



**ORIGINAL RESEARCH PAPER**

**Psychology**

**WORKING MEMORY AND LEARNING AND STUDY SKILLS AMONG UNIVERSITY STUDENTS**

**KEY WORDS:** working memory, learning and study skills, students

**Maryam Shirinmianesh**

Research Scholar, Department of Psychology, University of Mysore, Mysuru, Karnataka, India.

**ABSTRACT**

Working memory is essential for learning as it enables individuals to retain information while engaging in learning and aids in processing and organization of new information. Effective learning strategies directly impact the learning efficiency and outcomes. This study examined the relationship between working memory and learning and study skills among 220 university students aged 17 to 20. Working memory was assessed by the corresponding subtests of Brain Based Intelligence Test (BBIT), a standardized test developed in India (Das, et al., 2020). **Method:** A cross-sectional descriptive study was conducted in 2019, involving 220 students aged 17 to 20. The research utilized the Brain-Based Intelligence Test (BBIT) and the Learning and Study Skills Inventory (LASSI-2). Data analysis was performed using SPSS version 24, employing Pearson's correlation and multiple regression tests to examine relationships between variables. Ethical principles of research were strictly adhered to. **Results:** Among the participants, 200 were normal learners (100 female, 100 male; 50% arts, 50% sciences) and 20 were compensated dyslexic learners (8 female, 12 male; 30% arts, 70% sciences). Significant relationships were found between components of working memory (number span, letter sequences, and sentence span) and learning and study skills, predicting 16% of the variance in learning and study skills. Auditory and visual sequences showed no significant relationship. **Conclusions:** The findings suggest that working memory significantly contributes to students' ability to process and understand new information, follow instructions, and remember and apply knowledge. Enhancing working memory could potentially improve learning and study skills, thereby boosting academic performance.

**INTRODUCTION**

One primary objective of education is to cultivate effective learners. Numerous factors influence student learning in the classroom (Senemoglu, 2011), with educational background being a key variable. Traditionally, it has been assumed that as students age and gain more academic experience, their reading and learning skills naturally improve. However, many students lack effective learning strategies until they receive direct instruction (Ali, 2019). Consequently, academic decline and partial failures are common, even among students with the necessary talent and ability to succeed (Kwangmuang et al., 2021).

Academic decline is particularly concerning when capable students fail to achieve success. Educational phenomena are interlinked, and understanding the causes of academic failure requires examining multiple factors (Camacho et al., 2021; Latifian et al., 2023). Effective learning and study skills are crucial for academic success. Many students experience disappointment and failure due to the absence of these skills (Camacho et al., 2021; Muhajirah, 2020). Studies indicate that learning and study skills facilitate the learning process, thereby enhancing academic performance (Anmarkrud et al., 2019; Senemoglu, 2011).

The Learning and Study Skills Inventory (LASSI) by Weinstein et al. (1988) measures students' awareness and use of learning strategies. LASSI comprises ten subscales within three major components: skill, will, and self-regulation (Abulela & Davenport Jr, 2020; Khalil et al., 2020). Research shows that these components are correlated with academic performance (Serin et al., 2009).

Memory, particularly working memory, is a vital factor in academic success. Working memory involves the ability to store and manipulate information over short periods and is crucial for various academic tasks (Abd Ghani & Gathercole, 2013; Alloway et al., 2008; Gathercole & Alloway, 2004). Prior research has demonstrated a significant relationship between working memory and academic achievement (Abd Ghani & Gathercole, 2013; Juffs & Harrington, 2011). However, the relationship between working memory, learning, and study skills in education is still underexplored. This study aims to investigate this relationship among students aged 17 to 20.

**Methodology**

A cross-sectional descriptive study was conducted in 2019

with 220 students aged 17 to 20 from colleges/universities in Mysore city. The sample included 200 normal learners (100 males and 100 females) selected via convenience sampling, and 20 compensated dyslexic learners (12 males and 8 females) selected via convenience and snowball sampling.

