
**P-ISSN:** 2394-1685
**E-ISSN:** 2394-1693
Impact Factor (RJIF): 5.93
IJPESH 2025; 12(5): 585-588

https://www.kheljournal.com
Received: 05-07-2025
Accepted: 09-08-2025

**Sanchita Rathore**
Sports Officer, Govt. Madhav College, Chanderi, Madhya Pradesh, India

**Dr. Vishan Singh Rathore**
Professor, Guru Ghasidas University, Bilaspur, Chhattisgarh, India

**Dr. Arun Singh Rathore**
TGT- P&HE PM Shri Kendriya Vidyalaya Chanderi, Madhya Pradesh, India

**Corresponding Author:**
**Sanchita Rathore**
Sports Officer, Govt. Madhav College, Chanderi, Madhya Pradesh, India

# Comparative analysis of general intelligence and visual memory among middle-aged women with diverse lifestyle patterns

**Sanchita Rathore, Vishan Singh Rathore and Arun Singh Rathore**

**DOI:** https://doi.org/10.22271/kheljournal.2025.v12.i5i.4034

**Abstract**
This study investigates the relationship between lifestyle variations and cognitive functioning, focusing on general intelligence and visual memory among middle-aged women. A purposive sample of participants aged 40–55 years was assessed using standardized psychometric instruments. Data were analyzed using inferential statistical methods to identify intergroup differences associated with lifestyle patterns. Results revealed that specific lifestyle factors exert a measurable influence on both general intelligence and visual memory performance. The implications of these findings underscore the importance of cognitive engagement and daily activity structure in maintaining intellectual efficiency during mid-adulthood.

**Keywords:** Cognitive function, physical activity, visual memory, general intelligence, middle-aged women

## Introduction
Human ageing encompasses various biological and psychological transformations that occur successively across the lifespan. These changes differ essentially among individuals, reflecting the heterogeneous nature of ageing processes. Cognitive abilities—particularly memory and processing speed—typically reach optimal performance in early adulthood, followed by a gradual decline thereafter (Chang *et al*., 2010) [2]. Advancing age is often accompanied by deterioration in core cognitive domains such as attention, memory, and motor coordination, which generally contribute to reduced cognitive efficiency and lowered quality of life (Glisky, 2007; Riddle, 2010) [3, 7].

Regular engagement in structured physical activity plays a critical role in protecting both physiological health and psychological resilience across adulthood. Sustained exercise and physical activities contribute to greater functional independence, enhanced mobility, and overall well-being among ageing individuals. Empirical evidence indicates that habitual physical activity lessens the onset of chronic diseases such as arthritis, cardiovascular disorders, and diabetes, while improving balance, coordination, and cardiovascular efficiency (Yaffe *et al*., 2001) [10]. Furthermore, those women who does regular physical activity and exercise demonstrate a notably lower risk of age-related cognitive decline, underscoring the neuroprotective benefits of sustained physical engagement.

The Vienna Test System (VTS) represents a comprehensive computerized framework designed to evaluate a broad spectrum of psychological constructs with high accuracy. Developed by Schuhfried GmbH (Mödling, Austria), the system offers validated and standardized instruments for assessing cognitive performance and psychomotor efficiency. Its modules encompass measures of sustained attention, reaction latency, peripheral perception, stress tolerance, and temporal anticipation (Schuhfried, 2013) [8].

The primary objective of this investigation was to examine the extent of variation in general intelligence and visual memory among middle-aged women representing distinct lifestyle categories—regular exercisers, casual exercisers, and non-exercisers. The Vienna Test System, employing the Adaptive Matrices Test and Visual Memory Test, was utilized to obtain

standardized cognitive measurements for comparative analysis.

It was hypothesized that significant differences would emerge in both general intelligence and visual memory performance across lifestyle groups among middle-aged women.

## Materials and Methods

Data collection was conducted using the Vienna Test System (VTS), a computerized assessment platform designed to measure multiple cognitive domains with standardized precision. Testing was carried out in the Sports Psychology Laboratory at the Lakshmibai National Institute of Physical Education (LNIPE). Prior to administration, all participants received comprehensive instructions regarding test procedures and familiarization with the testing interface. The assessment specifically targeted two cognitive constructs: general intelligence and visual memory.

The Adaptive Matrices Test (AMT), Form S11, was employed as a non-verbal instrument for evaluating general intelligence. The AMT assesses an individual's inductive reasoning and problem-solving ability, offering a reliable estimate of cognitive adaptability and abstract thinking capacity.

The Visual Memory Test (VISGED), also administered using Form S11, was designed to evaluate short-term visual recall and spatial information processing. Participants were required to memorize and reproduce the spatial arrangement of symbols presented on a simulated map, thereby providing a quantitative measure of visual retention and reconstruction accuracy.

