



Original Article

## Exploring the Relationship Between Perceived Stress and Vigilance: Findings from a Cross-Sectional Study

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### ABSTRACT

**Background:** Stress is an inevitable component of modern life and has been widely recognized to influence cognitive functioning. Sustained attention or vigilance is a critical neuropsychological function that allows individuals to maintain attention over prolonged periods. While experimental studies have suggested that stress may impair cognitive processes such as attention, memory, and executive functioning, evidence regarding the relationship between perceived stress and vigilance in healthy populations remains limited.

**Aim:** To examine the relationship between perceived stress and vigilance performance among healthy adults.

**Methods:** This cross-sectional observational study was conducted over a six-month period from November 2023 to May 2024 at the Department of Psychiatry, Burdwan Medical College, Institute for Women Hastings House, and David Hare Training College. A total of 136 healthy adults aged  $\geq 18$  years were recruited through purposive sampling. Participants were assessed using the Perceived Stress Scale (PSS) to measure stress levels and Digit Vigilance Test from the NIMHANS Neuropsychological Battery (2004) to measure vigilance time and vigilance mistakes. Sociodemographic information was collected using a structured proforma. Statistical analysis was conducted using SPSS software. Independent sample t-tests, one-way ANOVA, and non-parametric correlation analyses (Spearman's rho and Kendall's tau-b) were used.

**Results:** The mean perceived stress score of the sample was  $21.28 \pm 5.98$ , indicating moderate stress levels. Females demonstrated significantly higher stress scores than males ( $22.83 \pm 6.60$  vs.  $20.11 \pm 5.19$ ;  $p = 0.008$ ). Religion was also significantly associated with stress levels ( $p = 0.003$ ). No significant differences were observed across background, academic stream, profession, marital status, education level, or social class. Correlation analyses revealed no significant association between perceived stress and vigilance time (Spearman  $r_s = 0.071$ ) or vigilance mistakes ( $r_s = 0.048$ ).

**Conclusion:** Although moderate perceived stress levels were observed among participants, perceived stress did not significantly influence vigilance performance in this healthy adult population. These findings suggest that moderate everyday stress may not substantially impair sustained attention in non-clinical populations.

**Keywords:** Perceived stress, vigilance, sustained attention, neuropsychological assessment, cognitive function.

### INTRODUCTION

Stress is a ubiquitous component of human life and has become increasingly prominent in contemporary society. Rapid social, occupational, and academic demands contribute to heightened levels of psychological stress across populations.

Stress has been conceptualized as a state of mental or emotional strain resulting from adverse or demanding circumstances. It arises when individuals perceive environmental demands as exceeding their coping resources.<sup>[1]</sup>

Psychological stress can have profound effects on both mental and physical health. Chronic stress has been linked with numerous psychiatric and medical conditions including anxiety disorders, depression, cardiovascular disease, and impaired immune functioning.<sup>[2][3]</sup> Beyond these clinical consequences, stress has also been shown to influence various cognitive processes such as attention, memory, decision-making, and executive functioning though the relation is complex and not uni-directional.<sup>[4]</sup>

One important cognitive domain that may be affected by stress is vigilance, also referred to as sustained attention. Vigilance represents the ability to maintain focus and detect relevant stimuli over prolonged periods of time.<sup>[5]</sup> This cognitive function plays a crucial role in everyday activities requiring continuous monitoring, such as driving, studying, teaching, and performing safety-critical occupational tasks. Impairment in vigilance may result in decreased efficiency, increased error rates, and potentially dangerous consequences in high-risk environments.

The neurobiological relationship between stress and cognition is complex. Exposure to stress activates the hypothalamic–pituitary–adrenal (HPA) axis, leading to the release of glucocorticoids such as cortisol.<sup>[6]</sup> Elevated cortisol levels can influence brain regions involved in cognitive processing, particularly the prefrontal cortex and hippocampus, which are critical for attention, working memory, and executive functions.<sup>[7][8]</sup> Experimental studies have demonstrated that acute stress can impair attentional control and cognitive flexibility.<sup>[9]</sup>

However, the relationship between stress and cognitive performance is not always straightforward. Some researchers have proposed an inverted-U relationship between stress and cognitive functioning, suggesting that moderate levels of stress may enhance performance while excessive stress impairs it.<sup>[7][10]</sup> This concept aligns with the Yerkes–Dodson law, which proposes that optimal arousal levels facilitate performance on cognitive tasks.<sup>[11]</sup>

Previous research investigating stress and attention has yielded mixed results. Several studies have reported that stress can negatively affect attention and increase cognitive errors.<sup>[12]</sup> Others have found minimal or no association between stress levels and sustained attention, particularly in healthy populations without psychiatric disorders.<sup>[14]</sup> These discrepancies may arise due to differences in study design, stress measurement methods, participant characteristics, and cognitive assessment tools.

