VOLUME 6

RIAGE
REVISTA IBERO-AMERICANA DE GERONTOLOGIA

Promoting Transversal Skills for Enhanced Quality of Life and Inclusion in people with Cognitive Deficits: A Bibliometric Analysis

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Informação do artigo
Recebido: 30/09/2024
Revisto: 30/10/2024
Aceite: 30/11/2024

ABSTRACT

This study aims to explore and analyze the existing literature on interventions promoting transversal skills (TS) to improve quality of life, well-being, and inclusion in individuals with cognitive needs. By employing advanced bibliometric techniques such as citation analysis and keyword mapping, academic publications were systematically examined across databases including the Online Knowledge Library (b-on), Web of Science (WoS), and PubMed. The selection criteria included publications in English or Portuguese that focused on programs developing transversal skills, such as memory, problem-solving, self-regulation, and cognitive flexibility, with an emphasis on health, well-being, and inclusion. The analysis demonstrated the effectiveness of a variety of interventions—cognitive training, physical activities, and creative interventions—that consistently showed improvements in executive functioning, memory, physical performance, and psychosocial well-being. Despite these findings, there remains a scarcity of comprehensive studies, with research on problem-solving and cognitive flexibility being more prevalent than on skills like self-directedness and creativity. Most studies focused on single interventions rather than multi-skill strategies or broader integration into cognitive support programs. The findings provide quantitative and qualitative insights into research trends and gaps, offering guidance for policymakers, practitioners, and educators. The study emphasizes the need for evidence-based guidelines and a more cohesive, interdisciplinary approach to research, advocating for increased collaboration and funding to explore under-researched areas. Ultimately, this research contributes to advancing interventions that enhance the quality of life and autonomy of individuals with cognitive deficits, particularly within the aging population.

Keywords: Bibliometric Analysis; Transversal Skills; Cognitive Needs; Elderly

INTRODUCTION

Transversal skills (TS), such as memory, cognitive flexibility, problem-solving, and self-regulation, are essential for the autonomy and well-being of individuals with cognitive deficits (Zimmerman, 2013). These skills enable individuals to navigate complex environments, fostering independence and meaningful community engagement. For those with cognitive impairments—such as older adults, individuals with autism spectrum disorder, or traumatic brain injury survivors—TS are crucial for adapting to daily challenges, improving quality of life, and facilitating social inclusion (Lancioni et al., 2020). Research increasingly highlights the value of both digital and non-digital interventions in developing these skills and enhancing cognitive health, physical function, and social inclusion (OECD, 2019).

Non-digital methodologies, such as person-centered approaches, task analysis, and social skills training, have proven effective in addressing specific challenges related to executive functioning, memory retention, and self-regulation (Ledford & Gast, 2018; Herrera et al., 2018). Digital tools, including assistive technologies, cognitive training apps, and virtual reality, offer interactive, adaptive learning environments that cater to individual needs (Lancioni et al., 2020). For example, virtual reality can simulate real-life situations, allowing individuals to practice decision-making and problem-solving in a safe space (Cunningham et al., 2020).

Cognitive interventions improve transversal skills, particularly memory, attention, and executive functioning, enhancing daily functioning and quality of life (Sala & Gobet, 2020). Weng et al. (2019) also found that working memory training enhances cognitive flexibility and problem-solving in individuals with mild cognitive impairments.

Creative activities like music therapy and art have shown promise in fostering TS by improving memory, executive function, and social engagement (Leggieri et al., 2019; Woods et al., 2021). Physical exercise, particularly aerobic activities, has also been linked to cognitive improvements, promoting neuroplasticity and resilience, especially in older adults (Stillman et al., 2020; Rosado et al., 2021).

Educators play a key role in ensuring the transferability of TS by guiding learning and providing social support, which facilitates the internalization and application of these skills in everyday life (Bandura, 1977; Stichter et al., 2019). However, there are gaps in the literature, particularly in adopting comprehensive, multi-skill approaches that integrate cognitive, physical, and social elements, as well as addressing younger populations and culturally diverse groups (Ritchie et al., 2021).

This study aims to explore and analyze existing interventions promoting transversal skills to enhance quality of life and inclusion for individuals with cognitive needs, addressing current gaps and providing insights into effective, adaptable strategies.

