

## EFFECT OF STUDENTS' INTELLECTUAL ABILITY ON STUDENTS' PERFORMANCE AT UNIVERSITY LEVEL

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Received	Revised	Accepted	Published
17 October, 2024	17 November, 2024	29 November, 2024	07 December, 2024

### ABSTRACT

Students' intellectual ability plays a significant role in shaping their academic performance, as cognitive skills such as memory, reasoning, and problem-solving are closely linked to learning outcomes. Higher intellectual ability often leads to better performance in complex academic tasks and problem-solving scenarios. The objectives of the study to find out the effect of students' Intellectual ability (Cognitive Development, Language Proficiency, Working Memory, Processing Speed, and Attention and Focus) on students' performance at university level. The design of the study is descriptive in nature. The philosophical paradigm of quantitative research is positivism. The population were comprised of all public and private universities of Lahore district. The total no of universities in Lahore district are 39 in which 16 are public and 23 are private (HEC, 2024). The instrument of the study were questionnaires. Validity of the instrument was tested through expert opinion while the reliability of the instrument was tested through pilot testing. Cronbach's Alpha was computed to assess the dependability of the tool. Primary source of data was in current research. The participants of this study were administering through questionnaires. Statistical package for social science (SPSS) was used for data analysis. Regression analysis were used for of all objectives. The findings of the study revealed that there was highly significant effect of students' Intellectual ability (Cognitive Development, Language Proficiency, Working Memory, Processing Speed, and Attention and Focus) on students' performance at university level.

**Keywords:** students' Intellectual ability, Cognitive Development, Language Proficiency, Working Memory, Processing Speed, and Attention and Focus, students' performance, university level

### INTRODUCTION

Intellectual ability is widely recognized as a crucial determinant of students' academic performance, encompassing various cognitive domains such as

reasoning, memory, verbal comprehension, and executive functioning (Carroll, 1993; Deary, 2012). Research indicates that intellectual capacity is a

significant predictor of achievement across subjects, particularly in disciplines demanding higher-order thinking skills, including mathematics, science, and language arts (Sattler, 2018; Rindermann & Ceci, 2018). Studies of cognitive development, rooted in Piaget's stage theory, demonstrate that intellectual maturation enhances the capacity to grasp complex concepts, directly influencing academic outcomes (Piaget, 1971; Siegler, 2016). Early proficiency in language and working memory has been shown to predict later success in literacy and numeracy (Gathercole & Alloway, 2008; Hulme et al., 2015). Working memory, specifically, plays a vital role in holding and manipulating information, which is essential for tasks such as reading comprehension and multi-step problem-solving (Baddeley, 2000; Swanson et al., 2018).

The significance of processing speed in academic performance is well-documented, as it affects how efficiently students absorb and apply new information (Kail, 2007; Fry & Hale, 1996). Faster processing speed is linked to improved performance in time-constrained environments, enabling students to handle cognitive loads more effectively (Deary et al., 2007; Lervåg & Hulme, 2009). Verbal comprehension, another critical facet of intellectual ability, supports reading and writing tasks by facilitating the interpretation of complex texts and articulation of ideas (Nation, 2017; Snow, 2010). Higher verbal comprehension skills are associated with enhanced critical thinking and academic success in humanities and social sciences (Cain & Oakhill, 2014; Kintsch, 1998). Executive functions, encompassing planning, impulse control, and task management, further contribute to academic achievement by fostering self-regulated learning (Diamond, 2013; Zelazo & Carlson, 2012). Students with well-developed executive functions exhibit better focus, organization, and resilience, which are essential for navigating academic challenges (Blair & Raver, 2015; Miyake et al., 2000).

Although intellectual ability is a robust predictor of academic performance, external factors such as socioeconomic status, parental involvement, and educational resources also play significant roles (Jeynes, 2005; Sirin, 2005). However, enhancing cognitive abilities through targeted interventions can significantly improve educational outcomes, highlighting the importance of cognitive skill

development in educational policies (Ritchie & Bates, 2013; Titz & Karbach, 2014). Intellectual ability serves as a cornerstone for academic performance, encompassing diverse cognitive processes essential for acquiring, processing, and applying knowledge. It is a multidimensional construct that includes reasoning, memory, problem-solving, verbal comprehension, and executive functioning. These cognitive abilities are not only foundational for academic success but also for broader life skills such as critical thinking, decision-making, and adaptability (Deary, 2012; Carroll, 1993). Research underscores that intellectual ability is strongly correlated with academic achievement across various domains. General intelligence, commonly measured through IQ, has been extensively linked to success in subjects that require analytical reasoning, such as mathematics and science. A meta-analysis by Rindermann and Ceci (2018) confirmed that higher IQ scores consistently predict better academic outcomes across diverse cultural and educational contexts. This correlation is particularly evident in STEM subjects, where abstract thinking and problem-solving are critical (Ullah et al., 2024; Kuncel & Hezlett, 2010).

