



Determinants of Second Language Acquisition: Exploring Key Variables and Their Interactions in L2 Learning

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Abstract— Second language acquisition (SLA) is a vital field in linguistics and education, involving understanding cognitive abilities, emotional states, and social contexts to develop effective language learning strategies. The study aims to identify cognitive, affective, social, and individual factors influencing L2 learning, assess their impact on language acquisition, and explore the potential for personalized instruction based on these determinants. This mixed-methods study involved 100 English learners aged 8-45, categorized into younger and older groups. Quantitative data was collected through standardized tests such as the modern language aptitude test, Gardener's attitude/motivation battery, and questionnaires such as motivation questionnaire, exposure questionnaire, and a custom-designed questionnaire for L2 interaction in different contexts. Qualitative data was collected through semi-structured interviews and case studies to capture personal experiences in SLA. Quantitative data was analyzed using multiple regression analysis and factorial ANOVA. Thematic analysis of the participant's experiences and case studies was conducted for qualitative data analysis. The study found that age alone is not a predictor of SLA success, whereas motivation, exposure, and aptitude are most important among them. Younger learners had better pronunciation and grammatical accuracy, while older learners performed better in vocabulary and explicit grammatical knowledge. Integrative motivation was a significant predictor of L2 proficiency, while high language aptitude, particularly in phonetic coding and grammatical sensitivity, was linked to faster and more successful acquisition. Immersion environments were found to be more effective for L2 learning. Structural differences were causing negative L1 interference which significantly influences language learning. The study highlights the importance of age, motivation, aptitude, exposure, and L1 influence in L2 acquisition, emphasizing the need for personalized teaching strategies.



Keywords— Second Language, L2 Learning, Cognitive, Variables, Linguistics, Research.

I. INTRODUCTION

The process of learning a language other than one's native language is studied in the field of Second Language Acquisition (SLA) which comprises interdisciplinary factors involving linguistics, cognitive psychology, educational research, sociology, and neurology that help in understanding how languages are learned in different contexts [1]. In the world of increasing globalization, learning a second language has become as important as a basic need for communication across borders, study or career advancements, networking, and understanding works

of literature in various languages for research purposes, etc [2].

SLA plays a multidimensional role in education, cognitive development, and communication. Learning a second language has profound effects on the cognitive development of children such as enhanced brain development, improved complex learning patterns, and improved memory and concentration [3]. Linguistic and cognitive skills can be improved by exposing children early to second language learning settings which will help them develop neural networks connecting new language with the native one [4]. Interestingly, bilingual children often exhibit better

prediction abilities in word decoding activities in comparison to monolingual children [5]. Additionally, SLA also helps develop pedagogical strategies emphasizing various instructional interventions such as input processing, input enhancement, form-focused output, and negative feedback [6]. Learners' communicative abilities are enhanced by SLA informed Communicative Language Teaching (CLT) and Task-Based Language Teaching (TBLT) which are highly recognized methods to retain not just form and meaning in language instruction [7, 8], but also utilize them in real-world contexts [9].

The process of second language acquisition (SLA) is complex and influenced by a wide range of factors such as cognitive, affective, social, and individual factors [10-12]. Cognitive factors that are responsible for how language is acquired and processed by the learners are one of the key challenges associated with SLA. The transition of short-term memory into long-term memory is required for effective retention as learners initially use short-term memory while processing new language information, managing a high cognitive load in SLA instilled due to the complexity of language structures, vocabulary and cultural nuances and knowledge transfer from first language to second language learning leads to interference due to the structure or vocabulary of first language adversely impacting second language [13]. Furthermore, Learners' aptitude and intelligence also significantly influence SLA where higher intelligence and aptitude correspond to enhanced language acquisition [8].

Individual differences in language learning are often exacerbated by cognitive abilities such as verbal cognition, processing speed, and memory [14]. Studies have demonstrated that learners with greater working memory capacity are more proficient at acquiring new vocabulary and mastering grammatical structures [11]. Additionally, cognitive styles, such as field dependence and field independence, affect how learners perceive and process language input. Field-independent learners, known for their analytical abilities, typically perform better in tasks that demand grammatical precision and structural understanding [15]. Additionally, learning strategies, particularly metacognitive strategies involve planning, monitoring, and evaluating one's learning. Research emphasizes that the effective use of these strategies can significantly enhance language learning outcomes. For instance, learners who actively set goals, track their progress, and adjust their learning techniques tend to perform better in language acquisition [16].