Transversal skills (TS), such as memory, cognitive flexibility, problem-solving, self-regulation, and self-directedness, are increasingly recognized as fundamental to the autonomy and well-being of individuals with cognitive deficits (Zimmerman, 2013). These skills allow individuals to navigate complex and ever-changing environments, empowering them to function independently and make meaningful contributions to their communities. For those with cognitive impairments—including older adults, individuals with autism spectrum disorder, traumatic brain injury survivors, and others facing age-related decline—transversal skills are crucial for adapting to daily challenges, engaging in social interactions,

and improving their overall quality of life (Lancioni et al., 2020). The growing body of research emphasizes the potential of both digital and non-digital interventions in developing these skills and highlights their impact on cognitive health, physical function, and social inclusion. Developing transversal skills improves cognitive functioning and, concomitantly, contributes to an increase in inclusion and well-being. (OECD, 2019). As societies increasingly emphasize inclusion and accessibility for people with cognitive deficits, there is a pressing need to ensure that interventions designed to build transversal skills are adaptable, scalable, and responsive to individual needs.

Non-digital and digital methodologies, intervention strategies have been developed to target TS. Non-digital interventions, such as person-centered approaches, task analysis, applied behavior analysis techniques, and social skills training, focus on personalizing instruction and provide structured and consistent support to the individual (Ledford & Gast, 2018), being effective for individuals with cognitive deficits, they offer tailored strategies to address specific challenges in areas like executive functioning, self-regulation, and memory retention. Visual supports, for example, can help break down complex tasks into manageable steps, while systematic instruction allows for step-by-step learning and skill reinforcement (Herrera et al., 2018).

Digital methodologies have gained prominence in recent years as a means of enhancing TS. Assistive technology, digital cognitive training, mobile applications, and virtual reality tools provide new opportunities for individuals with cognitive impairments to engage in interactive, adaptive learning (Lancioni et al., 2020). These tools leverage the power of technology to offer real-time feedback, customize learning experiences, and monitor progress, allowing individuals to practice cognitive tasks in a flexible and supportive environment. Virtual reality training for instance, can simulate real-life situations where individuals with cognitive deficits can practice decision-making and problem-solving skills in a controlled, low-stakes environment (Cunningham et al., 2020).

Cognitive interventions have been found to promote cognitive resilience and maintainess of independence among individuals facing cognitive challenges, they have demonstrated significant success in improving transversal skills, particularly in enhancing memory, attention, and executive functioning. Programs involving training designed to strengthen specific cognitive abilities generally result in improvements in daily functioning and overall quality of life (Diamond & Ling 2016) and can improve fluid intelligence and executive control, especially in older adults (Sala and Gobet 2020). Similarly, Weng et al. (2019) highlighted the effectiveness of working memory training in improving cognitive flexibility and problem-solving abilities in individuals with mild cognitive impairments.

Creative activities provide a unique platform for enhancing cognitive flexibility, emotional regulation, and social engagement. Music therapy can improved memory and executive functions, while drama and painting, have been shown to improve social engagement and emotional well-being (Leggieri et al. 2019; Woods et al., 2021), demonstrating the potential for creativity to foster the development of transversal skills in a holistic and engaging manner.

Physical exercise, is increasingly recognized for its cognitive benefits, which is another critical component of transversal skills development. Regular physical activity has been linked to improvements in memory, executive functions, and attentional control (Erickson et al., 2011).

Physical exercise, particularly aerobic activities, can enhance neuroplasticity and promote cognitive resilience, reducing the risk of neurodegenerative diseases and cognitive decline (Stillman et al., 2020). The positive effects of exercise on cognitive performance, particularly in older adults, have highlighted showing that combining physical and cognitive training can offer comprehensive benefits for individuals with both greater and lesser cognitive needs (Northey et al., 2018; Pereira et al., 2018; Rosado et al., 2021).

Ensuring their transferability across different contexts, is a challenge when promoting TS. In the teaching field, educators play a vital role in facilitating skills transferability across different contexts, guiding individuals through the learning process and helping them internalize new skills. (Stichter et al., 2019). Educators promote social learning and provide crucial social support, enabling individuals with cognitive needs to practice and generalize skills in supportive, interactive environments (Bandura, 1977). By fostering a strong foundation of mediation, learning, and social support, educators ensure that transversal skills are not only acquired but effectively transferred to everyday life.

