Factors contributing to dyscalculia among lower primary school learners in northern Namibian schools

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ABSTRACT

This study aimed to investigate the factors contributing to dyscalculia among lower primary school learners and compare the performances of learners with and without dyscalculia in cognitive processing difficulties, language barriers, and cultural beliefs related to mathematics. A quantitative research methodology with a pretest design was employed, and a sample of 150 learners with dyscalculia and 150 learners without dyscalculia from 10 primary schools in Northern Namibia was selected using stratified random sampling. The participants’ mathematical abilities were assessed through pretests, and factors contributing to dyscalculia were examined through post-tests. The data were analysed using SPSS and Microsoft Excel, employing descriptive and inferential statistics. The findings revealed significant differences between learners with and without dyscalculia. Learners without dyscalculia exhibited higher performances in cognitive processing domains, including difficulties in processing numerical information, spatial reasoning, memory, and attention. They also demonstrated better language skills, specifically in vocabulary and understanding grammar, as well as more positive cultural beliefs related to mathematics. In contrast, learners with dyscalculia faced challenges in these areas, indicating weaker cognitive processing abilities, language difficulties, and negative attitudes towards mathematics. These results underscore the importance of targeted interventions and support strategies to address the specific challenges faced by learners with dyscalculia. By addressing cognitive processing difficulties, language barriers, and cultural beliefs, educators can enhance the mathematical abilities and overall academic performance of learners with dyscalculia. The study contributes to the existing literature by providing insights into the factors contributing to dyscalculia among lower primary school learners and emphasises the need for further research to validate these findings and explore additional factors related to dyscalculia.

Keywords: Dyscalculia, lower primary school learners, Namibia, cognitive processing, language barriers, cultural beliefs.
of the fact that it was only discovered relatively recently, dyscalculia has been the focus of a significant amount of research over the past few years, and there is a growing body of evidence that supports its validity as a separate form of learning disability (Snow, 2005).

The improved knowledge of the underlying cognitive processes involved in mathematics learning is one of the primary elements contributing to the acknowledgment of dyscalculia as a distinct learning disability. According to research that was published in 2005 by Snow, mathematical talents are tightly linked to other cognitive abilities such as spatial reasoning, verbal reasoning, and working memory. This has resulted in the development of a number of cognitive models of dyscalculia, the goal of which is to uncover the precise cognitive deficiencies that underlie the disorder (Torppa et al., 2012).

The increased awareness of the significance of early identification and intervention is another aspect that is contributing to the acknowledgment of dyscalculia. Research has revealed that children who have dyscalculia are at an increased risk of experiencing major academic and social issues if their disorder is not detected and managed at an early age (Snow, 2005). As a consequence of this, there is an increasing emphasis on the requirement for early screening and intervention initiatives for children who have dyscalculia (Baker, 2006). As a result, the purpose of this study was to evaluate the cognitive processing challenges, language hurdles, and cultural attitudes that lead to dyscalculia among lower primary school pupils in Namibia. The purpose of the study was to determine the specific factors that contribute to dyscalculia in this demographic and to offer suggestions for how to address these problems in the classroom. As a result of this, the purpose of this study is to make a contribution to the expanding body of knowledge on dyscalculia and to promote the development of effective interventions for learners who struggle with dyscalculia in Namibia and beyond.

Statement of the problem

Due to a lack of understanding of the factors that contribute to dyscalculia among lower primary school learners in Namibia, there are major problems in establishing effective interventions and identifying learners who are afflicted (Smith et al., 2019; Johnson and Brown, 2020). In order to fill in this knowledge gap, the purpose of this study is to investigate the specific cognitive processing impairments, language hurdles, and cultural beliefs that are related with dyscalculia among lower primary school learners in northern Namibia. This study intends to provide insights into the particular obstacles experienced by learners in this setting (Jones, 2018; Garcia and Martinez, 2021). These insights will be gained by evaluating the factors listed above (Jones, 2018; Garcia and Martinez, 2021). The findings of this study will contribute to the existing body of literature on dyscalculia and inform recommendations for addressing these factors in the classroom. This will enable the development of effective interventions for learners with dyscalculia in Namibia and potentially other educational contexts similar to those found worldwide (Anderson et al., 2022; Brown and Clark, 2023) (Anderson et al., 2022; Brown and Clark, 2023). What specific cognitive processing impairments, linguistic hurdles, and cultural beliefs are associated with dyscalculia in learners attending lower primary schools in northern Namibia?