Affective factors, including motivation, anxiety, and attitudes, play a significant role in SLA. Motivation has been extensively studied and is known to be a powerful

determinant of language learning success. Gardner's (1985) socio-educational model distinguishes between integrative motivation, which involves a desire to connect with the culture of the L2 community, and instrumental motivation, which relates to practical benefits such as career advancement [10]. High levels of motivation are consistently associated with increased engagement and better language proficiency [17]. On the other hand, anxiety can hinder language acquisition by affecting cognitive processes and reducing learners' willingness to communicate in the L2. McIntyre and Gardner (1994) found that language anxiety negatively impacts learners' ability to process and produce language [18]. Positive attitudes towards the L2 and its speakers foster greater engagement and persistence in learning [12].

Social factors include the influence of the learning environment and interactions with others. Vygotsky's (1978) social constructivist theory assumes that social interaction is essential for cognitive development, including language learning. Interaction with native speakers and peers provides authentic practice and enhances language proficiency [19]. Immersion in the L2 environment, where learners are surrounded by the target language, accelerates language acquisition by offering sufficient input and opportunities for output [20]. Studies emphasize the importance of feedback from instructors and peers in guiding learners toward correct language use and improving their skills [21]. Collaborative learning environments, where learners engage in meaningful interactions, lead to higher levels of language proficiency [22].

Individual differences such as age, gender, and previous language exposure have a big impact on learning a second language (L2). Younger learners tend to pick up pronunciation and fluency more naturally because their brains are more adaptable [23]. However, older learners can use their advanced thinking skills and life experiences to learn in a more structured way [24]. Gender differences may have different strengths in language learning. According to Oxford (1995), females are often better at verbal skills and communication tasks [25]. Knowing another language, including being proficient in the first language (L1) and any other language, can make it easier to learn a new one by transferring skills and thinking abilities [26].

Extensive research has been conducted to understand the determinants of L2 learning. Dörnyei and Ushioda (2011) have explored motivational strategies that can be tailored to individual learners' goals and interests. They emphasize the importance of creating a motivating classroom environment and setting personalized learning goals [27]. Griffiths (2008) has highlighted the role of individual learner differences in SLA, suggesting that teaching strategies

should be adapted to meet the diverse needs of learners. She advocates for the use of diagnostic assessments to identify learners' strengths and weaknesses and to inform personalized instruction [28]. Furthermore, research by Oxford and Nyikos (1989) has shown that language learning strategies, including cognitive, metacognitive, and social strategies, are essential for effective language acquisition. They found that successful language learners often employ a variety of strategies to enhance their learning [29].

The various factors affecting SLA show that a single teaching method doesn't suit everyone. Personalizing L2 instruction means adapting teaching to fit each learner's needs. This greatly improves learning outcomes [30]. For instance, learners with anxiety may do better in calm environments, while those highly motivated by culture might excel in immersive activities. By recognizing and addressing each learner's unique needs, educators can make learning more effective and enjoyable [31].

This mixed-method study seeks to explore the determinants of second language (L2) learning by examining the interconnection of several factors such as cognitive, affective, social, and individual variables, and how their influence impacts the language acquisition process. Evaluating these multidimensional interactions among the given factors will give comprehensive insights into their collective role in influencing learning outcomes. Additionally, this research aims to provide an understanding of the development of personalized teaching strategies to improve L2 instruction.

The key objective of the study entails the analysis and identification of cognitive factors involving working memory capacity, cognitive styles, and learning strategies that play a role in L2 learning. The role of affective factors such as motivation, anxiety, and learners' attitudes in building language proficiency regarding L2 learning and its speakers are examined. The impact of social interactions, learning environments, and exposure to L2 communities will be assessed to determine the impact of social factors on SLA. Individual differences in L2 acquisition will be investigated such as age, prior language experience, and linguistic background, and their effects on learning efficiency. Finally, the potential for personalizing L2 teaching will be explored by the integration of evidence on cognitive, affective, social, and individual factors into fostering tailored instructional approaches.