Despite the above, there are still some gaps in the literature regarding the theme of the present study. Many studies focus on developing individual skills, such as memory or problem-solving, do not use comprehensive and multi-skill approaches integrating cognitive, physical, and social elements (Cunningham et al., 2020). Furthermore, the existing body of research predominantly focuses on older adults, with fewer studies exploring the impact of transversal skills interventions in younger populations or among diverse cultural and socioeconomic groups (Ritchie et al., 2021). Addressing these gaps is essential for developing more inclusive and effective interventions that meet the needs of a broader range of individuals with cognitive deficits.

Building on this understanding, this study aims to explore and analyze the existing literature on interventions promoting transversal skills to improve quality of life, well-being, and inclusion in individuals with cognitive needs. By examining multi-faceted, adaptable interventions, this study seeks to address existing gaps in the literature and provide insights into how TS can be effectively developed and applied across diverse contexts.

METHOD

This study employed a bibliometric analysis to explore the literature on interventions aimed at promoting TS in individuals with cognitive deficits. Bibliometric analysis allows for the identification of key themes, influential publications, and emerging trends by systematically mapping the structure of existing research. Following the guidelines outlined by Donthu et al. (2021), we used databases such as Web of Science and PubMed to analyze the evolution of TS interventions over time, focusing on aspects such as geographical distribution of research, author collaborations, and the number of publications. Data was gathered on key variables including the number, date, type, and geographical origin of the publications, along with their findings regarding the effectiveness of various skills training programs.

A blended methodology was used, combining a bibliometric approach with content analysis. The bibliometric analysis identified trends in published papers, the most prominent authors, and their respective works (Neely, 2005). The content analysis, following Bardin's (2008) approach, was then applied to identify and analyze the main variables related to transversal skills development—such as memory, problem-solving,

self-regulation, cognitive flexibility, and self-directedness.

The analysis proceeded in two steps. First, a quantitative analysis grouped publications by year and journal, with titles and abstracts entered into a Microsoft Excel database. Second, content analysis classified the articles according to whether they addressed the development of TS in adults with cognitive deficits. The selection of papers was conducted by two independent raters, with a third evaluator resolving any disagreements when consensus was not reached. This dual approach, along with the collaborative selection process, allowed for a comprehensive exploration of both the trends in the literature and the specific content related to TS interventions.

Data Collection

This study conducted a systematic review to explore articles on developing and enhancing transversal skills (TS)—memory, problem-solving, self-regulation, cognitive flexibility, and self-directedness—in adults with cognitive deficits. Searches in Online Knowledge Library (b-on), Web of Science (WoS), and PubMed yielded 58 articles using keywords: "Cognitive deficit," "Skills Training Programme," and "Adults or Aged or Elderly." After removing duplicates and applying inclusion criteria (English or Portuguese publications; programs developing TS in cognitive deficits; focus on health, well-being, inclusion), 8 articles were selected for detailed analysis.

RESULTS

The following sections illustrate the selection process and offer a detailed examination of the interventions, their outcomes, and their effectiveness in enhancing TS in diverse populations.

Selection Process

Figure 1- Identification, selection, and exclusion process of the articles.