The Perceived Stress Scale (PSS) is one of the most widely used instruments for assessing perceived stress. Developed by Cohen and colleagues, it measures the extent to which individuals perceive situations in their lives as stressful during the previous month.<sup>[15]</sup> Unlike objective stress measures, the PSS captures the subjective appraisal of stress, which may be more closely related to psychological outcomes.

Assessment of vigilance in neuropsychological research often involves tasks that require continuous monitoring and response to stimuli. The Digit Vigilance Test from the NIMHANS Neuropsychological Battery is a widely used tool for measuring sustained attention and processing speed.<sup>[16]</sup> It evaluates both vigilance time and vigilance mistakes, thereby providing a comprehensive assessment of attentional performance.

Although extensive research has examined stress and cognitive functioning, relatively few studies have explored the specific relationship between perceived stress and vigilance in healthy adults in India. Understanding this relationship has important implications for educational and occupational settings, where individuals often perform tasks requiring sustained attention under varying levels of stress.

Therefore, the present study was undertaken to investigate the association between perceived stress and vigilance performance in a sample of healthy adults from educational and community settings.

## **MATERIALS AND METHODS**

### **Study design and setting**

This was a cross-sectional observational study conducted over a period of six months from 1st December 2023 to 1st May 2024. The study was carried out simultaneously at the Department of Psychiatry, Burdwan Medical College, Institute for Women Hastings House, and David Hare Training College.

### **Sample**

A total of 136 healthy adults participated in the study. Participants were recruited from community settings, educational institutions, and hospital staff attendants using purposive sampling.

### **Inclusion criteria**

Participants were included if they fulfilled the following criteria:

- Age  $\geq 18$  years
- Apparently healthy individuals

- Ability to understand and complete the assessment tools

### Exclusion criteria

Participants were excluded if they had:

- Clinical Global Impression Severity (CGI-S)<sup>[17]</sup> score <1
- History of psychiatric illness
- Neurological disorders
- Substance dependence
- Significant medical illness affecting cognitive functioning

### Tools used

#### Clinical Global Impression Scale (CGI-S)

The CGI-S scale was used to screen participants and exclude individuals with significant psychiatric symptoms.

#### Perceived Stress Scale (PSS)

The PSS is a widely used self-report instrument designed to measure perceived stress during the previous month. The scale assesses the degree to which situations in one's life are appraised as stressful.

#### Digit Vigilance Test

Vigilance was assessed using the Digit Vigilance Test from the NIMHANS Neuropsychological Battery (2004). This test measures sustained attention by requiring participants to identify target digits within a matrix of numbers.

Two parameters were recorded:

- Vigilance Time – time required to complete the task
- Vigilance Mistakes – number of errors made during the task

#### Sociodemographic proforma

A structured proforma was used to collect data on:

- Age
- Sex
- Religion
- Marital status
- Background (urban/rural)
- Education level
- Academic stream
- Profession
- Social class (Modified BG Prasad Scale<sup>[18]</sup>)

#### Ethical considerations

Ethical approval was obtained from the institutional ethics committee. Written informed consent was obtained from all participants prior to participation.

#### Statistical analysis

Data were analyzed using **SPSS software**.

The following statistical procedures were applied:

- Descriptive statistics for sociodemographic variables
- Independent sample t-tests for group comparisons
- One-way ANOVA for categorical variables
- Spearman's rank-order correlation
- Kendall's tau-b correlation

A **p-value <0.05** was considered statistically significant.

## RESULTS

### Sociodemographic characteristics

A total of 136 participants were included in the final analysis.

The sample consisted of:

- 78 males (57.4%)
- 58 females (42.6%)

Most participants belonged to the Hindu religion (83.8%), while 16.2% were Muslim.

Regarding background:

- 69.1% urban
- 27.9% rural

Professionally:

- 52.9% teachers
- 45.6% students

Most participants belonged to the science stream (73.1%), while 26.9% were from humanities. The majority of participants were unmarried.