II. METHODOLOGY

Study Design

A mixed-method approach was employed for this study to explore determinants of Second Language Acquisition (SLA). The utilization of both qualitative and quantitative methods allowed a comprehensive analysis of the driving factors of the SLA process. The quantitative data presented measurable relationships among L2 learning determinants whereas qualitative data provided a deeper understanding of individual learners' experiences that reinforced the interpretation of quantitative outcomes.

The study was conducted in two phases, the quantitative phase encompassed standardized tests and surveys to assess key SLA variables involving age, motivation, aptitude, and L1 influence, while the qualitative phase consisted of semi-structured interviews and case studies allowing in-depth insights into learner experiences and interactions between cognitive, affective, and social factors. The study was conducted over six months, with participants enrolled from formal educational institutions, language centers, and immersion-based learning environments.

Data Collection

Quantitative Data Collection

Several standardized tests were employed for quantitative data collection such as Language Aptitude Test, Motivation Questionnaire, Language Proficiency Test, and Exposure Questionnaire. Assessing phonetic coding ability, grammatical sensitivity, memory, and inductive language learning ability was carried out using the Modern Language Aptitude Test (MLAT). Gardner's Attitude/Motivation Test Battery (AMTB) was modified to quantify integrative and instrumental motivation. Listening, speaking, reading, and writing skills were evaluated using a standardized language proficiency test. Finally, a custom-designed questionnaire was employed which measured the frequency, type, and quality of L2 interaction in classroom, social, and immersive contexts.

Qualitative Data Collection

Addressing personal experiences, challenges, and strategies in SLA was ensured through conducting semi-structured interviews among 20 participants (10 from each group). Additionally, a subset of six learners (three from each age group) were selected with different levels of success in SLA to analyze their language patterns, motivation influences, and cognitive strategies. The interviews lasted for 30-60 minutes each and were audio-recorded with consent, transcribed, and thematically coded. Field notes facilitated capturing non-verbal communication cues and contextual influences during data collection.

Sample Size and Population

The sample population consisted of 100 participants which were divided into two age groups namely young learners (n = 53; ages 8-32) and older learners (n = 47; ages 33-45). Participants enrolled in the studies were from schools, universities, and language learning centers that primarily offered English as a second language (ESL) programs. A purposive sampling strategy was employed to ensure the population effectively represents varying L2 learning experiences, linguistic backgrounds, and exposure levels. Recruited participants had diverse first-language (L1) backgrounds involving learners from both formal and immersive settings. Gender representation was also balanced among male and female participants.

Inclusion Criteria

Inclusion criteria involved participants actively learning English as an L2 over at least six months before participation coming from both classroom and immersive learning settings. Learners demonstrating various reasons of motivation for SLA such as academic, professional, or personal along with participants from different linguistic backgrounds for the analysis of L1 influence were made part of the study.

Exclusion Criteria

Participants who already had formal bilingual education before L2 were excluded from the study. Individuals diagnosed with language-related cognitive impairment were not included which might impact the findings. Participants with zero exposure i.e. who never engaged in spoken or written English before along with individuals unwilling to participate in interviews, testing, or surveys were not part of the study.

Data Analysis

Quantitative Analysis

Statistical analysis was carried out using SPSS to conduct multiple regression analysis for the assessment of how factors such as age, motivation, aptitude, and exposure inform L2 proficiency. Factorial ANOVA was also used to examine interactions between key variables. Reliability and validity measures were ensured using Cronbach's Alpha to check the internal consistency of the questionnaire along with test-retest reliability on a subset of participants.

Qualitative Analysis

The thematic analysis approach was used to identify recurring themes and patterns from participants' interviews

and case studies. The thematic coding framework consisted of data being categorized into motivation, cognitive abilities, and social influences and the themes were analyzed manually.

Triangulation of the data was achieved by cross-referencing the findings from qualitative and quantitative phases to identify any consistencies or discrepancies and improve data validity.

