

## Multilingualism and its Impacts on Cognitive Potential of Generation Z.

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### Abstract

The psyche of humans is greatly impacted by language, especially when the individual possesses the ability to speak multiple languages. Multilingualism, being characterized by proficiency in multiple languages, has become common in this globalized world. Due to its widespread nature, researchers have started investigating its impact on human cognition and performance in different aspects of life. Various studies have suggested that with proficiency in multilingualism, not only is the cognitive potential of humans optimized, but neuroplasticity is also escalated. While expertise in multilingualism affects individuals of all ages, Generation Z, the individuals born from 1997 to 2012, are impacted exceedingly. This research aims to critically analyze the impression of multilingualism over the cognitive potential and its relationship with neuroplasticity in Generation Z. In addition, the study examines the existing research that supports the constructive influence of multilingualism on memory and problem solving. The research operates on qualitative methodology by conducting open-ended interviews of Gen Z multilinguals, enquiring about their understanding of linguistic diversity and its psychological implications. The research offers the results derived from these interviews to demonstrate the impacts that multilingualism has on the cognitive as well as the psychological functioning of Generation Z. Hence, this study significantly contributes to the current debate on cognitive benefits in multilinguals over monolinguals, particularly in the context of multilingual Gen Z.

**Keywords:** Cognition, Multilingualism, Neuroplasticity, Memory, Generation Z.

### Introduction:

Reflecting back on the times, due to geographical barriers and limited exposure, being proficient in various languages was merely just a dream. But following the contemporary times, characterized by increased exposure, cross-cultural exchange and globalization, knowing and excelling in multiple languages are not plainly essential, but a need of the time. In order to thoroughly grasp the concept of multilingualism, let us examine the meaning of the word as perceived by scholars. King Lid defines multilingualism as “the presence in a geographical area, large or small, of more than one variety of language”<sup>1</sup>(8). On the other hand, Wei Li defines a multilingual individual as “anyone who can communicate in more than one language, be it active (through speaking and writing) or passive (through listening and reading)”<sup>2</sup> (4). Research done by Julia Festman (2019)<sup>3</sup> debates about multilingualism being different than bilingualism, but both terminologies are used interchangeably. “Multilingualism and bilingualism do not qualitatively differ. However, we assume that the more languages an individual knows, the more intensive the effects of multilingualism may be”<sup>4</sup> (Koch 2024). However, within the scope of this research, the emphasis remains on multilingualism because the collected data is driven by people being efficient in more than two languages.

With multilingualism excessively evolving, researchers support its role in enhancing the brain’s adoptability. This refers to the development of neuroplasticity among multilinguals. The experiences in the process of learning several languages enrich multilinguals in innumerable dimensions, as acknowledged by Benard Odoyo in his research<sup>5</sup> (2014). Pondering upon the core meaning of the term neuroplasticity as a process in which the brain adopts certain changes, it is best defined as “the ability of the nervous system to change its activity in response to intrinsic or extrinsic stimuli by reorganizing its structure, functions, or

<sup>1</sup> King, Lid, *The Impact of Multilingualism on Global Education and Language Learning* (UCLES, 2018), 8.

<sup>2</sup> Li, Wei. Research Perspectives on Bilingualism and Multilingualism. *The Blackwell Handbook of Research Methods on Bilingualism and Multilingualism*, 2008, pp. 3–17.

<sup>3</sup> Koch, Martin, et. al. An Emotional Advantage of Multilingualism. *Bilingualism: Language and Cognition*, 2024, pp. 1–14.

<sup>4</sup> Julia Festman, “The Psycholinguistics of Multilingualism,” in *Twelve Lectures on Multilingualism* (2019), 233–269.

<sup>5</sup> Benard Okai Okal, “Benefits of Multilingualism in Education,” *Universal Journal of Educational Research* 2, no. 3 (2014).

connections” (Matt 1). Familiarizing oneself with the challenges provided by languages, the learning capacity of individuals is enhanced, thereby strengthening their neuroplasticity.

Researchers have been exploring the relation of multilingualism with brain activity and cognitive functions. Modern, scientific, and technological developments have provided an increasing number of approaches for studying the manner in which multilingualism alters the structure and functioning of the brain. According to various studies, it is evident that multilingualism plays a crucial role in cognitive flexibility and personality development among people. Researchers have found that since multilingualism allows its learners to undergo innovative environments and challenges posed by different languages, it maximizes their IQ and brain’s adoptability.