Working memory is another key cognitive factor influencing academic performance, especially in tasks that require holding and manipulating information. Studies by Swanson et al. (2018) demonstrate that working memory capacity is a strong predictor of performance in reading comprehension and mathematics, as it enables students to juggle multiple pieces of information simultaneously. Furthermore, interventions aimed at improving working memory have shown promise in enhancing students' academic performance, suggesting its potential as a target for educational strategies (Ullah et al., 2024; Gathercole & Alloway, 2008). Processing speed, which determines how quickly and efficiently students can process information, plays a critical role in learning efficiency. Faster processing speed allows for quicker comprehension and application of new concepts, reducing cognitive load and increasing the likelihood of academic success (Deary et al., 2007; Kail, 2007). This ability is particularly important in timed environments, such as standardized testing, where rapid information processing is advantageous. Verbal comprehension, which involves

understanding and using language effectively, is crucial for success in reading and writing-intensive subjects. Research by Nation (2017) and Snow (2010) highlights that students with strong verbal comprehension skills excel in interpreting complex texts, engaging in critical discussions, and articulating their ideas clearly. These skills are foundational for academic success in humanities and social sciences, where language proficiency is integral to understanding and conveying complex concepts.

Executive functions, including planning, impulse control, and self-regulation, are essential for academic achievement. Diamond (2013) and Zelazo and Carlson (2012) emphasize that students with well-developed executive functions exhibit better focus, organization, and time management. These skills are particularly important in managing academic workloads, meeting deadlines, and maintaining sustained effort over time. Executive functioning is also linked to self-regulated learning, where students take initiative and responsibility for their educational progress (Blair & Raver, 2015). The role of external factors in shaping the impact of intellectual abilities on academic performance cannot be overlooked. Socioeconomic status, parental involvement, and access to educational resources significantly influence cognitive development and learning outcomes. Jeynes (2005) and Sirin (2005) argue that while intellectual ability is a strong predictor of academic success, the educational environment and social context play a crucial mediating role. For instance, students from supportive home environments with access to enriching educational materials tend to perform better academically, regardless of their baseline intellectual abilities. In conclusion, intellectual ability is a multifaceted construct that profoundly influences academic performance. Its components—general intelligence, working memory, processing speed, verbal comprehension, and executive functioning—collectively shape students' capacity to learn and succeed. By understanding and nurturing these cognitive abilities, educators and policymakers can develop targeted interventions to enhance educational outcomes and foster equitable learning environments. Future research should continue exploring the interplay between intellectual abilities and external factors to develop comprehensive

educational strategies that support diverse learner needs.

## Objectives

- 1- To find the effect of Cognitive Development on students' performance at University Level.
- 2- To find the effect of Language Proficiency on students' performance at University Level.
- 3- To find the effect of Working Memory on students' performance at University Level.
- 4- To find the effect of Processing Speed on students' performance at University Level.
- 5- To find the effect of Attention and Focus on students' performance at University Level.

## Methodology

The design of the study is descriptive in nature. The philosophical paradigm of quantitative research is positivism. The population were comprised of all public and private universities of Lahore district. The total no of universities in Lahore district are 39 in which 16 are public and 23 are private (HEC, 2024). Sample was chosen by using a multistage sampling technique. First of all the research divided all population in two strata (public/private) by using stratified sampling technique. The researcher then use the cluster sampling technique to divide the entire population into three zones (clusters) based on according to their location. From each cluster three private and two public universities were selected by using simple random sampling. A Sample of 750 students (50 from each university) was selected through simple random sampling techniques. The instrument of the study were questionnaires. Students' intellectual ability questionnaire adapts by (Busato, Prins, Elshout, & Hamaker, 2000) was for data collection. The researcher self-developed five-point likert scale questionnaire with the help of (Kausar, Danish, & Abid, 2022) for students' performance. Validity of the instrument was tested through expert opinion while the reliability of the instrument was tested through pilot testing. Cronbach's Alpha was computed to assess the dependability of the tool. The Students' intellectual ability score was 0.881

and students' performance value 0.854 whereas the reliability minimum of Cronbach's Alpha is 0.75. This demonstrated the instrument's dependability. Primary source of data was in current research. The participants of this study

were administering through questionnaires. Statistical package for social science (SPSS) was used for data analysis. Regression analysis were used for of all objectives.

