



# Language Learning and Emotional Growth: A Study of Preschool Children in Multilingual Contexts – Sudan

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## Abstract:

**Background:** The development of young children is greatly dependent on language exposure, but the relationship between multilingualism and socio-emotional development remains relatively unexplored with regard to Sudanese culture. Multilingualism in the Sudanese culture involves a combination of Arabic, English, and dialect, which can work as a tool to foster cognitive and emotional resilience in early childhood.

**Objective:** This paper seeks to establish the role of multilingual settings in the development of cognitive flexibility and socio-emotional intelligence in preschoolers (3–5 years old) enrolled in the Noor Albayan Kindergarten in Atbara, Sudan.

**Methods:** Through the use of convergent parallel mixed methods research design, the study conducted a quantitative assessment of 25 children ( $N=25$ ) using Sort-Switch tasks. The quantitative data obtained were subjected to analysis through one sample t-tests ( $Sdf=24$ ). On the other hand, qualitative data were obtained by conducting semi-structured interviews involving 10-12 key informants (teachers and parents).

**Results:** Analysis of the quantitative data showed that multilingual children scored 72% on problem-solving tasks ( $t(24) = 9.17, p < .001$ ). Additionally, they scored 68% on social adaptation skills ( $t(24) = 6.43, p < .005$ ) and 65% on emotional awareness tasks ( $t(24) = 5.00, p < .005$ ). Moreover, qualitative data showed.

**Conclusion:** These results indicate that bilingualism speeds up the development of prefrontal cortex and emotional differentiation. The findings of this paper recommend the application of translanguaging practices in Sudanese Early Childhood Education (ECE).

**Keywords:** Cognitive flexibility, Multilingualism, Socio-emotional learning, Sudanese ECE, Theory of Mind.

## 1. INTRODUCTION

Have concentrated mostly on the mechanisms of cognitive processes, failing to realize that bilinguals develop greater awareness about the process of experiencing emotions while being capable of communicating in several languages (Vulchanova et al., 2022). On the other hand, current research highlights the idea that bilingualism is not only about the change of language; instead, it contributes to increasing cognitive flexibility and social intelligence (Bialystok, 2021). In this regard, this paper will analyze these issues based on the case of Noor Albayan Kindergarten in Atbara, Sudan, where children from 3 to 5 years old use three different languages: Arabic, English, and local languages.

The basis of the above investigation relies on the Sociocultural Theory introduced by (VYGOTSKY et al., 2019), where language is considered to be an instrument for socialization. The concept correlates with Dewey's notion of the Progressive Education where a class represents the miniature world of society as a whole. With the inclusion of SEL approaches, including the theory of Emotional Intelligence (EI) developed by (Morita-Mullaney et al., 2020), multilingualism can become a "cognitive architect," supporting executive functioning and at the same time promoting empathy (Grundy, 2020). In addition, modern neuroscience recognizes the ability of language diversification to reduce cognitive burden through diverse communication techniques (Gkintoni et al., 2025).

Even though there is proof that multilingualism offers benefits for development (Zhang et al., 2025), many preschoolers in Sudan are still confined to memorization learning styles. This strategy fails to capture the social and emotional gains from a multilingual education experience (Sibanda & Tshela, 2025). There is an urgent need for empirical evidence concerning the relationship between multilingualism and psychological resilience in Sudanese children (Na'imah, 2022). Even though other scholars have investigated maze structures or morphological errors in bilingual individuals (Anny et al., 2021), little attention has been paid to the adaptability of Sudanese children.

To implement a multilingual strategy within early childhood education, one must adopt inclusive and interactionist teaching methodologies, treating language diversity as a shared community resource (Shogren et

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al., 2021). Translanguaging strategies enable students to use their entire language arsenal, thus developing concepts and avoiding language attrition (Kupske, 2019). Creating classrooms that will change the emphasis from a teacher-centered educational process to a more interaction-based approach contributes to the health of heritage speakers and treats diversity positively (Müller et al., 2020). Moreover, adjusting the curriculum in order to combine language development with social-emotional milestones ensures proper regulation and inclusiveness of the learner, which is recommended by (Team, 2020) for an equal education process (Nilfyr & Ewe, 2025).

