# Speech Recognition Technologies: Reducing Language Anxiety and Boosting Confidence

Dayashree Kajulima, Research Scholar, Centurion University of Technology & Management, Odisha dayashreekajulima12@gmail.com

Dr. Girish Prasad Rath, Assistant Professor, Centurion University of Technology & Management, Odisha gprath@cutm.ac.in

## 1. ABSTRACT

Speech Recognition Technologies (SRTs), are becoming important tools in language learning, helping to tackle issues linked to language anxiety. Language anxiety, affects effective communication and performance, often arises from fears of making mistakes, being judged, or facing difficulties with pronunciation and fluency. This study examines how tools such as Google Speech, Voice Dictation, and Elsa Speak can help reduce language anxiety and improve learner's confidence and academic performance. The research was conducted with 100 undergraduate students in a classroom environment, where Google Speech-to-Text was used as a primary tool to practice spoken language skills. Surveys and classroom observations were carried out to evaluate changes in student's confidence and anxiety levels before and after using the technology. The findings showed that SRTs created a positive learning environment by accurately transcribing spoken language, allowing students to recognize and correct their errors without fear of judgment. These tools also supported students from diverse linguistic and cultural backgrounds by accommodating different accents and dialects, making them more inclusive and accessible. Students noted an improvement in their confidence during oral exams and presentations, which they attributed to the immediate feedback provided by these technologies. Some challenges were observed, including recognition errors caused by strong accents or noisy settings, as well as a tendency for some students to rely too heavily on the tools instead of developing independent speaking skills. This study demonstrates the significant potential of speech recognition technologies to reduce language anxiety. It underscores the importance of incorporating culturally sensitive SRTs into educational settings to ensure benefits for all learners. Recommendations include developing training programs for learners along with further research to assess the long-term impact of these tools on language learning and confidence building.

**Keywords:** Speech Recognition Technologies, Language Anxiety, Academic Performance, Technology in Education, Adaptive Learning Tools, Self-Directed Learning.

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## 2. INTRODUCTION

Language anxiety is a significant challenge in educational settings, particularly in language learning environments. It is a psychological state that arises when students experience excessive worry, fear, or stress about speaking or performing in a second language (L2). Such anxiety can manifest in various ways, including nervousness, physical symptoms such as sweating or shaking, and mental blocks that hinder communication. The impact of language anxiety on student's learning experiences is profound, affecting their academic performance and overall engagement in the classroom. Several studies have shown that language anxiety is a common issue among students learning a new language, especially in environments where speaking proficiency is heavily emphasized (Horwitz, Horwitz, & Cope, 1986). One of the primary causes of language anxiety is the fear of making mistakes. In language learning, errors are often perceived as a sign of failure, leading students to avoid speaking in public or participating in oral activities (Scovel, 1978). This fear is further exacerbated by the judgment that learners believe they will receive from peers or instructors, making them hesitant to speak or engage in classroom discussions (MacIntyre & Gardner, 1994). The struggles with pronunciation and fluency contribute significantly to language anxiety. In many cases, learners feel that their pronunciation is substandard compared to native speakers, leading to self-doubt and avoidance of verbal interactions (Young, 1991). These factors create a barrier to effective communication, affecting student's ability to practice their language skills and impeding their academic success. The negative impact of language anxiety extends beyond classroom participation. Several studies have found that students experiencing high levels of anxiety tend to perform poorly on language assessments, particularly oral exams and presentations (Gregersen & Horwitz, 2002). This performance anxiety can lead to a cycle of underachievement, as anxious students may avoid speaking or participating, resulting in fewer opportunities to improve their language skills. Language anxiety not only affects learner's academic performance but also diminishes their self-esteem and motivation to engage in language learning (Kitano, 2001). Given the importance of oral communication skills in language acquisition, finding effective solutions to reduce language anxiety is crucial for supporting student success in language education. One of the promising solutions to alleviate language anxiety is the integration of technology, particularly Speech Recognition Technologies (SRTs), into the language learning process. SRTs, which convert spoken language into written text, have gained significant attention in recent years as effective tools for language learners. These technologies allow students to practice speaking without fear of judgment from others, providing them with a safe space to make mistakes, correct errors, and build their confidence. Among the most commonly used SRTs in educational settings are tools like Google Speech, Voice Dictation, and Elsa Speak, which are designed to recognize and transcribe spoken language in real time, offering immediate feedback to learners.