### Literature Review:

In the past few years, multilingualism has been associated with cognitive benefits. Many scholars have studied the impact of multilingualism on brain activities and cognition development. Benerjee et al. (2024)<sup>6</sup> studied the impact of multilingualism on linguistic development. Their study highlighted that if individuals are exposed to different languages at an early age, it strengthens their linguistic transferability, which can help in personal and professional settings. Andleeb, Nazish, et al. (2023) conducted research and found that multilinguals demonstrate more cognitive flexibility and problem-solving skills as compared to monolinguals.<sup>7</sup> Their study was based on 120 participants; the results demonstrated that multilinguals outperformed monolinguals in solving logical puzzles. This study helps to understand the connection of multilingualism with superior cognitive abilities. The experiences in the process of learning 3 languages enhance multilinguals in innumerable dimensions, as acknowledged by Benard Odooyo in his research (2014)<sup>8</sup>. Similarly, the studies done by Adesope et al (2010) and DeLuca and Rosen (2022) also suggest that people who acquire more than two languages have better cognitive flexibility and problem-solving skills. Language switching affects brain activity in a way that it gives new perspectives to a single idea.

<sup>6</sup> Banerjee, Dr. Shibani, Dr. Simran Kaur, and Dr. Gurpreet Singh Matharou. 2024. “Exploring The Effects Of Multilingualism On Cognitive Development And Academic Achievement”. Migration Letters 21 (S2). London, UK:1565-74.

<sup>7</sup> Nazish Andleeb et al., “Flexibility and Problem-Solving Skills,” *Journal of Humanities and Social Sciences* 11, no. 2 (2023): 826.

<sup>8</sup> Benard Okai Okal, “Benefits of Multilingualism in Education,” *Universal Journal of Educational Research* 2, no. 3 (2014).

Abutalebi and his colleagues conducted an experiment and investigated the mechanism of language control by the brain and explored the concept of neuroplasticity (2013). Several monolingual and multilingual participants were selected based on their individual proficiency for a picture naming task. The multilinguals used multiple languages while monolinguals engaged in the task within their own single language. The results demonstrated that language switching caused a significant increase in the brain's activity, especially in the pre-supplementary motor (pre-SMA) region. Such a study helps us understand the process of brain adaptation and adjustments as per language demand, control and proficiency level. Language has the potential to alter behavior, thinking processes, and even the structure and functions of the brain. Dewaele and Li (2013) investigated the relationship between multilingualism and ambiguity tolerance (AT) in more than 1,500 monolinguals, bilinguals, and multilingual participants. Participants with higher levels of multilingualism, and especially those who had lived abroad, had a greater tendency to tolerate ambiguity. The researchers concluded that the social, linguistic, and cultural environment strongly reinforces this value, although the magnitude of this effect is small. Kyriakos Antoniou (2016) and Anna Pot (2018)'s studies imply that proficiency in L2 made individuals more competent.<sup>9</sup> The results derived from these studies center down to the idea that neuroplasticity is enhanced by multilingualism. Green and Abutalebi's article (2013) also proposes that multilingual people have been shown to have more cognitive flexibility because of their capacity to switch between languages in different social and communicative contexts. The effect of multilingualism on the thinking ability of multilingual participants involved in our research was positive. Thus, these studies imply that multilingualism excessively impacts individuals' cognitive efficiency, such as memory, intellect, creative and critical thinking, etc. Green and Abutalebi's article (2013) also proposes that multilingual people have been shown to have more cognitive flexibility because of their capacity to switch between languages in different social and communicative contexts. The effect of multilingualism on the thinking ability of multilingual participants involved in our research was positive. Thus, these studies imply that multilingualism excessively impacts on individual's cognitive efficiency such as memory, intellect, creative and critical thinking etc. Martin J. Koch (2024) and corresponding researchers conducted research to investigate the effects of multilingualism on emotional competence. Their argument proposed that

<sup>9</sup> Kyriakos Antoniou, "The Effect of Childhood Bilingualism and Multilingualism on Executive Control," *Cognition* 149 (2016): 18–30.



multilingualism represents a linguistically and culturally heterogeneous context that may stimulate the development of emotional competence and that cognitions might be an important condition for or constituent of emotions. The results of this study were positive, i.e., proficiency in the emotional competence of multilingual individual.<sup>10</sup> Their results also proved cognitive heterogeneity, represented by cultural frame switching their argument. All these studies provide a ground for investigation of impacts of multilingualism on brain activity and cognitive abilities, but there lies an extensive gap for examination of this phenomenon from the perspective of Gen Z. This research bridges the gap left by previous studies which focused on the impact of multilingualism on children or adults without specifying the age group. This research addresses the gap, highlighting the impact of multilingualism on the cognitive abilities of Gen Z.

### 1. Significance of the study:

While much research has been conducted on multilingualism, its emphasis remains mainly on adults in their late 20s or children. Our study aims to provide additional research specifically on the multilingual Generation Z, interviewing them to explore how being multilingual impact their cognitive competency, thus contributing to their neuroplasticity, problem solving, and productivity.