The study sample comprised thirty middle-aged women, categorized into three lifestyle-based groups: (1) Regular exercisers, who engaged in daily free-hand exercise or walking for approximately 45 minutes; (2) Casual exercisers, who participated in physical activity once weekly for more than two hours; and (3) Non-exercisers, who reported no structured physical activity. Participants were volunteers aged 45–55 years (M = 48.81, SD = 3.58). Each lifestyle group consisted of ten individuals. All participants underwent cognitive testing using the Vienna Test System under standardized laboratory conditions.

## Results and Discussion

Statistical analyses were performed using IBM SPSS Statistics, Version 20.0. Descriptive statistics were computed to obtain the mean and standard deviation for each variable, and a one-way Analysis of Variance (ANOVA) was employed to determine intergroup differences across the three lifestyle categories.

**Table 1:** Descriptives Statistics of Cognitive Test Scores of the Middle Aged Women

| | | N | Mean | Std. Deviation |
|---|---|---|---|---|
| Visual memory test | Regular exerciser | 10 | 76.40 | 13.76 |
| | Casual exerciser | 10 | 35.70 | 23.95 |
| | Non exerciser | 10 | 32.60 | 24.28 |
| | Total | 30 | 48.23 | 28.84 |
| Adaptive matrices test | Regular exerciser | 10 | 43.50 | 22.96 |
| | Casual exerciser | 10 | 18.20 | 13.54 |
| | Non exerciser | 10 | 7.90 | 6.84 |
| | Total | 30 | 23.20 | 21.60 |

Descriptive measures, including means and standard deviations, for the Adaptive Matrices Test and Visual Memory Test administered through the Vienna Test System are presented in Table 1. These statistics summarize the cognitive performance of participants from the three lifestyle groups.

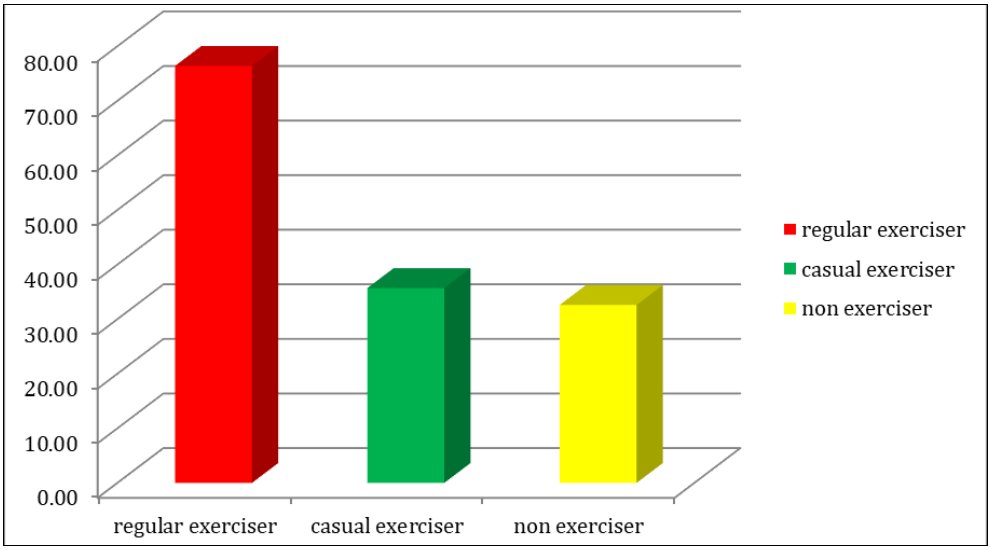


**Fig 1:** Mean Scores of visual memory of middle aged women with varied lifestyle

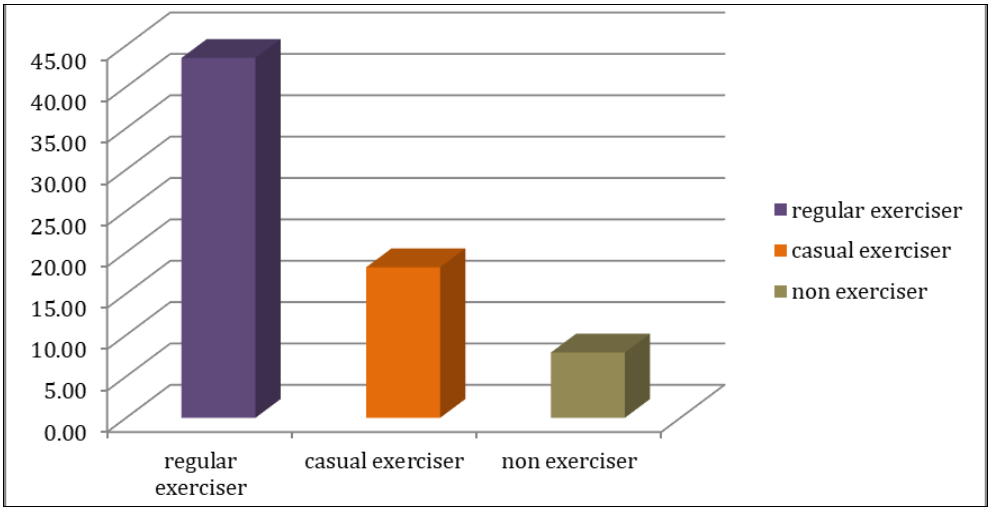


**Fig 2:** Mean Scores of adaptive matrices test of middle aged women with varied lifestyle

Table 2 presents the results of the one-way ANOVA performed to examine differences among the three lifestyle groups. The analysis revealed statistically significant variations in both general intelligence and visual memory scores ($p$<.05). Accordingly, the null hypothesis was rejected. Given the significance of the omnibus F-ratio, Tukey's HSD post hoc procedure was conducted to identify specific intergroup differences.

