



Original Article

Perceived Stress and Verbal Fluency in Normal Adult Population: A Cross-Sectional Study from Eastern India

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Received: 25-01-2026

Accepted: 14-02-2026

Available online: 26-02-2026

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Medical and Pharmaceutical Research

ABSTRACT

Background: Perceived stress has been implicated in executive functioning tasks such as verbal fluency. However, evidence from Indian populations examining the relationship between perceived stress and verbal fluency remains limited.

Aim: To assess perceived stress levels in a normal adult population and examine their association with verbal fluency performance as measured by the Controlled Word Association Test (COWAT).

Materials and Methods: This cross-sectional study was conducted on 136 healthy adults from a tertiary care setting. Perceived stress was assessed using the Perceived Stress Scale (PSS), while verbal fluency was evaluated using the Controlled Word Association Test (COWAT), including total score and mistake score. Sociodemographic variables were recorded. Statistical analysis was performed using SPSS, employing independent-samples *t*-tests, exploratory analysis of variance, and Pearson's and Spearman's correlation coefficients.

Results: The mean PSS score of the sample was 21.28 ± 5.98 . Female participants demonstrated significantly higher perceived stress ($p = 0.008$). Significant differences in PSS scores were also observed across religious groups ($p = 0.003$). No significant differences in perceived stress were found with respect to other demographic variables. Correlation analysis revealed no significant association between PSS scores and COWAT total scores ($r = 0.013$, $p = 0.882$) or COWAT mistake scores ($r = 0.048$, $p = 0.579$).

Conclusion: Perceived stress varies across certain sociodemographic variables such as sex and religion but shows no significant relationship with verbal fluency performance in a normal adult population. These findings suggest that everyday perceived stress may not directly impair phonemic verbal fluency among healthy individuals.

Keywords: Perceived stress, verbal fluency, COWAT, normal population, psychiatry.

INTRODUCTION

Stress is a ubiquitous psychological phenomenon that plays a crucial role in mental health and cognitive functioning. The concept of *perceived stress* emphasizes the subjective appraisal of stressors rather than the objective presence of stressful events. Individuals differ considerably in how they perceive, interpret, and respond to similar life circumstances, making

perceived stress a clinically relevant construct in psychiatry. The Perceived Stress Scale (PSS), developed by Cohen et al., is one of the most widely used instruments for measuring this subjective stress experience and has been validated across cultures, including Indian populations.¹

Stress has been shown to influence multiple neurobiological systems, particularly the hypothalamic–pituitary–adrenal (HPA) axis, leading to alterations in cortisol secretion and downstream effects on brain regions involved in cognition. The prefrontal cortex and hippocampus, both critical for executive functions and memory, are especially vulnerable to the effects of chronic stress.² Neuroimaging and experimental studies have demonstrated that sustained stress exposure may impair attention, working memory, and cognitive flexibility.³

Verbal fluency is an important executive cognitive function that reflects the integrity of frontal lobe functioning, lexical retrieval, and self-monitoring abilities. Phonemic verbal fluency, assessed using the Controlled Word Association Test (COWAT), requires individuals to generate words beginning with specific letters under time constraints while adhering to rules that inhibit repetitions and errors.⁴ Because of these demands, COWAT performance is sensitive to subtle executive dysfunction and has been widely used in both clinical and research settings.

In psychiatric populations, impaired verbal fluency has been consistently documented in disorders such as major depressive disorder, anxiety disorders, schizophrenia, and substance use disorders.^{5–7} Stress is believed to contribute to these impairments either directly through neurobiological mechanisms or indirectly through emotional dysregulation and attentional bias. However, findings regarding the relationship between stress and verbal fluency in *non-clinical* populations remain inconsistent. While some studies suggest that high stress levels may negatively affect executive performance, others report preserved cognitive functioning in healthy individuals experiencing moderate stress.⁸

Sociodemographic variables such as sex, education, religion, and social class further complicate this relationship. Gender differences in stress perception are well documented, with women often reporting higher perceived stress levels than men.⁹ Educational attainment and socioeconomic status have also been linked to stress exposure and coping resources, although their impact on cognitive outcomes is less clear. In the Indian sociocultural context, factors such as religion, family structure, and occupational roles may influence stress perception in unique ways.