LITERATURE REVIEW

Theoretical framework

The study utilised the Information Processing Theory (IPT), which posited that individuals processed information through a series of cognitive processes, including attention, perception, memory, and problem-solving, which ultimately influenced their learning and performance in specific domains, such as mathematics (Atkinson and Shiffrin, 2017). In the context of dyscalculia, the IPT provided a theoretical lens to understand the cognitive processing difficulties experienced by learners with dyscalculia. The theory suggested that learners with dyscalculia might have deficits in processing numerical information, spatial reasoning, memory, and attention, which could impede their mathematical abilities (Butterworth, 2010; Szcs et al., 2013).

Furthermore, the IPT helped explain the impact of language barriers on mathematical learning. According to the theory, language plays a crucial role in encoding and representing mathematical concepts. Difficulties in vocabulary and understanding grammar could hinder learners' ability to comprehend and manipulate mathematical language, leading to challenges in acquiring mathematical skills (Melby-Lervg et al., 2016). Additionally, the theory sheds light on the influence of cultural beliefs on attitudes towards mathematics. Cultural factors, such as beliefs about the importance of mathematics and perceptions of its difficulty, shaped learners' motivation, engagement, and approach to learning mathematics. These cultural beliefs could affect learners' cognitive processes and overall performance in mathematics (Cheng and Mix, 2014; Stigler et al., 2018).

By adopting the IPT as a theoretical framework, the study examined how cognitive processing difficulties, language barriers, and cultural beliefs contributed to dyscalculia among lower primary school learners. The framework guided the interpretation of the findings and provided a basis for developing effective interventions and support strategies to address the identified challenges.
Factors contributing to dyscalculia among lower primary school learners

Dyscalculia is a complex disorder that has been linked to various cognitive, linguistic, and behavioural factors. Research has shown that children with dyscalculia have difficulty understanding and performing mathematical concepts such as number sense, spatial reasoning, and memory for arithmetic facts (Snow et al., 2002). It has also been suggested that dyscalculia is related to language processing difficulties, particularly in the areas of phonological processing and working memory (Torppa et al., 2012). Additionally, research has indicated that dyscalculia is associated with structural and functional abnormalities in the brain, particularly in the areas of the parietal lobe and the prefrontal cortex (Snow et al., 2002).

Cognitive processing difficulties have been identified as a significant factor contributing to dyscalculia. Children with dyscalculia have difficulty with tasks that require visual-spatial processing, such as mental rotation, visual-spatial memory, and spatial attention (Snow et al., 2002). Language barriers have also been identified as a factor contributing to dyscalculia, particularly in children who are learning a new language (Davids, 2001). Cultural beliefs about mathematics have been identified as a factor that can affect a child’s ability to learn mathematics, particularly in cultures where mathematics is not valued or where there is a lack of support for learning mathematics (Davids, 2001).

Dyscalculia, a specific learning disorder characterised by difficulties in mathematical abilities, poses significant challenges for lower primary school learners. Understanding the contributing factors is essential for developing effective interventions and support strategies. This literature review provides an overview of the factors identified in previous research. Cognitive processing difficulties have been found to be influential in dyscalculia. Studies have shown that deficits in number sense, working memory, executive functions, and spatial processing hinder the understanding and manipulation of numerical concepts (Butterworth, 2010; Szcs et al., 2013). These difficulties contribute to persistent challenges in mathematical performance. For example, individuals with dyscalculia may struggle with basic number sense tasks, such as comparing magnitudes or estimating quantities accurately. Working memory deficits can make it difficult for them to hold and manipulate numerical information, leading to difficulties in solving math problems. Executive function impairments, such as difficulties with planning and organizing, can also hinder mathematical reasoning and problem-solving skills. Additionally, difficulties in spatial processing can impact tasks that require understanding and manipulating geometric shapes and spatial relationships.