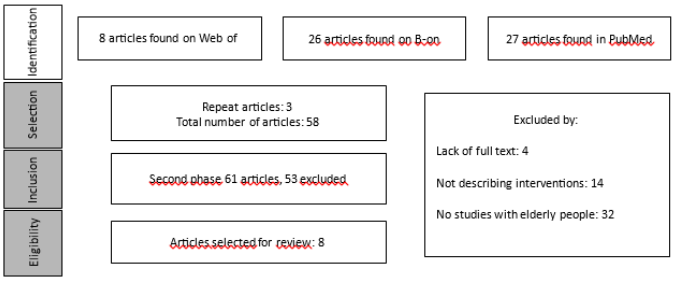

Figure 1 illustrates the selection process for the studies included in the bibliometric analysis. A total of 58 unique articles were identified through searches in the Online Knowledge Library (b-on), Web of Science, and PubMed databases. After removing duplicates and applying the predefined inclusion and exclusion criteria, 8 articles were selected for detailed analysis. The figure outlines the various stages of the selection process: initially, 61 articles were found across the three databases, and 3 duplicates were excluded. Of the 58 remaining articles, 53 were excluded after a rigorous screening process—4 due to the unavailability of full texts, 14 for not describing interventions, and 32 for not focusing on elderly populations, a key criterion of this study. Ultimately, the final 8 articles met all the inclusion criteria and were deemed eligible for review, ensuring their relevance to the analysis of interventions aimed at developing TS in individuals with cognitive deficits. In the database-specific searches, Web of Science yielded 8 articles, of which 1 was selected for analysis. The Online Knowledge Library (b-on) returned 26 articles, and 3 were included for review. Finally, PubMed identified 27 articles, and 4 were selected for detailed analysis.

The selected articles examined various interventions aimed at developing TS in individuals with cognitive deficits. These interventions targeted cognitive, physical, and psychosocial domains. The methodologies and key findings of

these studies are summarized in Table 1 and will be discussed in the following sections.

Table 1 - Summary of selected studies and interventions

Study	Sample (N)	Population	Intervention Type	Duration	Key Domains Targeted
Constantinidou F.	58	Persons with traumatic brain injury	Systematic Categorization Training	10-12 weeks	Perceptual and functional categorization, executive skills, attention, memory
Cordes et al.	1120	Nursing home residents	PROCARE: Multicomponent exercise program	16 weeks	Physical functioning, cognitive performance, psychosocial well-being
Baker-Ericzén et al.	8	Adults with autism spectrum	SUCCESS: Cognitive enhancement and social skills	6 months	Cognitive enhancement, social skills
Bugos & Wang	155	Older adults	Piano training	16 weeks (group sessions)	Executive functions, verbal fluency, psychosocial outcomes
Embon-Magal et al.	47	Community-dwelling older adults with cognitive impairment	TIM: Thinking in Motion (cognitive and motor training)	8 weeks (3 sessions per week)	Cognitive and motor performance, memory, executive control
Bongartz et al.	101	Geriatric patients with mild to moderate cognitive impairment	Home-based training (strength/power exercises, walking)	12 weeks	Motor performance, physical activity promotion
Beaudreau S. A.	46	Older adults	Psychotherapy (problem-solving vs. supportive)	12-week trial	Treatment response, remission in late-life depression
Cooper S. A.	21	Adults aged 50 years or older	Simvastatin (Alzheimer's disease prevention)	Longitudinal	Cognitive decline prevention, neuropsychology

The studies reviewed in Table 2 targeted cognitive, physical, and psychosocial domains to enhance transversal skills. Cognitive training aimed at improving functions like categorization, executive function, and problem-solving (Constantinidou 2019; Baker-Ericzén et al. 2018). Physical exercises combined cognitive tasks to enhance motor performance and health, highlighting the connection between physical and cognitive well-being (Cordes et al. 2019; Bongartz et al. 2017). Social and creative interventions included social skills training and creative activities, like piano lessons, which enhanced social interaction and emotional well-being (Baker-Ericzén et al., 2018; Bugos & Wang 2022). The interventions measured outcomes in several domains, all showing positive effects. Cognitive outcomes demonstrated sustained improvements in performance, particularly in those with traumatic brain injuries and autism (Constantinidou 2019; Baker-Ericzén et al. 2018). Physical outcomes from multicomponent exercises improved motor skills and activity levels, leading to better attention and memory (Cordes et al. 2019; Bongartz et al. 2017). Social and vocational outcomes showed increased employment rates and enhanced social skills (Baker-Ericzén et al., 2018). Psychosocial well-being was boosted through creative and motor tasks, impacting self-efficacy and social participation (Bugos & Wang 2022; Embon-Magal et al. 2022). Overall, cognitive training improved executive function and problem-solving, physical exercises benefited both health and cognition, and social/creative interventions enhanced cognitive and emotional well-being. However, limitations exist: few studies provided long-term data, and most focused on single skills rather than holistic approaches. Research primarily targeted older adults or those with autism, with limited diverse samples. More research is needed to explore real-world applications to develop practical, scalable interventions for broader use.