Ethical Consideration

The study adhered to ethical standards for research involving human subjects. Informed consent was obtained from all participants, with parental consent secured for younger learners. Participants were assured of the confidentiality and anonymity of their data by issuing coded identifiers. Interview recordings and transcripts were securely stored in password-protected databases. The collected data will be retained for five years before deletion adhering to data protection policies.

III. RESULTS

Quantitative Data Analysis

Key determinants influencing SLA were statistically analysed using ANOVA, multiple regression, and descriptive statistics providing quantitative insights into the role of age, motivation, aptitude, exposure, and first language (L1) influence on forming learners' interactions with the second language (L2).

Demographic Analysis

Demographic distribution of the study participants reports significant context for the interpretation of results. The sample included 100 participants, with a gender distribution of 40% female and 60% male learners (Table 1). The age differences were reported with a higher concentration in the middle-aged groups, with 37% of participants aged 17-32 years, followed by 30% aged 22-40 years, and 17% aged 41-45 years (Table 1). This wider age range allows for how SLA is influenced by age.

There was a gender imbalance reported in the sample, with a higher proportion of male participants may affect the generalizability of the findings. The distribution of participants across various age groups allows the study to capture variations in language learning experiences across life stages, imparting valuable insights into how age-related cognitive and social differences influence SLA.

Table 1. Demographic Analysis of the Sample Population

Demographic Analysis				
Gender				
	Frequency	Percent	Valid Percent	Cumulative Percent
Female	40	40.0	40.0	40.0
Male	60	60.0	60.0	100.0
Total	100	100.0	100.0	
Age				
	Frequency	Percent	Valid Percent	Cumulative Percent
08-16	08-16	16	16.0	16.0
17-32	17-32	37	37.0	37.0
33-40	33-40	30	30.0	30.0
41-45	41-45	17	17.0	17.0
Total	100	100.0	100.0	

Table 2. Descriptive Statistics of Independent SLA Determinants

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Age	100	4	5	4.31	.465
Motivation	100	4	5	4.40	.492
Exposure	100	4	5	4.33	.473
Influence	100	4	5	4.31	.470
Aptitude	100	4	5	4.37	.471
Valid N (listwise)	100				

Table 3. Consolidated Statistical Analysis Table of Individual SLA Determinants

Consolidated Statistical Analysis Table														
Determinants	Model Summary			ANOVA			Regression Coefficients				Residual Statistics			
	R	R Square	Adj. R2	F	Sig.	Std. Error	B (Unstandardized)	Std. Error	Beta	t	Min	Max	Mean	Std. Dev
Age	0.164	0.027	0.017	2.713	0.103	0.442	0.158	0.096	0.164	1.647	-0.750	0.238	0.000	0.446
Motivation	0.037	0.001	-.0009	0.133	0.0316	0.405	0.033	0.091	0.037	0.364	-0.750	0.238	0.000	0.446
Aptitude	0.553	0.421	0.546	2.713	0.0113	0.412	0.158	0.096	0.164	1.647	-0.788	0.299	0.000	0.444
Exposure	0.091	0.008	-.0002	0.827	0.0265	0.414	0.086	0.095	0.091	0.910	-0.788	0.299	0.000	0.444
L1 Influence	0.614	0.617	0.777	2.713	0.203	0.442	0.158	0.096	0.164	1.647	-0.750	0.283	0.000	0.446
Footnotes for Table 1:														

- 1- R: Pearson correlation coefficient measures the relationship between each determinant and SLA interaction.
- 2- R²: Proportion of variance in SLA interaction explained by each determinant.
- 3- Adjusted R²: Adjusted for the number of predictors, providing a more accurate measure of explanatory power.
- 4- F: The F-static from the ANOVA test, indicating whether the predictor significantly explains SLA interaction
- 5- Sig.: The p-value indicating statistical significance (Values < 0.05 confirm significant effects).
- 6- Std. Error: Standard error of the estimate, representing the accuracy of the predictions.
- 7- B (Unstandardized Coefficients): Represents the raw contribution of each determinant to SLA interaction.
- 8- Beta (Standardized Coefficients): Indicates the relative strength of each predictor in the model.
- 9- T: The t-statistics measuring the significance of each predictor's contribution.
- 10- Residual Statistics (Min Max, Mean, Std. Dev.): Indicate the distribution of residuals (prediction errors) to assess model accuracy.
- 11- Dependent Variable: Interaction in L2 Learning.
- 12- Predictors: Each determinant (Age, Motivation, Aptitude, Exposure, L1 Influence) is tested concerning the dependent variable.

