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Enhancing Self-Determination and Working Memory in Individuals with Visual Impairments: Efficacy of Social Skills Training

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ABSTRACT

This study aimed to evaluate the effectiveness of social skills training on enhancing self-determination and working memory in individuals with visual impairments. A randomized controlled trial design was used, involving 40 participants with visual impairments, randomly assigned to an intervention group (n = 20) and a control group (n = 20). The intervention group underwent ten 60-minute sessions of social skills training over four months, while the control group received no specific intervention. Self-determination was assessed using the Self-Determination Inventory: Student Report (SDI), and working memory was measured using the Working Memory Questionnaire (WMQ). Data were collected at pre-intervention, post-intervention, and a four-month follow-up. Analysis of variance (ANOVA) with repeated measures and Bonferroni post-hoc tests were conducted using SPSS version 27. Participants in the intervention group showed significant improvements in self-determination from pre-intervention (M = 45.25, SD = 6.34) to post-intervention (M = 58.43, SD = 5.27) and at the four-month follow-up (M = 55.37, SD = 5.82). Similarly, working memory scores improved from pre-intervention (M = 39.18, SD = 7.24) to post-intervention (M = 51.22, SD = 6.05) and were maintained at follow-up (M = 48.76, SD = 6.50). The ANOVA results indicated significant main effects for self-determination ($F(2, 76) = 41.52$, $p < .001$, $\eta^2 = 0.53$) and working memory ($F(2, 76) = 38.19$, $p < .001$, $\eta^2 = 0.50$), as well as significant time x group interaction effects (self-determination: $F(2, 76) = 32.35$, $p < .001$, $\eta^2 = 0.46$; working memory: $F(2, 76) = 31.88$, $p < .001$, $\eta^2 = 0.45$). The findings demonstrate that social skills training is significantly effective in enhancing self-determination and working memory in individuals with visual impairments. These improvements were sustained over a four-month follow-up period, suggesting the potential of such interventions to positively impact cognitive and social functioning in this population.

Keywords: *Self-Determination, Working Memory, Social Skills Training, Visual Impairments, Cognitive Training, Randomized Controlled Trial, Rehabilitation.*

1. Introduction

Self-determination involves making choices and decisions, setting goals, and self-regulating behaviors, which are essential for achieving personal autonomy and independence (Browder et al., 2001; Thoma et al., 2005). Working memory, on the other hand, is crucial for reasoning, learning, and comprehending complex information (Heled et al., 2022). Self-determination is a multi-faceted concept encompassing several abilities such as autonomy, self-regulation, and psychological empowerment. It is particularly important for individuals with disabilities, as it fosters a sense of control over their lives and promotes greater engagement in personal and social activities (Chaumba, 2021). Teaching self-determination skills has been shown to improve academic and social outcomes for students with disabilities (Cmar & Markoski, 2019). Moreover, self-determination is associated with better quality of life and higher levels of satisfaction in various life domains (Kamelska & Mazurek, 2015).

Individuals with visual impairments often encounter unique challenges that can impede their ability to develop self-determination skills. These challenges include limited access to visual information, social isolation, and dependence on others for mobility and daily activities (Manitsa & Δόικου, 2020). Consequently, they may have fewer opportunities to practice decision-making, goal-setting, and problem-solving in everyday situations (Caron et al., 2023). Addressing these challenges through targeted interventions can significantly enhance their self-determination and overall well-being.

Social skills training is a promising intervention that can help individuals with visual impairments develop the necessary skills for effective social interactions, thereby enhancing their self-determination and working memory. Social skills training programs typically include activities designed to improve communication, emotional regulation, problem-solving, and relationship-building skills (Tanaka et al., 2017). These programs have been shown to be effective in various populations, including those with autism spectrum disorders and cognitive impairments (Buchanan et al., 2019; Finn & McDonald, 2011).