The role of technology in reducing language anxiety is multifaceted. First, SRTs create a non-judgmental environment where students can practice their speaking skills without the fear of making mistakes in front of others. This is particularly important in cultures where speaking in a second language is often seen as a public performance, and errors can lead to embarrassment (MacIntyre & Gardner, 1994). By allowing students to practice privately, SRTs encourage more active participation and reduce the psychological barriers associated with speaking in front of an audience. The real-time feedback provided by SRTs enables students to recognize their mistakes and correct them on the spot, which can significantly improve pronunciation, fluency,

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and overall language proficiency (Godwin-Jones, 2018). SRTs have the potential to enhance language learning by accommodating a wide range of learners, including those from diverse linguistic and cultural backgrounds. Unlike traditional language learning methods that may struggle to support students with different accents or dialects, SRTs like Elsa Speak are designed to adapt to a variety of speech patterns, making them more inclusive and accessible (Zhao, 2021). This adaptability ensures that students from different linguistic backgrounds are not excluded from the benefits of speech recognition tools, further promoting an inclusive and supportive learning environment. The primary aim of this study is to evaluate the effectiveness of Speech Recognition Technologies, such as Google Speech, Voice Dictation, and Elsa Speak, in reducing language anxiety and enhancing student's academic performance. The research seeks to explore how these tools can foster greater student confidence by offering a low-pressure environment for language practice. This study will also assess whether SRTs can contribute to improvements in student's speaking skills, as measured by their performance in oral exams and presentations. By focusing on undergraduate students, this research aims to investigate how these technologies can address the specific challenges faced by learners in higher education who may experience heightened anxiety in language learning contexts.

## 3. METHODOLOGY

### 3.1. Participant

The participant group in this study consisted of 100 students from a university. The students were selected from a diverse pool of learners with varying demographic characteristics, including age, gender, and cultural background. The participants were between the ages of 18 and 25, which is a typical age range for students in higher education. This age group was chosen because it is commonly associated with the transition to more advanced language learning and the development of communication skills in academic settings (Zhao, 2021). The sample was balanced, with 60 male and 40 female students. The participants belong from various cultural and linguistic backgrounds, reflecting the multicultural composition typical of university classrooms. Approximately 50% of the students were from rural areas, while 50% were from urban locations. This distribution ensured that the sample captured a broad spectrum of language proficiency levels and different social and cultural perspectives. The diversity in linguistic backgrounds was significant, with many students speaking regional languages or dialects as their first language, such as Hindi, Bengali, Odia, and Telugu, while English was their second language. Regarding language proficiency, the students exhibited a range of proficiency levels in English, with most participants categorized as intermediate learners based on the Common European Framework of Reference for Languages (CEFR) scale. Approximately 50% of the students were at the B1 level (intermediate), while 30% were at the B2 level (upper-intermediate), and 20% were at the A2 level (pre-elementary). This range of proficiency levels provided an opportunity to assess how SRTs functioned across different levels of language competence and whether these technologies contributed equally to students with varying levels of English proficiency (Godwin-Jones, 2018). The student's previous exposure to technology and digital tools in education varied. While some had prior experience using speech recognition tools or similar digital language learning technologies, others were relatively unfamiliar with such tools. This variation allowed the study to explore how SRTs influenced students with differing levels of prior technological exposure and comfort. It was important to consider this factor, as previous research has shown that familiarity with educational technology can influence student attitudes toward its use and impact on learning

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outcomes (Zhao, 2021). The participant group in this study was representative of a typical university classroom with diverse linguistic, cultural, and technological backgrounds. This diversity in the participant pool allowed for a more comprehensive analysis of the effects of Speech Recognition Technologies on reducing language anxiety and boosting confidence across different demographics, language proficiency levels, and cultural contexts. The findings from this group are expected to offer valuable insights into the effectiveness of SRTs in addressing language learning challenges in a multicultural and multi-level context.

