



Psychometric Scales for Measuring Public Speaking Stress and Anxiety: A Comprehensive Review

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ABSTRACT

Background: Public speaking anxiety (PSA) is the most prevalent and debilitating type of social anxiety, limiting academic performance, work attendance, and social involvement.

Objectives: This narrative review addresses the psychosocial basis of PSA and summarizes psychometric and biological strategies to capture the stress and anxiety that arise from public speaking.

Methodology: According to contemporary theoretical models, specifically cognitive-behavioral, evolutionary, and acceptance-based perspectives, PSA is a multidimensional condition that is characterized by maladaptive cognitions, avoidance, and sympathetic arousal. Standard test tools, including the Personal Report of Communication Apprehension (PRCA-24), the Personal Report of Public Speaking Anxiety (PRPSA), the Social Avoidance and Distress Scale (SADS), the Fear of Negative Evaluation Scale (FNE) and the Brief Fear of Negative Evaluation Scale (BFNE), have played a critical role in the evolution of research on PSA. Conversely, the majority of these measures provide only minimal contextual specificity and have not necessarily been extensively validated across various cultural contexts. Newer tools have greater sensitivity to performance-related situations and cognitive self-evaluations throughout the speaking tasks ^(38, 39): for example, Public Speaking Anxiety Scale (PSAS) Public Speaking Class Anxiety Scale (PSCAS), Self-Statements During Public Speaking Scale (SSPS), Liebowitz Social Anxiety Scale (LSAS), Social Phobia and Anxiety Inventory (SPAI).

Results: Besides the subjective self-report instruments, biological assessment techniques offer objective data related to the physiological correlates of public speaking anxiety. Among these are cardiovascular monitors, electrodermal activity, neuroendocrine profiling, and other similar multimodal indices, acquired via wearable sensor technologies. Combining physiological indicators with psychometric assessments may enhance diagnostic specificity, which may in turn help to elucidate biological mechanisms and allow for more tailored interventions. Standardization of biological reference ranges and assessing their responsiveness to therapeutic approaches should offer further opportunities to optimize treatment. Future research is called upon to establish culturally appropriate, multimodal measures able to assess anticipatory anxiety, in-task experience, and post-event processing. More attention should be paid to stress profiles predicted by various speaking contexts and to the delivery of just-in-time adaptive interventions. This review emphasizes the importance of multimethod assessment frameworks which integrate self-report, behavioral, and physiological measures of public speaking anxiety to enhance our ability to accurately identify, manage, and effectively treat individuals suffering from public speaking anxiety.

Keywords: Psychometric scales, public speaking anxiety; physiological stress markers; social anxiety

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INTRODUCTION

Public speaking anxiety (PSA) is a widespread and disabling example of social phobia, with about 70% of the population affected to some degree. At a time when communication skills, including public speaking, are highly sought after by employers, individuals with high PSA begin to limit their career options and advancement, which may pose an obstacle to career success ^(1,2, 3). The anxiety related to public speaking makes the students suffer greatly affecting their studies and professional development. Content Presentation Anxiety (PA) affects the level of classroom participation, limits engagement in collaborative hybrid learning, and undermines students' confidence in their communication skills. In addition to this, anxiety can also affect performance during presentations due to fluency of speech, lack of attention, and failure to express ideas clearly ^(4, 5). Previous literature evidence reported that more severe public speaking anxiety leads to substantially poorer academic performance apparently because excessive anxiety interrupts many cognitive functions needed for effective encoding, processing, and learning of relevant and critical information ^(6, 7).

Assessment through psychometric measurement is crucial in this regard; the impact of valid, empirical assessment is necessary before effective treatment, and for tracking outcome. Conventional approaches used one-dimensional instruments, such as the Personal Report of Public Speaking Anxiety (PRPSA), or the Personal Report of Communication Apprehension (PRCA-24) developed by McCroskey ^(8, 9). The PRPSA was used to select the most anxious students, but it has also been criticized for using a true-false scale and that it focused more on situations outside of the classroom rather than in a controlled setting like the classroom. Likewise, the PRCA-24 reflects a surface trait-like disposition across many communication channels (eg dyads; small groups), limiting its ability to define an

individual instance of public speaking as a stressor ^(8, 9).

Over the years, psychometric instruments of measuring stress have evolved towards multidimensional scales. The limitations of previous assessment tools include the use of only one type of wording; however, Bartholomay and Houlihan developed the Public Speaking Anxiety Scale (PSAS), which contains both positively-worded and negatively-worded items to avoid acquiescence bias ^(10, 11). Based on the cognitive, behavioral, and physiological dimensions of the three-component model of anxiety, the Public Speaking Anxiety Scale (PSAS) describes public speaking anxiety based on cognitive, behavioral, and physiological aspects. Domain specific subscales have added separate subscales in these domains, this adds greater detail to the diagnostic profile and facilitates a more comprehensive understanding of the observations made about the way anxiety is manifested in individuals ⁽¹⁰⁾. The last work is the scale Public Speaking Class Anxiety Scale (PSCAS), which was developed to measure anxiety levels experienced by English as Foreign Language (EFL) learners in classroom speaking activities ⁽¹²⁾. In contrast to general public speaking measures, the PSCAS focuses on language-specific stressors such as fears of making mistakes in the target language, fears of negative evaluation, and anxiety associated with speaking (or even performing) in a non-native language, which is a form of stage fright specific to language use ^(12,13).

