention given to their application for teachers. As educators face unprecedented challenges and changes, understanding how wearable technologies can support them is important. The present study is part of a broader research effort that seeks to explore the potential of innovative wearable technologies for preservice teachers, particularly in managing anxiety. Mercer & Leone (2024) conducted a narrative review on understanding teacher emotions through physiological data and found that triangulating the objective biometric data with subjective self-report measures was essential. By combining these approaches, researchers can develop a more comprehensive understanding of teacher emotions and stress levels. The FTAQ serves as the baseline self-assessment measure in this context, providing a foundation for future studies that aim to integrate physiological data with self-reported experiences. Ultimately, such advancements could lead to more effective strategies for managing stress and enhancing resilience in educational environments, within the context of an increasingly digitalised world.

For these reasons, the present study assesses the concurrent validity of the FTAQ, an instrument specifically designed to measure the different dimensions of anxiety experienced by pre-service teachers. Furthermore, it aims to fill gaps found in the literature, thus contributing to scientific research on this topic.

### 3. Methodology

#### 3.1 Sample

For the recruitment of participants, a convenience, non-probabilistic sampling method was employed. The sample consisted of 224 future teachers enrolled at the University of Palermo. The students were in their third year of their Primary Education Sciences degree course. Of the sample, the majority of participants identified as female (95.5%). Participants had a mean age of 22.71 years ( $SD = 4.08$ ). Participation was voluntary, and consent was gained to process the results. Ethical approval was granted from the University of Palermo ethics board.

#### 3.2 Instruments

##### *Future Teacher Anxiety Questionnaire*

The Future Teacher Anxiety Questionnaire (FTAQ; Mercer et al., 2024) was developed to assess anxiety in pre-service teachers, addressing the specific stressors they encounter during training. Items were generated based on existing literature, observational data, and later piloted and refined through factor analysis and qualitative feedback from pre-service teachers, gaining insights into its clarity, relevance, and structure. Based on these findings, modifications were made to the questionnaire. The FTAQ consists of 32 items across six subscales: Classroom Confidence and Student Engagement Anxiety (CCSE), Workload Stress (WLS), Anxiety about Performance and Assessments (PA), Emotional and Physical Manifestations of Anxiety and Stress (EPM), Bureaucratic and Precarious Stress (BPS), and Interpersonal Relationships in the

Workplace (IR). The CCSE subscale addresses classroom management and student rapport, with items such as: «I am afraid I won't be able to build a good rapport with my students». The WLS subscale focuses on workload and work-life balance, including items like: «I feel overwhelmed thinking about how I will balance lesson planning, grading, and other tasks» and «I feel stressed thinking about how I will balance my teaching responsibilities with my personal life». The PA subscale pertains to anxiety around performance and assessments, with items such as: «I feel anxious about being observed by supervisors or colleagues while teaching». The EPM subscale covers the physical signs of anxiety, as identified during the item generation phase, and includes statements like: «I often experience physical symptoms (e.g., sweating, trembling, fast heartbeat) while preparing for or teaching lessons». The BPS subscale was introduced after feedback from the pilot phase, focusing on bureaucratic and administrative stress, with items such as: «I feel that the bureaucratic processes required by the school will interfere with my ability to focus on teaching» and «I worry about the uncertainty of my teaching position». Finally, the IRW subscale was added in response to participant feedback, which highlighted the importance of workplace relationships. This section includes items such as: «I feel nervous about how my interactions with colleagues may affect my professional development». Each item is rated on a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree), with higher scores indicating greater levels of anxiety. Total mean scores can be calculated for each subscale, as well as the total overall scale.