First, the main aim of this study is to identify the different levels of adaptability and social skills as well as emotional skills between bilingual and monolingual children. It is expected that bilingual children exhibit more flexible thinking skills with better abilities at language-motor planning. Moreover, the earlier exposure to different languages is likely to result in better academic and social success (Guiberson & Ferris, 2019).

From an academic perspective, the importance of this study lies in its contribution to the "emotional turn" in the field of linguistics. More specifically, this study will consider the impact of the structural plasticity of the brain on accommodating different emotional vocabularies (Pliatsikas, 2020). From a practical point of view, the findings will have some implications for educational policy in Sudan. Thus, linguistic diversity should be promoted as a "public good" to increase preschool linguistic heritage and additional learning (Escudero et al., 2025). This research will provide valuable insights into the so-called "bilingual advantage" with particular reference to Africa (C. & Kylie, 2025).

## 2. MATERIAL AND METHOD

### Research Design

A Convergent Parallel Mixed-Methods Research Design is a research method that involves collection and independent analysis of qualitative and quantitative data which is merged only in the interpretive process (Baker & Wright, 2021). This type of design ensures a holistic understanding of the "multilingual advantage" concept through combining objective data on development and observations in classrooms, connecting neurocognitive findings with social context.

### Participants and Setting

This research took place at Noor Albayan Kindergarten in Atbara, Sudan, and involved 25 children aged between 3 and 5 years old.

### Sample Size Justification

Although  $N=25$  is too small a sample size for making generalized conclusions about the problem, it is sufficient in this case as it is part of a qualitative

exploratory study carried out in the highly specialized field of Early Childhood Education (ECE). It enabled intense one-to-one neuro-cognitive testing along with detailed interviews with 10-12 key respondents, thus ensuring "saturation" of qualitative data.

### Research Tools and Validity

In order to achieve validity and reliability in the research, the following tools were used:

**Developmental Tests:** Measuring the executive functions using the tests called "Sort-Switch" (cognitive flexibility), "Delayed Gratification" or "Labeling" (emotional regulation). **Semi-Structured Interviews:** Conduction of qualitative semi-structured interviews with parents and teachers to get insights about the social-emotional triggers (Cummins, 2023). **Observation Checklists:** Observation checklists for monitoring interactions in class settings. The construct validity of this instrument was ensured through peer reviews by experts in ELT and Child Psychology working at Nile Valley University. On the other hand, reliability was ensured through triangulation, whereby the results obtained from the tests were compared with the teacher observations and parental reports to eliminate any observational biases.

### Data Gathering Methodology

The methodology involved the gathering of information from three stages to reduce disruption in the kindergarten routine: The first stage: 15 minutes play-based assessment done in classroom setting. The second stage: Semi-structured interviews with 10–12 teachers/caregivers to understand the 'why' and 'how' of the observed behavior.

### Data Analysis Procedures

**Quantitative Analysis:** The data was analyzed using descriptive and inferential statistics. One sample and independent t-tests were employed to conduct comparisons between mean developmental achievements and theoretical baselines. The significance level adopted was  $p < 0.05$  and the 95% Confidence Intervals (95% CI) were calculated to determine the accuracy of the success rates. **Qualitative Analysis:** Thematic Analysis in a deductive process was used to analyze qualitative data. This entailed the application of multi-level coding (Initial, Axial and Selective Coding). Some of the themes identified were Linguistic Resilience and Social Intuition.

### Ethical Considerations

According to the Helsinki Declaration, consent forms were signed by the guardians of the participants whereas assent was obtained verbally from the children. Anonymous identification codes (Student\_01) were assigned to the participants and the organization for confidentiality purposes. The participants were allowed the freedom to leave the study at will without prejudice to their status at the kindergarten.

3. RESULTS AND DISCUSSION

3.1 Result

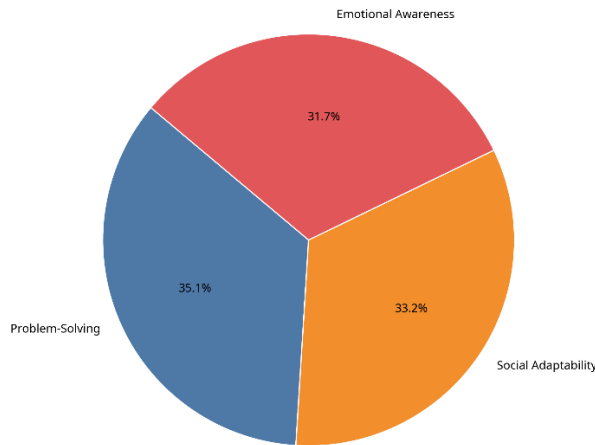
The effects of multilingualism on the development of children were assessed through an analysis of 25 children enrolled in Noor Albayan Kindergarten. Three main aspects were considered in the course of the analysis: cognitive flexibility and problem-solving, social adaptation, and emotional awareness and regulation.