Although instruments for assessing anxiety surrounding public speaking are increasingly becoming more available, the literature has remained limited in terms of its overview of psychometric properties, conceptual dimensions, context of use, and physiological correlates of these measures. Most of the previous research has been on the unidimensional measures or on specific domains:

Few published studies have two or more public-speaking-specific psychometric scales integrated within a comparison alongside behavioral and/or physiological assessment approaches ^(13–15). Specifically, the relative merits of combining self-report, behavioral, and physiological measures have received considerable attention lately since each approach may reflect different aspects of the public speaking anxiety response ⁽¹³⁾. Moreover, detailed assessment by newer instruments including the Public Speaking Anxiety Scale (PSAS) that were specifically designed to measure cognitive, behavioral, and physiological factors of speech anxiety ⁽¹⁰⁾, has shown in subsequent psychometric work that reduced shorter versions of established instruments provide more pragmatic and psychometrical testing in university populations, such as the PRPSA-18 ⁽¹⁴⁾. Likewise, the research investigating speaking anxiety in a second language has shown that anxiety can be powerfully affected by situational factors such as fear of negative evaluation, language-focused anxiety, and perceived communication competence, underscoring the need for context-sensitive measurement tools ⁽¹⁵⁾.

AIMS OF THE STUDY

this narrative review aims to summarize the existing psychometric scales quantifying public speaking stress and anxiety by providing an recent overview, alongside relevant behavioral and physiological assessment approaches.

METHODOLOGY

Research Strategy

A structured literature search was conducted to find publications addressing public speaking stress and anxiety, psychosocial and physiological correlates of public speaking stress and emotion, and psychometric instruments used to evaluate the responses. Database searching was performed on PubMed/MEDLINE, Scopus and Web of Science from database inception to December 2025. Also, the

reference lists of pertinent articles and review papers were searched by hand for potentially relevant publications that may have been missed in the electronic database search. The search strategy used combinations of the following keywords and Boolean operators: "public speaking anxiety", "public speaking stress", "communication apprehension", "speech anxiety", "social anxiety", "performance anxiety", "fear of public speaking", "psychometric scale", "psychological assessment", "anxiety scale", "stress scale".

Eligibility Criteria

The studies were eligible for inclusion if they were reported as full-text articles in peer-reviewed journals and fall into one or several of the following categories: (1) public speaking anxiety or stress; (2) communication apprehension or performance-related social anxiety; (3) development, validation, or application of psychometric scales to measure public speaking anxiety or related constructs; (4) behavioral [measures including avoidance behavior] and cognitive assessment of speech anxiety and/or (5) physiological/biological responses associated with public speaking such as cardiovascular, autonomic, electro dermal, or neuroendocrine responses. In addition, articles describing relevant theoretical models or conceptual frameworks that contributed substantially to our understanding of public speaking anxiety or its assessment were included.

Studies were excluded if they were not relevant to public speaking or performance-related anxiety, it examined only clinical anxiety disorders that are unrelated to public speaking and/or presentation skills, did not provide adequate information regarding the assessment approach, or constituted editorials, conference abstracts, letters, opinion pieces or non-peer-reviewed publications. Records in this set were excluded if they were a duplicate.

Study Selection

After this step, the obtained records were screened first by title and abstract based on the eligibility criteria. Full-text assessment of potentially

relevant articles was then performed. More relevant publications were found based on manual inspection of the reference lists of included articles and key review papers. The literature was thematically organized by psychometric assessment, cognitive and behavioral measures, social anxiety-related instruments, and physiological/biological assessment methods.

CONCEPTUAL AND THEORETICAL FOUNDATIONS

Dimension of social anxiety

Social phobia is commonly reported to be the most frequently co-occurring anxiety disorder for both major depression and bipolar disorder, and tends to precede the onset of these illnesses when they co-occur. Such results have been used to support the "social risk" theory of social anxiety, which posits that anxiety symptoms develop to mitigate risk of exclusion from survival-enhancing social contexts ⁽¹⁴⁾. In contrast, performance anxiety is a specific condition that the DSM-5 categorizes as a specified of social anxiety disorder (SAD) instead of generalized social phobia because it is not widespread in its nature ⁽¹⁵⁾. While generalized social anxiety exists in many classically social situations, PSA is much more specific to the anticipation, performance and experience before, during and following public ⁽¹⁶⁾. This is clinically relevant since participants with isolated PSA may manage well in typical social circumstances, but suffer significant distress in more formal situations (i.e., presentations) ⁽¹⁷⁾.