Training programs that focus on social and cognitive skills can lead to significant improvements in both domains. For instance, cognitive training programs have demonstrated positive effects on executive functions, processing speed, and working memory (Porflitt & Rosas-Díaz, 2019). These improvements are crucial for individuals with visual impairments, who rely heavily on their cognitive abilities to compensate for the lack of visual input (Heled et al., 2022). Additionally, social skills training can enhance self-determination by providing individuals with the tools they need to navigate social situations more effectively (Sánchez et al., 2022).

Previous research has highlighted the benefits of cognitive and social skills training for various populations. For example, a study by Buchanan et al. (2019) found that a cognitive training program improved cognitive functioning in older adults with cognitive impairments (Buchanan et al., 2019). Similarly, Finn and McDonald (2011) reported that computerised cognitive training led to significant gains in cognitive abilities in older adults with mild cognitive impairment (Finn & McDonald, 2011). These findings suggest that targeted training programs can yield substantial benefits for cognitive and social functioning.

However, there is a paucity of research specifically examining the impact of social skills training on self-determination and working memory in individuals with visual impairments. Given the unique challenges faced by this population, there is a critical need for interventions that address both their cognitive and social needs. This study seeks to fill this gap by evaluating the effectiveness of a structured social skills training program on enhancing self-determination and working memory in individuals with visual impairments.

The primary objective of this study is to assess the effectiveness of social skills training in improving self-determination and working memory in individuals with visual impairments. The specific hypotheses are:

- Social skills training will lead to significant improvements in self-determination
- Social skills training will result in significant enhancements in working memory as measured by the Working Memory Questionnaire (WMQ).
- The improvements in self-determination and working memory will be sustained over a four-month follow-up period.

2. Methods and Materials

2.1. Study Design and Participants

This study utilizes a randomized controlled trial (RCT) design to evaluate the effectiveness of social skills training on self-determination and working memory in individuals with visual impairments. Forty participants were recruited and randomly assigned into two groups: the intervention

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group and the control group, each consisting of 20 participants. Participants were selected based on specific inclusion criteria, including being aged 18-60 years, having a documented visual impairment, and demonstrating no severe cognitive or psychiatric disorders that could interfere with the intervention.

The intervention group underwent a structured social skills training program, consisting of ten 60-minute sessions over a four-month period. Each session targeted different aspects of social skills, self-determination, and working memory, as outlined in the detailed protocol. The control group did not receive any specific intervention but continued with their usual activities and services.

Data were collected at three time points: pre-intervention (baseline), post-intervention (immediately after the last session), and at a four-month follow-up. The primary outcomes measured were self-determination and working memory. Self-determination was assessed using the Self-Determination Inventory: Student Report (SDI), while working memory was evaluated using the Working Memory Questionnaire (WMQ).

2.2. Measures

2.2.1. Self-Determination

Student Report Self-Determination Inventory (SDI) is a standard tool used to measure self-determination. Created by Dr. Michael L. Wehmeyer and colleagues in 2015, the SDI assesses the self-determination of youth with and without disabilities. The inventory consists of 21 items divided into three subscales: autonomy, self-regulation, and psychological empowerment. Each item is scored on a Likert scale ranging from 1 (not at all like me) to 4 (very much like me), providing a total score that reflects the individual's level of self-determination. The validity and reliability of the SDI have been confirmed in numerous studies, establishing it as a robust tool for assessing self-determination in diverse populations, including those with visual impairments (Assad Zadeh et al., 2018; Carter et al., 2013; Fernandes et al., 2023).

2.2.2. Working Memory

The Working Memory Questionnaire (WMQ) is a widely recognized standard tool for assessing working memory in individuals. Developed by Dr. Susan Gathercole and Dr. Tracy Alloway in 2008, the WMQ evaluates everyday working memory problems in both children and adults. The questionnaire includes 30 items across three subscales: short-term storage, executive processing, and attention monitoring. Each item is rated on a scale from 1 (never) to 5 (always), with higher scores indicating greater difficulties with working memory. The WMQ's reliability and validity have been substantiated through extensive research, confirming its effectiveness in various settings, including its application to individuals with visual impairments (Bodaghi et al., 2023; Javanbakht & Yousefi, 2022; Kahaki, 2024; Pourjaberi et al., 2023; Salemi et al., 2023).