Discussion

The findings of this study provide an in-depth review of the literature, underscoring the importance of interventions that promote transversal skills to improve the quality of life, well-being, and inclusion of individuals with cognitive needs. The interventions reviewed—ranging from cognitive training to creative activities and physical exercises—consistently showed positive effects on cognitive, social, and physical functioning. These results support previous research on the value of such interventions for enhancing memory, executive function, and problem-solving skills (Sala & Gobet, 2020; Weng et al., 2019; Pereira et al., 2018).

For example, cognitive training programs, such as Constantinidou's (2019) categorization approach, improved cognitive flexibility and executive function. Similarly, Baker-Ericzén et al. (2018) showed that the SUCCESS program enhanced cognitive and social skills in adults with autism, highlighting the practical importance of transversal skills development.

Creative interventions, like the piano training in older adults demonstrated by Bugos and Wang (2022), contribute to cognitive and psychosocial well-being. These findings align with meta-analyses showing the benefits of music and arts-based therapies (Leggieri et al., 2019), offering an engaging alternative to traditional cognitive training.

Physical exercise also proved essential. Studies by Cordes et al. (2019) and Bongartz et al. (2017) found that multicomponent exercise programs significantly improved motor and cognitive performance. These results align with broader evidence on the benefits of physical activity for cognitive health, particularly in older adults (Northey et al., 2018).

However, there is limited research on the long-term sustainability of these interventions. Few studies include follow-up data to assess whether improvements in cognitive, social, and physical domains are maintained over time. Future research should prioritize longitudinal studies, particularly for populations with progressive cognitive impairments (Stillman et al., 2020).

Moreover, most studies focus on specific skills, such as memory or problem-solving, without adopting a holistic approach that addresses a broader range of transversal skills. An integrated approach, combining cognitive, physical, and social interventions, would better equip individuals with the tools needed to function effectively across different life domains (Giné-Garriga et al., 2020).

The lack of research on diverse populations also presents a notable gap. Most studies focus on older adults, with fewer exploring how these interventions could be adapted for younger or culturally diverse groups (Ritchie et al., 2021). Future research should address these limitations to ensure the broader applicability of interventions.

Finally, educators play a crucial role in the practical application of transversal skills interventions. Projects like TETRA-S, which aims to enhance educators' competencies in teaching transversal skills, are crucial for ensuring these interventions translate effectively into real-world settings (Zimmerman, 2013).

While this review provides valuable insights, it has limitations. It focused on English-language publications and peer-reviewed literature, potentially excluding relevant research in other languages or grey literature. Additionally, the heterogeneity of intervention methods and target populations across studies may limit the generalizability of the findings. Future research should aim to include more diverse populations and methodologies to better understand the effectiveness of transversal skills interventions.

The findings of this study provide a comprehensive analysis of the existing literature, highlighting the

relevance of interventions that promote transversal skills to enhance the quality of life, well-being, and inclusion of individuals with cognitive needs. The results of interventions reviewed in this study—spanning cognitive training, creative activities, and physical exercises—consistently demonstrated their positive impacts on cognitive, social, and physical functioning. These results align with research that supports the value of cognitive training, creative interventions, and multimodal exercise programs for improving memory, executive functions, and problem-solving skills (Sala & Gobet, 2020; Weng et al., 2019, Pereira et al., 2018; Young et. Al 2015). The effectiveness of cognitive training, like Constantinidou's (2019) categorization program, shows how structured, task-based methods can improve cognitive flexibility and executive function. Similar to the broader findings in cognitive science, these interventions confirm the ability of targeted training programs to enhance transversal skills over time (Diamond & Ling, 2016). Baker-Ericzén et al. (2018) also demonstrated that the SUCCESS program improved both cognitive and social skills in adults on the autism spectrum, with significant gains in employment outcomes, further underscoring the practical importance of transversal skills development.

Creative interventions, like piano training in older adults, demonstrated in the study by Bugos and Wang (2022), support the notion that creative activities contribute to both cognitive and psychosocial well-being. These findings echo the results of recent meta-analyses showing that music and arts-based therapies can improve memory, executive functioning, and emotional resilience (Leggieri et al., 2019). Such creative interventions offer an engaging and effective alternative to traditional cognitive training programs, making them a valuable part of transversal skills development.