Epidemiological studies suggest PSA rate prevalent differed however, with an estimation between 21% and 74% in university students and professional based cohorts ^(18, 19). Such variability is attributed to differences in how methods are evaluated, what the cutoff values of rating systems done and also cultures surrounding it. Hofmann et al. In the current study, we examined whether PCA has the same structure as did the comorbidity analysis of generalized social anxiety which includes items

related to fear of negative evaluation and catastrophic misattribution of social performance ⁽²⁰⁾. But because this describes PSA itself and how it behaves, its emphasis on conversation and observation necessitates different metrics for PSA ⁽²¹⁾. From an evolutionary perspective, PSA is a byproduct of some primordial threat-detection systems that are triggered when social evaluation was perceived in public contexts ⁽²²⁾. A phylogenetic ancestry roots for why public speaking in a non-life threatening, unitary modern context elicits vigorous autonomic and neuroendocrine responses ⁽²³⁾.

The Nature of Anxiety

Anxiety is the mental and physical state of negative anticipation -- mentally emphasized as increased arousal and negative expectancy tortured into worry and physically characterized by activation of multiple body systems, ostensibly preparation for coping with a non-specific ominous upcoming event or injury ⁽²⁴⁾. The cognitive domain includes relevant maladaptive cognitions: anticipatory social anxiety about upcoming public events (eg, thinking about what others will think of you), negative self-referential thinking (eg, brooding over their failure to behave), and post-event rumination regarding the content of social interactions ⁽²⁵⁾. In fact, the higher PSA likes to cause others assessment catastrophic ⁽²⁶⁾, does queuing damage and making social errors. These cognitive distortions are sustained ⁽²⁷⁾ through intentional bias towards threat-related stimuli and confirmatory interpretation of ambiguous social cues.

PSA can be ⁽²⁸⁾: auto-regulated through 'behavioral avoidance' of feared stimuli, reduced safety behaviors and impairment. Avoidance may range from outright rejection of speaking opportunities, to more indirect behaviours such as reading directly from notes or avoiding eye contact ⁽²⁹⁾. Although safety behaviours may provide immediate short-term relief by reducing subjective anxiety, they maintain beliefs about danger by preventing feared outcomes from being disconfirmed ⁽³⁰⁾. PSA is defined as performance on sympathetic

nervous system and hypothalamic-pituitary-adrenal axis activation, leading to tachycardia, diaphoresis, tremor and gastrointestinal manifestations ⁽³¹⁾. Regardless, physiological reactivity can be an order of magnitude higher than the felt distress level experienced, suggesting dissociation of experience from somatic response within these separate facets of anxiety ⁽³²⁾.

A conceptual model to which this experience can be applied is Lang's tripartite model of anxiety ⁽¹⁾, where they are dependent on each other but, also somewhat independent response systems. As a model of the elements composing each feature (i.e., cognitive (verbal-subjective), behavioral (motoric) and physiological (autonomic)) could also yield different activation patterns, further complicating assessment and intervention with these subjective features ⁽³³⁾. Recently, there has been psychometric impetus to prioritize multi-scale instruments over the more traditionally utilized unidimensional measures in order to account for this multidimensionality ⁽³⁴⁾. The latter effect is influenced by individual differences in anxiety sensitivity ⁽³⁴⁾, trait anxiety, and impairment of executive control functions ⁽³⁵⁾.

Theories Explaining Public Speaking Anxiety

There are many theories that have been suggested to clarify both the maintenance and etiology of PSA. The cognitive-behavioral model, outlined by Clark and Wells, over nine steps take the view that self-focused attention (especially penetrating imagery) as well as negative self-imagery are vital for maintaining anxiety loops ⁽³⁶⁾. In this model, PSA individuals assume an observer perspective during performance (observing their internal sensations) and create distorted mental representations of how they appear to the audience ⁽³⁷⁾. It is this increase in self-focus that steals attentional resources from the most relevant cues for task planning, which means lower quality performance against a negative expectation ⁽³⁸⁾.

The social evaluation theory which originates from the classical literature investigating social

facilitation suggests that mere audience presence increases arousal and enhanced dominant response tendencies ⁽³⁹⁾. This arousal causes working memory and executive functions for complex tasks (such as public speaking) to interfere with the performance ⁽⁴⁰⁾. For this purpose, the Yerkes and Dodson inverted-U hypothesis ⁽⁴¹⁾ identifies an optimal level of arousal for performance, such that hypoarousal or hyperarousal result in poorer performance. PSA has a persistent over activity in those that suffer from it, which is kept above this optimal point consistently ⁽⁴²⁾. Attachment theory proposes a developmentally relevant framework; Caregiving experiences early in life shape internal working models for self-worth and social acceptance ⁽⁴³⁾. Insecure attachment styles have been linked to higher rejection sensitivity and fear of negative evaluation in performance settings Anxious-ambivalent styles. These defensive tactics, which activate attachment-related imagery, were used in the occasion of public speaking, leading to manifest anxiety expressions ⁽⁴⁵⁾.

In 1977, George L. Engel proposed the bio psychosocial model (BPS) as a necessary medical model of psychiatric disorders. Since then, this model had been accepted as the preferred one for most of the world. This integrated the multiple effects of three key areas (biological, psychological and social) in the emergence of psychiatric disorders ⁽⁴⁶⁾. Based on classic twin studies, PSA is thought to be moderately heritable (30%–50%) ⁽⁴⁷⁾. Neuroimaging studies revealed the co-activation of the amygdala and insula with anticipation of public speaking as well as decreased prefrontal regulatory control ⁽⁴⁸⁾. Neurobiological results were integrated with psychological theories emphasizing bottom-up threat detection and top-down cognitive regulation mechanisms ⁽⁴⁹⁾.