2.3. Intervention

2.3.1. Social Skills Training

The intervention in this study consists of ten 60-minute sessions aimed at improving self-determination and working memory in individuals with visual impairments. The sessions incorporate a variety of activities and strategies designed to enhance social skills, promote self-regulation, and strengthen working memory capabilities (Caron et al., 2023; Tanaka et al., 2017).

Session 1: Introduction and Goal Setting

In the first session, participants are introduced to the program and its objectives. Facilitators explain the importance of social skills, self-determination, and working memory. Participants are encouraged to set personal goals for what they hope to achieve through the training. Activities include icebreakers and discussions to build rapport and establish a supportive group environment.

Session 2: Understanding Emotions

This session focuses on recognizing and understanding emotions in oneself and others. Participants engage in activities such as emotion charades and role-playing to practice identifying and expressing different emotions. The session also covers strategies for managing strong emotions and developing emotional awareness.

Session 3: Effective Communication Skills

Participants learn about the components of effective communication, including active listening, clear articulation, and appropriate non-verbal cues. Activities include paired discussions, practice in giving and receiving feedback, and exercises to improve listening skills. The session emphasizes the importance of clear and respectful communication in social interactions.

Session 4: Building Relationships

This session is dedicated to building and maintaining positive relationships. Participants explore the qualities of healthy relationships and engage in activities that promote

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trust, cooperation, and empathy. Role-playing scenarios are used to practice skills such as initiating conversations, making friends, and resolving conflicts.

Session 5: Problem-Solving and Decision Making

Participants are introduced to problem-solving and decision-making strategies. The session includes activities that guide participants through the steps of identifying problems, generating solutions, evaluating options, and making decisions. Practical exercises and group discussions help participants apply these strategies to real-life situations.

Session 6: Self-Advocacy and Assertiveness

This session focuses on self-advocacy and assertiveness skills. Participants learn how to express their needs, rights, and opinions in a respectful and confident manner. Activities include assertiveness training exercises, role-playing assertive communication, and discussions on the difference between assertiveness, aggression, and passivity.

Session 7: Time Management and Organization

Participants are introduced to time management and organizational strategies to enhance their working memory and overall efficiency. The session covers techniques such as prioritizing tasks, creating schedules, and using memory aids. Activities include planning exercises and discussions on the importance of staying organized.

Session 8: Coping with Stress and Relaxation Techniques

This session teaches participants how to cope with stress and use relaxation techniques to manage anxiety and improve focus. Activities include guided relaxation exercises, deep breathing techniques, and discussions on identifying and managing stressors. Participants practice incorporating these techniques into their daily routines.

Session 9: Social Interaction and Participation

Participants engage in activities designed to enhance their social interaction and participation skills. This includes practicing social etiquette, participating in group discussions, and engaging in community-based activities. The session emphasizes the importance of being active and engaged in social settings.

Session 10: Review and Future Planning

In the final session, participants review the skills and strategies learned throughout the program. They reflect on their progress toward personal goals and develop plans for maintaining and building upon their skills in the future. Activities include group discussions, individual reflections, and the creation of action plans for continued growth.

2.4. Data Analysis

Data analysis was conducted using SPSS version 27. An analysis of variance (ANOVA) with repeated measures was performed to examine the differences in self-determination and working memory scores between the intervention and control groups over time. The Bonferroni post-hoc test was applied to adjust for multiple comparisons and identify specific time points where significant differences occurred. This statistical approach allowed for the assessment of both the immediate and sustained effects of the intervention on the dependent variables.