### Perceived stress scores

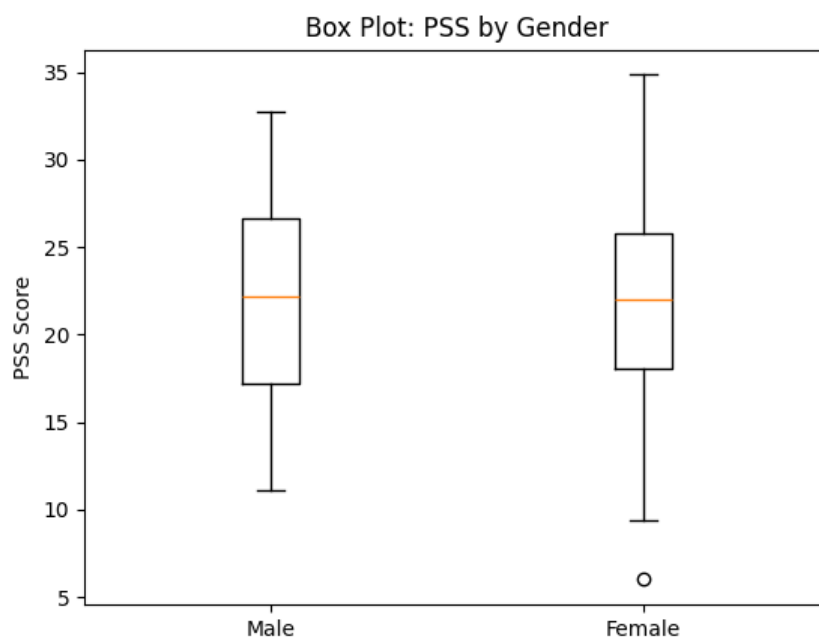
The mean PSS score of the entire sample was  $21.28 \pm 5.98$ , indicating moderate perceived stress.

### Sex-wise comparison

Female participants had significantly higher stress scores compared with males:

- Female:  $22.83 \pm 6.60$
- Male:  $20.11 \pm 5.19$

This difference was statistically significant ( $t = -2.67$ ,  $p = 0.008$ ).



### Religion-wise comparison

A significant difference in perceived stress was observed between religious groups ( $p = 0.003$ ), with Hindu participants reporting higher stress scores than Muslim participants.

### Other sociodemographic variables

No statistically significant differences were observed in PSS scores with respect to:

- Background (urban/rural)
- Academic stream
- Profession
- Marital status
- Education level
- Social class

### Relationship between perceived stress and vigilance time

Spearman correlation analysis revealed no significant association between perceived stress and vigilance time.

- Spearman  $r_s = 0.071$

Kendall's tau-b analysis also indicated no significant correlation.

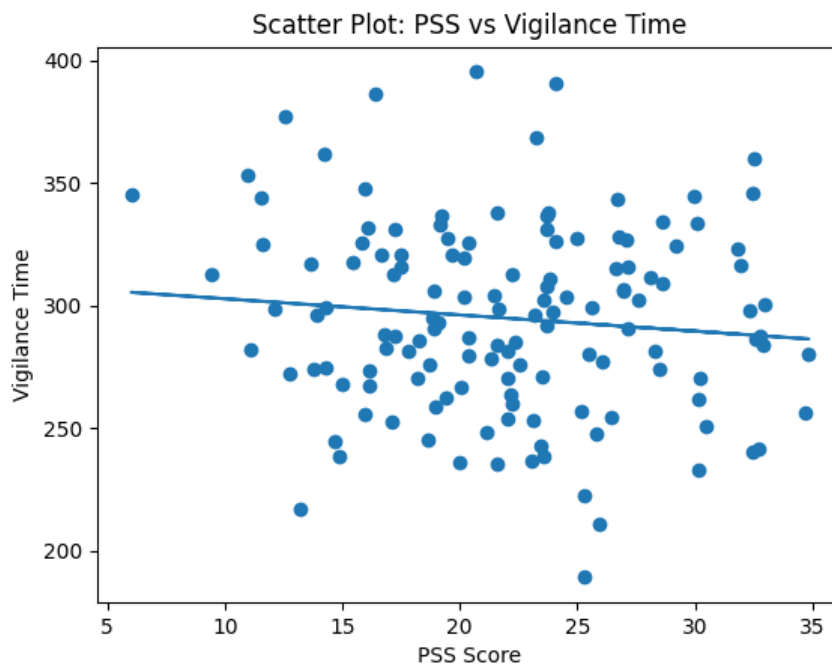
### Relationship between perceived stress and vigilance mistakes

Similarly, no significant association was found between perceived stress and vigilance mistakes.