Even more recently than the methodology described above, an alternative acceptance-based model of anxiety suggests that it is not maladaptive cognitions per se but rather experiential avoidance that is the main pathogenic process ⁽⁵⁰⁾. Efforts on

suppressing anxious symptoms paradoxically preserve their frequency and strength ⁽⁵¹⁾, thereby maintaining PSA. Interventions based on acceptance and commitment therapy center specifically around the use of mind ⁽⁵³⁾.

Psychometric Tools for Public Speaking Anxiety **Personal Report of Communication Apprehension (PRCA-24)**

Personal Report of Communication Apprehension was developed to measure the communication apprehension with intercultural context. This instrument is used on factor(s) better than the PRCA24 for this domain of communication ⁽⁵⁴⁾. The PRCA-24 covers four communication dimensions: dyads, meetings, small groups, and speaking in public ⁽⁵⁵⁾. Instrument subscales include the following: public speaking (six items), meetings (six items), group discussions (6-items) and interpersonal conversations (six items). Participants indicated their level of agreement with each statement using a five point Likert scale ranging from strongly agree to strongly disagree. The subscale of public speaking is a good fit for people with formal oral presentation anxiety specifically, which is quite prevalent in both the clinical and educational space ⁽⁵⁶⁾.

Total scale and subscale Cronbach's alpha coefficients for PRCA-24 have typically been >0.90 for the full scale and between 0.75 and 0.85 for individual subscales ⁽⁵⁷⁾. The temporal stability calculated for test-retest reliability over 2-3 months is between 0.75 and 0.80, suggested acceptable ⁽⁵⁸⁾. It has established some construct validity as the measure is correlated with other behavioral measures of avoidance, observer ratings of anxiety, and physiological measures of heart rate and skin conductance ⁽⁵⁹⁾. Its multi-factorial structure of the PRCA-24 has been evidenced as a means of criticism, whereas others reported that communicative apprehension is arguably a unitary construct as opposed to context specific manifestations ⁽⁶⁰⁾. However, the tool is still a

common component in communication sciences and educational psychology research on public speaking anxiety.

Personal Report of Public Speaking Anxiety (PRPSA)

McCroskey realized that a more focused assessment device was necessary and created the 34-item unidimensional Personal Report of Public Speaking Anxiety to measure anxiety only during formal speeches ⁽⁶¹⁾. In addition, the PRPSA was developed to be a more comprehensive tool addressing limitations in the existing PRCA-24 public speaking subscale which includes only six items and therefore may have a limited tuning range to provide a full measure ⁽⁶²⁾. The items refer to cognitive, affective and behavioral symptoms of public speaking anxiety—anticipatory worry (AW), physiological arousal in performance context (PR) as well as post-speech rumination (PSR).

Psychometric testing has shown good internal consistency, with Cronbach's alphas ranging from 0.94 to 0.96 ⁽⁶³⁾. Most factor analytic studies have supported a unidimensional structure even though some identified method factors in relation to positively and negatively worded items ⁽⁶⁴⁾. In relation to PRCA-24 public speaking subscale ($m-r = 0.75$ to 0.85), the PRPSA is moderately correlated with this scale ⁽⁶⁵⁾. Furthermore, PRPSA associated more closely with behavioral measures of speaking anxiety compared to bPRCA-24 ⁽⁶⁵⁾. However, the length of this instrument has constrained its use in scenarios where rapid assessment is needed, and it has informed the design of shorter alternatives ⁽⁶⁶⁾.

Social Avoidance and Distress Scale (SADS)

The Social Avoidance and Distress Scale ⁽⁶⁷⁾ created by Watson and Friend is an example of a pioneering measure for social anxiety, especially regarding talking in public. The 28-item tool is made up of two subscales, the social avoidance scale measuring behavioral disposition to avoid social situation or escape from them and the social distress scale reflecting subjective discomfort in a social context.

The SADS has been used in many studies investigating social fears related to performance because it covers formal social situations, not specifically public speaking anxiety ⁽⁶⁸⁾.

Internal consistency coefficients for the total scale and subscales have mostly been greater than 0.80, with test-retest reliability coefficients from 0.68 to 0.79 over one-month intervals ⁽⁶⁹⁾. Correlations with self-report measures of anxiety, behavioral avoidance tests, and clinician ratings have supported construct validity ⁽⁷⁰⁾. The SADS has been shown to be sensitive to treatment effect in individualized cognitive-behavioral intervention for social phobia, including public speaking anxiety ⁽⁷¹⁾. Nonetheless, because the instrument is more broadly concerned with general social functioning than actual situational performance contexts, this measure would not be useful to researchers conducting experimental studies that wish to identify varying levels of public speaking anxiety while controlling for other related fears in social situations ⁽⁷²⁾.