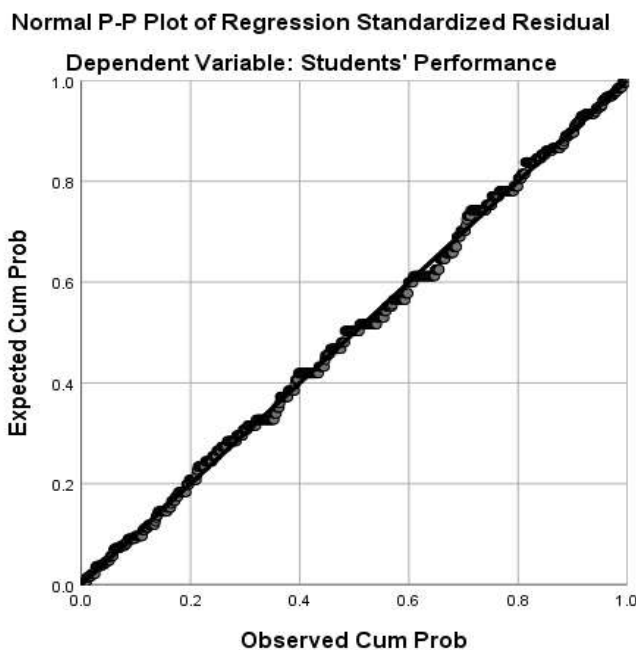
## Data analysis

**Table 1**

*Effect of Cognitive Development on Students' Performance at university level*

	Unstandardized Coefficients		Standardized	t	Sig.
	B	Std. Error	Beta		
<b>Cognitive Development</b>	.086	.016	.189	5.265	.000

a. Dependent Variable: Students' Performance



The above table illustrates the effect of Cognitive Development on Students' Performance at university level. The B value 0.189, t-value 5.265 and Sig-value

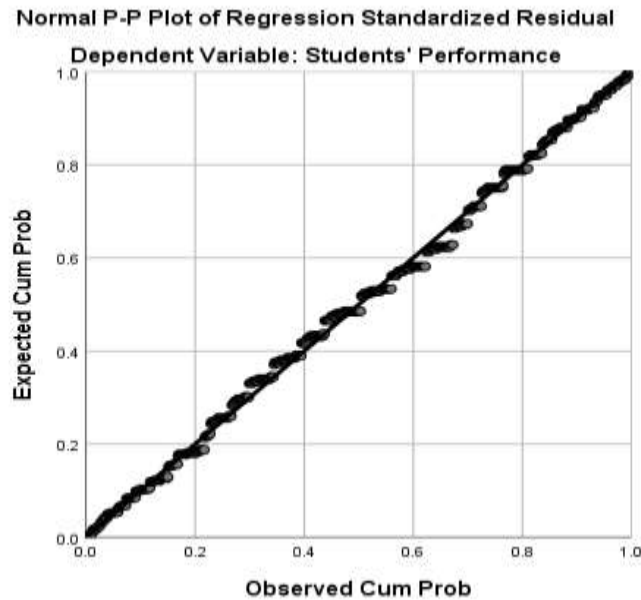
0.000 which shows that there was highly significant effect of Cognitive Development on Students' Performance at university level.

**Table 2**

*Effect of Language Proficiency on Students' Performance at university level*

	Unstandardized Coefficients		Standardized	T	Sig.
	B	Std. Error	Beta		
<b>Language Proficiency</b>	.055	.013	.152	4.210	.000

a. Dependent Variable: Students' Performance



The above table illustrates the effect of Language Proficiency on Students' Performance at university level. The B value 0.152, t-value 4.210 and Sig-value