Physical exercise also emerged as a key component of successful interventions. Studies such as those by Cordes et al. (2019) and Bongartz et al. (2017) found that multicomponent exercise programs led to significant improvements in both motor performance and cognitive functioning. These findings align with the broader literature, which highlights the benefits of physical activity on cognitive health, particularly in older adults (Northey et al., 2018; Stillman et al., 2020, Pereira et al., 2018). The combination of physical and cognitive tasks, seen in interventions like Thinking in Motion (Embon-Magal et al., 2022), illustrates the interconnectedness of physical and cognitive health and supports the argument for integrated approaches to promoting TS.

Despite the proven immediate benefits of the described interventions, there is still a gap in the literature about their long-term sustainability. Few studies, including those reviewed here, include follow-up data to assess whether improvements in cognitive, social, and physical domains are maintained over time. Future research should prioritize longitudinal studies to evaluate the durability of these benefits, particularly in populations with progressive cognitive impairments (Stillman et al., 2020).

This study also emphasizes the need for comprehensive, multi-skill interventions. While many of the reviewed studies focused on individual skills, such as memory or problem-solving, few adopted a holistic approach that addresses the full spectrum of transversal skills. An integrated approach that combines cognitive, physical, and social interventions would be essential to equip individuals with cognitive deficits with the tools they need to function effectively across different life domains, aligning with recent suggestions that multi-skill approaches yield more significant improvements in overall functioning (Giné-Garriga et al., 2020).

The lack of research involving diverse populations also presents a notable gap. Most studies have focused on elderly populations, while fewer have explored how TS interventions can be adapted for younger individuals or those from different cultural or socioeconomic backgrounds. This gap limits the generalizability of the findings and highlights the need for future research to explore how interventions can be tailored to different demographic groups (Ritchie et al., 2021).

Finally, the role of educators in facilitating the transferability of TS is a key factor in ensuring the real-world application of these interventions. Projects like the TETRA-S project, which focuses on enhancing educators' competencies in teaching TS, are directly relevant to this issue. By providing educators with the tools and strategies necessary to foster transversal skills in diverse learning environments, TETRA-S aims to bridge the gap between controlled interventions and practical applications (Zimmerman, 2013). This project's emphasis on both digital and non-digital tools for creating powerful learning environments further supports the need for adaptable, scalable interventions that can be implemented across various contexts.

While this study provides valuable insights through a bibliometric analysis of interventions promoting TS, there are several limitations that must be acknowledged. First, the scope of the literature review was confined to articles published in English, which may have excluded relevant research in other languages. Additionally, the databases used—Online Knowledge Library (b-on), Web of Science (WoS), and PubMed—though comprehensive, may not encompass all existing studies on TS interventions, particularly in niche or emerging fields. Another limitation is the focus on published peer-reviewed literature, which may introduce publication bias by overlooking relevant interventions reported in grey literature, such as conference papers or practitioner reports. Finally, this analysis did not account for the heterogeneity of the intervention methods and target populations across studies, which may limit the generalizability of the findings to specific demographic or cultural groups. Future research should consider expanding the scope to include more diverse populations and methodologies to gain a more comprehensive understanding of TS interventions.

CONCLUSION

This study underscores the effectiveness of diverse interventions to develop transversal skills (TS) in individuals with cognitive deficits. Cognitive training, physical activities, and creative interventions showed improvements in executive functioning, memory, physical performance, and psychosocial well-being. These findings support holistic approaches that address both cognitive and physical needs, particularly in elderly populations and those with conditions like autism or traumatic brain injury.

The review identified gaps, such as a lack of long-term studies and multi-skill interventions, suggesting that while immediate benefits exist, their long-term impact remains unclear. Future research should develop comprehensive programs targeting multiple TS and include diverse populations.

Projects like TETRA-S aim to bridge these gaps by equipping educators to teach TS effectively across digital and non-digital settings. Overall, interventions targeting TS can improve cognitive, social, and physical functioning. To maximize benefits, flexible, multi-faceted programs adaptable to different contexts are essential for enhancing autonomy, well-being, and inclusion in everyday life.

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O(s) autor(es) declara(m) que não há conflito de interesse.