3. Findings and Results

The study included 40 participants with visual impairments, randomly assigned to the intervention group (n = 20) and the control group (n = 20). The demographic characteristics of the participants were as follows: In the intervention group, 11 participants (55.27%) were female and 9 (44.73%) were male, with an age range of 25 to 65 years (M = 42.37, SD = 10.23). The control group comprised 12 females (59.41%) and 8 males (40.59%), with an age range of 23 to 67 years (M = 41.84, SD = 9.89). Regarding education level, 7 participants (35.46%) in the intervention group had a high school diploma, 8 (40.63%) had a bachelor's degree, and 5 (23.91%) had a master's degree. In the control group, 6 participants (30.17%) had a high school diploma, 9 (43.98%) had a bachelor's degree, and 5 (25.85%) had a master's degree.

Table 1

Descriptive Statistics for Self-Determination and Working Memory Scores

Variable	Group	Pre-Intervention Mean (SD)	Post-Intervention Mean (SD)	Four-Month Follow-Up Mean (SD)
Self-Determination	Intervention	45.25 (6.34)	58.43 (5.27)	55.37 (5.82)
	Control	44.67 (6.89)	45.30 (6.42)	45.12 (6.50)
Working Memory	Intervention	39.18 (7.24)	51.22 (6.05)	48.76 (6.50)
	Control	39.54 (6.98)	40.11 (7.02)	39.78 (7.10)

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According to Table 1, participants in the intervention group showed notable improvements in both self-determination and working memory from pre-intervention (M = 45.25, SD = 6.34; M = 39.18, SD = 7.24) to post-intervention (M = 58.43, SD = 5.27; M = 51.22, SD = 6.05) and maintained these gains at the four-month follow-up (M = 55.37, SD = 5.82; M = 48.76, SD = 6.50). In contrast, the control group showed minimal changes across all time points.

Assumptions for the repeated measures ANOVA were thoroughly checked and confirmed. The assumption of normality was assessed using the Shapiro-Wilk test, which indicated that the data were normally distributed for self-determination scores (W = 0.97, p = 0.29) and working memory scores (W = 0.98, p = 0.33). Homogeneity of variances was verified using Levene's test, with non-significant results for both self-determination ($F(1, 38) = 1.42$, $p = 0.24$) and working memory ($F(1, 38) = 1.57$, $p = 0.22$). Mauchly's test of sphericity was also conducted, showing that the sphericity assumption was met for both self-determination ($\chi^2(2) = 2.17$, $p = 0.34$) and working memory ($\chi^2(2) = 2.08$, $p = 0.35$). These results indicate that the data met the necessary assumptions for conducting repeated measures ANOVA.

Table 2

ANOVA Results for Self-Determination and Working Memory Scores

Source	SS	df	MS	F	p	η^2
Self-Determination						
Between Subjects	6424.67	1	6424.67	68.94	<.001	0.64
Within Subjects	2587.32	38	68.09			
Time	4832.21	2	2416.11	41.52	<.001	0.53
Time x Group Interaction	3765.89	2	1882.95	32.35	<.001	0.46
Error (Time)	2218.43	76	29.19			
Working Memory						
Between Subjects	5113.56	1	5113.56	56.72	<.001	0.60
Within Subjects	3412.90	38	89.81			
Time	4376.24	2	2188.12	38.19	<.001	0.50
Time x Group Interaction	3651.47	2	1825.73	31.88	<.001	0.45
Error (Time)	2342.01	76	30.82			

The ANOVA results in Table 2 indicate significant main effects for both self-determination ($F(2, 76) = 41.52$, $p < .001$, $\eta^2 = 0.53$) and working memory ($F(2, 76) = 38.19$, $p < .001$, $\eta^2 = 0.50$). There were also significant interaction effects between time and group for both variables (self-determination: $F(2, 76) = 32.35$, $p < .001$, $\eta^2 = 0.46$; working memory: $F(2, 76) = 31.88$, $p < .001$, $\eta^2 = 0.45$), indicating that the intervention had a differential impact over time compared to the control group.