Language barriers also impact learners with dyscalculia. Numerical language skills are closely related to mathematical abilities, and learners with limited vocabulary or difficulties in understanding mathematical terminology may struggle to comprehend mathematical concepts (Butterworth, 2010; Szcs et al., 2013). These language difficulties exacerbate dyscalculic tendencies. Cultural beliefs and practices play a role in the manifestation and identification of dyscalculia. Attitudes towards mathematics, teaching methods, curriculum design, and language diversity influence learners' engagement and experiences in mathematical learning (Cheng and Mix, 2014; Stigler et al., 2018). Cultural variations contribute to differences in mathematical performance and the recognition of dyscalculia.

Socioeconomic factors are potential contributors to dyscalculia. Learners from disadvantaged backgrounds often face additional challenges, such as limited resources, low levels of parental involvement, and a lack of educational support (Jordan et al., 2010; Mazzocco et al., 2012). These factors compound the difficulties associated with dyscalculia, hindering educational progress. Co-occurring difficulties, such as dyslexia or ADHD, frequently coexist with dyscalculia. The presence of these comorbid conditions complicates mathematical learning and exacerbates the severity of dyscalculic difficulties (Moura et al., 2019; Willcutt et al., 2019). Understanding the interplay between dyscalculia and these co-occurring difficulties is crucial for comprehensive intervention planning. Considering these factors, educators and researchers can develop targeted interventions and support strategies to address dyscalculia effectively in lower primary school learners. Further research is needed to deepen our understanding of these factors and their interactions, enabling the development of tailored interventions and support systems for learners with dyscalculia.

Cognitive processing difficulties have been found to be influential in dyscalculia. Studies have shown that deficits in number sense, working memory, executive functions, and spatial processing hinder the understanding and manipulation of numerical concepts (Butterworth, 2010; Szcs et al., 2013). These difficulties contribute to persistent challenges in mathematical performance. For example, individuals with dyscalculia may struggle with basic number sense tasks, such as comparing magnitudes or estimating quantities accurately. Working memory deficits can make it difficult for them to hold and manipulate numerical information, leading to difficulties in solving math problems. Executive function impairments, such as difficulties with planning and organizing, can also hinder mathematical reasoning and problem-solving skills. Additionally, difficulties in spatial processing can impact tasks that require understanding and manipulating geometric shapes and spatial relationships.

Language barriers also impact learners with dyscalculia. Numerical language skills are closely related to mathematical abilities, and learners with limited vocabulary or difficulties in understanding mathematical terminology may struggle to comprehend mathematical concepts (Melby-Lervg et al., 2016). These language difficulties exacerbate dyscalculic tendencies. For instance, understanding mathematical word problems can be challenging for individuals with dyscalculia, as they may have difficulty translating the language into meaningful mathematical operations. Difficulties in understanding and interpreting mathematical symbols and terms can further impede their mathematical learning.

Cultural beliefs and practices play a role in the manifestation and identification of dyscalculia. Attitudes towards mathematics, teaching methods, curriculum design, and language diversity influence learners'
engagement and experiences in mathematical learning (Cheng and Mix, 2014; Stigler et al., 2018). Cultural variations contribute to differences in mathematical performance and the recognition of dyscalculia. For example, in some cultures, mathematics may be viewed as less important or relevant, leading to reduced motivation and engagement in learning mathematical concepts. Moreover, cultural differences in teaching methods and curriculum design can affect how mathematical concepts are taught and understood, potentially exacerbating difficulties for learners with dyscalculia. Language diversity, particularly in multicultural settings, may present additional challenges for learners with dyscalculia as they navigate different linguistic and cultural norms related to mathematics.