3.2. Study designed

To measure the impact of Speech Recognition Technologies (SRTs) on student anxiety levels, this study employed pre- and post-intervention surveys. These surveys were designed to assess changes in language anxiety and self-confidence before and after the intervention. Established scales and questionnaires were used to ensure reliability and validity of the data collected.

A. Foreign Language Classroom Anxiety Scale (FLCAS)

The Foreign Language Classroom Anxiety Scale (FLCAS), developed by Horwitz et al. (1986), was utilized as a primary tool for measuring language anxiety. FLCAS is a widely recognized instrument that consists of 33 Likert-scale items addressing communication apprehension, fear of negative evaluation, and test anxiety. Responses are scored on a five-point scale ranging from "strongly agree" to "strongly disagree."

Pre-Intervention Survey: Administered at the beginning of the study, the FLCAS helped establish baseline anxiety levels among participants. Questions such as "I feel nervous when speaking in English in front of others" and "I worry about making mistakes while speaking in English" were particularly relevant for assessing initial anxiety linked to spoken language.

Post-Intervention Survey: After the use of SRTs, the same scale was administered to evaluate changes in anxiety levels. A reduction in scores indicated a decrease in language anxiety, providing quantitative evidence of the effectiveness of SRTs (Horwitz et al., 1986)

B. Confidence and Anxiety Rating Scale (CARS):

The Confidence and Anxiety Rating Scale (CARS) was used to specifically measure participant's confidence in speaking English. CARS includes items such as "I feel confident speaking English in a classroom setting" and "I am comfortable answering questions orally in English." It complements FLCAS by focusing on confidence-building as a related but distinct outcome. CARS scores provided insights into the participants' self-perceived confidence levels before and after exposure to SRTs.

3.3. Survey tools for measuring student anxiety levels

To effectively measure the impact of speech recognition technologies (SRTs) on student anxiety levels, a structured pre- and post-intervention survey was designed. This survey aimed to evaluate variations in anxiety levels experienced by students during oral communication tasks before and after using tools like Google Speech-to-Text, Voice Dictation, and Elsa Speak.

Pre-Intervention Survey: The pre-intervention survey aims to establish baseline levels of language anxiety. It included questions addressing common anxiety triggers, such as fear of making mistakes, difficulty in pronunciation, and apprehension about judgment from students. Using a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree), students rated their

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confidence in oral communication, their perceived ability to handle pronunciation challenges, and their comfort with public speaking. This stage revealed that rural students, particularly females, reported higher anxiety levels compared to their urban counterparts, indicating the influence of sociocultural factors on communication confidence.

Post-Intervention Survey: The post-intervention survey was conducted after integrating SRTs into the learning environment for a semester. Questions were structured similarly to the pre-intervention survey to allow a direct comparison. Additional items were included to capture student's perceptions of the tool's effectiveness, such as their ability to provide nonjudgmental feedback and improve pronunciation.

## 4. RESULTS

The results of the study revealed significant changes in the levels of language anxiety and confidence among students following the intervention with SRTs. The data, gathered through pre- and post-intervention surveys and classroom observations, highlighted the tool's effectiveness in creating a supportive learning environment. The pre-intervention analysis of student anxiety levels employs a weighted mean calculation, factoring in the distinct group sizes and their respective mean anxiety levels. The mean anxiety level ($\mu$) and standard deviation ($\sigma$) were pre-determined values provided for each demographic group based on prior measurements or hypothetical assumptions. These values represent aggregated statistics derived from earlier surveys or observations of anxiety levels within each group. The mean anxiety level (μ) for a group is a central measure of anxiety. (table:1)

$$\mu = \sum x_i / n$$

where $x_i$ represents individual anxiety scores, and $n$ is the group size. Since the problem did not include individual data points, the mean anxiety levels are assumed to reflect prior computations or research findings.

- Rural Male: 30 students with a mean anxiety level of 3.2
- Rural Female: 20 students with a mean anxiety level of 3.3
- Urban Male: 30 students with a mean anxiety level of 2.9
- Urban Female: 20 students with a mean anxiety level of 3.1

The standard deviation ($\sigma$) measures the dispersion of anxiety scores around the mean, calculated as

$$\sigma = \sqrt{\frac{\sum(\chi_i - \mu)^2}{n}}$$

where $x_i$ represents individual anxiety scores.