Negative evaluation avoidance scale (FNE)

However, the first and foremost aspect of cognition is assessed through a Fear of Negative Evaluation Scale developed by Watson and Friend ⁽⁷³⁾, which typically evaluates apprehension regarding evaluation from others. Respondents indicated the degree to which they were concerned about being judged negatively with respect to these 30 items that comprised the original scale used in very different situations ⁽⁷⁴⁾. The notion of fear of negative evaluation has been highlighted as a core maintaining factor for social anxiety disorders ⁽⁷⁴⁾, especially in performance situations where surveillance is explicit and evaluative ⁽⁷⁵⁾.

Moreover, psychometric properties of the FNE include internal consistency coefficients between 0.90–0.95 and test-retest reliability are above 0.75 over two weeks ⁽⁷⁶⁾. It has shown a moderate correlation with both behavioral measures of social skill and observer ratings of social performance, thus providing evidence for its construct validity ⁽⁷⁷⁾.

Research has repeatedly shown higher FNE scores in public speaking anxious individuals than in non-anxious controls, demonstrating its discriminate utility ⁽⁷⁸⁾. The instrument has been translated in many languages and validated in several other cultural contexts, enabling cross-national research on public speaking anxiety ⁽⁷⁹⁾.

Brief Fear of Negative Evaluation Scale (BFNE)

Brief Fear of Negative Evaluation Scale (BFNE) ⁽⁸⁰⁾ resolves the practical problems with the original 30-item FNE, by keeping nine items with a similar fundamental structure. The BFNE is a 20-item instrument derived from an item response theory analysis to identify the most information and discriminating items in the original item pool ⁽⁸¹⁾. The use of this short form has been particularly useful in research that used multiple assessments or to decrease participant burden ⁽⁸²⁾.

Internal consistency of the BFNE was found to be high, with Cronbach's alpha values ranging from 0.88 - 0.94 ⁽⁷⁹⁾. Factor structures have generally supported a single-factor solution, but several studies reported average method variance due to item wording effects based on the Utrecht Work Engagement Scale (UWES) ⁽⁵¹⁾. The Brief Fear of Negative Evaluation Scale (BFNE) has a high correlation with the original scale of FNE ($r = 0.90$ – 0.95 and similar criterion validity to predict social anxiety and avoidance behaviors ⁽⁷⁴⁾. The BFNE has been extensively used in research on public speaking anxiety, especially as it pertains to cognitive mechanisms and outcome studies due to these psychometric strengths ⁽⁸³⁾.

Public Speaking Anxiety Scale (PSAS)

The Public Speaking Anxiety Scale (PSAS) created by Bartholomay and Houlihan in 2016 was developed specifically to measure public speaking anxiety due to the lack of a widely-used measurement scale, monitor the therapeutic effect on patients' anxiety level. It consists of 17 Likert-scale items classified into three domains: cognitive symptoms (8 items), behavioral responses (4 items) and

physiological reactions (5 items). In your assessment of speech anxiety, the scale items are developed around what related to a full spectrum of cognitions, emotions, behaviors, and physical responses to public speaking experiences ⁽¹⁰⁾. Respondents rate how anxious they feel in a number of different specific speaking contexts (classroom presentations, work meetings, formal speeches) using a five-point Likert scale ⁽¹¹⁾.

The total scale achieved a good overall internal consistency at each time point (early validity studies: $\alpha = 0.94$) and subscale coefficients were reported as acceptable to good (α from 0.82 to 0.89) ⁽⁸⁴⁾. Previous studies have provided support for the three-factor structure using confirmatory factor analyses with undergraduate ⁽⁸⁴⁾ and community samples ⁽⁸⁵⁾. The PSAS showed moderate convergent validity with the PRCA-24 ($r = 0.65$) and a strong positive correlation with the PRPSA ($r = 0.82$), both supporting evidence of the tool's convergent and discriminant validity ⁽²⁰⁾. The scale has also demonstrated sensitivity to change following cognitive-behavioral therapy interventions for public speaking anxiety, with treatment effect sizes in the same range as those reported for established measures. Moreover, its multidimensional structure allows clinicians and researchers to pinpoint particular anxiety components that need to be intervened ⁽⁸⁶⁾.

Public Speaking Class Anxiety Scale (PSCAS)

Based on the language context specificity problem, the Public Speaking Class Anxiety Scale as developed by: Yaikhong and Usaha ⁽¹²⁾ is one of that can closely match the need, since this instrument accommodates specific classroom contextual linguistic situation within English as a Foreign Language (EFL), such that they integrate domain performance anxiety. The 30-item instrument was developed based on a series of qualitative interviews with EFL students followed by factor analytic refinement ⁽¹²⁾. This includes preparation anxiety, performance anxiety fear as well as instructor and

peer evaluation fear in public speaking courses items ⁽⁸⁷⁾.

Exploratory/confirmatory factor analysis by Toth et al. ⁽⁸⁸⁾ has shown good internal consistency reliability coefficients above 0.90 and four-factor structure/modalities consisting of communication apprehension, fear of negative evaluation, preparation anxiety and physiological symptoms in both Thai EFL samples from Thailand and other international EFL samples ⁽⁸⁹⁾. PSCAS shows more moderate to high relationships with general foreign language anxiety measures ($rs = 0.55$ to 0.65) but even higher relationships with public speaking-specific outcomes ⁽⁹⁰⁾. The instrument's factorial invariance across Asian and European educational contexts has been supported by cross-cultural validation studies ⁽⁹¹⁾. The PSCAS has been effective in screening for students with high risk in required programs on early interventions and the evaluation of the effectiveness of communication skills training programs ⁽⁹²⁾.

