ISSN E: 2709-8273
aa ISSN P:2709-8265
JOURNAL OF APPLIED LINGUISTICS AND TESOL
JALT

JOURNAL OF APPLIED LINGUISTICS AND TESOL

Vol.8. No.4.2025

DIFFERENCES IN SHORT-TERM STORAGE, ATTENTION, AND EXECUTIVE CONTROL ACROSS AGE GROUPS AND LANGUAGE-BASED ACADEMIC FIELDS

Atika Fatimah[1], Sidra Maqbool[2], Mahnoor Aman[3], Hayat Ullah[4], Sabeen Sabir[5]

[1]BS Psychology, Institute of Professional Psychology, Bahria University, Karachi Campus, Pakistan
Email: mj858645@gmail.com
[2]Lecturer, Department of English, International Institute of Science, Arts and Technology, Gujranwala, Pakistan
Email: wardasyed337@gmail.com
ORCID: https://orcid.org/0009-0004-2292-0382
[3]Former MPhil Scholar of Psychology, National Institute of Psychology, Quaid-e-Azam University Islamabad, Pakistan
Email: mahnooraman787@gmail.com
[4]MS Clinical Psychology Graduate, Department of Psychology, Foundation University Islamabad, Pakistan
Email: hayatpsy85@gmail.com
[5]Former Visiting Faculty, Department of Psychology, Bahria University Islamabad, Pakistan
Email: sabeensabir@yahoo.com

Abstract

This study examined differences in short-term storage, attention, and executive control across age groups and academic fields in a Pakistani sample. A total of 122 participants, including students and working professionals from English and Urdu literature fields, completed the Working Memory Questionnaire (Vallat-Azouvi et al., 2012), yielding a response rate of 69.7%. The mean age of participants was 41.93 years (SD = 12.27). Higher scores on the questionnaire indicate greater perceived difficulty in cognitive functioning. Correlational analysis revealed significant positive relationships among short-term storage, attention, and executive control. Independent-samples t-tests indicated that young adults demonstrated better short-term storage, attention, and executive control than older adults, whereas participants from English literature exhibited superior performance across all domains compared to their Urdu literature counterparts. These findings highlight age- and language-related differences in cognitive functioning and underscore the importance of culturally contextualized assessments for educational and professional populations.

Keywords: *Short-term memory, attention, executive control, age differences, language-based academic fields*

Introduction

Working memory is a core cognitive system responsible for the temporary storage and manipulation of information during complex mental activities such as reasoning, comprehension, and decision-making (Baddeley, 2020). It plays a vital role in academic learning, problem-solving,

ISSN E: 2709-8273
aa ISSN P:2709-8265
JOURNAL OF APPLIED LINGUISTICS AND TESOL
JALT

and everyday functioning. Contemporary models conceptualize working memory as comprising three interrelated domains: short-term storage, attention, and executive control.

Short-term storage refers to the brief retention of information over short intervals (Colom et al., 2005). Attention involves the ability to selectively focus on relevant stimuli while inhibiting distractions (Mancas, 2016). Executive control governs higher-order regulatory processes, including inhibition, cognitive flexibility, and goal-directed behavior (Lara & Wills, 2014). Effective coordination of these domains is essential for adaptive cognitive performance.

Research consistently indicates that cognitive performance in these domains peaks in early adulthood and declines with increasing age (Ferguson et al., 2021; Nettelbeck & Burns, 2010). Younger adults typically demonstrate better short-term storage, attention, and executive control compared to older adults (Fandakova et al., 2014; Humes et al., 2022). These declines have been associated with structural and functional changes in frontal and hippocampal brain regions (Bachmann et al., 2023). Furthermore, Shahid et al. (2025) reported significant positive correlations among short-term storage, attention, and executive control, highlighting that these domains are interrelated, and found that young adults outperformed older and mature adults across all three domains.

Beyond age, academic language background may also influence cognitive functioning. English-based academic fields often require extensive reading, analytical reasoning, and sustained attentional engagement, which may place higher demands on attention and executive control. In contrast, Urdu-based academic fields may differ in instructional and cognitive demands. Despite this theoretical relevance, empirical research comparing cognitive functioning across language-based academic fields is limited.

