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Differences in Cognitive Functions based on English Language Proficiency in Young Adults

Methmi Liyanage[1], Avishka Gamaathige[1], Sanithma Hewagama[1], Taveesha Perera[1], Nilusha Goonetilleke[1]

[1]*Sri Lanka Institute of Information Technology, Malabe, 10115, Sri Lanka*

Corresponding author*: methmianime7302@gmail.com

Abstract

Cognitive assessments rely heavily on language-based tasks, potentially confounding cognitive performance with language proficiency, particularly in multilingual settings. This study investigated the influence of English language proficiency on cognitive functioning among young adults in Sri Lanka, a linguistically diverse country. 51 participants aged 18–26 were assessed using the Montreal Cognitive Assessment (MoCA) and grouped by first-language English and non-first-language status. Standardised administration protocols and ethical guidelines were followed. Data analysis using an independent sample t-test revealed a significant difference in overall MoCA scores between the two groups, suggesting that language proficiency may influence MoCA performance. These findings emphasise the importance of culturally and linguistically appropriate tools and the need for caution when interpreting cognitive assessments in multilingual contexts.

Keywords: Cognitive function; English proficiency; MoCA; Bilingualism; Cognitive assessment

Introduction

Cognitive functions such as attention, memory, language, and executive control provide the foundation for adaptive human behaviour and learning. These functions are commonly assessed using standardised screening tools, many of which rely on language-based tasks (Van den Berg et al., 2025). However, in multilingual contexts, language proficiency may unintentionally influence cognitive assessment outcomes, raising important questions about test fairness and validity (Vassiliu et al., 2024).

English serves as a dominant language in global academia and professional domains, increasingly becoming a benchmark for educational and occupational access. Existing literature has shown that bilingualism and high language proficiency are associated with enhanced executive control and cognitive flexibility (Xia et al., 2025) and that higher language proficiency contributes to improved performance in language-mediated cognitive tasks, such as attention, working memory, and verbal abstraction (Xie, 2018). According to the executive control framework, bilinguals constantly manage two linguistic systems by inhibiting one and activating the other, which improves domain-general executive processes like response inhibition, selective attention, working memory, task switching, and cognitive flexibility (Diamond, 2013). These improved executive functions can have an impact on a wide range of cognitive activities, implying that performance disparities between bilingual and monolingual persons may be due to differences in cognitive control rather than language aptitude alone.

Sri Lanka's multilingual context, in which Sinhala, Tamil, and English coexist in education and daily life, provides an ideal setting for investigating the impact of English competence on cognitive function (Gunawardena, 2024). English, which is frequently learnt as a second or third language, varies greatly across young adults, potentially impacting memory, attention, and executive control tasks (Vassiliu et al., 2024; Purpuri et al., 2024). The Montreal Cognitive Assessment (MoCA) (Nasreddine et al., 2005) is culturally adapted and validated and offered in English, Sinhala, and Tamil. Despite global recognition of these factors, empirical research in the Sri Lankan context remains limited. Understanding how English competency interacts with cognitive functioning can improve assessment practices, educational strategies, and policies aimed at addressing language-related inequalities. This study aims to fill that notable gap.

This study aims to examine whether English language proficiency is associated with differences in cognitive function among young adults in Sri Lanka. By comparing the MoCA performance of individuals with English as a first language (L1) to those for whom English is a learned language, this research seeks to contribute to a more refined understanding of cognitive assessment in multilingual populations. Specifically, it examines how first-language proficiency affects cognitive test outcomes among young adults in Sri Lanka.

Objectives of the study:
1. To assess the overall cognitive performance of young adults through the MoCA
2. To identify the specific cognitive domains in which English language proficiency has the greatest impact.

Hypotheses
H1 - Cognitive performance is influenced by language proficiency
H0 - Cognitive performance is not influenced by language proficiency

Materials and Methods

A sample of 51 young adults, aged 18-26 years, was recruited for this study. 27 and 24 of them were L1 Sinhala and L1 English speakers, respectively. The sample was selected using a combination of purposive and convenience sampling methods. Inclusion criteria included general English language proficiency, age between 18 to 26. Individuals who did not meet the age requirements, had insufficient English proficiency, or were experiencing psychological or physical illness during the study were excluded.

The Montreal Cognitive Assessment (MoCA)- English Version 7.1 (Nasreddine et al., 2005) was the primary assessment tool. Before data collection, all researchers underwent a comprehensive lecture and a hands-on trial session to ensure standardised and correct administration of the MoCA. All assessments were conducted in a quiet, distraction-free environment to minimise external influences and to ensure optimal participant performance.