Self-statements during public speaking (SSPS)

Although the Self-Statements During Public Speaking Scale ⁽⁵⁾ is a fairly novel contribution as it targets cognitive self-talk process during public speaking performance and does not investigate general anxiety symptoms. A 10-item self-statement inventory that measures the frequency of negative (e.g., "I am getting started in my tasks") and positive self-statements (e.g., "I can cope with this situation") immediately after performing a speaking task ⁽⁵⁾. This performance-based methodology to assessment is an important advance because retrospective self-report measures are susceptible to memory biases and state-dependent recall ⁽³⁰⁾.

Internal consistency for the negative self-statements subscale has been between 0.85 and 0.91, whereas coefficients for the positive subscale have varied to a greater extent (0.70 to 0.82), which may be due to anxious individuals reporting that few of their cognitions are positive ⁽²⁵⁾. The SSPS has moderate correlations with trait measures of public

speaking anxiety ($r = 0.60$ to 0.70) but exhibits stronger associations with observer ratings of performance quality and post-speech physiological recovery ⁽⁹³⁾. It is widely used in cognitive-behavioral intervention research, as changes in self-statement ratios have predicted treatment outcomes above and beyond traditional measures of anxiety severity ^(94, 95).

Liebowitz Social Anxiety Scale (LSAS)

The Liebowitz social anxiety scale (LSAS) ⁽⁹⁴⁾ is a clinician guide with excellent applicability on performance-social fears such as public speaking. The fear and avoidance 24-item scale covers 11 social interaction situations and 13 performance situations, having public speaking explicitly included among the second type ⁽⁹⁶⁾. Separately, each item is rated on four-point scales for fear ($0 = \text{none to } 3 = \text{severe}$) and avoidance ($0 = \text{never; } 3 = \text{usually}$), providing total, fear, avoidance, social interaction, and performance subscale scores ⁽⁹⁷⁾.

Psychometric characteristics include good inter-rater reliability (intraclass correlation coefficients > 0.90) and excellent internal consistency ($\alpha > 0.90$ for total scale) ⁽⁹⁸⁾. The performance subscale, which includes the social anxiety of speaking in front of an audience, has been especially sensitive to pharmacological and psychological treatments for performance anxiety ⁽⁹⁹⁾. The LSAS have been used in many clinical trials for social anxiety disorder, and has helped to establish public speaking anxiety as a treatment outcome measure ⁽¹⁰⁰⁾. Although clinician administration limits its utility for large-scale survey research and educational purposes ⁽¹⁰¹⁾.

The Social Phobia and Anxiety Inventory (SPAI)

Social Phobia and Anxiety Inventory, is an extensive instrument consisting of 45 items in the cognitive, somatic and behavioral domains to measure social anxiety in different contexts ⁽³⁾. The instrument consists of two subscales: the Social Phobia Scale that measures anxiety in some specific social situations like public speaking, and Agoraphobia Scale which is a discriminant validity index ⁽¹⁰²⁾. Items are scored on seven-point scales indicating how often and intense each anxiety experience occurred ⁽¹⁰³⁾.

Psychometric validation has indicated internal consistency coefficients above 0.95 for the total scale and between 0.90 and 0.96 for the subscales ⁽¹⁰⁴⁾. Test-retest reliability is 0.86 over one week; longer intervals yield coefficients > 0.70 ⁽¹⁰⁵⁾. The highly discriminant validity was also indicated, which help users well discriminating social phobia from agoraphobia, specific phobia and panic disorder, respectively in the study of ⁽¹⁰⁶⁾. The questionnaire has been utilized extensively to investigate combinations between disorders and to assess construct specificity of intervention effects in people with public speaking fear ⁽¹⁰⁷⁾. The Social Phobia and Anxiety Inventory (SPAI) is especially appropriate for studies exploring whether the transference of the effects of public speaking anxiety will generalize to other social situations and interpersonal contexts due to its more comprehensive coverage of social and performance situations ⁽¹⁰⁸⁾. Table 1 summarizes a comparative analysis for the previously mentioned scales.

Table (1): Comparative characteristics of psychometric instruments for assessing public speaking anxiety and related constructs