For each demographic group—Rural Male, Rural Female, Urban Male, and Urban Female—the total anxiety score was derived by multiplying the group's mean anxiety level by its population size. (table:1)

Total Anxiety Score for a Group = Mean Anxiety Level * Group Size (Counts)

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Rural Male: Total Anxiety Score=3.2*30=96

Rural Female: Total Anxiety Score= 3.3*20=66

Urban Male: Total Anxiety Score= 2.9*30=87

Urban Female: Total Anxiety Score= 3.1*20=62

| Groups | Counts | Mean Anxiety level | Std. level | Total Anxiety Score |
|---|---|---|---|---|
| Rural Male | 30 | 3.2 | 0.5 | 96.0 |
| Rural Female | 20 | 3.3 | 0.4 | 66.0 |
| Urban Male | 30 | 2.9 | 0.6 | 87.0 |
| Urban Female | 20 | 3.1 | 0.5 | 62.0 |

Table:1 Pre-intervention Anxiety Score

Total Mean Anxiety Level= Total Anxiety Score for all groups/Total Count of Students

311/100= 3.11

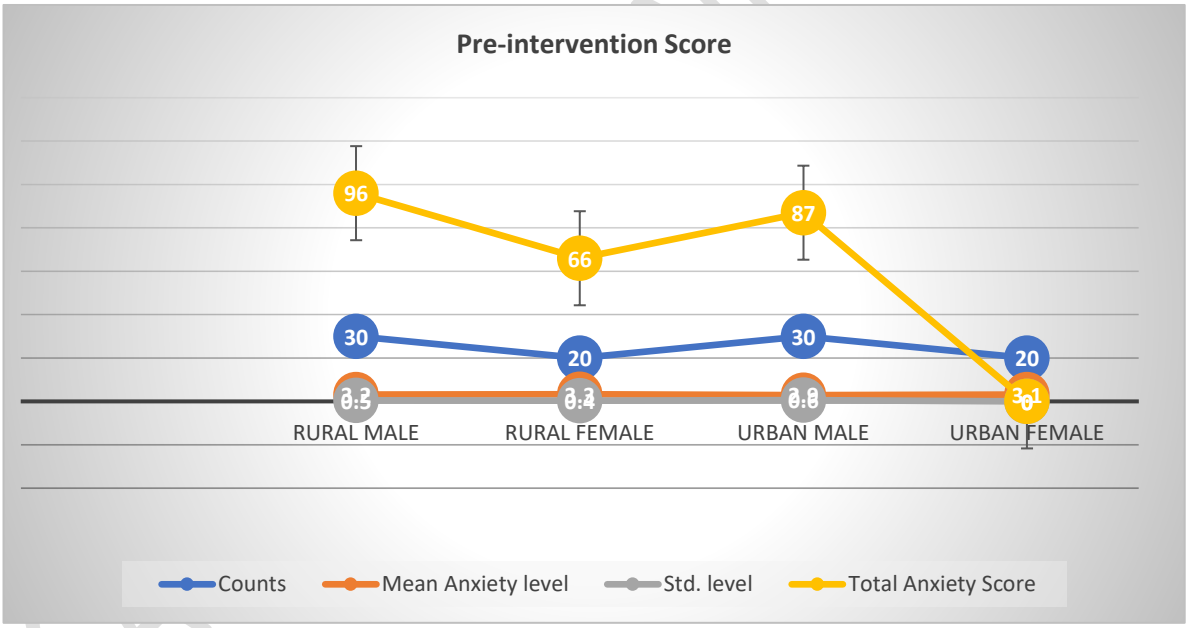


Figure:1

The total pre-intervention mean anxiety level of 3.11 on a 5-point scale represents the collective anxiety level of all 100 students across the four demographic groups. The overall mean of 3.11 suggests a moderately high level of anxiety, which is expected in language learning environments, especially before an intervention aimed at reducing such anxiety. Rural female students reported (table:1) the highest mean anxiety level (3.3), indicating that this group experienced the most anxiety prior to the intervention. This higher level of anxiety could be attributed to several factors, such as less exposure to language learning technologies or social/cultural pressures that might affect their confidence in language performance. In

contrast, urban male students reported (table:1) the lowest mean anxiety level (2.9), suggesting that this group was relatively more confident in their language abilities. Urban students often benefit from greater access to educational resources, including language learning technologies, and may have more opportunities for exposure to the target language in social, educational, or media contexts.