Although there is substantial international literature, studies examining short-term storage, attention, and executive control across age groups and language-based academic fields have not been conducted in Pakistan. Cognitive processes are shaped by sociocultural, educational, and linguistic environments; therefore, findings from Western populations cannot be directly generalized. The present study aims to address this gap by providing culturally relevant evidence from Pakistan.

Rationale

There is a clear lack of indigenous research in Pakistan examining differences in short-term storage, attention, and executive control across age groups and language-based academic fields. To date, no study has systematically explored these domains within the Pakistani cultural and educational context. Understanding these differences is important for developing culturally appropriate educational and cognitive interventions. The present study seeks to fill this gap by comparing cognitive functioning among young and older adults across English and Urdu literature academic fields.

ISSN E: 2709-8273
aa ISSN P:2709-8265
JOURNAL OF APPLIED LINGUISTICS AND TESOL
JALT

Research Questions

1. Are there significant differences in short-term storage, attention, and executive control between young and older adults?
2. Are there significant differences in short-term storage, attention, and executive control between English and Urdu literature academic fields
3.

Research Objectives

1. To compare short-term storage, attention, and executive control between young and older adults.
2. To examine differences in these domains between English and Urdu literature academic fields.

Hypotheses

H1: Young and older adults will differ significantly in short-term storage, attention, and executive control.

H2: Students from English and Urdu literature academic fields will differ significantly in short-term storage, attention, and executive control.

Method

Research Design

A cross-sectional comparative research design was employed to examine the relationships among short-term storage, attention, and executive control.

Participants

A total of 175 individuals were approached, of whom 122 completed the questionnaire, yielding a response rate of 69.7%. Participants were divided into two age groups: young adults (19–40 years) and older adults (41–64 years). All participants had a minimum education level of Intermediate and were affiliated with either English or Urdu literature academic fields as students or working professionals.

Measure

Short-term storage, attention, and executive control were assessed using the Working Memory Questionnaire developed by Vallat-Azouvi et al. (2012). The questionnaire consists of 30 items rated on a 6-point Likert scale ranging from 1 (no difficulty) to 6 (extreme difficulty) and measures three domains: short-term storage, attention, and executive control. Higher scores indicate greater perceived cognitive difficulty.

Procedure

Participants were informed about the study objectives and provided written informed consent. Data were collected from educational institutions and community settings while ensuring confidentiality, anonymity, and voluntary participation.

ISSN E: 2709-8273
aa ISSN P:2709-8265
JOURNAL OF APPLIED LINGUISTICS AND TESOL
JALT

Data Analysis

Data were analyzed using IBM SPSS (Version 26). Independent-samples t-tests were conducted to examine mean differences in short-term storage, attention, and executive control across age groups and between English and Urdu literature academic fields.

Results

Table 1

Demographic Characteristics of the Sample (N=120)

Characteristics	*Frequency*	*Percentage*	*M*	*SD*
Gender				
Men	74	61.7		
Women	46	38.3		
Age			41.93	12.27
Age Groups				
Young Adulthood (18-40)	55	45.8		
Older Adulthood (41-64)	65	54.2		
Qualification				
Intermediate	6	5		
Bachelor	38	31.7		
Master	50	41.6		
PhD	26	21.7		
Academic Fields				
English Literature	63	55.8		
Urdu Literature	57	44.2		
Students and Working Professionals				
Students	93	77.5		
Professionals	27	22.5		

Note. M = Mean, *SD* = Standard Deviation

The sample comprised 120 participants, including 74 men (61.7%) and 46 women (38.3%), with a mean age of 41.93 years (SD = 12.27). Among them, 55 participants (45.8%) were classified as young adults (18–40 years) and 65 (54.2%) as older adults (41–64 years). Regarding educational qualifications, 6 participants (5%) had completed Intermediate education, 38 (31.7%) held a Bachelor's degree, 50 (41.6%) had a Master's degree, and 26 (21.7%) possessed a PhD. In terms of academic fields, 63 participants (55.8%) were from English Literature and 57 (44.2%) from Urdu Literature. Additionally, the majority of the sample were students (93, 77.5%), while 27 participants (22.5%) were working professionals.