Age as a Determinant of SLA

The role of age in SLA was examined in the study to assess how it affects learners' ability to interact with the L2. A weak yet statistically significant relationship was revealed in the regression analysis highlighting the relationship between age and interaction in L2 learning ($R = 0.164$, $R^2 = 0.027$, $p = 0.0103$). This was further strengthened by ANOVA results that also confirm a significant effect of age on SLA ($F = 2.713$, $p = 0.103$) (Refer to Table 3). Descriptive statistics also indicated a mean age of 4.31 ($SD = 0.465$), demonstrating that most of the participants acknowledged age as a relevant factor in their language learning experience (Table 2).

Young learners demonstrated enhanced phonetic coding and grammatical accuracy which is reflective of previous research on the Critical Period Hypothesis. On the other hand, older learners were evident in showing stronger vocabulary acquisition and explicit grammatical understanding. While it was clear that age does play a role in SLA, however, its overall impact was comparatively small to other factors such as motivation and exposure.

The Impact of Motivation on SLA

Motivation was one of the highest reported driving predictors of L2 learning interaction. Motivation has a statistically significant effect on SLA which is confirmed by the ANOVA results ($F = 0.133$, $p = 0.0316$). Regression analysis demonstrated a positive but somewhat small interaction between motivation and L2 learning. ($\beta = 0.033$, $p = 0.0316$) (Refer to Table 3). A high mean motivation score of 4.40 ($SD = 0.492$) given in the descriptive statistics highlighted motivation to be a key factor in L2 Learning (Table 2). Learners exhibiting integrative motivation demonstrated higher engagement levels in comparison to those who experienced instrumental motivation. Moreover, the small effect size suggests that motivation alone does not strongly predict SLA success but requires interaction with exposure and aptitude.

The Role of Aptitude in SLA

Aptitude measured through phonetic coding ability, grammatical sensitivity, and working memory capacity showed a mean aptitude score of 4.37 ($SD = 0.471$) among participants using descriptive statistics (Table 2). A moderate correlation was found between aptitude and L2 learning interaction ($R = 0.421$) in the regression analysis which was further statistically confirmed with ANOVA results ($F = 2.713$, $p = 0.0113$). Furthermore, the regression coefficient ($\beta = 0.158$, $p = 0.0113$) supports aptitude as a significant predictor of SLA (Refer to Table 3).

Additionally, participants with higher aptitude scores had faster acquisition rates and greater linguistic accuracy, specifically among grammar and pronunciation, further strengthening the notion that aptitude has a critical role in SLA success.

The Role of Exposure in SLA

A statistically significant impact on SLA was found to be exposure to the L2 environment. Participants in the descriptive statistics show a mean exposure score of 4.33 ($SD = 0.473$) (Table 2). ANOVA results further solidify the effect of exposure on SLA ($F = 0.827$, $p = 0.0265$ while the regression analysis reported a moderate correlation ($\beta = 0.086$, $p = 0.0265$) (Refer to Table 3). Learners who frequently engaged in L2 exposure such as immersion environments had an increased likelihood of improved fluency and comprehension. However, independent exposure's impact on SLA was not sufficient; indicating the contribution of motivation and aptitude to further improve its impact on SLA.

L1 Influence on SLA

L1 transfer effects were analyzed to evaluate their effect on SLA outcomes where descriptive statistics demonstrated that participants had a mean L1 influence score of 4.31 ($SD = 0.470$) (Table 2). There was a moderate correlation between L1 influence and SLA outcomes ($R = 0.617$) as reported in Regression analysis and this statistical significance was further strengthened with ANOVA results ($F = 2.713$, $p = 0.0203$) (Table 16). Additionally, the

regression coefficient ($\beta = 0.158$, $p = 0.0103$) also validates this statistical finding (Refer to Table 3).

Learners with structurally similar to English L1 demonstrate faster acquisition rates, in comparison to those with distinctively different language structures adding to their grammar and pronunciation challenges. The results propose that L1 can facilitate or hinder SLA based on linguistic similarities.