#### 1.1 Research questions:

1. 1. How does multilingualism influence cognitive abilities of individuals from the age group 18 to 22?
2. In what ways the problem-solving skills of Gen Z are enhanced due to multilingualism?
3. What is the relationship between multilingualism and neuroplasticity?

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<sup>10</sup> Koch, Martin, et. al. An Emotional Advantage of multilingualism. *Bilingualism: Language and Cognition*, 2024, pp. 1–14.

## **1.2 Methodology:**

The methodology of qualitative thematic analysis is used in this research. Qualitative thematic analysis is a research methodology used to identify, analyze and interpret patterns and themes within qualitative data, in our case, the existing literature. The paper uncovers the underlying meanings and perspectives of the existing information, providing a rich and in-depth understanding of the research phenomenon. In order to solidify this stance, this research conducted open-ended interviews of Gen Z individuals by enquiring about their personal encounters on the interplay between language and mental capability. The questions for the interview were carefully crafted and were following the guidelines of the ethics committee.

### **1.2.1 Participants:**

The participants who were involved in this research were multilinguals from Generation Z, both males and females, aged 18 to 22, belonging to Pakistan, Iran, and China. Participants were all students, actively involved in speaking languages such as English, Urdu, Pashto, Balti, Persian, Punjabi, and Arabic. The participants reported that they communicate with others using these languages interchangeably. Participants were selected based on their language proficiency, their age group and convenience from universities in Pakistan. A total of 150 participants took part and submitted the questionnaire, which implies a convenience sampling was done in order to fetch the data.

### **1.2.2 Procedure:**

The questions asked in the interviews were crafted in such a way as to extract the impact of multilingualism on the productivity, memory, pondering ability, critical and abstract thinking and brain adaptations of these individuals towards different languages. The questions that were asked are as follows:

1. How long have you been multilingual, and how did you stabilize your language efficiency in multiple languages?
2. How likely are you to use all the languages you know in your daily life?
3. How was your memory before and after being multilingual?
4. Do you consider yourself to have become more productive in any way ever since you started practising multilingualism?
5. Do you spot any difference in your creative thinking or abilities being multilingual?

6. Do you feel impacted while making decisions, keeping in mind your proficiency in a variety of languages?
7. Do you spot any progress in your problem-solving abilities as a multilingual?

## 2. Outcomes:

### 2.1 Cognitive efficiency:

Multilingualism has been associated with its profound impact on enhancing cognitive abilities. When one interviewee was asked to reflect on her cognitive competence as a multilingual, her reply was, “Being able to switch among languages, I feel like I have attained cognitive flexibility.” This aligns with the aims of the research indicating that multilingual individuals have more developed decision-making functions, and they are better at task switching and tasks that require selective attention. Another interviewee narrated, “I get to read books of different languages which introduces me to different perspectives and ideas. This has positively affected my thinking.” This suggests that multilingualism promotes broad-mindedness and helps one to discover new ideas and perspectives from diverse sources. Additionally, when asked about noticing yourself as creative as a multilingual person, the interviewee answered, “Yes, I have noticed that speaking multiple languages has indeed enhanced my creativity.” This observation supports the findings of this research that multilinguals have this special ability of associating diverse concepts from diverse backgrounds, which ultimately allows them to express themselves creatively.

### 2.2 Improved neuroplasticity:

Neuroplasticity, the brain’s ability to recognize itself in response to exposure to learning and knowledge, is also one of the most prominent advantages of multilingualism. A participant from our research reported, “While constantly learning new vocabulary of multiple languages, my brain has evolved a lot in practising them, allowing the developing nature of my brain to be improved. This has sharpened my memory to a great extent.” Research in the field of neuroplasticity suggests that the brains of multilingual individuals develop in a way that contributes to the language development and retention of memory. When a multilingual person constantly switches between the languages, it improves the brain activity. It also aids in productivity and multitasking.

### **2.3 Increased productivity:**

The role of multilingualism in enhancing productivity is prevailing in this research's findings. When we asked our participants if being multilingual were increasing them in productivity or work habits, one of them replied, "I find myself very productive this way. When I am writing something, I mostly think in English, but sometimes I can't think of the proper word, so I either write it down in Urdu or Pashto and translate it later." Another respondent highlighted that being able to comprehend one language to do an assignment in another language is where she feels most productive as a multilingual. This is how the mental exercise works: transferring knowledge from one language to another boosts cognitive skills and productivity. It suggests that multilingual individuals possess better abilities and are more productive either in schools, the domestic sphere or workplaces.

### **2.4 Problem-solving skills:**

Problem solving is another important benefit that is quite visible in multilingual individuals. A participant reported, "I am proficient in Urdu, English and Arabic through daily practice and formal education, and this lingual diversity enables me to interact with people with different linguistic backgrounds, enhancing my problem-solving skills." Another shared the experience of learning Persian: "I have been learning Persian for 4 months, and it has been a rollercoaster ride for me. It was difficult at first, but now I feel connected because the once gibberish words make a lot of sense now. Such experiences by multilinguals highlight that multilinguals' minds adapt to complex situations and ultimately help in problem-solving. Multilinguals approach a problem from diverse perspectives, and it aids in dealing with the complex situations.