- Spearman  $r_s = 0.048$

- Kendall tau-b = 0.034

These findings indicate that perceived stress did not significantly influence vigilance performance in this sample.



## DISCUSSION

The present study examined the relationship between perceived stress and vigilance performance among healthy adults. The findings provide insights into the cognitive effects of everyday stress within a non-clinical population.

### Perceived stress levels

The mean PSS score of the sample indicated moderate levels of perceived stress, which is consistent with previous community-based studies in India.<sup>[19]</sup> Moderate stress levels are commonly reported among students and teachers due to academic demands, occupational responsibilities, and social expectations.

### Gender differences in stress

Female participants demonstrated significantly higher stress scores than males. This finding is consistent with several previous studies reporting greater perceived stress among women.<sup>[19][20]</sup> Possible explanations include biological, psychological, and sociocultural factors influencing stress perception and coping styles.<sup>[20]</sup>

Women may experience greater emotional reactivity to stressors and may also face additional social pressures related to family roles and occupational expectations<sup>[21]</sup>.

### Sociodemographic variables

No significant differences in stress scores were observed across background, profession, academic stream, education, or social class. These findings suggest that perceived stress may be relatively evenly distributed across these demographic groups in the studied population. These findings are in contrast to Indian study where education and socio-economic class influenced perceived stress<sup>[19]</sup>, probably because the participants were having comparable education and poor representation from lower socio-economic class.

Similar findings have been reported in earlier studies where stress levels were influenced more by individual coping styles rather than demographic variables.<sup>[22][23]</sup>

### Relationship between perceived stress and vigilance

The most important finding of the study was the absence of a significant relationship between perceived stress and **vigilance** performance.

Both vigilance time and vigilance mistakes showed no significant correlation with perceived stress scores.

These results suggest that moderate levels of perceived stress may not substantially impair sustained attention among healthy adults.

### Comparison with previous literature

Research investigating stress and attention has produced mixed findings. Some experimental studies have shown that acute stress impairs attentional performance and increases cognitive errors.<sup>[12]</sup>

However, several community-based studies have reported minimal associations between perceived stress and attentional performance especially in those without psychiatric comorbidity.<sup>[14]</sup>

One possible explanation is that perceived stress measured by the PSS reflects subjective appraisal of stress rather than physiological stress responses. Cognitive impairment may be more strongly associated with physiological stress markers such as cortisol levels.

Additionally, moderate stress levels may not be sufficient to disrupt attentional processes. According to the Yerkes-Dodson law, moderate arousal may actually enhance cognitive functioning, while only extreme stress leads to impairment<sup>[11]</sup>.

### Neurobiological considerations

Stress influences cognitive functioning through multiple neurobiological pathways involving the HPA axis and catecholamine systems. Elevated cortisol levels may affect the functioning of the prefrontal cortex, which plays a key role in attention and executive control.<sup>20</sup>

However, healthy individuals with effective coping mechanisms may compensate for stress-related cognitive demands, thereby maintaining adequate vigilance performance.

### Implications

The findings have several practical implications:

- Moderate everyday stress may not significantly impair sustained attention in healthy individuals.
- Educational and occupational environments may tolerate certain levels of stress without compromising cognitive performance.
- Stress management interventions may still be important for overall mental health even if vigilance remains unaffected.

### Limitations

Several limitations should be considered while interpreting the results:

1. The cross-sectional design limits causal interpretation.
2. The sample size was relatively modest.
3. Participants were mainly students and teachers, which may limit generalizability.
4. Physiological stress markers such as cortisol were not measured.
5. Only one neuropsychological measure of vigilance was used.

Future studies should include larger and more diverse samples and incorporate biological stress markers.

### CONCLUSION

- The present study investigated the relationship between perceived stress and vigilance performance in a sample of healthy adults.
- Although moderate levels of perceived stress were observed among participants, no significant association was found between perceived stress and vigilance performance.
- These findings suggest that moderate subjective stress may not substantially impair sustained attention in non-clinical populations.
- Further research using longitudinal designs and physiological stress measures is required to better understand the complex relationship between stress and cognitive functioning.

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