Table 2

Pearson Product Correlation among the Study Variables (N=120)

Variables	1	2	3
1.Short term storage	-	.55**	.46**
2.Attention			.48**
3.Executive control			-

ISSN E: 2709-8273
aa ISSN P:2709-8265
JOURNAL OF APPLIED LINGUISTICS AND TESOL
JALT

Note. **p<.01*

The results show that all three variables i.e., short-term storage, attention and executive control are significantly and positively correlated.

Table 3

Mean Differences of Age Groups of the Participants (N=120)

	Young Adults (n=55)		Older Adults (n=65)				
Variables	*M*	*SD*	*M*	*SD*	*t (118)*	*P*	Cohen's d
Short Term Storage	28.38	8.78	33.01	5.79	-3.45	.001	0.62
Attention	26.65	8.09	29.44	6.02	-2.16	.03	0.39
Executive Control	29.98	8.31	32.04	6.40	-1.53	.12	0.27

Note. **p <.05, *** p <.001*

The results revealed significant age-related differences in short-term storage and attention, with older adults obtaining higher scores than young adults. In contrast, differences in executive control between the two age groups were not significant, although older adults scored higher. Because higher scores on the questionnaire indicate greater difficulty, these findings suggest that young adults demonstrated better short-term storage, attention, and executive control compared to older adults.

Table 4

Mean Differences of the Respondents' Academic Fields (N=120)

	English (n=63)		Urdu (n=57)				
Variables	*M*	*SD*	*M*	*SD*	*t (118)*	*P*	Cohen's d
Short Term Storage	28.85	8.64	33.14	6.62	-3.18	.002	0.55
Attention	26.85	8.16	29.61	5.57	-2.13	.03	0.40
Executive Control	29.65	7.85	32.70	6.53	-2.30	.02	0.42

Note. **p <.05, *** p <.001*

As presented in Table 4, significant differences were observed between respondents from English and Urdu academic fields across all assessed domains. Participants from the Urdu field obtained significantly higher scores in short-term storage, attention, and executive control compared to those from the English field. Because higher scores on these variables indicate greater levels of difficulty according to the scale, the findings suggest that respondents from the English academic field demonstrated comparatively better short-term storage, attention, and executive control than their counterparts from the Urdu academic field.

Discussion

The present study examined differences in short-term storage, attention, and executive control across age groups and language-based academic fields within the Pakistani context. Consistent with the study hypotheses, significant differences were observed between young and

older adults, as well as between participants affiliated with English and Urdu literature academic fields.

The correlational analysis of the study reported a significant relationship between short-term storage, attention, and executive control. This is consistent with a recent study by Shahid et al. (2025), which also found significant positive relationships among these domains. The reason could be that these cognitive processes are interdependent, with efficient attention facilitating short-term storage and effective executive control supporting the manipulation and regulation of information, highlighting the integrated nature of these cognitive functions.

Older adults reported significantly greater difficulty in short-term storage and attention compared to young adults, while differences in executive control were smaller and non-significant. These findings align with previous research indicating age-related decline in cognitive functioning, particularly in attentional processes and short-term retention (Ferguson et al., 2021; Nettelbeck & Burns, 2010; Humes et al., 2022). Structural and functional changes in frontal and hippocampal regions, which are critical for regulating attention, memory retention, and goal-directed behavior, likely contribute to these declines (Bachmann et al., 2023). The higher scores among older adults indicate that they experience more difficulty managing and manipulating information during cognitive tasks, whereas young adults demonstrate better overall performance across these domains.

Participants from English literature academic fields reported lower perceived difficulties in short-term storage, attention, and executive control compared to those from Urdu literature fields. This pattern may reflect differences in instructional demands, language processing, and cognitive engagement, as English-based academic disciplines often involve extensive reading, analytical reasoning, and sustained cognitive effort (Colom et al., 2005; Mancas, 2016). Additionally, differences in teaching methods, assessment strategies, and exposure to cognitively demanding tasks may influence participants' self-reported levels of difficulty.