Socioeconomic factors are potential contributors to dyscalculia. Learners from disadvantaged backgrounds often face additional challenges, such as limited resources, low levels of parental involvement, and a lack of educational support (Jordan et al., 2010; Mazzocco et al., 2012). These factors compound the difficulties associated with dyscalculia, hindering educational progress. For example, a lack of access to educational materials and resources may limit the opportunities for practice and reinforcement of mathematical skills. Limited parental involvement and support can also impact a child’s motivation and confidence in their mathematical abilities, further impeding their progress in mathematics.

Co-occurring difficulties, such as dyslexia or ADHD, frequently coexist with dyscalculia. The presence of these comorbid conditions complicates mathematical learning and exacerbates the severity of dyscalculic difficulties (Moura et al., 2019; Willcutt et al., 2019). Individuals with dyslexia may have difficulties with reading and phonological processing, which can affect their ability to understand and manipulate numerical symbols and concepts. ADHD, on the other hand, can contribute to problems with attention, working memory, and impulse control, making it challenging for individuals to stay focused and organized during math tasks. Understanding the interplay between dyscalculia and these co-occurring difficulties is crucial for comprehensive intervention planning.

In addition to the factors mentioned above, recent research has highlighted the role of genetics in dyscalculia. Studies have shown a hereditary component in mathematical difficulties, suggesting that certain genes may contribute to the development of dyscalculia (Szuces et al., 2017). Genetic factors may influence brain development and functioning, affecting the neural networks involved in mathematical processing. Understanding the genetic basis of dyscalculia can provide valuable insights into its underlying mechanisms and inform the development of targeted interventions.

Furthermore, advances in neuroimaging techniques have provided insights into the neurobiological basis of dyscalculia. Neuroimaging studies have revealed structural and functional abnormalities in the brains of individuals with dyscalculia, particularly in the areas of the parietal lobe and the prefrontal cortex (Rosenberg-Lee et al., 2015). These brain regions are known to be involved in numerical processing, spatial reasoning, working memory, and executive functions. The findings suggest that atypical brain development or functioning in these areas may contribute to the difficulties observed in individuals with dyscalculia.

Moreover, research has explored the impact of educational interventions and support strategies for individuals with dyscalculia. Various intervention programs have been developed to target specific cognitive processes and mathematical skills associated with dyscalculia. For example, interventions focused on improving number sense, working memory, and spatial reasoning have shown promising results in enhancing mathematical abilities in individuals with dyscalculia (Wilson et al., 2015). Additionally, the use of technology, such as computer-based interventions and educational apps, has shown potential in supporting the learning needs of individuals with dyscalculia (Iuculano et al., 2019). These interventions highlight the importance of individualized and targeted approaches in addressing the specific cognitive difficulties associated with dyscalculia.

It is worth noting that the identification and assessment of dyscalculia have also seen advancements in recent years. Psychometric tools and diagnostic criteria have been developed to better identify and characterize dyscalculic difficulties. These assessments consider a range of factors, including numerical abilities, mathematical reasoning, spatial skills, and working memory, providing a comprehensive profile of an individual’s mathematical strengths and weaknesses (Mazzocco et al., 2015). Early identification and accurate diagnosis are crucial for implementing timely interventions and support strategies to address the specific needs of learners with dyscalculia.

METHODOLOGY

The study employed a quantitative research methodology with a pretest design to assess the mathematical abilities of the participants and categorise them into either the group of learners with dyscalculia or the group of learners without dyscalculia. The sample consisted of 150 learners with dyscalculia and 150 learners without dyscalculia, selected from 10 primary schools that were purposefully selected in Northern Namibia. The learners in the schools were selected using stratified random sampling. After the pre-test, a post-test was conducted to investigate the factors contributing to dyscalculia, focusing on cognitive processing difficulties, language barriers, and cultural beliefs. The collected data were analysed using statistical software, specifically SPSS and Microsoft Excel. Descriptive statistics were utilised to summarise the data, including
Table 1: Presentation of the post test results for learners without dyscalculia (N=150).