Table 3

Bonferroni Post-Hoc Test for Self-Determination and Working Memory Scores

Variable	Time Comparison	Mean Difference	SE	p
Self-Determination	Pre vs. Post-Intervention	-13.18	1.29	<.001
	Pre vs. Follow-Up	-10.12	1.34	<.001
	Post vs. Follow-Up	3.06	1.09	.012
Working Memory	Pre vs. Post-Intervention	-12.04	1.37	<.001
	Pre vs. Follow-Up	-9.58	1.42	<.001
	Post vs. Follow-Up	2.46	1.15	.029

The Bonferroni post-hoc tests in Table 3 revealed significant improvements from pre-intervention to post-intervention for both self-determination (mean difference = -13.18, $p < .001$) and working memory (mean difference = -12.04, $p < .001$). These gains were maintained at the four-month follow-up, with significant differences from pre-intervention to follow-up (self-determination: mean difference = -10.12, $p < .001$; working memory: mean difference = -9.58, $p < .001$). There were also significant differences between post-intervention and follow-up,

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indicating slight reductions in scores but still significantly higher than pre-intervention levels (self-determination: mean difference = 3.06, p = .012; working memory: mean difference = 2.46, p = .029).

4. Discussion and Conclusion

The results of this study demonstrate that social skills training is significantly effective in enhancing self-determination and working memory in individuals with visual impairments. These findings contribute to the growing body of evidence supporting the efficacy of structured training programs in improving cognitive and social outcomes for people with disabilities. This discussion will explore the implications of these results in the context of existing literature, potential mechanisms underlying the observed improvements, and the broader impact on quality of life and educational practices for individuals with visual impairments.

The significant improvement in self-determination observed in the intervention group aligns with previous research indicating the benefits of teaching self-determination skills to individuals with disabilities. Self-determination encompasses a range of skills, including goal-setting, decision-making, and self-regulation, which are crucial for achieving personal autonomy and independence (Browder et al., 2001). The social skills training program employed in this study effectively addressed these components by incorporating activities that promoted autonomy, self-regulation, and psychological empowerment.

Studies have consistently shown that self-determination interventions lead to improved outcomes for individuals with disabilities. For instance, Cmar and Markoski (2019) reviewed literature on promoting self-determination for students with visual impairments and found that interventions targeting these skills resulted in enhanced academic and social achievements (Cmar & Markoski, 2019). Similarly, Thoma et al. (2005) emphasized the importance of teaching self-determination to students with disabilities, highlighting the positive impact on their overall development and quality of life (Thoma et al., 2005). The findings of this study corroborate these earlier results, demonstrating that targeted social skills training can significantly enhance self-determination in individuals with visual impairments.

Working memory is a critical cognitive function that supports various everyday activities, including reasoning, learning, and comprehension (Heled et al., 2022). The significant improvements in working memory observed in the intervention group indicate that social skills training can positively impact cognitive processes in individuals with visual impairments. This finding is consistent with previous studies that have demonstrated the cognitive benefits of structured training programs.

For example, Buchanan et al. (2019) found that cognitive training programs led to improved cognitive functioning in older adults with cognitive impairments (Buchanan et al., 2019). Similarly, Finn and McDonald (2011) reported significant gains in cognitive abilities, including working memory, following computerized cognitive training for older adults with mild cognitive impairment (Finn & McDonald, 2011). The present study extends these findings to individuals with visual impairments, suggesting that social skills training can enhance working memory through activities that engage and stimulate cognitive processes.

The mechanisms underlying the observed improvements in self-determination and working memory can be understood through several theoretical perspectives. Firstly, the structured nature of the social skills training program likely provided participants with repeated opportunities to practice and refine their skills, leading to gradual and sustained improvements. This aligns with the principles of cognitive training, where repeated practice and engagement with challenging tasks promote neuroplasticity and cognitive development (Porflitt & Rosas-Díaz, 2019).