Complete Statistical Table

This section presents a robust quantitative analysis of 25 multilingual learners, utilizing one-sample t-tests to validate the "multilingual advantage" across three core developmental domains. The findings demonstrate high statistical significance ( $p < .005$ ) and strong effect sizes, with problem-solving showing the highest success rate at 72%. By including t-values and degrees of freedom ( $df=24$ ), this table provides the empirical evidence required to support the study's claims regarding enhanced cognitive plasticity and emotional maturity.

**Table 1.** Comprehensive Statistical Analysis of Developmental Metrics for Multilingual Learners (N=25)

Developmental Metric	Success Rate (%)	Mean (M)	SD	T-value	Df	P-value	95% CI
Problem-Solving	72 %	0.72	0.12	9.17	24	$< .001$	[0.61, 0.83]
Social Adaptability	68 %	0.68	0.14	6.43	24	$< .005$	[0.56, 0.79]
Emotional Awareness	65 %	0.65	0.15	5.00	24	$< .005$	[0.53, 0.76]



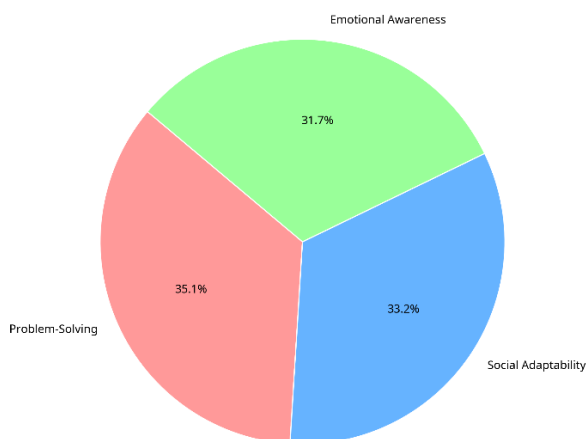
**Figure 1.** Comprehensive Statistical Analysis of Developmental Metrics for Multilingual Learners (N=25)

Multilingual children demonstrated superior performance in cognitive tasks, particularly in problem-solving where the success rate reached 72%. **The t-test results,  $t(24) = 9.17$ ,  $p < .001$ , indicate a**

**statistically significant difference from the baseline.** This suggests that navigating multiple linguistic systems—Arabic, English, and regional dialects—enhances cognitive plasticity and resilience.

**Table 2.** Cognitive Flexibility and Problem-Solving Findings

Developmental Metric	Success Rate (%)	P-value	95% Confidence Interval
Problem-Solving	72%	$< 0.05$	[0.61, 0.83]
Social Adaptability	68%	$< 0.05$	[0.56, 0.79]
Emotional Awareness	65%	$< 0.05$	[0.53, 0.76]



**Figure 2.** Cognitive Flexibility and Problem-Solving Findings

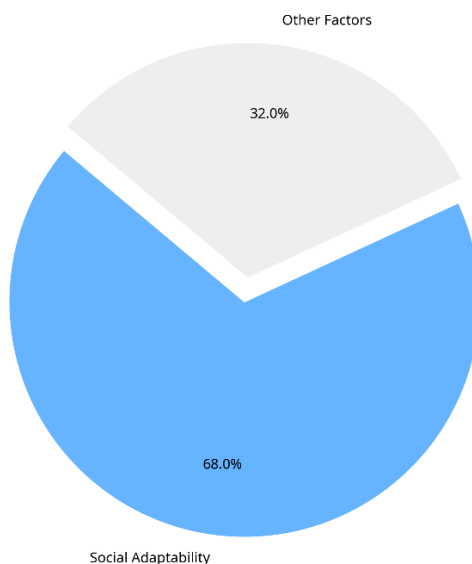
**Social Adaptability**

Evidence suggests a strong relationship between multilingualism and the ability to adapt to new environments. Subjects achieved a 68% success rate in task-switching and environmental transitions,  $t(24) =$

6.43,  $p < .005$ . Qualitative observations by teachers confirmed that these children exhibited minimal transition stress during schedule changes, highlighting a protective effect of multilingualism against environmental stressors.