Following ethical approval, potential participants were provided with an information sheet detailing the study's purpose, procedures, and their rights. Written informed consent was obtained from all participants prior to their involvement. Participants were grouped based on their self-reported English proficiency. Each participant then underwent the MoCA, administered individually by a trained researcher according to the standardised procedures learned during the training session. All instructions were provided in English. Participant confidentiality was maintained throughout the study and will be protected in the future.

Ethical Considerations

This research was conducted as a part of the education module 'Biological and Cognitive Psychology' and received ethical clearance from the School of Psychology of Sri Lanka Information Technology (SLIIT) before conducting the research. An information sheet was provided to all potential participants, clearly outlining the study's objectives, procedures, potential risks, and benefits. Written informed consent was

obtained from all participants before their involvement. Participant confidentiality was strictly maintained throughout the study, with all data anonymised to protect individual identities. All the ethical -related procedures were followed.

Data Analysis

Data collected from the MoCA were analysed using Jamovi statistical software (The Jamovi Project, 2022) by the researchers. The independent sample t-test was employed to compare MoCA scores between L1 English and Sinhala speakers. The participant groups were assigned values (L1 English = 1 and L1 Sinhala = 0) for the purpose of this data analysis.

Results

Table 1: *Descriptive Statistics of MoCA Scores by First-Language English Proficiency*

	L1 Eng	VS & Exec	Naming	Attention	Language	Abstraction	DR	Orientation	Total
N	0	27	27	27	27	27	27	27	27
	1	24	24	24	24	24	24	24	24
Mean	0	4.41	2.85	5.30	1.89	1.70	3.78	6.00	25.9
	1	4.79	3.00	5.83	2.88	1.79	3.79	5.96	28.1
Standard deviation	0	0.844	0.456	1.17	0.974	0.542	1.09	0.00	3.92
	1	0.509	0.00	0.381	0.338	0.415	1.25	0.204	1.61

Table 1 depicts the descriptive statistics of the domains of the MoCA and the total score of the participant groups. The mean and standard deviation of the total scores of the two participant groups were 0 = 28.1, 1.61, respectively and 1= 25.9, 3.92, respectively. The L1 English participants scored higher than the L1 Sinhala participants, with a noticeable difference between the two groups.

According to the above table, the differences between the groups can mainly be seen through the means of the Language (0= 1.89, 1= 2.88), Attention (0= 5.30, 1= 5.83) and Visuospatial and Executive (0= 4.41, 1= 4.79) sections.

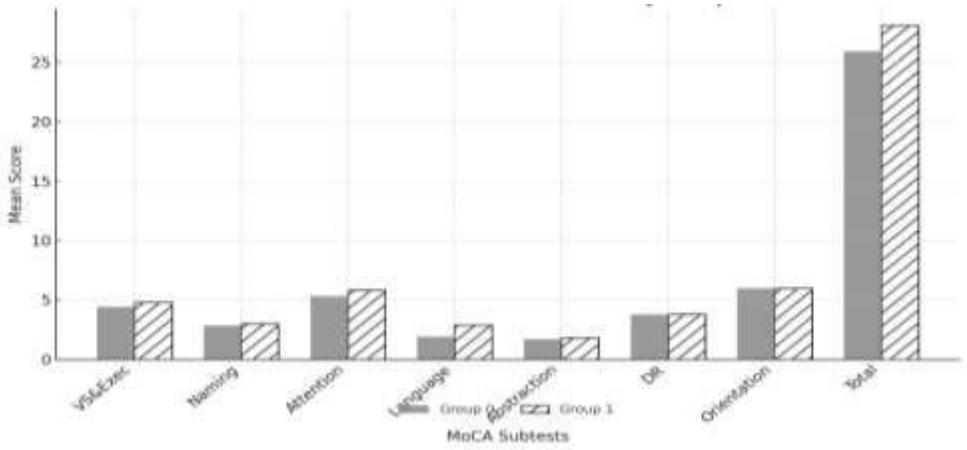

Figure 1: *Mean Scores on MoCA Subtests by First-Language Group (1= L1 English, 0= L1 Sinhala)*

As indicated in Figure 1, participants with L1 English outperformed those with L1 Sinhala on all MoCA subtests. The largest differences were seen in the Attention and Language domains, with smaller gaps in Abstraction and Orientation.