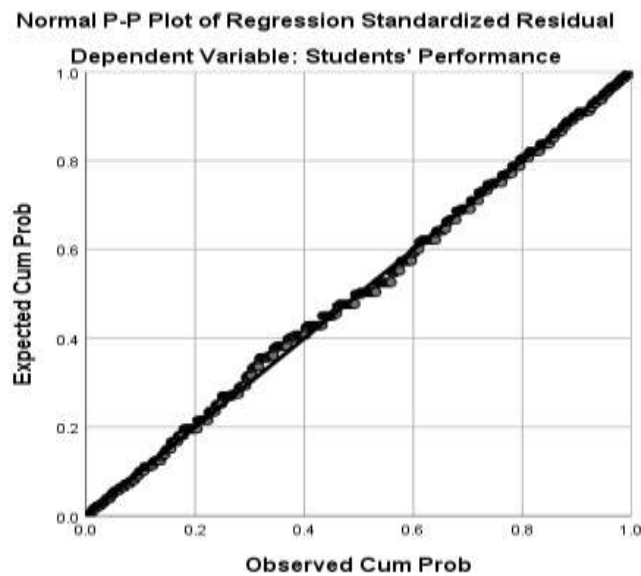
0.000 which shows that there was highly significant effect of Language Proficiency on Students' Performance at university level.

**Table 3**

*Effect of Working Memory on Students' Performance at university level*

	Unstandardized Coefficients		Standardized Coefficients		Sig.
	B	Std. Error	Beta	t	
<b>Working Memory</b>	.077	.015	.186	5.184	.000

a. Dependent Variable: Students' Performance



The above table illustrates the effect of working memory on Students' Performance at university level. The B value 0.186, t-value 5.184 and Sig-value

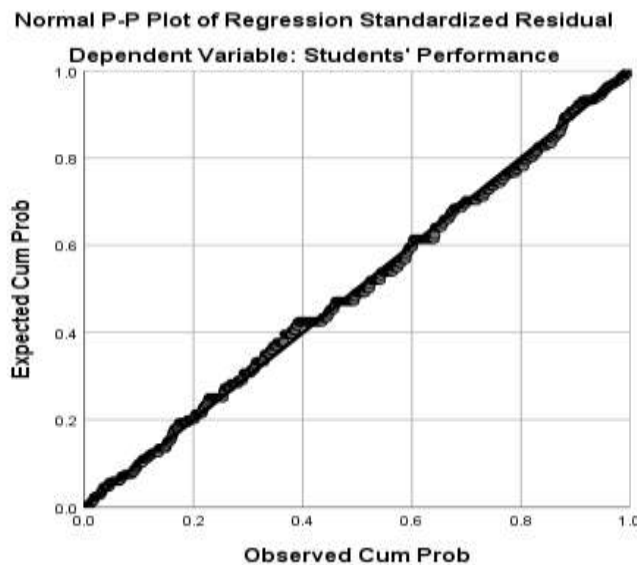
0.000 which shows that there was highly significant effect of working memory on Students' Performance at university level.

**Table 4**

*Effect of Processing Speed on Students' Performance at university level*

	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
	B	Std. Error	Beta			
<b>Processing Speed</b>	.030	.014	.080		2.208	.028

a. Dependent Variable: Students' Performance



The above table illustrates the effect of processing speed on Students' Performance at university level. The B value 0.080, t-value 2.208 and Sig-value 0.028

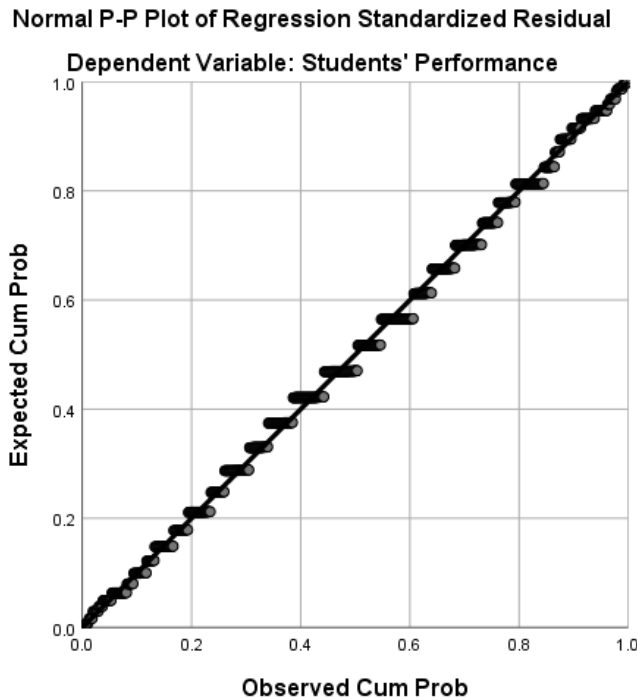
which shows that there was highly significant effect of processing speed on Students' Performance at university level.