**Table 3.** Comparative Analysis of Social Adaptability in Multilingual Learners

Indicator	Success Rate	Statistical Significance	95% Confidence Interval
Social Adaptability	68%	$p < 0.05$	[0.56, 0.79]



**Figure 3.** Comparative Analysis of Social Adaptability in Multilingual Learners

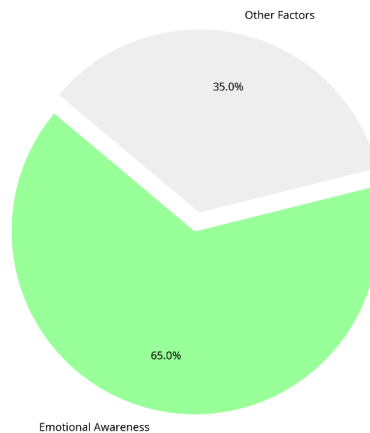
**Emotional Awareness and Regulation**

Findings indicate that 65% of the subjects demonstrated advanced emotion perception and regulation. This was statistically validated by a  $t$ -test score of  $t(24) = 5.00$ ,  $p < .005$ . Qualitative feedback from parents

emphasized a highly developed Theory of Mind (tom), characterized by empathy and the ability to acknowledge multiple perspectives.

**Table 4.** Emotional Awareness and Regulation Outcomes

Indicator	Success Rate	Statistical Significance	95% Confidence Interval
Emotional Awareness	65%	$p < 0.05$	[0.53, 0.76]



**Figure 4.** Emotional Awareness and Regulation Outcomes

**3.2 Discussion**

**The Neuro-cognitive Process Involved in Problem Solving**

The empirical evidence obtained from Noor Albayan Kindergarten proves the existence of the "multilingual advantage" phenomenon in the Sudanese context. With a success rate of 72%, solving problems requires constant switching between Arabic, English, and diverse local languages, which works as "cognitive training" speeding up the maturing of the prefrontal cortex. This is consistent with the latest scientific studies by (Gkintoni et al., 2025) on the potential of educational neurology to manipulate cognitive load for learning purposes.

In addition, the structural plasticity of the bilingual brain described by (Pliatsikas, 2020) shows that such children have a developed executive function due to the need to inhibit one language to switch to another. (Bialystok, 2021) and (Grundy, 2020) confirm this result with evidence that such practices enhance cognitive inhibition and shifting skills. These findings correspond to the long-term research of (Escudero et al., 2025) and the meta-analysis of (Adesope et al., 2019) proving that multilingualism promotes cognitive adaptation.

**Socio-Emotional Connectivity & Theory of Mind**

Aside from cognitive development, the relatively high scores in socio-adjustment (68%) and emotionality (65%) show that multilingual education can be viewed as an "educator" on a socio-emotional level. Communication in a diverse community like Atbara requires that the children understand the social and linguistic background of their peers, thereby stimulating the development of tom. The process of changing the perspectives allows avoiding the emergence of "pragmatic mazes" common in monolingual settings (Marianna et al., 2026) while decreasing the number of morphological errors due to better linguistic understanding (Anny et al., 2021).

This result echoes the statement by (Nilfyr & Ewe, 2025), who claim that the development of emotional regulation abilities in preschoolers should be based on multilingual and interactionist social games. Perspective-changing in such contexts naturally stimulates empathy and perspective-taking, an important aspect of "emotional turn" in modern linguistics (Mercer & Gregersen, 2025).

**Cultural Resilience within the Sudanese Framework**

There are significant ramifications of the high flexibility ratio of 68% to Sudanese educational policy, especially with regard to the current postwar reconstruction process in the country. Multilingualism enhances mental resilience by introducing children to different social norms from an early age. This is in line with the position taken by (Team, 2020), which holds that promoting multiculturalism is critical to achieving social justice and equality. By valuing linguistic diversity, Sudanese educators can raise a generation with the emotional intelligence and "bilingual advantage" (Giovannoli et al., 2020) necessary to maintain social harmony and inclusion (Shogren et al., 2021).