Despite the growing interest in stress and cognition, there is a relative paucity of Indian studies examining the association between perceived stress and verbal fluency in healthy adults. Establishing normative relationships is essential to distinguish pathological cognitive changes from normal variations. Therefore, the present study aimed to assess perceived stress levels in a normal adult population and examine their association with verbal fluency performance as measured by the Controlled Word Association Test.

MATERIALS AND METHODS

Study design and setting

This was a cross-sectional observational study

Place of Study: Conducted simultaneously at Department of Psychiatry, Burdwan Medical College, Institute for Women Hastings House, and David Hare Training College

Study Duration: 6 months (1st November 2023 to 1st May 2024)

Sample

A total of 136 healthy adults were included in the study. Participants were recruited from the community and hospital staff attendants by purposive sampling

Inclusion criteria

- Age ≥ 18 years
- Apparently healthy individuals
- Ability to understand and complete the assessment tools

Exclusion criteria

- CGI-S(21): < 1 or 0
- History of psychiatric illness
- Neurological disorders
- Substance dependence
- Significant medical illness which may affect cognition

Tools used

1. **CGI-S (21)**- to exclude psychiatric illness
2. **Perceived Stress Scale (PSS)**:A widely used self-report instrument assessing perceived stress over the past month.
3. **Controlled Word Association Test (COWAT)**: Used to assess phonemic verbal fluency. Both total word count and mistake score were recorded.
4. **Sociodemographic proforma**: Included age, sex, religion, marital status, background, education, academic stream, profession, and social class.

Ethical considerations

Ethical approval was obtained from the institutional ethics committee. Written informed consent was taken from all participants.

Statistical analysis

Data were analysed using SPSS software. Descriptive statistics were used for sociodemographic variables. Independent-samples *t* tests were applied to compare PSS scores across binary sociodemographic variables. Exploratory analyses were conducted for variables with more than two categories. Pearson's and Spearman's correlation coefficients were used to assess the relationship between PSS scores and COWAT scores. A *p* value <0.05 was considered statistically significant.

RESULTS

Sociodemographic Characteristics

A total of **136 participants** were included in the final analysis. The sociodemographic profile of the sample is presented using both tabular and graphical formats for clarity.

The sample consisted of **57.4% males (n = 78)** and **42.6% females (n = 58)**. The majority of participants belonged to the **Hindu religion (83.8%)**, while **16.2%** were Muslim. Most participants were from an **urban background (69.1%)**, and the remaining **27.9%** were from rural areas.

Regarding educational status, the largest proportion comprised **postgraduate students and graduates**, followed by teachers. Professionally, **52.9% were teachers** and **45.6% were students**. Most participants were unmarried.

Table 1. Sociodemographic characteristics of the sample (N = 136)

Variable	Category	n (%)
Sex	Male	78 (57.4)
	Female	58 (42.6)
Religion	Hindu	114 (83.8)
	Muslim	22 (16.2)
Background	Urban	94 (69.1)
	Rural	38 (27.9)
Profession	Student	62 (45.6)
	Teacher	72 (52.9)