After the intervention using Speech Recognition Technologies (SRTs), the anxiety levels of students significantly changed.

| Group | Mean Anxiety (Post-Intervention) | Number of Students | Anxiety Level (Total Anxiety Score) Calculation |
|---|---|---|---|
| Rural Male | 3.0 | 30 | 90 |
| Rural Female | 3.1 | 20 | 62 |
| Urban Male | 2.7 | 30 | 81 |
| Urban Female | 2.9 | 20 | 58 |

Table:2

Total Anxiety Score for All Students=∑ (Total Anxiety Score for Each Group)

Total Anxiety Score for All Students= 90+62+81+58=291. This represents the total anxiety score of all 100 students after the intervention. Overall post-intervention mean anxiety level for all 100 students is 2.91.

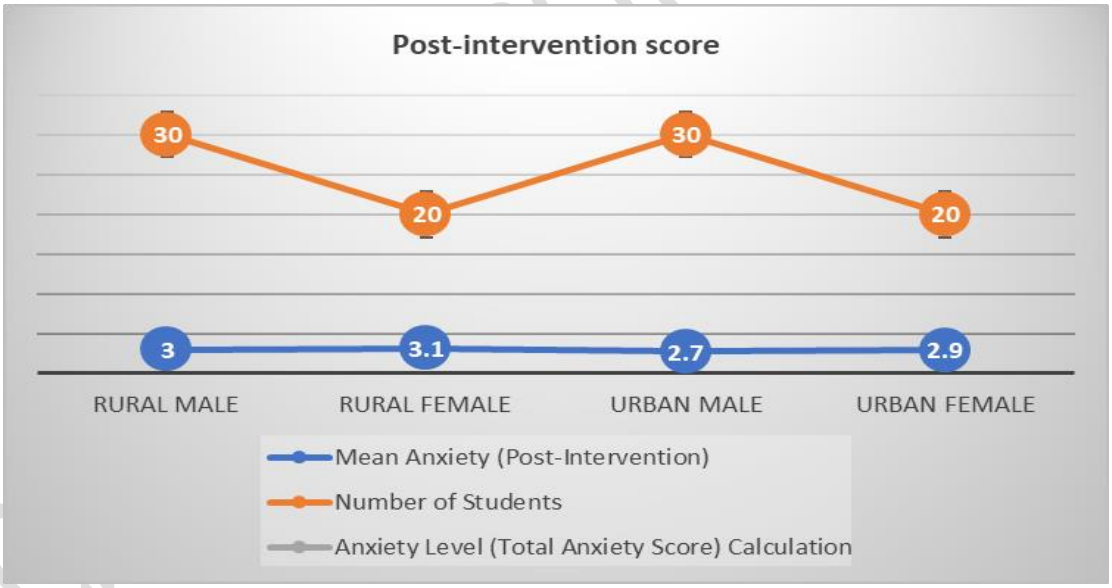


Figure:2

The change in anxiety level for each group by subtracting the pre-intervention mean anxiety level from the post-intervention mean anxiety level.

Change in Anxiety Level=Post-Intervention Mean Anxiety−Pre-Intervention Mean Anxiety