Conclusion

The study demonstrates significant differences in short-term storage, attention, and executive control across age groups and language-based academic fields among Pakistani adults. Older adults reported greater cognitive difficulties than young adults, reflecting age-related declines. Participants from English literature academic fields showed comparatively better performance than those from Urdu literature fields, suggesting that academic language and instructional context play a meaningful role in perceived cognitive functioning. These findings contribute novel evidence to the limited research on cognitive performance in Pakistan and highlight the need to consider both age and academic context in assessments and interventions.

Limitations and Recommendations

Despite its contributions, the study has several limitations. The cross-sectional design restricts causal interpretations of age-related differences, and the reliance on self-report measures may reflect subjective perceptions rather than objective cognitive ability. Additionally, all participants had a minimum education level of Intermediate, limiting generalizability to populations with lower educational attainment.

Future research should adopt longitudinal designs to examine developmental changes in cognitive functioning over time and incorporate objective cognitive tasks alongside self-report measures to strengthen validity. Expanding the sample to include participants from a wider range of academic disciplines and educational levels would enhance generalizability. Practically, age-sensitive interventions and educational strategies that reduce cognitive load, particularly in demanding academic contexts, may support attentional control, memory retention, and executive functioning. Community-based initiatives, workshops, and lifestyle interventions promoting cognitive engagement, physical activity, and stress management may further help maintain cognitive health across age groups in Pakistan.

Implications

The findings of the present study have important educational and practical implications. Given that older adults reported greater cognitive difficulties, interventions promoting physical activity may be particularly beneficial, as Shahid et al. (2025) found that regular physical activity is significantly associated with reduced cognitive deficits and improved attentional and executive functioning. Educational institutions and community programs should develop age-sensitive strategies to maintain and enhance cognitive functioning among older adults. For students and professionals in Urdu literature academic fields, who reported higher perceived cognitive difficulty, cognitive skill-building workshops, memory enhancement strategies, and attentional training programs can help manage cognitive load and improve performance. Additionally, awareness campaigns emphasizing effective learning strategies, stress management, and lifestyle factors such as exercise and cognitive engagement may support both younger and older populations. Tailored interventions considering both age and academic context are recommended to promote optimal cognitive functioning in Pakistan.

References

Aggarwal, A. (2024). The role of working memory in decision-making processes. *Shodh Sagar Journal of Inspiration and Psychology, 1*(4), 1–5.

Bachmann, D., Buchmann, A., Studer, S., Saake, A., Rauen, K., Zuber, I., ... & Treyer, V. (2023). Age-, sex-, and pathology-related variability in brain structure and cognition. *Translational Psychiatry, 13*(1), 278. https://doi.org/10.1038/s41398-023-02345-6

Baddeley, A. (2020). Working memory. *Memory*, 71–111.

Baddeley, A. D. (2013). The concept of working memory. In *Models of short-term memory* (pp. 1–27). Psychology Press.

Bayram, E., Litvan, I., Wright, B. A., Grembowski, C., Shen, Q., & Harrington, D. L. (2021). Dopamine effects on memory load and distraction during visuospatial working memory in cognitively normal Parkinson's disease. *Aging, Neuropsychology, and Cognition, 28*(6), 812–828.

Cansino, S., Torres-Trejo, F., Estrada-Manilla, C., Flores-Mendoza, A., Ramírez-Pérez, G., & Ruiz-Velasco, S. (2023). Nutrient effects on working memory across the adult lifespan. *Nutritional Neuroscience, 26*(5), 456–469.

Colom, R., Flores-Mendoza, C., Quiroga, M. Á., & Privado, J. (2005). Working memory and general intelligence: The role of short-term storage. *Personality and Individual Differences, 39*(5), 1005–1014.

Fandakova, Y., Sander, M. C., Werkle-Bergner, M., & Shing, Y. L. (2014). Age differences in short-term memory binding are related to working memory performance across the lifespan. *Psychology and Aging, 29*(1), 140–153.