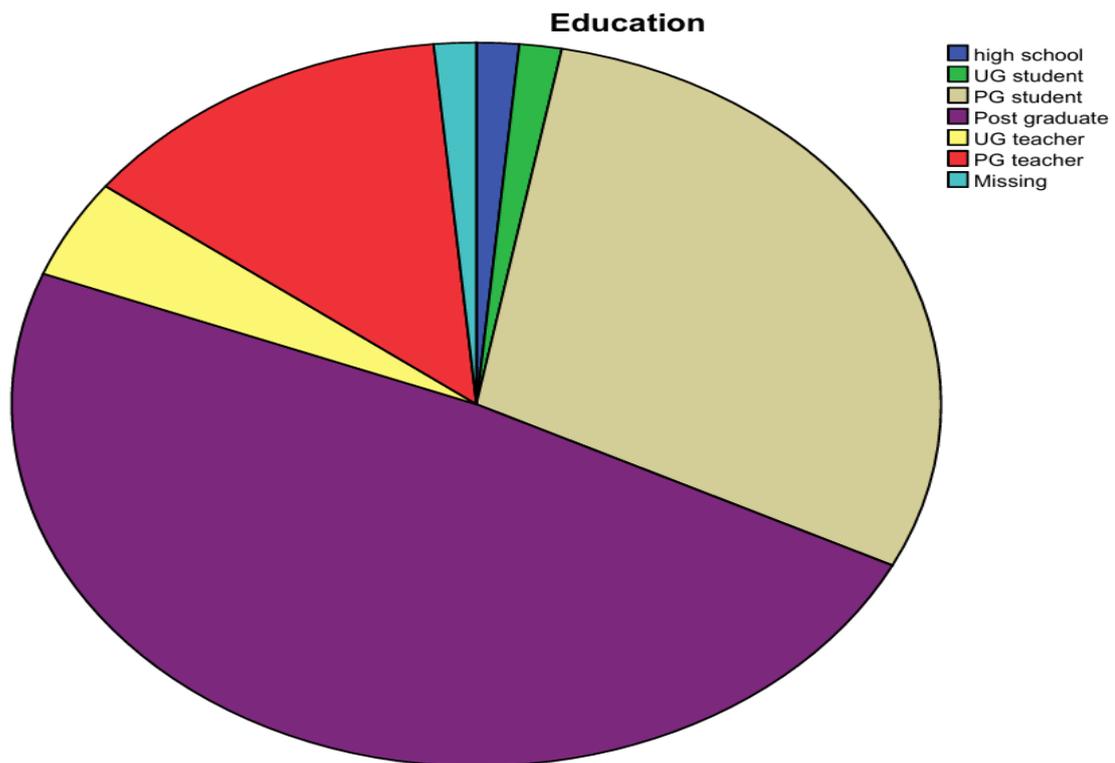
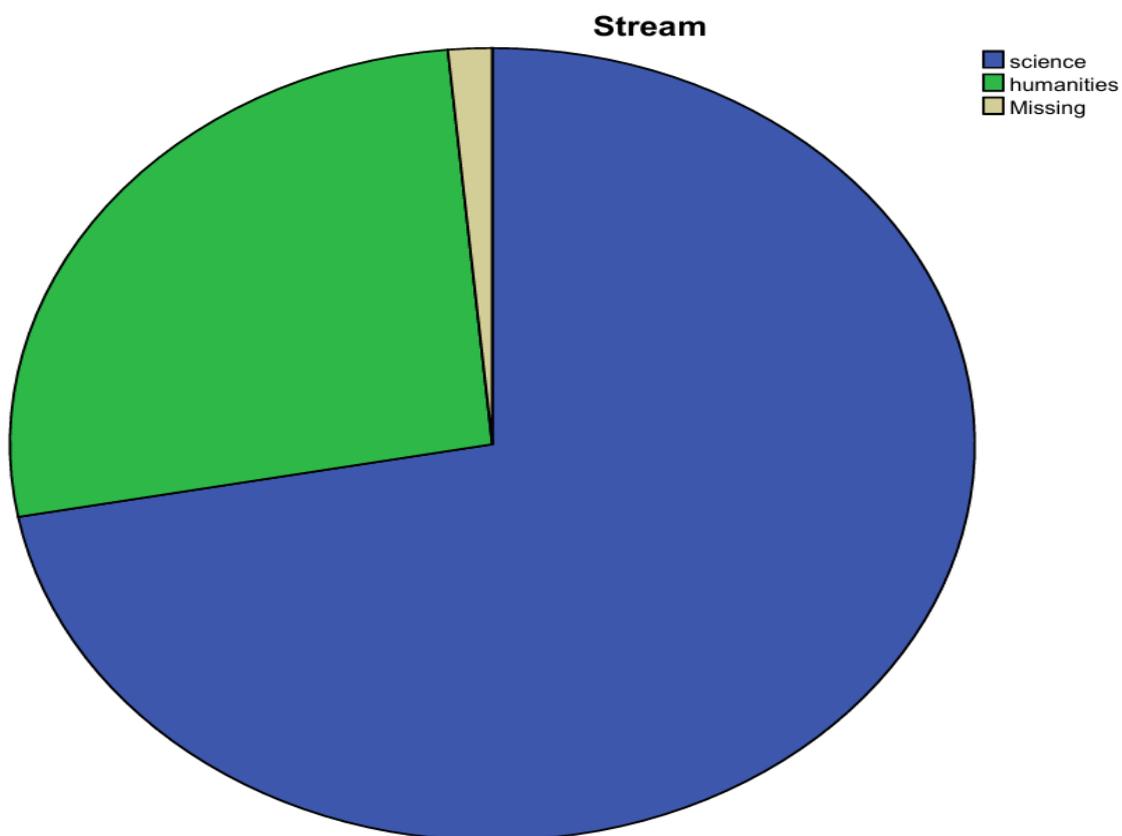