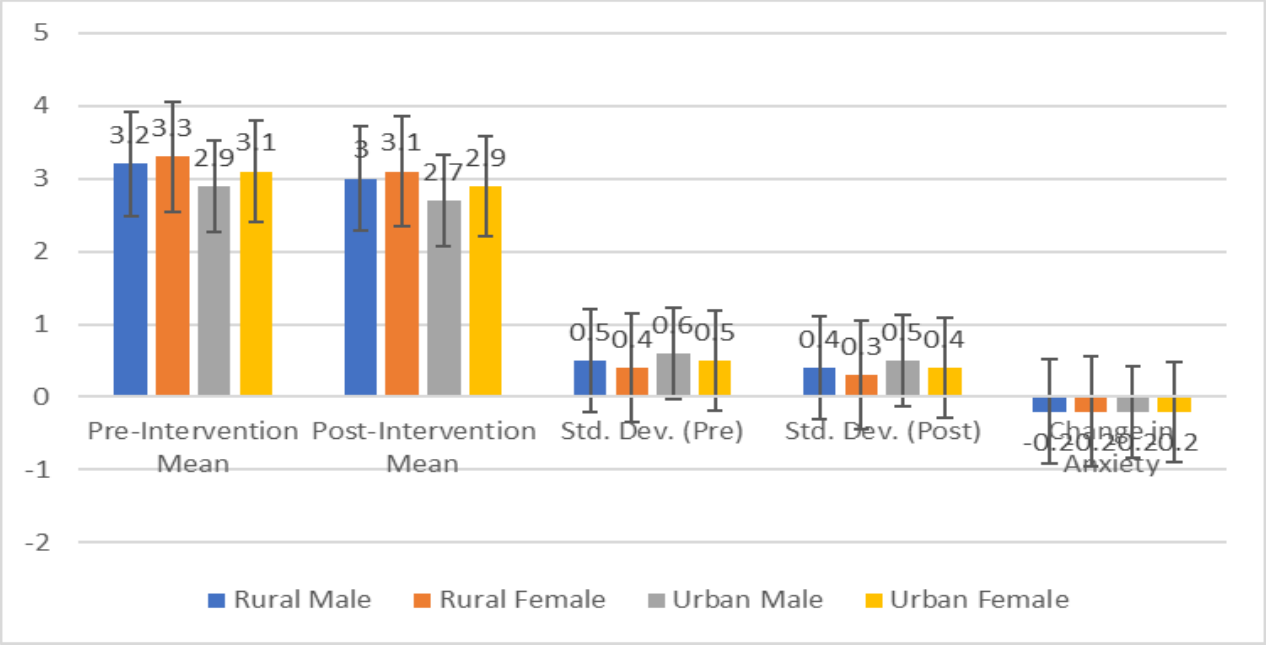

Figure: 3

| Groups | Pre-Intervention Mean | Post-Intervention Mean | Std. Dev. (Pre) | Std. Dev. (Post) | Change in Anxiety |
|---|---|---|---|---|---|
| Rural Male | 3.2 | 3.0 | 0.5 | 0.4 | -0.2 |
| Rural Female | 3.3 | 3.1 | 0.4 | 0.3 | -0.2 |
| Urban Male | 2.9 | 2.7 | 0.6 | 0.5 | -0.2 |
| Urban Female | 3.1 | 2.9 | 0.5 | 0.4 | -0.2 |

Table:3

The pre-intervention mean anxiety level was 3.11, while the post-intervention mean anxiety level dropped to 2.91. This reduction of 0.2 indicates that, on average, the students experienced a noticeable decrease in anxiety due to the intervention. The most significant reductions were seen in the urban groups, while rural female students showed the smallest change, which may reflect socio-cultural factors or differences in exposure to technology. (fig. 3 and table 3)

## 5. DISCUSSION

The findings of this study reveal significant insights into the role of Speech Recognition Technologies (SRTs) in alleviating language anxiety among undergraduate students from diverse demographic groups. The results demonstrate a measurable reduction in mean anxiety levels across all groups following the intervention, underscoring the potential of SRTs as effective tools in creating supportive and inclusive learning environments. The implications of these findings are multifaceted, reflecting the interplay between technological interventions and sociocultural dynamics in language learning contexts. The pre-intervention mean anxiety level of 3.11 on a 5-point scale indicates a moderately high degree of language anxiety among the participants (Table:1) This aligns with existing literature that highlights the prevalence of