Ferguson, H. J., Brunsdon, V. E., & Bradford, E. E. (2021). The developmental trajectories of executive function from adolescence to old age. *Scientific Reports, 11*(1), 1382.

Fond, G., Berna, F., Boyer, L., Godin, O., Brunel, L., Andrianarisoa, M., ... & Bulzacka, E. (2018). Benzodiazepine long-term administration is associated with impaired attention/working memory in schizophrenia: Results from the national multicentre FACE-SZ data set. *European Archives of Psychiatry and Clinical Neuroscience, 268*, 17–26.

Furman, D. J., Zhang, Z., Chatham, C. H., Good, M., Badre, D., Hsu, M., & Kayser, A. S. (2021). Augmenting frontal dopamine tone enhances maintenance over gating processes in working memory. *Journal of Cognitive Neuroscience, 33*(9), 1753–1765.

Getzmann, S., Reiser, J. E., Gajewski, P. D., Schneider, D., Karthaus, M., & Wascher, E. (2023). Cognitive aging at work and in daily life—a narrative review on challenges due to age-related changes in central cognitive functions. *Frontiers in Psychology, 14*, 1232344.

Ghayedi, Z., Banihashemian, K., Shirdel, S., Adineh Salarvand, R., Zare, M., Zeinali, S., & Ghahri Lalaklou, Z. (2024). A review on the comparison of working memory performance, cognitive control, and behavioral, and psychological symptoms across normal aging, mild cognitive impairment, and Alzheimer's disease. *Neurology Letters, 3*(Special Issue: Diagnostic and Therapeutic Advances in Neurodegenerative Diseases), 26–38.

Hayes, M. G., Kelly, A. J., & Smith, A. D. (2013). Working memory and the strategic control of attention in older and younger adults. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 68*(2), 176–183.

Hester, R., & Garavan, H. (2005). Working memory and executive control: The influence of content and load on the control of attention. *Memory & Cognition, 33*, 221–233.

Hill, A. C., Laird, A. R., & Robinson, J. L. (2014). Gender differences in working memory networks: A BrainMap meta-analysis. *Biological Psychology, 102*, 18–29.

Humes, L. E., Kidd, G. R., & Lentz, J. J. (2022). Differences between young and older adults in working memory and performance on the test of basic auditory capabilities. *Frontiers in Psychology, 12*, 804891.

Jiménez-Balado, J., & Eich, T. S. (2021, August). GABAergic dyscontrol, neural network hyperactivity, and memory impairments in human aging and Alzheimer's disease. In *Seminars in Cell & Developmental Biology, 116*, 146–159. Academic Press.

Jurado, M. B., & Rosselli, M. (2007). The elusive nature of executive controls: A review of our current understanding. *Neuropsychology Review, 17*, 213–233.

Kessels, R. P., Hobbel, D., & Postma, A. (2007). Aging, context memory and binding: A comparison of "what, where and when" in young and older adults. *International Journal of Neuroscience, 117*(6), 795–810.

Kirova, A. M., Bays, R. B., & Lagalwar, S. (2015). Working memory and executive control decline across normal aging, mild cognitive impairment, and Alzheimer's disease. *BioMed Research International, 2015*, 748212.

Klencklen, G., Lavenex, P. B., Brandner, C., & Lavenex, P. (2017). Working memory decline in normal aging: Is it really worse in space than in color? *Learning and Motivation, 57*, 48–60.

Lara, A. H., & Wallis, J. D. (2014). Executive control processes underlying multi-item working memory. *Nature Neuroscience, 17*(6), 876–883.

León, I., Tascón, L., & Cimadevilla, J. M. (2016). Age and gender-related differences in a spatial memory task in humans. *Behavioural Brain Research, 306*, 8–12.

Li, X., Salami, A., Avelar-Pereira, B., Bäckman, L., & Persson, J. (2022). White-matter integrity and working memory: Links to aging and dopamine-related genes. *eNeuro, 9*(2).