Table 2: *Independent Sample t-Test Results for Total MoCA Scores by First-Language Group*

		Statistic	df	p	Mean difference	SE difference		Effect Size
Total	Welch's t	-2.62	35.4	0.013	-2.16	0.823	Cohen's d	-0.720

Note. $H_a\ \mu 0 \neq \mu 1$

An independent-samples Welch's t-test was conducted to compare total MoCA scores between participants with L1 English and those with L1 Sinhala. The results revealed a statistically significant difference between groups, t (35.4) = -2.62, p= .013. The mean difference was -2.16 (SE= 0.82), indicating that participants with L1 English scored higher on the MoCA compared to those with L1 Sinhala. Cohen's d= -0.72 indicates a medium-to-large effect, suggesting that first-language background was significantly related to differences in cognitive ability. The Welch's test was conducted after its necessity was confirmed by the two tests stated below.

Table 3: *Shapiro-Wilk Test for Normality of Total MoCA Scores*

	W	P
Total	0.854	< .001

Note. A low p-value suggests a violation of the assumption of normality

The results indicated a significant deviation from normality, W = 0.85, p < .001, suggesting that the distribution of scores was not normally distributed. This violation of the normality assumption confirms the use of Welch's t-test for group comparisons.

Table 4: *Levene's Test for Homogeneity of Variances of Total MoCA Scores*

	F	df	df2	P
Total	7.61	1	49	0.008

Note. A low p-value suggests a violation of the assumption of equal variances

This test was conducted to examine whether the assumption of equal variances was met for total MoCA scores. The test was significant, F (1, 49) = 7.61, p = .008, indicating that the variances between the first-language groups were not equal. This violation of the homogeneity assumption supported the use of Welch's t-test to compare group means.

Discussion and Conclusion

The present study aimed to examine whether English language proficiency affects cognitive assessment performance in Sri Lankan young adults. The results indicate a statistically significant difference in the MoCA scores of participants with L1 English and L1 Sinhala, with the L1 English group performing better on average.

The Language, Attention and Visuospatial and Executive function domains displayed a noticeable mean difference between the two groups. Since the MoCA requires participants to follow verbal instructions and comprehend complex language, the L1 English speakers may have navigated these demands more fluently due to their higher proficiency and familiarity with the English language (0=25.9, 128.1). Most notably,

there was a significant difference in the language (0=1.89, 1=2.88), attention (0=5.30, 1=5.83) and visuospatial and executive function (0=4.41, 1=4.79) areas. This may suggest that these areas had required greater English proficiency, leading to participants with L1 Sinhala having greater difficulty when performing the tasks. These findings are further supported by the results of the Independent Sample T-Test, where the mean difference is -2.16. The medium to large effect size (d=-0.720) suggests that this study has real-world applications. In the current study, the null hypothesis (H_0: language proficiency does not influence cognitive performance) was not supported, but the alternative hypothesis (H_1: language proficiency does influence cognitive performance) was accepted: English language proficiency has an effect on cognitive performance. Descriptive data and mean-level comparisons (Table 1, Figure 1) revealed that participants with L1 English outperformed those with L1 Sinhala on the majority of MoCA subtests. The groups also differed considerably in total MoCA score, with the observed effect size indicating that the performance difference was not trivial. This finding supports the study's aim of determining whether English language proficiency is associated with differences in cognitive functioning and cognitive screening performance in Sri Lanka. Previous studies suggest similar improvement in areas such as conflict resolution and inhibitory control (Novitskiy et al., 2019, p. 10; Jia, 2022).

Additionally, the current findings indicate that delivering cognitive examinations in a participant's second or third language may disadvantage them, as performance discrepancies may reflect the additional demands of language processing rather than true cognitive deficiencies. This emphasises the need of administering evaluations in an individual's primary language to ensure validity (Elyas et al., 2024). Furthermore, new research suggests that combining personalised second-language experiences can help improve cognitive performance (Xia et al., 2025). However, the current study indicated a small difference in memory scores between the two groups (L1 English = 3.79; L1 Sinhala = 3.78); previous research by Sun et al. (2019) found that language proficiency has no meaningful effect on working memory.

Meanwhile, several limitations should be acknowledged in the current study. The sample size was comparatively small and restricted to young adults, which limits the applicability of the findings to other age groups, particularly older adults, where cognitive decline may interact differently with language proficiency. The cross-sectional design also prevents causal inferences about the relationship between language and cognition. Future research should include more diverse populations, employ longitudinal designs, and examine additional factors such as bilingual proficiency, frequency of code-switching, and exposure to English in academic versus informal contexts. It is also recommended that both qualitative and mixed-method approaches be used in future studies to provide a more comprehensive understanding of these relationships.

This study met its aim of assessing the connection between English language competency and cognitive functioning among Sri Lankan young adults. The study found substantial disparities in overall MoCA performance and specific cognitive domains, with L1 English speakers outperforming L1 Sinhala speakers. These findings confirm the concept that language proficiency influences cognitive functions, emphasising the significance of culturally and linguistically sensitive approaches to cognitive testing in multilin gual societies.

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