Scale	Primary construct assessed	Main domains or focus	No. of items	Response format	Major limitations
Personal Report of Communication Apprehension (PRCA-24)	Communication apprehension	Communication apprehension across dyadic, group, meeting, and public-speaking contexts	24	Likert-type scale	Not specific to public speaking; reflects a broader trait-like communication tendency
Personal Report of Public Speaking Anxiety (PRPSA)	Public speaking anxiety	Anxiety specifically associated with public speaking	34	True/False	Dichotomous response format may reduce sensitivity; limited contextual specificity
Public Speaking Anxiety Scale (PSAS)	Public speaking anxiety	Cognitive, behavioral, and physiological components of anxiety	17	Likert-type scale	Requires further validation across diverse cultural and clinical populations
Public Speaking Class Anxiety Scale (PSCAS)	Public speaking anxiety in classroom settings	Anxiety associated with classroom public speaking and language-related performance	18	Likert-type scale	Primarily designed for EFL contexts; generalizability beyond language-learning settings may be limited
Self-Statements During Public Speaking Scale (SSPS)	Cognitive anxiety and negative self-evaluation during public speaking	Negative and positive self-statements during speaking	30	Likert-type scale	Focuses mainly on cognitive aspects and does not comprehensively assess physiological symptoms
Social Avoidance and Distress Scale (SADS)	Social avoidance and social distress	Avoidance and distress in social situations	28	True/False	Not specific to public speaking; may over represent broader social situations
Fear of Negative Evaluation Scale (FNE)	Fear of negative evaluation	Concern about being judged negatively by others	30	True/False	Does not directly assess public-speaking situations or physiological anxiety
Brief Fear of Negative Evaluation Scale (BFNE)	Fear of negative evaluation	Cognitive concern regarding negative evaluation	12	Likert-type scale	Measures a specific component rather than PSA as a whole
Liebowitz Social Anxiety Scale (LSAS)	Social anxiety and avoidance	Fear/anxiety and avoidance across social-interaction and performance situations	24 situations	Rating scale	Broader than PSA and therefore less context-specific
Social Phobia and Anxiety Inventory (SPAI)	Social phobia and anxiety	Social anxiety, avoidance, and related behavioral responses	45	Likert-type scale	Lengthy and broader than public-speaking anxiety specifically

Assessment of Public Speaking Stress

The most commonly used approach to measure public speaking-related stress and anxiety is via self-report questionnaires. Yet assessment approaches have increasingly broadened to include biological and physiological markers in addition to self-report measures ⁽³²⁾. These objective measures of autonomic and neuroendocrine functioning yield important complementary information, compensating for some limitations related to self-reported data (e.g., recall bias and the role of social desirability). This multimodal perspective acknowledges that public speaking anxiety comprises multiple systems – cognitive, behavioral, and physiological – that may not function effectively (i.e. a poor match across individuals/contexts ⁽²⁴⁾). Recent advances in electronic sensor technology and continuous data collection (more than 24 hours — days — during ecological speech-related tasks) have enabled a biological component ⁽¹⁰⁹⁾.

Despite the fact that cardiovascular parameters represent the most widely investigated physiological correlates to public speaking stress. In public speaking tasks, a decrement of heart rate variability (var) response is observed, again consistent with bias toward sympathetic activity and withdrawal of parasympathetic activity ^(31, 110). Blood pressure elevations across tasks, and particularly the dynamic systolic responses to the stress tasks were only weakly correlated with the self-reported anxiety severity ⁽⁴²⁾.

The vascular effects are mediated by catecholamine release with adaptive functions in preparing metabolic resources for physical exertion to then contribute to allostatic load parameters and cardiovascular disease risk due to chronic activation ⁽¹¹¹⁾. The establishment of specific scales has progressed to standardization in the biological quantification of public speaking stress, as discovered by Al-Assadi et al. ⁽¹¹²⁾ creating a new instrument that combines cardiovascular, electro dermal, and respiratory variables into a composite stress index. It

showed good psychometric properties and classified high and low anxiety speakers with 85% classification accuracy, supporting its use as a tool for objectively quantifying stress in forensic and clinical settings ⁽¹¹³⁾.

Another commonly used biomarker is Electro dermal activity, which indicates sympathetic cholinergic activation at the level of sweat glands. Public speaking anticipation and performance are accompanied with a marked increase in skin conductance responses, with trait-anxious individuals displaying significantly different habituation patterns compared to the non-anxious counterparts ⁽¹¹⁴⁾. The temporal pattern of electro dermal reactivity particularly the anticipatory change preceding speech has been shown to be more evidentiary than absolute level measures for subjective distress and may underpin a central maladaptive process of anticipatory arousal ⁽¹¹⁵⁾. Using multimodal datasets like WESAD (Wearable Stress and Affect Detection) have allowed to characterize the physiological signatures corresponding to these conditions simultaneously through the synchronized recording of electrocardiogram, electro dermal activity, respiration, skin temperature, and electromyography during different stress protocols including public speaking tasks ⁽¹¹⁰⁾. However, Prajod et al. ⁽¹¹⁶⁾ note, cross-dataset generalizability is a well-known limitation of present-day models trained on WESAD and similar laboratory datasets: they fail to perform in real-world public speaking settings. The resultant performance drop is due to the heterogeneous nature of the stressor and the baseline physiology of subjects as well as both the placement and calibration of sensors before use in a real-world application ⁽¹¹⁶⁾.