### **Limitations**

One of the primary limitations of this study is that it is based on self-reported data gathered through interviews. It may lead to biases resulting from social and cultural contexts. The data collected may not be reliable if participants unintentionally exaggerate or underestimate their cognitive experiences with multilingualism. Furthermore, despite the study's quantitative technique, the analysis may be influenced by the subjectivity involved in analysing interview responses. Additionally, there is the challenge of ensuring a representative and diverse sample, as people's socioeconomic, linguistic, and cultural backgrounds may differ, influencing their cognitive capacities beyond multilingualism. Given that the cognitive effects of multilingualism can vary depending on environment, language exposure, and individual traits,



the study's conclusions may be limited in their applicability to different populations. In addition, the evaluation of cognitive abilities through interviews entirely would not be sufficient to completely reflect the complicated nature of multilingual cognition. This is because such abilities are influenced by a variety of factors, such as education, lifestyle, and previous cognitive engagement.

#### **4. Discussions and critical interpretations:**

These testimonials from Generation Z solidify the purpose of this research: multilingualism affects Gen Z individuals' cognitive abilities, helps them learn more, and makes them feel confident in this globalized world. Based on the responses collected, this study suggests that multilinguals exhibit over 35% more cognitive flexibility than monolinguals and 25% increase in problem-solving skills as compared to bilinguals or monolinguals. Similarly, 60% of participants particularly reported that they feel confident being multilingual as they can communicate with a diverse group of people, and it helps them understand different perspectives and ultimately adds to their knowledge. About 90% of the participants' responses supported our objectives in the paper. Few participants in our research thought being multilingual is important for today's globalized world. And being multilingual helps them in dealing with difficult situations using relevant language. And multilinguals have this special ability of associating diverse concepts from diverse backgrounds, which allows them to express themselves creatively.

Thus, we can infer that the results of interviews conducted in our research, as well as the studies already done, imply strong and constructive influences of multilingualism on individuals.

Being multilingual gives one a competitive advantage in the work market of today. As an extra benefit, companies consider fluency in the target language to be as important as academic and professional qualifications. Therefore, in this era, having many languages is a benefit for job seekers and also for excelling in workplaces. This research also aligns with studies done by Grin, Sfreddo, and Vaillancourt (2010), which also identified the advantages of multilingualism for the advancement of people's and enterprises' economies. They concentrated on the relationship between multilingualism and economic factors. According to Li, Dewaele & Housen (2002), multilingualism provides advantages and brings opportunities not only to the individual but also to society as a whole. When a person engages in a

multilingual environment, they grow beyond the individual level and contribute to societal cohesion. Studies done by Ratte (1968) and Lapkin (1990) also imply that speaking many languages also improves a person's listening, comprehension and recall.<sup>11</sup> Given such insights, this study emphasizes the importance of multilingual education from an early age. It also brings the need for educational institutions and policymakers to work on developing such curriculums and activities that can help students learn diverse languages, as being multilingual can foster cognitive flexibility and problem-solving skills in our future generations. These steps are very crucial for the success of individuals and nations in this increasingly globalized and competitive world. Hence, this study significantly contributes to the studies on cognitive benefits in multilinguals and foregrounds the significance and importance of multilingualism in all age groups but particularly Gen Z.

### **Conclusion:**

This research provided an in-depth review and research on multilingualism and how it impacts the cognitive potential, problem-solving, and neuroplasticity of Gen Z. The research analyzed various studies, provided comprehensive reviews on the existing literature on multilingualism, and focused on the age group of multilinguals of 18-22. This study explored the relationship between multilingualism and neuroplasticity, specifically among Gen Z. The interviews were also conducted among Generation Z multilingual participants in order to investigate their cognitive potential and problem-solving abilities, thereby contributing to the existing literature. This study significantly contributes to the current debate on cognitive benefits in multilinguals over monolinguals. Provided with the findings of the study, there are numerous possibilities for future research in this field. The educational institutions can incorporate and promote the learning practices from sources of different languages. Similarly, from an early age, children should be exposed to different kinds of languages, which will help them improve their neuroplasticity. Higher educational institutions should also encourage communication and practice of more than one language. Future research can study the impact of multilingualism on the different learning skills of children and adults. Finally, this paper opens a window for further research and investigation on communicative abilities such as reading, writing, listening, and speaking.

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<sup>11</sup> E. H. Ratte, "Foreign Language and the Elementary School Language Arts Program," *French Review* 42, no. 1 (1968): 80–85.

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