**Data Collection And Analysis**

Approval was obtained from the University of Mysore. Data were collected using the BBIT and LASSI-2, administered by a psychologist. SPSS version 24 was used for data analysis, including Pearson's correlation and multiple regression tests. Ethical principles, including informed consent and confidentiality, were strictly followed.

**Instruments**

**Brain-Based Intelligence Test (BBIT):** Developed in India, BBIT measures cognitive processes such as planning, executive functions, and information integration (P. Das et al., 2020). This study utilized components like sentence span, number span, letter sequences, auditory sequences, and visual sequences to measure working memory.

**Learning and Study Skills Inventory (LASSI-2):** Designed by Weinstein and Palmer (2002), LASSI-2 assesses ten components of learning and study strategies. Reliability and validity have been established through prior studies (Deming et al., 1994; Weinstein et al., 1987; Weinstein et al., 1988).

**RESULTS**

**Participant Demographics**

The study included 200 normal learners (100 female, 100 male; 50% arts, 50% sciences) and 20 compensated dyslexic learners (8 female, 12 male; 30% arts, 70% sciences).

**Statistical Analysis**

The Kolmogorov-Smirnov Test confirmed data normality, allowing the use of parametric tests. Pearson's correlation revealed significant positive relationships between working memory components (number span, letter sequences, and sentence span) and learning and study skills, predicting 16% of the variance.

**Regression Analysis**

Multiple regression analysis showed that number span ( $\beta = 0.69$ ) and letter sequences ( $\beta = 3.67$ ) positively correlated with learning and study skills, while sentence span ( $\beta = -1.68$ )

had a negative correlation. Auditory and visual sequences were excluded from the model due to non-significance.

### DISCUSSION

The study confirmed a significant positive relationship between working memory and learning and study skills, consistent with previous research (Abd Ghani & Gathercole, 2013; Anmarkrud et al., 2019; Poloczek et al., 2012). Working memory is crucial for various academic tasks, and improving it can enhance learning and study skills.

### Anxiety And Working Memory

Negative relationships were found between anxiety and both auditory and visual sequences, aligning with prior findings that anxiety can impair working memory (Pickering et al., 2022; Tseng et al., 2018).

### Educational Implications

Improving working memory can enhance students' academic performance. Educational interventions should focus on strengthening working memory and teaching effective learning and study strategies.

### CONCLUSION

This study highlights the critical role of working memory in learning and academic success. Enhancing working memory and learning and study skills can significantly improve students' educational outcomes.