Figure 1. Pie chart showing education status distribution of the study sample



2. Pie chart showing stream distribution of the study sample

Figure

Perceived Stress Scores

The mean PSS score of the total sample was 21.28 ± 5.98 , indicating a moderate level of perceived stress among participants.

Sex-wise comparison

Female participants demonstrated significantly higher perceived stress scores compared to male participants (22.83 ± 6.60 vs. 20.11 ± 5.19 ; $t = -2.67$, $p = 0.008$).

Religion-wise comparison

A statistically significant difference in PSS scores was observed across religious groups ($p = 0.003$), with Hindu participants reporting higher perceived stress compared to Muslim participants.

Other sociodemographic variables

No statistically significant differences in perceived stress scores were observed with respect to background (urban/rural), academic stream, profession, marital status, education level, or social class.

Table 2. Comparison of PSS scores across sex

Sex	Mean \pm SD	t	p
Male	20.11 ± 5.19		
Female	22.83 ± 6.60	-2.67	0.008

Relationship Between Perceived Stress and Verbal Fluency

Correlation analysis revealed no significant association between perceived stress and verbal fluency performance:

- PSS vs. COWAT total score:
Pearson's $r = 0.013$, $p = 0.882$
- PSS vs. COWAT mistake score:
Pearson's $r = 0.048$, $p = 0.579$

Non-parametric analysis using Spearman's correlation also failed to demonstrate any significant association, confirming the robustness of the findings.