### *The Teaching Anxiety Scale*

The Teaching Anxiety Scale (TCHAS; Parsons, 1973) is widely regarded as one of the most effective measures of teaching anxiety (Bilali, 2014). Over the years, it has been utilized in various educational populations and contexts (Bosica, 2022; İpek, 2016; Liu & Wu, 2021; Marso & Pigge, 1998; Pelton, 2014). Though not previously utilised within an Italian context in part due to the lack of the use of tools specific for pre-service teacher anxiety utilised within Italian studies, this tool has demonstrated strong validity and reliability in other educational populations and has been translated by a native speaker of Italian for this study. The use of the TCHAS as the criterion for comparison was important due to its design for use in pre-service teacher contexts, not just in-service teachers. TCHAS comprises self-report statements designed to assess teachers' responses to teaching-related situations, categorised into two main areas: emotional reactions to different teaching scenarios and attitudes toward teaching as a profession. Originally developed at Stanford University, the TCHAS underwent modifications in subsequent years, with various versions emerging. Parsons (1973) reported all versions to demonstrate high internal consistency, with alphas ranging between  $\alpha = 0.87$  to  $\alpha = 0.94$ . The present study employed the unidimensional TCHAS (1)-29, which consists of 29 statements rated on a 5-point Likert scale (1 = never; 5 = always). Roughly half of the items are positively worded, while the remaining items are negatively phrased. To maintain consistency in scoring, responses to positively worded items are reverse scored, ensuring that higher scores indicate greater teaching anxiety. Traditionally, the total TCHAS score is calculated by summing the item scores. However, for data analysis of the comparability with the FTAQ in the present study, total scores were converted to mean scores by dividing the sum by the number of items.

### **3.3 Data collection**

The data was collected through convenience, non-random sampling via an online questionnaire, Google Forms. The two questionnaires (FTAQ and TCHAS) were both administered at the same time within the online form, so to adhere to the guidelines of assessing concurrent validity (West & Beckman, 2018). Participation in the study was voluntary with consent obtained to process their responses. Given the sensitive nature of the anxiety questionnaires, participants were provided with an explanation of the content before initiating the survey. It was emphasized that they were free to skip any questions or discontinue the questionnaire at any time without consequence. The anonymity of the surveys and the confidentiality of the data were explicitly assured to all participants.



### 3.4 Data analysis

After data collection, the raw data was cleaned, prepared, and processed in Jamovi 2.2.5 software, inclusive of handling missing data and assumption checks for correlation analysis. Screening and a scatterplot (Figure 1) indicated the presence of a monotonic relationship between the two measures. A paired observations design was used, as the participants completed both measures. Spearman's rho correlation analysis was used due to the ordinal nature of the Likert scale data to assess the FTAQ's concurrent validity, an approach of criterion validity (Lin & Yao, 2023). The TCHAS, an extensively validated 'gold standard' measure, served as the criterion for comparison.