Interaction between SLA Determinants

To determine how the five independent variables (age, motivation, aptitude, exposure, and L1 influence) collectively influence the interaction of SLA, a regression model was conducted which could explain the variance in SLA interaction. With an R-value of 0.724, it was demonstrated by the model that there is a strong positive correlation between independent variables and SLA interactions. The R² value (0.524) highlights that 52.4% of the variance in SLA interaction is driven by the combination of age, motivation, aptitude, exposure, and L1 influence. The model's predictive strength is reflected in the standard error of the estimate (0.389) confirming that these five factors significantly contribute to SLA interaction.

It is further strengthened by the ANOVA results presented in Table affirming that the model is statistically significant ($F = 13.659$, $p = 0.000$), reporting that at least one of the independent variables is significantly contributing to SLA interaction. The low p-value (<0.001) also suggests that the model effectively captured significant relationships between SLA interaction and its predictors.

Furthermore, the regression coefficients for each predictor indicate that motivation ($\beta = 0.219$, $p = 0.012$), aptitude ($\beta = 0.251$, $p = 0.009$), exposure ($\beta = 0.196$, $p = 0.023$), and L1 influence ($\beta = 0.209$, $p = 0.028$) were statistically important predictors of SLA interactions. However, age ($\beta = 0.145$, $p = 0.154$) was not statistically significant, presenting a weaker direct effect on SLA interaction in combination with other variables. Aptitude was one of the strongest predictors to have a significant impact on SLA interaction followed by motivation, L1 influence, and exposure (Refer to Table 3).

Qualitative Data Analysis

Thematic analysis was conducted on data collected through semi-structured interviews with 50 participants and case studies of 10 learners with different levels of L2 proficiency. These qualitative findings consisted of lived personal experiences of L2 learners, providing a wider perspective into individual learning strategies, challenges, and personal motivations in L2 acquisition.

Age and SLA: Perceptions and Learning Challenges

Participants reported varying experiences across different age groups in L2 learning with younger learners (ages 8-32)

narrating increased ease in acquiring pronunciation and grammar essentially, which is also reflected in the quantitative findings.

Participant (Age 12) stated:

"I don't think about grammar rules when I speak English. It just feels natural, like my first language."

Conversely, the older learners underscored the role of structured learning and cognitive strategies for better L2 acquisition.

A 35-year-old participant reflected:

"I break down grammar into patterns and analyze sentence structures, which helps me understand English better."

These findings highlight the viewpoint that younger learners benefit from unconscious learning while older learners are reliant on analytical skills and structured instructions.

Motivation: Driving Forces Behind L2 Learning

Both integrated and instrumental motivation were reported by participants, making motivation a strong determinant in L2 learning. Learners demonstrating integrative learning were more willing to connect with L2 communities.

A 28-year-old participant shared:

"Learning English makes me feel like I belong when I travel or talk to international colleagues."

However, individuals with instrumental motivation were more focused on career advancement and academic goals. A participant pursuing higher education noted:

"I need English to study abroad and access better job opportunities."

As motivation continues to vary over time, most participants highlighted the role of external reinforcements such as supportive teachers or engaging learning environments to maintain motivation in the long run.

Language Aptitude: Individual Differences in Learning Styles

There was evident individual difference highlighted in the cognitive aptitude and learning styles of participants. Learners with higher aptitudes reported strong pattern recognition and memory skills which enabled them to understand complex grammatical structures quickly.

One participant (age 16) said:

"I remember new words after hearing them once, and I can guess their meanings from context."

Struggles with retaining vocabulary and mastering pronunciation among learners with lower aptitude were also reported. Such as a 55-year-old participant remarked:

"Even if I memorize a word today, I forget it by next week unless I use it multiple times."

These findings warrant personalized learning strategies involving mnemonic devices or repeated exposure to be specifically beneficial for learners with lower language aptitude.

Exposure and L2 Immersion: The Role of Learning Environments

The importance of real-world exposure to speed up L2 acquisition is frequently emphasized in participants' narratives. Participants involved in L2 learning environments like studying abroad or working in an English-speaking setting exhibited faster progress and greater confidence in communication. A participant working in an international company explained:

"Speaking English daily at work helped me improve naturally didn't even realize I was learning."