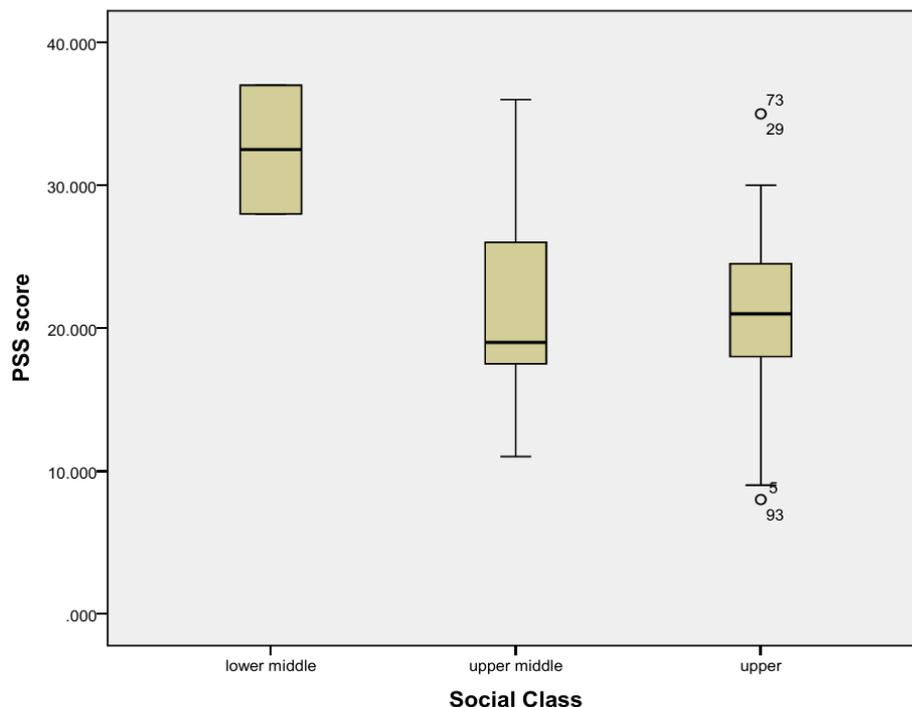


Figure 3. Boxplot showing Perceived