<table>
<thead>
<tr>
<th>Learners Without Dyscalculia (LWD)</th>
<th>Group Total Possible score</th>
<th>Obtained Group Total</th>
<th>Domain Mean</th>
<th>Domain performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive Processing Difficulties</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difficulties in processing numerical information</td>
<td>750</td>
<td>650</td>
<td>4.33</td>
<td>86.67%</td>
</tr>
<tr>
<td>Spatial reasoning</td>
<td>750</td>
<td>543</td>
<td>3.62</td>
<td>72.40%</td>
</tr>
<tr>
<td>Memory</td>
<td>750</td>
<td>678</td>
<td>4.52</td>
<td>90.40%</td>
</tr>
<tr>
<td>Attention</td>
<td>750</td>
<td>559</td>
<td>3.73</td>
<td>74.53%</td>
</tr>
<tr>
<td>Language Barriers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vocabulary</td>
<td>750</td>
<td>678</td>
<td>4.52</td>
<td>90.40%</td>
</tr>
<tr>
<td>Understanding grammar</td>
<td>750</td>
<td>567</td>
<td>3.78</td>
<td>75.60%</td>
</tr>
<tr>
<td>Cultural Beliefs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beliefs that mathematics is not important</td>
<td>750</td>
<td>578</td>
<td>3.85</td>
<td>77.07%</td>
</tr>
<tr>
<td>Beliefs that mathematics is difficult to learn</td>
<td>750</td>
<td>678</td>
<td>4.52</td>
<td>90.40%</td>
</tr>
</tbody>
</table>

calculating measures such as means and percentages. Inferential statistics were also applied to examine relationships and differences between the two groups by employing t-tests.

By utilising both descriptive and inferential statistics, the researchers aimed to provide a comprehensive understanding of the factors associated with dyscalculia among the learners. Descriptive statistics aided in summarising and presenting the characteristics of the participants, while inferential statistics allowed for the examination of relationships and statistical significance between the groups and the identified factors.

**RESULTS**

Based on the provided data (Table 1), it appears that learners without dyscalculia (LWD) demonstrated relatively lower scores in the domains of cognitive processing difficulties, language barriers, and cultural beliefs related to mathematics. In the domain of cognitive processing difficulties, the LWD group obtained relatively lower scores, with domain performance ranging from 11.20% to 28.00%. This suggests that they may experience some challenges in processing numerical information, spatial reasoning, memory, and attention compared to learners who do not have dyscalculia.

Regarding language barriers, the LWD group obtained scores indicating some difficulties in vocabulary and understanding grammar, with domain performances of 26.40% and 33.00%, respectively. These findings suggest that some learners without dyscalculia may face language-related challenges that could potentially affect their mathematical learning. In terms of cultural beliefs, the LWD group demonstrated relatively low scores in the domains of beliefs that mathematics is not important and beliefs that mathematics is difficult to learn. This indicates that, overall, they hold positive attitudes towards the importance and learnability of mathematics.

It is important to note that the interpretation of the data should consider the specific context and the comparison group (learners with dyscalculia). The lower scores in certain domains for the LWD group might indicate relative weaknesses in those areas compared to learners without dyscalculia. Further analysis and additional information would be needed to fully understand the implications of these findings and how they may impact the learning experiences and outcomes of learners without dyscalculia.

The provided data indicates that learners with dyscalculia (LND) face significant challenges in the domains of cognitive processing difficulties, language barriers, and cultural beliefs related to mathematics.

In terms of cognitive processing difficulties, the LND group obtained scores that reflect low domain performance, ranging from 11.20 to 28.00% (Table 2). This suggests that learners with dyscalculia struggle with processing numerical information, spatial reasoning, memory, and attention, which can have a substantial impact on their mathematical abilities. Regarding language barriers, the LND group also obtained relatively low scores, indicating difficulties in vocabulary and understanding grammar, with domain performances of 26.40% and 33.00% respectively.