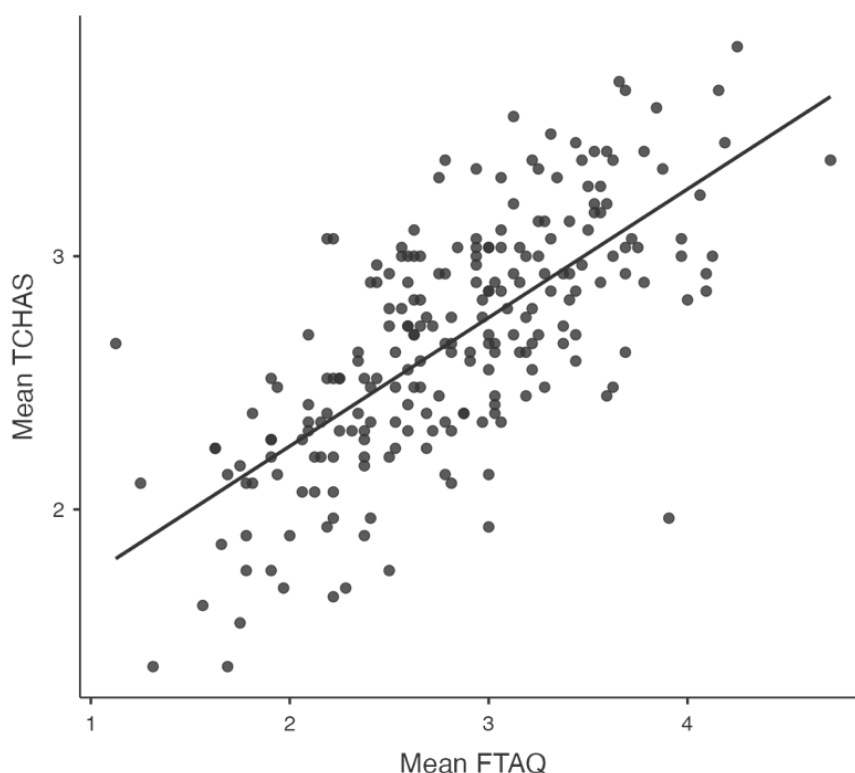


Fig. 1: Scatterplot FTAQ and TCHAS

## 4. Methodology

Descriptive statistics for the Future Teacher Anxiety Questionnaire (FTAQ) and the Teaching Anxiety Scale (TCHAS) are presented in Tables 1 and 2, respectively.

<i>Subscales</i>	<i>No. Items</i>	<i>Mean</i>	<i>SD</i>	<i>Minimum</i>	<i>Maximum*</i>	<i>Cronbach's alpha</i>
Classroom Confidence + Student Engagement	9	3.01	0.728	1.22	4.78	0.865
Workload Stress	5	2.73	0.854	1.00	5.00	0.873
Performance + Assessment Anxiety	3	3.30	0.985	1.00	5.00	0.868
Emotional + Physical Manifestations	6	2.52	0.870	1.00	4.83	0.843
Bureaucratic + Precarious Stress	6	2.83	0.829	1.00	5.00	0.840
Interpersonal Relationships	3	2.58	0.903	1.00	5.00	0.769
Total Scale	32	2.83	0.649	1.13	4.72	0.941

Tab. 1: Descriptives and Reliability of FTAQ Total and Subscales

\* Theoretical minimum and maximum values for all subscales and the total scale are 1 and 5.

The mean score for the total FTAQ was  $M = 2.83$ ,  $SD = 0.65$ , while the total TCHAS had a mean score of  $M = 2.67$ ,  $SD = 0.47$ . To evaluate the internal consistency of the newly developed questionnaire as well as the criterion measure, Cronbach's alpha coefficients were calculated. Tables 1 and 2 also represent the Cronbach's alpha coefficients for the FTAQ and its six subscales, and the TCHAS, respectively. All FTAQ subscales and the total scale demonstrated high reliability, through high Cronbach's alpha values (Nunnally & Bernstein, 1994; George & Mallery, 2016), ranging between  $\alpha = 0.840$  and  $\alpha = 0.941$ , indicating that the items within the scale measured a coherent construct. The criterion measure, the TCHAS, also demonstrated a high Cronbach's alpha of  $\alpha = 0.856$ , echoing previous findings (Bilali, 2014; Parsons, 1973).

	<i>No. Items</i>	<i>Mean</i>	<i>SD</i>	<i>Minimum</i>	<i>Maximum**</i>	<i>Cronbach's alpha</i>
Total (Mean) TCHAS	29	2.67	0.469	1.38	3.83	-
Total TCHAS*	29	77.42	13.613	40.00	111.00	0.856

Tab. 2: Descriptives and Reliability of TCHAS

\* As mentioned, for correlation analyses purposes, mean scores of the TCHAS were used, but we present both the sum and mean here for informative purposes.

\*\* Theoretical minimum and maximum values for the mean scores are 1 and 5, whilst theoretical minimum and maximum values for the sum scores are 29 and 145.

To examine the concurrent validity of the FTAQ, a Spearman's correlation was conducted between the FTAQ and TCHAS total mean scores (Table 3). Results indicated a significant, strong, positive correlation ( $r = .70$ ,  $p < .001$ ), supporting the FTAQ as a valid measure of teaching anxiety in pre-service educators. This correlation suggests that individuals with higher FTAQ scores also tend to have higher TCHAS scores.