Stress among different social class

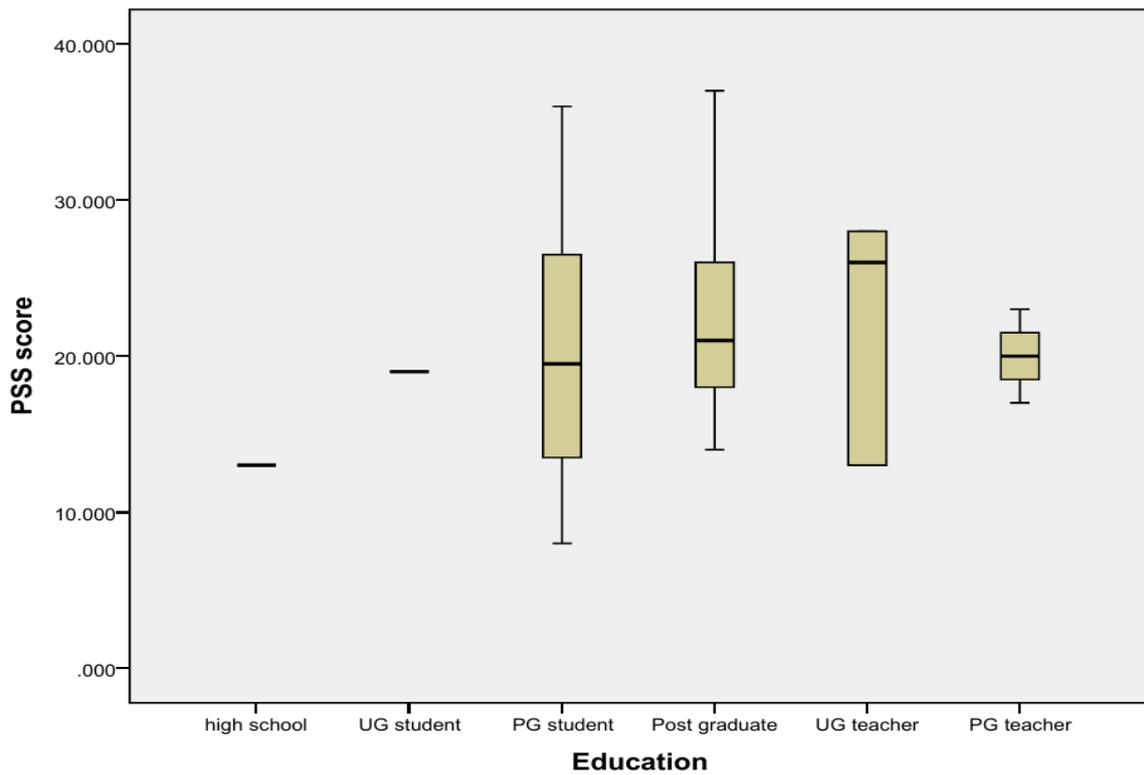