### REFERENCES

1. Abd Ghani, K., & Gathercole, S. E. (2013). Working memory and study skills: a comparison between dyslexic and non-dyslexic adult learners. *Procedia-Social and Behavioral Sciences*, 97, 271-277.
2. Abulela, M. A., & Davenport Jr, E. C. (2020). Measurement Invariance of the Learning and Study Strategies Inventory-(LASSI-II) across Gender and Discipline in Egyptian College Students. *Educational Sciences: Theory and Practice*, 20(2), 32-49.
3. Ali, S. S. (2019). Problem based learning: A student-centered approach. *English language teaching*, 12(5), 73-78.
4. Alloway, T. P. (2006). How does working memory work in the classroom? *Educational Research and reviews*, 1(4), 134-139.
5. Alloway, T. P., Gathercole, S. E., Kirkwood, H., & Elliott, J. (2008). Evaluating the validity of the automated working memory assessment. *Educational Psychology*, 28(7), 725-734.
6. Anmarkrud, Ø., Andresen, A., & Bråten, I. (2019). Cognitive load and working memory in multimedia learning: Conceptual and measurement issues. *Educational Psychologist*, 61-83, (2)54.
7. Bergman Nutley, S., & Söderqvist, S. (2017). How is working memory training likely to influence academic performance? Current evidence and methodological considerations. *Frontiers in Psychology*, 8, 69.
8. Camacho, A., Correia, N., Zaccocchetti, S., & Daniel, J. R. (2021). Anxiety and social support as predictors of student academic motivation during the COVID-19. *Frontiers in Psychology*, 12, 644338.
9. Chow, B. W.-Y., Mo, J., & Dong, Y. (2021). Roles of reading anxiety and working memory in reading comprehension in English as a second language. *Learning and Individual Differences*, 92, 102092.
10. Deming, M. P., Valeri-Gold, M., & Idleman, L. S. (1994). The reliability and validity of the Learning and Study Strategies Inventory (LASSI) with college developmental students. *Literacy Research and Instruction*, 33(4), 309-318.
11. Gathercole, S. E., & Alloway, T. P. (2004). Working memory and classroom learning. *Dyslexia Review*, 15, 4-9.
12. Järvinmäki, V., & Nyblom, V. (2022). Working memory in adults with documented childhood dyslexia.
13. Juffs, A., & Harrington, M. (2011). Aspects of working memory in L2 learning. *Language teaching*, 44(2), 137-166.
14. Khalil, M. K., Williams, S. E., & Hawkins, H. G. (2020). The use of Learning and Study Strategies Inventory (LASSI) to investigate differences between low vs high academically performing medical students. *Medical Science Educator*, 30, 287-292.
15. Kwangmuang, P., Jarutkamolpong, S., Sangboonraung, W., & Daungtod, S. (2021). The development of learning innovation to enhance higher order thinking skills for students in Thailand junior high schools. *Heliyon*, 7 (1).
16. Latifian, M., Raheb, G., Abdi, K., Alikhani, R., & Shariful Islam, S. M. (2023). The effectiveness of psychoeducation in improving attitudes towards psychological disorders and internalized stigma in the family members of bipolar patients: A quasi-experimental study. *PsyCh Journal*, 12(2), 272-279.
17. Li, Y., Hui, Y., Li, H., & Liu, X. (2021). Compensation for poor character learning: intact visual and phonetic strategies among Chinese children with dyslexia. *Annals of Dyslexia*, 71, 127-149.
18. Muhajirah, M. (2020). Basic of learning theory: (behaviorism, cognitivism, constructivism, and humanism). *International Journal of Asian Education*, 1(1), 37-42.
19. P. Das, J. B. B., U. Dash, R. Goyal, & Nair, P. (2020). Brain based intelligence test (bbi). Hyderabad: Bbit india.
20. Pyle, G. D., & Pickering, S. J. (2006). *Working memory and education*. Elsevier.
21. Pickering, H. E., Parsons, C., & Crewther, S. G. (2022). The effect of anxiety on working memory and language abilities in elementary schoolchildren with and without Additional Health and Developmental Needs. *Frontiers in Psychology*, 13, 1061212.

22. Poloczek, S., Büttner, G., & Hasselhorn, M. (2012). Relationships between working memory and academic skills: Are there differences between children with intellectual disabilities and typically developing children. *Journal of Cognitive Education and Psychology*, 11(1), 20-38.
23. Senemoglu, N. (2011). College of education students' approaches to learning and study skills. *Egitim ve Bilim*, 36(160), 65.
24. Serin, O., Serin, N. B., & ahin, F. S. (2009). Factors affecting the learning and studying strategies, and locus of control of the trainee teachers. *Procedia-Social and Behavioral Sciences*, 1(1), 1127-1136.
25. Tseng, Y.-L., Lu, C.-F., Wu, S.-M., Shimada, S., Huang, T., & Lu, G.-Y. (2018). A functional near-infrared spectroscopy study of state anxiety and auditory working memory load. *Frontiers in Human Neuroscience*, 12, 313.
26. Weinstein, C. E., Zimmermann, S. A., & Palmer, D. R. (1988). Assessing learning strategies: The design and development of the LASSI. In *Learning and study strategies* (pp. 25-40). Elsevier.