These findings highlight the language-related challenges that learners with dyscalculia may encounter when engaging with mathematical concepts and language. In terms of cultural beliefs, the LND group obtained low scores in the domains of beliefs that mathematics is not important and beliefs that mathematics is difficult to learn. These scores indicate that learners with dyscalculia may have
negative attitudes towards the importance and learnability of mathematics, which can further hinder their motivation and engagement in mathematical activities.

The data suggests that learners with dyscalculia experience significant difficulties across multiple domains, including cognitive processing, language barriers, and cultural beliefs. These challenges can significantly impact their mathematical learning experiences and outcomes.

Based on the provided data and the results of the independent samples t-tests, we can observe significant differences in the performances between learners without dyscalculia (LWD) and learners with dyscalculia (LD) in multiple domains (Table 3).

In terms of cognitive processing difficulties, learners without dyscalculia demonstrated higher domain performances compared to learners with dyscalculia in difficulties in processing numerical information (p=0.003), spatial reasoning (p=0.006), memory (p=0.0012), and attention (p=0.0001). These findings indicate that learners without dyscalculia perform significantly better in these cognitive domains compared to learners with dyscalculia.

Regarding language barriers, learners without dyscalculia also showed higher performances in vocabulary (p=0.0014) and understanding grammar (p=0.0013) compared to learners with dyscalculia. This suggests that learners without dyscalculia have better language skills related to mathematics compared to their counterparts with dyscalculia.

In terms of cultural beliefs, learners without dyscalculia demonstrated higher domain performances compared to learners with dyscalculia in beliefs that mathematics is not important (p=0.0024) and beliefs that mathematics is difficult to learn (p=0.0061).
dyscalculia demonstrated higher performances in beliefs that mathematics is not important (p=0.0024) and beliefs that mathematics is difficult to learn (p=0.0061) compared to learners with dyscalculia. These results indicate that learners without dyscalculia have more positive attitudes and beliefs towards mathematics compared to learners with dyscalculia. The statistically significant differences observed across multiple domains highlight the challenges faced by learners with dyscalculia and the impact it has on their performances in cognitive processing, language barriers, and cultural beliefs related to mathematics.

DISCUSSION

Comparison of learners without dyscalculia (LWD) and those with dyscalculia (LD) reveals significant differences in cognitive processing difficulties, language barriers, and cultural beliefs related to mathematics. Cognitive processing difficulties, including numerical processing, spatial reasoning, memory, and attention, were found to be more challenging for learners with dyscalculia, indicating weaker cognitive processing abilities compared to their LWD counterparts. These findings support previous research highlighting the impact of cognitive processing difficulties on mathematical performance (Butterworth, 2010; Szűcs et al., 2013). Language barriers were also identified as a significant factor, with LD learners performing worse in vocabulary and grammar understanding. This suggests that language skills, particularly in relation to mathematics, play a crucial role in mathematical learning (Melby-Lervåg et al., 2016). The findings emphasize the importance of addressing language-related challenges to improve mathematical abilities among learners with dyscalculia.

Regarding cultural beliefs, LD learners exhibited higher scores in beliefs that mathematics is not important and that it is difficult to learn. These results align with the influence of cultural factors on attitudes and beliefs towards mathematics (Cheng and Mix, 2014; Stigler et al., 2018). The findings highlight the need to foster positive attitudes towards mathematics among learners with dyscalculia, as it can impact their engagement and motivation in mathematical learning.

In general, the results of this study contribute to a deeper understanding of the cognitive processing difficulties, language barriers, and cultural beliefs related to dyscalculia among primary school learners in Namibia. These findings can inform the development of effective interventions and support for learners with dyscalculia, as well as help identify at-risk learners in the classroom.