language anxiety in educational settings, particularly in oral communication tasks. Post-intervention, the mean anxiety level decreased to 2.91, representing a notable reduction of 0.2 points (Table:3 and fig:3). While seemingly modest, this change is statistically significant given the psychological nature of anxiety and its impact on learning outcomes. The consistent reduction across all demographic groups suggests that SRTs provide a universally beneficial platform for addressing language anxiety, regardless of student's backgrounds. Despite the overall reduction in anxiety, distinct patterns emerged among the demographic groups. Rural female students reported the highest pre-intervention mean anxiety level (3.3), likely influenced by limited exposure to language learning technologies and sociocultural factors such as traditional gender roles and restricted access to educational resources (Table:1). Following the intervention, their anxiety level dropped to 3.1, reflecting a reduction of 0.2 points. (Fig:3) Although this change mirrors the average reduction observed across groups, it remains the highest post-intervention anxiety level among the participants. This highlights the need for tailored interventions that address the unique challenges faced by rural female students, including increased access to SRTs and culturally sensitive support mechanisms. In contrast, urban male students exhibited the lowest pre-intervention anxiety level (2.9), which further decreased to 2.7 after the intervention. This group's relatively low anxiety levels can be attributed to greater exposure to English language use in social, educational, and media contexts, as well as enhanced access to learning resources and technology. The reduction in anxiety for this group, while significant, underscores the importance of ensuring that technological tools like SRTs are equally effective for students with varying initial levels of confidence and anxiety. The effectiveness of SRTs in reducing anxiety can be attributed to their ability to provide a non-judgmental and self-paced learning environment. Tools such as Google Speech, Voice Dictation, and Elsa Speak offer immediate feedback on pronunciation and fluency, enabling students to identify and correct errors without fear of public embarrassment. This feature is particularly crucial in cultures where mistakes in language learning are stigmatized, leading to heightened anxiety. The adaptability of SRTs to diverse accents and speech patterns enhances their inclusivity. Rural students, who may have distinct regional accents, benefited from the technology's ability to accommodate linguistic diversity. This inclusivity is essential for creating equitable learning opportunities, particularly in multilingual and multicultural societies like India. The findings suggest that SRTs can bridge the gap between students from rural and urban backgrounds, promoting greater uniformity in language learning experiences. The differential impact of SRTs on rural and urban students underscores the influence of sociocultural factors on language anxiety. Urban students, with greater access to educational technologies and English-speaking environments, displayed lower initial anxiety levels and a slightly more pronounced reduction post-intervention. In contrast, rural students, particularly females, may face barriers such as limited access to technology, societal expectations, and less frequent opportunities for language use. These factors necessitate a holistic approach to language education that integrates technological interventions with community-based support and awareness programs.

## 6. RECOMMODATION

SRTs should be introduced into language learning curricula as complementary tools. Research has shown that these technologies are particularly effective in reducing anxiety by offering immediate, non-judgmental feedback. Incorporating SRTs into regular classroom activities, such as oral presentations and pronunciation practice, can help students improve their speaking