**Table 5**

*Effect of Attention and Focus on Students' Performance at university level*

	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
	B	Std. Error	Beta			
<b>Attention and Focus</b>	.050	.015	.122		3.358	.001

a. Dependent Variable: Students' Performance



The above table illustrates the effect of Attention and Focus on Students' Performance at university level. The B value 0.080, t-value 2.208 and Sig-value 0.028 which shows that there was highly significant effect of Attention and Focus on Students' Performance at university level.

## Discussion

Cognitive development significantly impacts university students' academic performance, influencing their ability to process information, solve complex problems, and engage in critical thinking. Higher-order cognitive skills, such as reasoning and executive functions, enable students to manage academic tasks effectively and adapt to the demands of advanced education (Diamond, 2013; Zelazo & Carlson, 2012). Additionally, working memory and processing speed are crucial for academic success, particularly in tasks requiring the simultaneous handling of multiple sources of information (Swanson et al., 2018). Enhancing cognitive skills through targeted interventions can improve students' academic outcomes and readiness for professional challenges.

Language proficiency plays a crucial role in university students' academic performance, as it affects their ability to comprehend course material,

participate in discussions, and express ideas effectively. Students with higher language proficiency are better equipped to engage with complex texts, articulate arguments, and excel in both written and verbal assessments (Nation, 2017). Conversely, limited language skills can hinder comprehension and reduce academic confidence, leading to poorer performance and higher dropout rates (Sirin, 2005). Therefore, developing language proficiency is essential for academic success in higher education contexts.

Working memory is a critical cognitive skill that directly impacts university students' academic performance. It enables students to retain and manipulate information in real time, essential for tasks such as problem-solving, reasoning, and understanding complex concepts (Baddeley, 2000). Students with stronger working memory abilities are better able to manage multiple tasks and integrate new information, leading to improved academic outcomes (Swanson et al., 2018). In contrast, deficits in working memory can result in difficulties with reading comprehension, mathematics, and overall academic success, particularly in challenging university-level coursework (Gathercole & Alloway, 2008).

Processing speed is a vital factor in university students' academic performance, influencing their ability to quickly and efficiently complete assignments, exams, and cognitive tasks. Faster processing speed enables students to process and respond to information more effectively, leading to improved performance in time-sensitive academic settings (Fry & Hale, 1996; Kail, 2007). Students with slower processing speeds may struggle with tasks such as reading comprehension, problem-solving, and responding during lectures, which can negatively impact their grades and overall success (Deary, 2012). Therefore, enhancing processing speed can contribute to better academic outcomes in higher education.

Attention and focus are critical for university students' performance, as they enable effective engagement with lectures, reading materials, and academic tasks. Students who can maintain sustained attention and resist distractions are more likely to retain information and perform well in exams and assignments (Diamond, 2013; Swanson et al., 2018). Lack of attention and poor focus can result in difficulties processing complex ideas, lower academic achievement, and increased cognitive overload, affecting overall performance in higher education (Zelazo & Carlson, 2012). Therefore, fostering strong attention and focus is essential for academic success at the university level.

## Conclusion

In conclusion, cognitive and psychological factors such as language proficiency, working memory, processing speed, and attention significantly impact university students' academic performance. Language proficiency, for instance, is essential for comprehension and expression, influencing a student's ability to engage with complex academic material and perform in both written and verbal assessments (Nation, 2017; Sirin, 2005). Similarly, strong working memory facilitates better problem-solving and multitasking abilities, leading to enhanced academic outcomes (Swanson et al., 2018). Processing speed also plays a crucial role, as it enables students to efficiently manage time-sensitive tasks like exams and assignments, directly correlating with academic achievement (Fry & Hale, 1996). Attention and focus further contribute to cognitive engagement, allowing students to retain

and apply knowledge more effectively in academic settings (Diamond, 2013). Ultimately, a well-rounded cognitive skill set enhances not only academic success but also the ability to manage the demands of university life, including the development of critical thinking and adaptive learning strategies. Students who possess and refine these cognitive abilities are better equipped to thrive in the challenging and dynamic environment of higher education. Therefore, fostering these skills through interventions or support systems can play a crucial role in boosting students' academic performance and long-term success.

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