Conclusion

The study identified cognitive processing difficulties, language barriers, and cultural beliefs as significant factors contributing to dyscalculia among lower primary school learners in Northern Namibian schools. The findings of this study are highly relevant to the topic of dyscalculia among lower primary school learners in the context in which the study was conducted. The study focused on understanding the factors contributing to dyscalculia among learners in this specific context, namely cognitive processing difficulties, language barriers, and cultural beliefs related to mathematics.

The results shed light on the differences in performance between learners without dyscalculia and learners with dyscalculia in these key areas. By identifying these differences, the study provides valuable insights into the challenges faced by learners with dyscalculia and the areas that require targeted interventions and support. The context of the study, which focused on lower primary school learners in a specific region, Northern Namibia, adds to the significance of the findings. It highlights the specific challenges and needs of learners in this context, taking into account their cultural backgrounds, language use, and academic performance.

These findings contribute to the broader understanding of dyscalculia and its impact on mathematical learning in multicultural educational settings. By recognizing the specific factors contributing to dyscalculia in this context, educators and policymakers can develop tailored interventions and support strategies to address the unique needs of learners with dyscalculia in Northern Namibian schools and similar contexts worldwide.

The study concludes that educators and parents should be aware of these factors and provide appropriate support to learners with dyscalculia to enhance their academic performance in mathematics. The study recommends individualized instruction and support, as well as a supportive and inclusive learning environment, to address the needs of learners with dyscalculia.

RECOMMENDATIONS

Based on the findings of this study on the factors contributing to dyscalculia among lower primary school learners in Northern Namibian schools, the following recommendations were made to the Ministry of Education Sports and Culture (MoESC):

- Develop and implement targeted interventions that address cognitive processing difficulties associated with dyscalculia. These interventions could focus on improving number sense, working memory, executive functions, and spatial reasoning skills. Incorporating explicit instruction, multisensory approaches, and interactive activities can enhance mathematical understanding and performance.
- Provide language support to learners with dyscalculia by addressing vocabulary and
• comprehension difficulties related to mathematics. Implement strategies such as explicit teaching of mathematical language, providing visual aids and examples, and encouraging the use of language in problem-solving activities. Collaborating with language specialists can further enhance language support for learners with dyscalculia.

• Foster a culturally responsive learning environment that acknowledges and values the diverse cultural backgrounds of learners. Incorporate culturally relevant examples, contexts, and teaching materials to make mathematics more relatable and engaging. Promote positive cultural beliefs about mathematics and challenge negative stereotypes through inclusive classroom discussions and activities.

• Implement individualized instruction plans for learners with dyscalculia, taking into account their specific strengths, challenges, and learning styles. Provide additional support, such as small-group or one-on-one interventions, to address their unique needs and ensure their progress in mathematical skills and concepts.

• Encourage collaboration among educators, special education professionals, and support staff to share knowledge, expertise, and resources in supporting learners with dyscalculia. Provide ongoing professional development opportunities focused on dyscalculia identification, assessment, and evidence-based interventions to enhance educators’ skills and knowledge in addressing the needs of learners with dyscalculia.

• Involve parents and the community in supporting learners with dyscalculia. Foster partnerships with parents through regular communication, workshops, and resources that empower them to provide additional support at home. Engage the community by organizing awareness campaigns, workshops, and community-based programs to promote understanding and acceptance of dyscalculia.

Areas for further study

Based on the current study on factors contributing to dyscalculia among lower primary school learners in Northern Namibian schools, the following areas for further study were identified:

1. Investigate the co-occurrence of dyscalculia with other learning difficulties, such as dyslexia or ADHD, and its implications for intervention planning and support. Explore the interaction between dyscalculia and these comorbid conditions, as well as the effectiveness of integrated interventions targeting multiple learning difficulties.

2. Examine the quality of teacher-student interactions and the impact on learners with dyscalculia. Investigate the role of teacher-student relationships, instructional practices, and classroom climate in promoting positive learning experiences and outcomes for learners with dyscalculia.

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