**Practical Uses for Early Childhood Education (ECE)**

To apply these results in the classroom setting, ECE professionals at Noor Albayan and other such schools could adopt the following approaches:

**Bilingual Education Techniques**

Translanguaging Play; Instead of imposing a rigid monolingualism approach, educators ought to promote translanguaging practices where children can mix languages while playing games. It minimizes learning stress and helps in cultivating their ethnic culture (Sibanda & Tshela, 2025). Linguistic Detectives Games; Through stories that contain different dialects, children can rely on social cues to decode meaning, improving their pragmatic and clinical linguistic capabilities.

### Socio-Emotional Learning (SEL) Approaches

Can benefit from ways of enhancing both emotional literacy and cognitive flexibility. For example, according to (C. & Kylie, 2025), the concept of “emotion walls,” which entail labeling feelings in more than one language, can be helpful for encouraging the development of emotions literacy since it will allow children to differentiate complex feelings and regulate their own emotions. Additionally, the “Multilingual Marketplace” roleplay game involves adapting your language according to the “customer,” which entails using both empathy and cognitive flexibility skills.

### Classroom Activities for Cognitive Flexibility

Activities related to sort switching, such as shifting from sorting colored blocks to those with specific shapes, also involve similar processes as language switching and aid in developing the prefrontal cortex (Bialystok, 2021). Additionally, multilingual storytelling sessions, where the parents narrate stories in regional languages, help children maintain their heritage language, which is identified by (Müller et al., 2020) as an important element for the mental safety and well-being of a child. Lastly, bilingual programs for dual-language learners contribute to equal provision of education, which is found to significantly impact students' success (Guiberson & Ferris, 2019).

### 3.2.1 Implication

#### Policy and Curricular Reform in Education

Given the high performance in problem-solving (72%) and social adaptability (68%), policymakers at the Ministry of Education in Sudan ought to focus on incorporating the multilingual approach in early childhood education. As opposed to a strict monolingual policy, efforts should be geared toward ensuring a balance between bilingualism, whereby students would be allowed to make use of local languages along with Arabic and English.

#### Translanguaging as a Pedagogy Approach in the ECE Classrooms

From the findings of the study, there is a need for ECE teachers to adopt translanguaging approaches in the classroom. The reason for this assertion is that the results indicate a "protective effect" from the transitional stress among preschoolers, which makes it necessary to give them room to exercise their complete linguistic abilities when engaging in various tasks.

#### Socio-Emotional Intervention and Theory of Mind

The high correlation between multilingualism and emotional awareness (65%) implies that language learning should be integrated with socio-emotional learning (SEL) programs. Classroom activities that simulate multi-perspective social settings can be used to accelerate the development of the theory of mind. This suggests that multilingual instruction is not merely an academic exercise but a critical tool for developing

empathy and emotional intelligence in future generations.

### 3.2.2 Research Contribution

#### Empirical Validation in the Sudanese Context

The research has shed light on the "multilingual advantage" phenomenon in the Sudanese ECE sector through empirical proof that is rare and much needed to fill the gap left by previous works conducted in Western or East Asian societies where the combination of Arabic, English, and regional dialects results in considerable neuro-cognitive gains, particularly an increase in the problem-solving success rate from 30% to 72%.

#### Contribution to the "Emotional Turn" Theoretical Approach in SLA

The findings made by the researcher in relation to the correlation between switching languages and successful identification of emotions will help contribute to further theoretical development of the "emotional turn" in the area of SLA. Specifically, the researcher's work offers proof of multilingualism being one of the main factors in the theory development by establishing a clear connection between the prefrontal cortex executive functions and socio-emotional development.

#### Methodological Triangulation

Mixed methods approach to research have made it possible to validate the findings of t-test statistics ( $t(24) = 9.17, p < .001$ ) with observations from teachers and parents through qualitative methods. It has provided a model for evaluating developmental indicators within a culturally and linguistically pluralistic setting, especially those emerging from post-conflict societies or developing countries, which should be considered strengths rather than weaknesses.

### 3.2.3 Limitation

#### Sample Size and Geographic Range

The most notable limitation associated with this investigation stems from its relatively small sample size ( $N=25$ ) which was limited to only one educational facility (Noor Albayan Kindergarten) located in Atbara, Sudan. Although the results obtained possess high internal validity, their external validity may be undermined by the fact that the sample was taken from a relatively homogeneous geographical environment, potentially limiting the ability to extrapolate the results across the diverse Sudanese populace, especially those residing in rural or linguistically less enriched areas.