**Table 2:** ANOVA of Cognitive Domains among Middle Aged Women with Varied Lifestyle

| | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Visual memory test | Between Groups | 11948.47 | 2 | 5974.23 | 13.25* | .00 |
| | Within Groups | 12172.90 | 27 | 450.85 | | |
| | Total | 24121.37 | 29 | | | |
| Adaptive metrices test | Between Groups | 6711.80 | 2 | 3355.90 | 13.29* | .00 |
| | Within Groups | 6817.00 | 27 | 252.48 | | |
| | Total | 13528.80 | 29 | | | |

*0.05 > 3.35 (2, 27 df)

Table 3 displays the results of the Tukey HSD post hoc analysis. Significant pairwise differences were observed between regular exercisers and both casual and non-exercisers in visual memory performance (p =.001 and $p$<.001, respectively). Similarly, adaptive matrices scores differed significantly between regular exercisers and the other two groups (p =.004 and $p$<.001). In contrast, no statistically significant differences were found between casual exercisers and non-exercisers for either test (p >.05). These findings indicate that consistent physical activity is associated with superior cognitive outcomes in midlife.

**Table 3:** Post hoc Comparison of Means Using Tukey HSD Test for Cognitive Tests among Middle Aged Women with Varied Lifestyle

| Dependent Variable | (I) Middle Aged Women with Varied Lifestyle | (J) Middle Aged Women with Varied Lifestyle | Mean Difference (I-J) | Sig. |
|---|---|---|---|---|
| Visual Memory Test | Regular exerciser | casual exerciser | 40.70* | .001 |
| | | non exerciser | 43.80* | .000 |
| | Casual exerciser | regular exerciser | 40.70* | .001 |
| | | non exerciser | 3.10 | .943 |
| | Non exerciser | regular exerciser | 43.80* | .000 |
| | | casual exerciser | 3.10 | .943 |
| Adaptive Matrices Test | Regular exerciser | casual exerciser | 25.30* | .004 |
| | | non exerciser | 35.60* | .000 |
| | Casual exerciser | regular exerciser | 25.30* | .004 |
| | | non exerciser | 10.30 | .331 |
| | Non exerciser | regular exerciser | 35.60* | .000 |
| | | casual exerciser | 10.30 | .331 |

The findings demonstrate that general intelligence and visual memory vary significantly among middle-aged women with distinct lifestyle patterns. Regular exercisers, characterized by consistent daily physical activity, outperformed both casual and non-exercisers in measures of cognitive efficiency. These results are consistent with prior research, including the meta-analysis by Sofi *et al*. (2011) [9], which reported a strong protective effect of physical activity against cognitive decline. Similarly, Bherer *et al*. (2013) [1] emphasized exercise as an effective nonpharmacological intervention for maintaining cognitive vitality during ageing, while Ratey and Loehr (2011) [6] highlighted the neurobiological mechanisms through which physical activity enhances mental function. Collectively, these findings reinforce the role of sustained exercise as a determinant of cognitive health in midlife.

No statistically significant differences were detected between casual exercisers and non-exercisers on either the visual memory or adaptive matrices measures. This suggests that

infrequent or irregular engagement in physical activity may not yield measurable cognitive benefits comparable to those achieved through consistent exercise routines.

Based on mean comparisons, regular exercisers exhibited superior performance in both visual memory (M = 76.40, SD = 13.76) and general intelligence (M = 43.50, SD = 22.96) relative to the other groups. These findings underscore the cognitive advantages associated with sustained physical activity. The broader implications highlight the growing societal participation of women in active lifestyles, which not only fosters physical well-being but also enhances cognitive capacity, psychological resilience, and overall quality of life.

## Conclusion and Implications

The present study concludes that regular physical exercise is significantly associated with higher performance in general intelligence and visual memory among middle-aged women. Participants who engaged consistently in physical activity demonstrated superior cognitive functioning compared to casual and non-exercising counterparts. These findings highlight the potential of structured physical routines as a nonpharmacological strategy to enhance cognitive efficiency during midlife. Moreover, increased participation of women in regular exercise contributes not only to physical health but also to improved psychological well-being, self-concept, and overall quality of life.

The implications of this study extend to public health initiatives and cognitive ageing research, emphasizing the value of consistent exercise in preserving cognitive function among women. Future investigations could incorporate longitudinal designs, neuroimaging assessments, or diverse demographic groups to explore the underlying neural mechanisms linking physical activity and cognitive resilience.

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