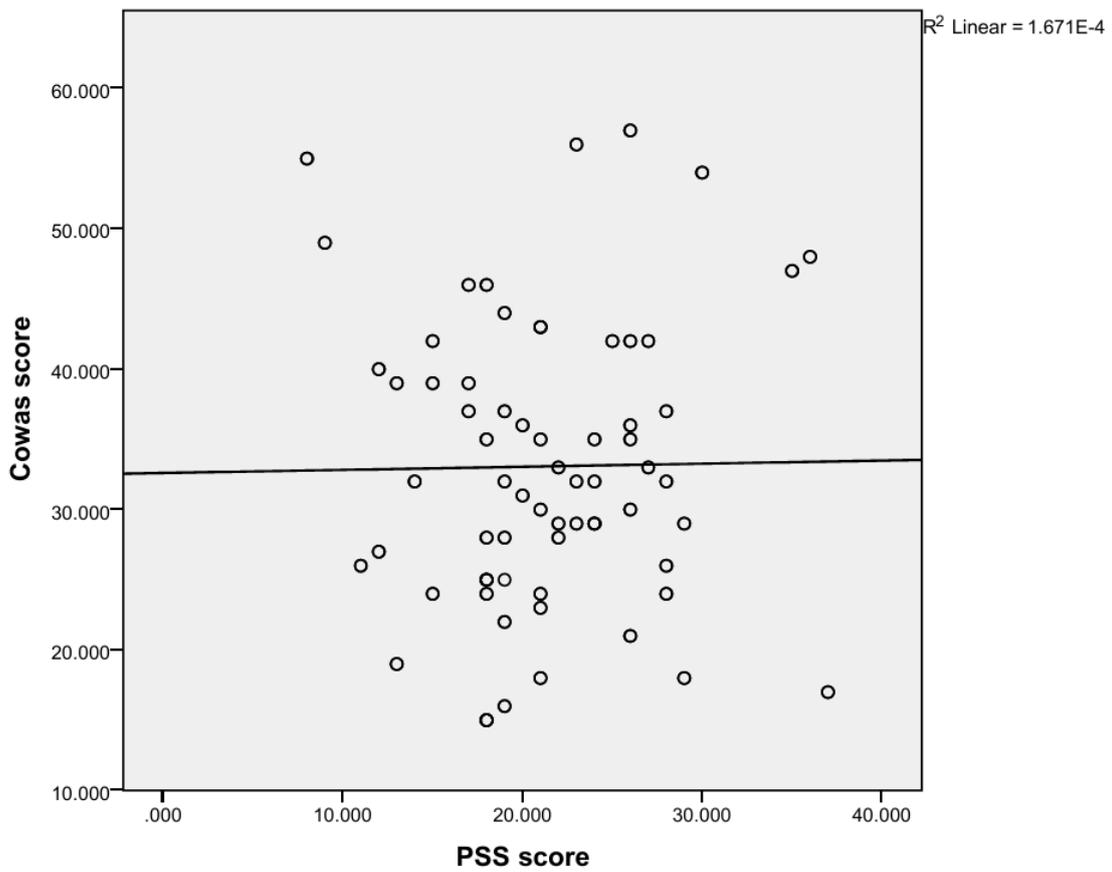
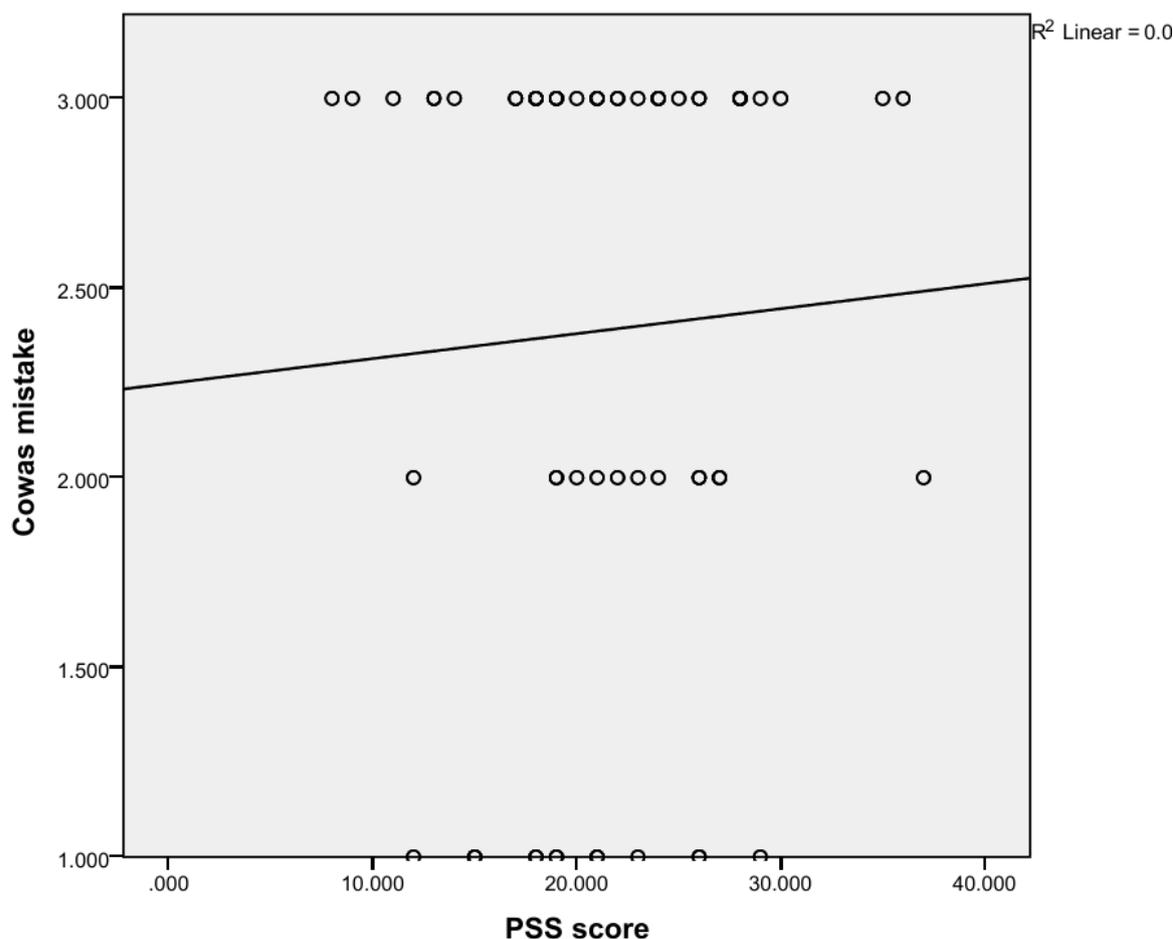