Neuroendocrine assessment gives important yet lesser concordant data that speaks to hypothalamic–pituitary–adrenal pivot actuation for patient sickle with limited hands-free assessment. Public speaking tasks have been associated with a reliable increase in cortisol levels, with maximal cortisol responding measured 20 to 40 min after the stressor ⁽¹¹⁷⁾. The intensity of the cortisol response

during public speaking appears to be partly correlated with dispositional traits and attributes relating to anxiety, as well as perfectionism-indicate that such neuroendocrine activation is under psychological central regulatory control ⁽¹¹⁸⁾. These results have encouraged the development of innovative pharmacological strategies directed at modulating neuroendocrine signaling mechanisms associated with stress. Specifically, interventions focusing on antagonism of the glucocorticoid receptor system, including Mifepristone, show early promise in decreasing public speaking anxiety. Nonetheless, safety, adverse events and long-term effects have so far precluded their routine implementation in clinical practice. ⁽¹¹⁹⁾. Oral vitamin C therapy is among the most recently developed low-cost, least invasive therapies for the treatment of psychobiological symptoms with the potential for buffering of physiological stress. Al-Fahham ⁽¹²⁰⁾ investigated the effects of low-dose vitamin C on speaking anxiety on public speaking stress during group presentations. Antioxidant mediation of glucocorticoid signaling and catecholamine synthesis is a mechanism that remains to be replicated in larger samples ⁽¹²⁰⁾.

Some respiratory parameters such as tidal volume (TV), respiratory rate (RR) and end-tidal CO₂ (PETCO₂) show well-known changes because of the stress of public speaking. Some hyperventilation patterns (with hypocapnia) propagate anxiety through the somatic symptoms they evoke (dizziness and paresthesia), which are misinterpreted as indicating death ⁽¹²¹⁾. Breathing training assisted with capnography has been shown to assist with changing respiratory pattern aberrations and lowering panic-like symptoms while conducting speaking tasks ⁽¹²³⁾. Notably, respiratory observation is still technically challenging to integrate into systems used for patients remotely, but they allowed novel behavioral-modification therapies with real-time feedback ⁽¹²³⁾.

Physiological assessment can serve an essential functional objective complement to self-reported public speaking anxiety by capturing

autonomic and neuroendocrine responses that may not be fully captured via subjective ratings. Cardiovascular measures (especially heart rate, heart-rate variability and blood pressure) are the most studied indicators; public speaking generally yields increased sympathetic activation, decreased parasympathetic activity and heightened responses of blood pressure ^(31, 42, and 110), although physiological measures often correlate only modestly with perceived anxiety. Electro dermal activity provides a further measure of sympathetic activation, with anticipatory skin-conductance responses being especially informative in the context of anxiety-related reactivity ^(114, 115). Both situational and neuroendocrine measures (most notably cortisol) jointly inform about hypothalamic – pituitary – adrenal - axis activation; whereas public speaking stress is usually followed by an increase in plasma cortisol concentrations that peaks approximately 20 to 40 min after the onset of stress exposure ^(117, 118), Respiratory indices (respiratory rate, tidal volume and end-tidal CO₂) may also serve to highlight stress-induced hyperventilation along with principles of somatic symptoms although their incorporation into remote or field based assessment proves technically demanding ^(121, 123). Recently developed wearable-sensor platforms allow for simultaneous monitoring of multiple physiological signals (e.g. electrocardiography, electro dermal activity, respiration and skin temperature) to be conducted, thus allowing for a more ecologically valid and multimodal approach to assessment ^(110, 116). However, physiological measures in isolation have a limited clinical utility because they can be influenced by individual baseline characteristics (e.g., gender), sensor placement, environmental conditions and contextual factors. Additionally, especially promising intervention strategies for targeting physiological stress responses (low-dose vitamin C and glucocorticoid-receptor modulation with mifepristone) are still preliminary in nature and should not yet be regarded as established treatments until validated in larger, well-controlled, independently replicated

studies ^(119, 120). In that context, future work must aim for standardized protocols with respect to the stress paradigm employed, ecologically relevant real-world monitoring of wearables and multiparametric integration of heart rate signals with criterial scores from established psychometric scales.

CONCLUSIONS:

This narrative review suggests that PPAS is a multidimensional construct involving cognitive, behavioral, and physiological responses and thus cannot be properly assessed with just one method. While established measures such as the PRCA-24 and PRPSA continue to be beneficial for global functional assessment of communication apprehension, more context-variable measures such as the PSAS and PSCAS may better detect varying levels of performance- and classroom-related anxiety. Though physiological measures (e.g., cardiovascular, electrodermal, respiratory, neuroendocrine) provide vital objective data that can supplement self-report assessments, current variability in measurement protocol and differences between how individuals respond physiologically and the low generalizability of these indicators across contexts makes them inappropriate for stand-alone diagnostic tools currently. Thus, clinically and educationally the assessment should be chosen based on purpose/population, context/culture and speaking environment with multimodal assessment as the recommended if resources allow. In practice, a validated psychometric scale together with some selected physiological measures might assist in the early identification of clinically or academically meaningful anxiety and promote tailored interventions as well as the tracking of treatment response. Future research should include cross-cultural validation and measurement invariance, standardized protocols for assessing physiological signatures of social anxiety that are not reliant on self-reporting, longitudinal studies, and validation of sensor systems worn during real-world speaking experiences. Additional research

is warranted to see whether multimodal assessment offers an advantage in predicting functional impairment and treatment response over self-report alone. Lastly, novel and potentially promising approaches to modulation of physiology such as low-dose vitamin C or pharmacologic intervention in glucocorticoid signaling must be viewed as early stage under a greater burden of proof ⁽⁴⁰⁾ and will need larger-scale independent well controlled studies for clinical recommendations.

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