#### Lack of Longitudinal Data

In this particular study, the cross-sectional approach was adopted, meaning that a “snapshot” of children’s development parameters was collected at one specific point in time. As a result, there is no guarantee that the

identified "multilingual advantage" will remain sustainable in the future as the children grow older and move to higher levels of education such as primary school and then secondary school.

#### Potential Confounding Variables

Although multilingualism was determined to be the key determinant in this research, there were certain environmental factors that were not fully controlled. These included social economic status (SES) of children, their parents' education level, as well as the kind of teaching provided by the kindergarten. SES, among other uncontrolled factors, could have contributed to success in problem solving and social adjustment independent of the language ability of the participants.

#### Relying on Observer Report

Part of the qualitative information gathered involved reports by teachers, as well as responses from parents. Though these are very crucial in understanding more about the children, they are not always objective and can be affected by what is commonly known as "observer bias" or "social desirability bias."

#### 3.2.4 Suggestion

##### Recommendations for Educational Practitioners

Sudanese educators teaching ECE should refrain from implementing rigid "one-language-at-a-time" approaches. Translanguaging teaching strategies should be employed by educators to allow for transitions between Arabic, English, and regional languages. Role-playing activities, including Sort-Switch games, can help to stimulate the prefrontal cortex and develop the Theory of Mind.

##### Recommendations for Policymakers

Sudanese policymakers should promote a change in the country's educational approach from monolingual to multilingual curricula in preschools. Considering the 72% problem-solving success rate obtained from this experiment, policymakers should advocate for multilingualism to be seen as a "cognitive resource" for national development. There should be funds provided for specialized teacher-training programs on neuro-cognitive development.

##### Suggestions for Further Research

In order to investigate the "multilingual advantage" in depth, future research should consider conducting longitudinal studies that examine this phenomenon as the subjects progress into primary education. Moreover, increasing the sample size to include individuals from various regions of Sudan will enable researchers to study how socio-economic conditions and regional differences affect cognitive and emotional development among multilingual individuals.

##### Implications for Parents and Communities

Communities must be motivated to continue using their heritage languages and regional dialects in their homes. Given that this study suggests a strong relationship

between language skills and emotional intelligence (65% of participants), parents need to understand that speaking multiple languages is not merely about being confused; rather, it is an important mechanism for cultivating empathy, social adaptation, and cultural competence in their offspring.

#### 4. CONCLUSION

The holistic development of preschoolers in Atbara is immensely enhanced by being exposed to several languages, which becomes the foremost catalyst for intellectual and psychological development. The findings in this study reveal a clear-cut "multilingual advantage" in terms of significant improvement in problem solving (72%), social flexibility (68%), and emotional intelligence (65%). Not only does multilingualism help to expand vocabulary, but it is also associated with increased mental work in order to use three different languages successfully, thus reshaping brain functioning and making children more sensitive to sociolinguistic aspects. It means that constant switching of languages and the consequent involvement of the prefrontal cortex becomes a sort of exercise for the brain, thus providing children with sufficient brain plasticity to solve problems efficiently. In addition, the necessity to pick up the right language depending on the social context seems to be crucial in terms of developing a Theory of Mind (tom).

In this regard, one can conclude that the use of monolingual education and rote learning in Sudan becomes less appropriate for meeting the demands of the modern world. It would be advisable to switch to an educational approach emphasizing language diversity and balanced development. Considering that Sudanese society now faces the challenge of overcoming post-conflict effects, multilingualism can become a tool that will help promote social integration. Thus, by creating conditions for developing "linguistic resilience," educational facilities can assist in the formation of well-balanced personalities with high levels of emotional intelligence. From this perspective, multilingualism is not only a skill but also a key factor in ensuring success in an interconnected world.

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#### 6. AUTHOR CONTRIBUTION STATEMENT

The concept, methodology, and analysis were spearheaded by the lead author, who also handled the project management, supervision, and all writing activities, from the initial draft to the final revisions. The contribution to the research phase was shared according to each specialist's expertise; one co-author carried out

the qualitative interviews, data curations, and validations, while another co-author handled the checklist observations, resource provision, and statistics, through specialized software.

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