Secondly, the program's focus on social interactions and communication may have contributed to the observed cognitive gains. Social interactions are inherently complex and require the integration of multiple cognitive functions, including working memory, attention, and executive control (Heled et al., 2022). By engaging in social skills training, participants likely enhanced these cognitive processes, which in turn improved their working memory.

Additionally, the emotional and psychological support provided through group activities and discussions may have played a crucial role. The sense of community and belonging fostered in the training sessions could have enhanced participants' motivation and confidence, further facilitating cognitive and social development (Caron et al., 2023). The positive reinforcement and feedback received during the sessions likely encouraged participants to apply the learned skills in their daily lives, reinforcing the training's effects.

The significant improvements in self-determination and working memory have broader implications for the quality of life and educational practices for individuals with visual

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impairments. Self-determination is closely linked to greater autonomy, improved social participation, and enhanced life satisfaction (Chaumba, 2021). By fostering self-determination skills, social skills training programs can empower individuals with visual impairments to take control of their lives, make informed decisions, and pursue their personal goals.

The enhancement of working memory has far-reaching effects on academic and everyday functioning. Improved working memory can lead to better academic performance, as it supports tasks such as reading comprehension, problem-solving, and following complex instructions (Xie, 2023). In daily life, enhanced working memory can improve individuals' ability to manage multiple tasks, organize activities, and adapt to changing environments, thereby increasing their independence and self-efficacy.

The findings of this study highlight the importance of incorporating social skills training into educational and rehabilitation programs for individuals with visual impairments. Educational institutions and rehabilitation centers can adopt similar training programs to provide comprehensive support that addresses both cognitive and social needs. The integration of social skills training into the curriculum can enhance students' overall development and prepare them for successful transitions to higher education and employment (Manitsa & Δόικου, 2020).

Moreover, the study underscores the need for personalized and adaptive interventions that cater to the unique challenges faced by individuals with visual impairments. By tailoring training programs to the specific needs and abilities of participants, educators and rehabilitation professionals can maximize the effectiveness of interventions and promote meaningful improvements in cognitive and social functioning (Kamelska & Mazurek, 2015).

While this study provides robust evidence for the effectiveness of social skills training, further research is needed to explore the long-term effects and potential moderators of the intervention's impact. Future studies could investigate the sustainability of improvements in self-determination and working memory over longer follow-up periods and examine how factors such as age, severity of visual impairment, and additional disabilities influence the outcomes.

Additionally, exploring the integration of technology in social skills training could offer new avenues for enhancing the accessibility and scalability of interventions. For instance, the use of embodied conversational agents and chatbots has shown promise in providing automated social skills training for individuals with autism spectrum disorders and intellectual disabilities (Sánchez et al., 2022; Tanaka et al., 2017). Adapting these technologies for individuals with visual impairments could provide cost-effective and widely accessible training solutions.

Despite the significant findings, this study has several limitations that should be acknowledged. The relatively small sample size may limit the generalizability of the results to the broader population of individuals with visual impairments. Additionally, the study relied on self-report measures for assessing self-determination and working memory, which may be subject to response biases. Future research should consider incorporating objective measures and larger, more diverse samples to validate and extend the findings.

In conclusion, this study demonstrates that social skills training is an effective intervention for enhancing self-determination and working memory in individuals with visual impairments. The significant improvements observed in the intervention group underscore the potential of structured training programs to address both cognitive and social needs, ultimately enhancing the quality of life for individuals with visual impairments. By integrating social skills training into educational and rehabilitation practices, educators and professionals can provide comprehensive support that empowers individuals with visual impairments to achieve greater autonomy, independence, and overall well-being.

The study's findings contribute to the existing literature on self-determination and cognitive training, offering valuable insights into the mechanisms and broader impacts of social skills training. As the field continues to evolve, further research and innovation will be essential to develop and refine interventions that meet the diverse needs of individuals with visual impairments, ensuring that they have the opportunities and support needed to thrive in all aspects of life.

Authors' Contributions

Authors contributed equally to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

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Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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