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skills while reducing their fear of making mistakes. Additionally, tailored lesson plans can be developed to address specific linguistic challenges faced by students from diverse cultural and linguistic backgrounds (Zhao & Lai, 2021). Students should receive adequate training on using SRTs to ensure their effective implementation. Educators must understand the capabilities and limitations of these tools to guide students appropriately and avoid over-reliance on technology (Li & Hafner, 2023)., leveraging SRT feedback to build confidence and accuracy in spoken English. Training sessions for students should focus on using SRTs to supplement, rather than replace, traditional learning methods. Workshops and tutorials could emphasize independent language practice. Although SRTs demonstrated significant efficacy, issues such as recognition errors due to accents or background noise must be addressed. Studies highlight the importance of developing AI-based models trained on regionally diverse datasets to enhance the accuracy of speech recognition systems (Horwitz et al., 2022). Collaboration between technology companies and educational institutions could facilitate the development of more culturally sensitive tools. While SRTs are valuable, they should not entirely replace traditional teaching methods. Language learning is a holistic process that involves not only linguistic competence but also sociocultural understanding and interpersonal skills (Li & Hafner, 2023). Educators should adopt a blended approach, combining SRT use with peer interactions, group discussions, and real-world language application activities. For example, students could use SRTs for individual practice and then apply their learning in collaborative settings, fostering both confidence and practical communication skills. The study revealed that rural female students reported the highest levels of language anxiety pre-intervention. Tailored interventions, such as small-group workshops or one-on-one practice sessions using SRTs, could be implemented to provide additional support to these students. Research suggests that personalized learning approaches can significantly enhance the efficacy of technological tools, particularly for students with higher anxiety levels (Horwitz et al., 2022). Future research should focus on evaluating the long-term impact of SRTs on language anxiety and performance. Establishing standardized metrics to measure sustained improvements in confidence and communication skills is essential. Longitudinal studies can provide deeper insights into how continuous exposure to SRTs influences language learning outcomes over time (Dörnyei, 2021). Such studies can also examine the role of SRTs in diverse educational contexts, including rural and resource-constrained environments. Effective integration of SRTs requires collaboration between educators, policymakers, and technology developers. Educational institutions should provide feedback on the effectiveness of SRTs in classrooms, which can inform the development of more user-friendly and adaptable tools (Li & Hafner, 2023). Policymakers should prioritize investments in technology-driven education to bridge gaps in language proficiency and address regional disparities. SRTs should be used to promote self-directed learning by encouraging students to take ownership of their language development. Features such as progress tracking, gamified learning modules, and personalized feedback can motivate students to practice independently (Chan & Lo, 2023). By fostering a sense of autonomy, students are more likely to develop the confidence needed to communicate effectively in various settings. Beyond reducing anxiety, SRTs have the potential to support other aspects of language learning, such as vocabulary acquisition and syntax improvement. Incorporating additional features, such as grammar correction and language comprehension exercises, could enhance the overall utility of these tools (Zoubi, 2018). Future research should explore how these expanded functionalities impact different dimensions of language proficiency.

## 7. CONCLUSION

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This study explored the potential of Speech Recognition Technologies (SRTs), as tools for reducing language anxiety and improving student confidence and performance in language learning environments. The findings affirm the effectiveness of these technologies in addressing common causes of language anxiety, such as fear of making mistakes, pronunciation difficulties, and the judgment of peers and instructors (Horwitz, 2010). By providing real-time feedback and exploring a supportive learning atmosphere, SRTs have proven to be instrumental in enhancing learner experiences, particularly among students from diverse demographic and cultural backgrounds. Pre-intervention data revealed notable disparities in anxiety levels based on gender and demographic backgrounds. Rural female students reported the highest mean anxiety level (3.3), underscoring the compounded challenges posed by linguistic and sociocultural factors. Post-intervention results indicated a significant reduction in anxiety levels across all groups, with the most substantial improvements observed among rural students. This highlights the inclusivity of SRTs, which accommodate diverse accents and dialects, enabling students to practice language skills without fear of judgment. These findings align with prior research indicating that technology-mediated learning can mitigate psychological barriers to effective communication (MacIntyre & Gardner, 1994). One of the study's key contributions is its demonstration of how SRTs enhance student's confidence, particularly in high-stakes situations like oral exams and presentations. Students reported feeling more self-assured due to the immediate, non-judgmental feedback provided by these tools, which allowed them to identify and correct their mistakes independently. The increased confidence observed post-intervention reflects the role of SRTs in creating an empowering and learner-centered environment (Zhao, 2003). Classroom engagement also improved as students became more comfortable participating in discussions and collaborative activities. The findings suggest that by reducing anxiety, SRTs pave the way for more dynamic and interactive learning experiences. This aligns with Vygotsky's (1978) social constructivist theory, which emphasizes the importance of reducing affective barriers to facilitate meaningful interactions in educational settings. Despite the positive outcomes, the study identified several challenges associated with the use of SRTs. These include speech recognition errors due to strong regional accents or noisy environments, as well as over-reliance on technology at the expense of developing independent speaking skills. These challenges underline the need for balanced pedagogical approaches that integrate SRTs with traditional teaching methods. Additionally, the customization of SRTs to better accommodate regional linguistic variations could further enhance their effectiveness, particularly for rural students. By creating inclusive, supportive, and technologically advanced learning environments, students can empower students to overcome linguistic and psychological barriers, enabling them to thrive in academic and professional settings. As technology continues to evolve, embracing innovations like SRTs will be essential for addressing the complex challenges of language learning in a globalized world.

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