Figure 3. Boxplot showing Perceived Stress among different education category





DISCUSSION

The present study explored perceived stress and its relationship with verbal fluency performance in a normal adult population. The findings indicate that while perceived stress varies across certain sociodemographic variables, it does not show a significant association with phonemic verbal fluency or error rates on the Controlled Word Association Test.

Perceived stress in the normal population

The mean PSS score observed in this study reflects moderate levels of perceived stress, comparable to values reported in previous Indian and international normative studies.¹⁰ This suggests that the sample represents a reasonably typical non-clinical adult population rather than individuals experiencing extreme stress. Such moderate stress levels are common in contemporary society and may not necessarily translate into functional cognitive impairment.

Sex differences in perceived stress

Female participants in the present study reported significantly higher perceived stress compared to male participants. This finding is consistent with a substantial body of literature indicating that women tend to report higher stress levels and greater emotional distress than men.^{9,11} Possible explanations include greater exposure to psychosocial stressors, role overload, and differences in coping strategies. Neurobiological factors, including sex differences in HPA axis reactivity, may also contribute to heightened stress perception among women.¹²

Importantly, despite higher perceived stress, female participants did not demonstrate poorer verbal fluency performance, suggesting that increased stress perception does not necessarily translate into measurable executive dysfunction in healthy individuals.

Religion and perceived stress

A statistically significant difference in perceived stress was observed across religious groups. While this finding is noteworthy, it should be interpreted cautiously due to unequal group sizes. Religion may act as both a source of stress and a coping resource, depending on sociocultural context, social support, and personal belief systems. Previous Indian studies have highlighted the complex relationship between religion, stress, and mental health, emphasizing the need for nuanced interpretation.¹³

Education, profession, and social class

No significant differences in perceived stress were found across educational levels, profession, or social class. This aligns with several studies suggesting that while socioeconomic disadvantage may increase exposure to stressors, subjective stress perception is also influenced by coping mechanisms, resilience, and expectations.¹⁴ The absence of a social class effect on perceived stress in the present study supports the view that perceived stress is not solely determined by material resources.

Perceived stress and verbal fluency performance

The most important finding of the study is the absence of a significant relationship between perceived stress and COWAT performance, including both total word count and mistake scores. This suggests that moderate levels of perceived stress in healthy individuals do not adversely affect phonemic verbal fluency.

This finding is consistent with studies reporting preserved executive functioning in non-clinical populations under everyday stress conditions.^{8,15} Experimental studies indicate that acute or severe stress may impair prefrontal cortex functioning, whereas mild to moderate stress may have minimal or even neutral effects on cognition.^{2,3} The Yerkes–Dodson law provides a theoretical framework for understanding this relationship, proposing that optimal levels of arousal may support performance, while excessive stress leads to impairment.

The lack of association between stress and COWAT mistake scores further suggests intact self-monitoring and inhibitory control in the study population. Error patterns in verbal fluency tasks are often linked to frontal lobe dysfunction and are more commonly observed in clinical populations.^{4,6} The absence of such associations in the present study underscores the cognitive resilience of healthy adults.

Comparison with clinical populations

In contrast to findings in normal populations, studies in psychiatric samples frequently demonstrate significant associations between stress, executive dysfunction, and verbal fluency deficits.^{5,7} Chronic stress, depression, and anxiety are associated with prolonged HPA axis activation, neuroinflammatory changes, and structural alterations in the prefrontal cortex and hippocampus.¹⁶ These mechanisms may underlie the verbal fluency impairments observed in clinical conditions but are unlikely to be present at comparable levels in healthy individuals.

Implications for psychiatry

The findings of the present study have important implications for psychiatric assessment and research. First, they emphasize the importance of considering normative stress levels when interpreting cognitive test performance. Second, they suggest that verbal fluency tasks such as COWAT may remain robust in the face of moderate perceived stress, limiting their sensitivity to subclinical stress-related cognitive changes.

Limitations and future directions

Despite its strengths, the study has several limitations. The cross-sectional design precludes causal inference. The reliance on self-reported stress measures may not capture physiological stress responses. Unequal subgroup sizes for certain sociodemographic variables may have limited statistical power. Future studies incorporating longitudinal designs, biological stress markers, and more comprehensive cognitive batteries would provide a deeper understanding of stress–cognition relationships.

CONCLUSION

Perceived stress in a normal adult population varies across certain sociodemographic factors, particularly sex and religion. However, perceived stress does not appear to significantly influence verbal fluency performance as measured by the Controlled Word Association Test. These findings highlight the resilience of executive cognitive functions to moderate levels of perceived stress in healthy individuals.

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