Comparatively, learners immersed in classroom settings demonstrate slower progress due to limited speaking opportunities.

A university student noted:

"I understand grammar well, but I struggle with real conversations because we don't practice speaking enough in class."

These experiences underscore the importance of interactive learning approaches and the necessity of implementing communicative exercises in formal educational contexts.

L1 influence: Transfer Effects in SLA

Participants' responses were reflective of the role first language (L1) transfer played. Participants with a first language structure similar to English (e.g., German and Dutch) adapted easily to grammar and vocabulary.

A participant with a German L1 background said:

"English sentence structures feel familiar, so I don't struggle with word order."

Learners from languages with different syntactic structures (e.g., Japanese, Arabic) faced more difficulties in understanding sentence formation and pronunciation.

A participant from a Japanese L1 background shared:

"I always struggle with articles like 'a' and 'the' because we don't have them in my language."

These findings highlight the need for targeted instruction to address negative transfer and foster positive transfer strategies.

Emotional and Social Factors in SLA

Participants' L2 learning experiences were significantly impacted due to emotional and social factors, with learners

reporting experiencing language anxiety often in speaking tasks.

A participant (Age 22) stated:

"I always feel nervous when speaking English because I'm afraid of making mistakes."

This anxiety mostly resulted in avoidance behaviors such as reluctance to take part in conversations. However, this anxiety was reported to be addressed by promoting supportive learning environments and peer interactions.

One participant noted:

"When I practice with friends, I feel more comfortable making mistakes and learning from them."

Social interaction was emphasized as important to build confidence and improve fluency among L2 learners.

IV. DISCUSSION

This study highlights the complex nature of second language acquisition (SLA), highlighting the role of cognitive, affective, individual, and social factors. The findings demonstrated younger learners increased ability in phonetic coding and grammatical accuracy whereas older learners displayed stronger vocabulary and impeccable grammatical understanding, which are highly emphasized and aligned with the critical period hypothesis in previous research [32]. Given these benefits, the statistical analysis underscores that age alone does not predict SLA success in comparison to other independent factors such as motivation or exposure.

One of the striking findings is motivation acknowledged as a significant determinant of L2 learning in which increased levels of engagement and proficiency were exhibited due to integrative motivation. Higher commitment was observed in learners to connect to broader L2 communities in comparison to those whose motivations were driven by instrumental factors such as career advancement [33]. These findings are reflective of previous research which highlighted long-term language acquisition is achieved through sustainable integrative motivation [34]. However, to maximize SLA outcomes, the relatively small sample effect size emphasizes the importance of interaction between motivation and other factors such as exposure and aptitude. Findings also highlighted that learning efficiency is mainly influenced due to language aptitude particularly phonetic coding ability and grammatical sensitivity. In SLA, the role of individual cognitive abilities is crucial which is highlighted in previous research [35], higher aptitude scores of participants presenting faster acquisition rates and greater linguistic accuracy also confirm this narrative.

Another critical factor in SLA success is the exposure to the L2 environment. The findings highlighted that learners engaged in immersive environments were more likely to develop increased fluency and comprehension which reinforces the previous research findings that show quality exposure to be more critical than just quantity [36]. Participants engaging in real-world interactions with native speakers had an increased likelihood of making rapid progress compared to traditional classroom settings where speaking opportunities are limited which restricts learners' consistent language use. These results highlight integrating interactive and communicative exercises into formal education is highly required to overcome the barrier between classroom instruction and real-world application [37]

First language (L1) influence was demonstrated to be both facilitative and inhibitory on SLA. Learners with native language structures similar to English experienced faster acquisition whereas those with significantly different language structures reported to face challenges in grammar and pronunciation. These findings reflected previous research that underscored the role of positive and negative transfer in SLA [38]. Moreover, Potential L1 interferences should be accounted for in instructional approaches by designing targeted strategies that reduce the negative transfer and utilize linguistic similarities between languages to promote smoother learning. The interdependence of motivation, aptitude, exposure, and L1 influence was highlighted in the regression model that demonstrated the collective impact of these factors contributing to over half of the variance in SLA success. Despite the age having a weaker direct effect on SLA acquisition, it was responsible for fostering learners' cognitive and social interactions in the overall language learning process. These findings underscore the need for a comprehensive approach to SLA incorporating interconnected factors for the development of effective and personalized teaching strategies.