		<i>Mean TCHAS</i>	<i>Mean FTAQ</i>
Mean TCHAS	Spearman's rho	—	
	df	—	
	p-value	—	
Mean FTAQ	Spearman's rho	0.699	—
	df	222	—
	p-value	<.001	—

Tab. 3: Correlation Matrix OF total FTAQ and TCHAS

Spearman's rho correlation analysis was also conducted between the TCHAS and each of the six subscales of the FTAQ (Table 4), to conduct a thorough examination of how the individual components of the newly developed FTAQ correspond to the construct of teaching anxiety measured by the criterion. As seen in Table 4, all six subscales demonstrate positive, significant correlations with the TCHAS. Correlations were moderate to strong ( $r = .46$  to  $r = .66$ ), further demonstrating the concurrent validity of the FTAQ through its granular correspondence with the TCHAS.

		<i>CCSE</i>	<i>WLS</i>	<i>PA</i>	<i>EPM</i>	<i>BPS</i>	<i>IR</i>
Mean TCHAS	Spearman's rho	0.655	0.497	0.542	0.547	0.456	0.463
	df	222	222	222	222	222	222
	p-value	<.001	<.001	<.001	<.001	<.001	<.001

Tab. 4: Correlation Matrix of TCHAS and FTAQ Subscales

Overall, these results confirm the FTAQ's concurrent validity and reliability, reinforcing its applicability for assessing teaching anxiety in pre-service educators.

## 5. Discussion

The present study provides supportive evidence for the validity of the Future Teacher Anxiety Questionnaire (FTAQ), as demonstrated by its significant correlation with the Teaching Anxiety Scale (TCHAS). This finding indicates that the FTAQ effectively captures the construct of teaching-related anxiety in pre-service educators, supporting its use as a reliable self-report measure. Given that teachers' emotions can negatively impact classroom performance, student engagement, and teaching effectiveness (Aldrup et al., 2024), having a dedicated tool for assessing this anxiety in future educators is particularly valuable.

The strong correlation with the TCHAS suggests that the FTAQ measures similar constructs of anxiety while offering a more specific focus on the unique challenges faced by pre-service teachers of today. Traditional teaching anxiety measures primarily focus on in-service teachers with established classroom experience, whereas the FTAQ captures the stressors inherent to pre-service teachers, such as balancing training and assessment demands, uncertainty of future positions, and feelings of comparison to other students in training programmes. The use of the Parsons (1973) TCHAS as the criterion measure in this study was particularly important as it was designed also to be adaptable to pre-service teachers, thus was a good fit to the focus of the newly developed questionnaire. However, although the TCHAS was designed with pre-service teachers in mind, it cannot fully address the contemporary pressures faced by modern-day future teachers (Gorospe, 2022). Therefore, by addressing these unique stressors, the FTAQ fills an important gap in the literature and provides a more relevant and up to date measure for early-career educators.

The development and continued validation of the FTAQ is significant not only for its theoretical contributions but also for its practical applications in teacher training settings. Given that teacher attrition is often linked to burnout which affects both the teacher and their students (Brackett et al., 2010; Madigan & Kim, 2021), early identification of these issues is essential. Teacher training programmes could use the FTAQ to assess anxiety levels over time, identify at-risk individuals and promote self-awareness of anxiety and stress, implementing targeted interventions aimed at reducing stress before escalation.