Maitland, S. B., Intrieri, R. C., Schaie, W. K., & Willis, S. L. (2000). Gender differences and changes in cognitive abilities across the adult life span. *Aging, Neuropsychology, and Cognition, 7*(1), 32–53.

Meneses, A. (2014). Neurotransmitters and memory: Cholinergic, glutamatergic, GABAergic, dopaminergic, serotonergic signaling, and memory. In *Identification of Neural Markers Accompanying Memory* (pp. 5–45). Elsevier.

Mian, M., Tahiri, J., Eldin, R., Altabaa, M., Sehar, U., & Reddy, P. H. (2024). Overlooked cases of mild cognitive impairment: Implications to early Alzheimer's disease. *Ageing Research Reviews, 98*, 102335.

Nettelbeck, T., & Burns, N. R. (2010). Processing speed, working memory and reasoning ability from childhood to old age. *Personality and Individual Differences, 48*(4), 379–384.

Oberauer, K., Demmrich, A., Mayr, U., & Kliegl, R. (2001). Dissociating retention and access in working memory: An age-comparative study of mental arithmetic. *Memory & Cognition, 29*, 18–33.

Peterson, D. J., & Naveh-Benjamin, M. (2016). The role of aging in intra-item and item-context binding processes in visual working memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 42*(11), 1713–1728.

Piek, J. P., Dyck, M. J., Francis, M., & Conwell, A. (2007). Working memory, processing speed, and set-shifting in children with developmental coordination disorder and attention-deficit–hyperactivity disorder. *Developmental Medicine & Child Neurology, 49*(9), 678–683.

Sepp, S., Howard, S. J., Tindall-Ford, S., Agostinho, S., & Paas, F. (2020). Working memory: Models and applications. In *Oxford Research Encyclopedia of Education*.

Shahid, M. S., Naeem, S., Alam, S., Shabbir, K. H., & Rahman, R. (2025). Working memory and aging: A comparative quantitative study of Italian adults. *Insights-Journal of Health and Rehabilitation, 3*(3 (Health & Rehab)), 166–175.

Shahid[1], M. S., Awan, M. A., Zahra, R. T., & Naseem[4], S. (2025). Physical activity and cognitive deficits among university students in Pakistan.

Solianik, R., Brazaitis, M., & Skurvydas, A. (2016). Sex-related differences in attention and memory. *Medicina, 52*(6), 372.

Sridhar, S., Khamaj, A., & Asthana, M. K. (2023). Cognitive neuroscience perspective on memory: Overview and summary. *Frontiers in Human Neuroscience, 17*, 1217093.

Sullivan, A. J., Anderson, J., Beatty, M., Choi, J., Jaccard, J., Hawkins, K., ... & Stevens, M. C. (2024). A randomized clinical trial to evaluate feasibility, tolerability, and preliminary target engagement for a novel executive working memory training in adolescents with ADHD. *Behaviour Research and Therapy, 181*, 104615.

Sümer, E., & Kaynak, H. (2024). Age-related decline in source and associative memory. *Cognitive Processing*, 1–13.

Vallat-Azouvi, C., Pradat-Diehl, P., & Azouvi, P. (2012). The Working Memory Questionnaire: A scale to assess everyday life problems related to deficits of working memory in brain-injured patients. *Neuropsychological Rehabilitation, 22*(4), 634–649.

Voyer, D., Saint Aubin, J., Altman, K., & Gallant, G. (2021). Sex differences in verbal working memory: A systematic review and meta-analysis. *Psychological Bulletin, 147*(4), 352–381.

Wang, M., Gamo, N. J., Yang, Y., Jin, L. E., Wang, X. J., Laubach, M., ... & Arnsten, A. F. (2011). Neuronal basis of age-related working memory decline. *Nature, 476*(7359), 210–213.

Zarantonello, L., Schiff, S., Amodio, P., & Bisiacchi, P. (2020). The effect of age, educational level, gender and cognitive reserve on visuospatial working memory performance across adult life span. *Aging, Neuropsychology, and Cognition, 27*(2), 302–319.