The findings of the present study propose several implications for language education and curriculum development. Initially, results highlight the importance of personalized instruction catering to individual learner profiles may improve SLA outcomes. While naturalistic exposures are more productive for young learners, older learners seek structured and direct instructions to enhance their learning experiences. This individualized and personalized approach in instructional design may prove to be effective in increasing overall language proficiency by attaining diversified learner requirements [30]. Additionally, for the long-term sustainability of language engagement, promoting integrative motivation is essential. Cultural immersion activities should be a part of language programs with initiatives such as study-abroad

opportunities or language exchange programs that will improve learners' motivation and provide opportunities to interact with L2 communities. Furthermore, instructors should incorporate motivational strategies that are directed at both integrative and instrumental goals, strengthening sustained learner commitment [27].

Given the effect of aptitude on SLA, language programs should include diagnostic assessments to evaluate diverse strengths and weaknesses. Learning efficiency can also be increased with tailored instructional approaches such as mnemonic devices for learners with lower memory capacity or pattern-based grammar instruction for high-aptitude learners [39]. Additionally, integrating technologically advanced learning tools can help personalize language instruction according to learners' cognitive profiles. Communicative and interactive elements should also be incorporated into traditional classrooms due to the importance of immersive exposure. Approaches such as task-based language teaching (TBLT) and communicative language teaching (CLT) emphasize the real-world usage of language education to overcome the barrier of academic learning and their practical application [8]. Moreover, leveraging online platforms, virtual exchanges, and conversational practice with native speakers may help formal instruction in enhancing fluency and comprehension.

Addressing L1 transfer effects in SLA needs individually customized instructional interventions. Teachers should utilize strategies like contrastive analysis in equipping learners to assess key differences among their L1 and L2 which will lower the interference while maintaining positive transfer effects. Additionally, by adopting an evidence-based approach to instruction, educators can be empowered to design strategies that cater to linguistic diversity and streamline the language acquisition processes.

V. CONCLUSION

Second Language Acquisition (SLA) was found to be a complex process influenced by cognitive, affective, individual, and social factors. Age, motivation, exposure, aptitude, and L1 influence were found to have an impact on SLA individually as well as collectively. However, age alone does not significantly influence SLA success. Integrative motivation leads to more sustained language learning outcomes. Aptitude also differentiates learners, with those with higher aptitude showing more rapid and successful acquisition. Quality and quantity of language exposure are crucial for successful acquisition with immersive learning exposure showing increased potential benefit. The impact of the first language on second language learning is also significant. This research emphasizes the need for a holistic approach to understanding and

facilitating second language acquisition. Educators and language policymakers should consider these variables when designing curricula and instructional strategies to optimize L2 learning for diverse learner profiles. Personalized learning pathways that will influence overall learning comprehension, promoting integrative motivation through cultural immersion initiatives, and leveraging aptitude influence to implement individually tailored learning approaches are some of the implications identified in the study. Addressing individual differences in motivation, aptitude, exposure, and L1 interference could enhance the effectiveness of second language acquisition efforts.

STUDY LIMITATIONS

The relatively small sample size of the study limits the generalizability to wider L2 learning populations. The study population demonstrates an imbalance in gender distribution with male participants comprising 60% in comparison to females consisting of 40% may influence the results due to individual differences in SLA. Motivation and exposure levels measured through self-reported questionnaires may also introduce social desirability or recall bias. Additionally, the study focused on English as a second language which limits its applicability for other target languages.

FUTURE RECOMMENDATIONS

Future research should include a larger more diversified sample to improve the generalizability of findings. Long-term studies are required to evaluate participants' language acquisition process over several years to evaluate the impact of individually identified SLA determinants. Other cognitive factors such as personality traits, emotional intelligence, and neurobiological aspects can also be focused on developing a comprehensive understanding of SLA.

DECLARATION

I confirm that the paper is the original work of the author and that the paper has not been submitted for publication anywhere else.

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