Furthermore, as mentioned, teachers in today's educational contexts are increasingly expected to serve also as emotional support figures for their students, extending beyond their traditional roles as solely knowledge providers. Research has demonstrated that teacher emotions significantly influence both student wellbeing and student academic outcomes (Frenzel et al., 2021), thus having effects throughout the entire classroom environment. This underscores the critical importance of developing and validating specific, up to date assessment tools like the FTAQ, particularly for pre-service and early career educators who are still forming their professional identities. By creating robust measures to assess teaching anxiety during formative training stages, teacher education programmes and institutions could more effectively identify potential emotional challenges before these pre-service teachers enter full-time practice. Pre-service teachers require wellbeing support to employ the coping strategies and emotional regulation skills necessary to facilitate positive interactions and coregulation with their students (Sáez-Delgado et al., 2022), and early identification and intervention through validated measures can assist in equipping future teachers with these skills. This approach is essential for developing resilient educators capable of supporting not only their students' academic growth but also their socioemotional development in an ever-changing educational landscape.

Ultimately, the development and validation of the FTAQ provide a critical resource for teacher education programmes, enabling early identification of anxiety among pre-service teachers and facilitating the implementation of interventions that promote the awareness of teacher well-being. This research contributes to the broader goal of creating a sustainable, resilient teaching workforce prepared to navigate the complexities of modern education, leading to more positive and inclusive classrooms for future generations.



## 6. Limitations and future research directions

Regarding the studies' limitations and future research directions, while the findings of this study support the validity and reliability of the Future Teacher Anxiety Questionnaire (FTAQ), its limitations must be acknowledged. First, the study relied on a sample of 222 pre-service teachers from a single university, which may limit the generalizability of the results. Future research should aim to confirm these findings with a larger and more diverse sample, ensuring that the FTAQ is applicable across diverse contexts.

A key next step in validating the FTAQ is conducting a Confirmatory Factor Analysis (CFA) with a larger sample size to verify the revised factor structure. While the present study provides evidence of concurrent validity, finalizing the questionnaire's dimensional structure is essential for establishing it as a standardized tool.

Beyond psychometric validation, future studies should also integrate the FTAQ into research on stress-management approaches using innovative technologies. The integration of the FTAQ with emerging technology opens exciting opportunities for further research. As wearable devices that measure physiological markers, such as heart rate and electrodermal activity, become more accessible, combining these objective data with results from the FTAQ as a self-report data source through triangulation can increase the validity of findings, providing deeper insights into the emotional experiences of pre-service teachers. The FTAQ offers a standardized baseline measure for such studies, offering a comprehensive approach to provide an understanding of how future teachers experience anxiety, thus facilitating innovative interventions tailored to support teacher well-being, within the digital era.

To conduct such triangulation studies using wearables, it is first important to examine pre-service teachers' perceptions of these technologies, to understand how such tools can be effectively incorporated into teacher training programmes and be accepted by the future teachers who could benefit, future studies should explore this.

## 7. Conclusions

The present study confirms the concurrent validity of the Future Teacher Anxiety Questionnaire (FTAQ) as an effective tool for assessing anxiety in pre-service educators. By demonstrating a strong correlation with the established Teaching Anxiety Scale (TCHAS), the FTAQ stands as a more relevant, specific measure that captures the unique stressors faced by future teachers. This study discusses the importance of self-report measures such as the FTAQ for early identification and intervention in managing teacher anxiety, as unaddressed stress can impact both future teacher wellbeing and student experiences. Moreover, the study has discussed the FTAQ's potential in future research as a subjective data source for potential data triangulation with objective data from wearable devices, to offer a more holistic understanding of teaching-related anxiety and explore technology-assisted stress management. The ability to triangulate self-reported and physiological data paves the way for innovative research and practical applications in teacher training programmes. While this study provides strong evidence for the FTAQ's validity, further research is needed to generalize findings across diverse populations and educational contexts with larger, diverse samples. This study contributes to the broader goal of supporting pre-service teachers in developing resilience and well-being, ultimately fostering more effective and emotionally balanced educators.

## Funding acknowledgement

This research is funded by "SiciliAn MicronanOTech Research And Innovation Center "SAMOTH-RACE" (MUR, PNRR-M4C2, ECS\_00000022), spoke 3 - Università degli Studi di Palermo "S2-COMMs - Micro and Nanotechnologies for Smart & Sustainable Communities".

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