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Effects of structured group reminiscence in sports and non-sports environments on cognitive empowerment and optimism in older adults: a quasi-experimental study

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Abstract

Background: Research indicates that engaging in various activities and exercising in a green outdoor environment offers numerous psychological and physiological benefits, particularly for the older adults, when compared to indoor or non-sport environments. Therefore this study aimed to investigate the impact of structured group reminiscence on cognitive empowerment and optimism in older adults, addressing the need for effective interventions to promote successful aging.
Methods: A quasi-experimental pretest-posttest design was employed, involving 36 older adults (aged 60–79) selected via convenience sampling. Participants were randomly assigned to either a reminiscence group in a sports environment, a reminiscence group in a non-sports environment, or a control group (12 participants in each group). The intervention were conducted once weekly for 12 weeks, each session lasting 60 to 90 minutes. Cognitive empowerment was measured using the Older Adults Cognitive Empowerment Questionnaire, and optimism was assessed using the Optimism (Life Orientation) Questionnaire.
Results: The multivariate analysis of the covariance (MANCOVA) revealed significant improvements in cognitive empowerment ($P < 0.05$) and optimism ($P < 0.05$) post-test scores in both reminiscence groups (sports and non-sports environments) compared to the control group. There was a trend toward greater gains in the sports environment group, although this difference was not statistically significant.
Conclusion: Structured group reminiscence, regardless of the environment, is an effective intervention for enhancing cognitive empowerment and optimism in older adults. These findings suggest that incorporating reminiscence therapy into programs for older adults can contribute to improved psychological well-being and successful aging. Further research is warranted to explore the potential benefits of sports environments in maximizing the effects of reminiscence therapy.
Keywords: Reminiscence, older adults, cognitive empowerment, optimism, sports environment, aging

Introduction

Population aging is a global phenomenon. In 2020, an estimated 727 million older adults were living worldwide. All nations are witnessing a rapid expansion in their aging populations, with projections suggesting that by 2050, this number will double to exceed 1.5 billion [1]. The growing population of older adults is contributing to a higher prevalence of age-related health challenges [2, 3]. As a result, nations are confronted with significant obstacles in ensuring their healthcare and social support systems are equipped to address this demographic shift [4]. Aging is inherently linked with complex conditions such as declining physical health and loss of autonomy, both of which are associated with adverse mental health outcomes. Fur-

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thermore, psychosocial stressors, including loneliness, bereavement, diminished income, and societal changes, may exacerbate mental health challenges in older adults, ultimately diminishing their quality of life [5].

Active aging emphasizes the empowerment of older adults across biological, psychological, and social domains. Empowerment, in this context, encompasses fostering self-improvement, autonomy, self-confidence, alignment with personal values, and the ability to assert one's rights and freedoms [6, 7]. Consequently, in recent years, the concept of patient empowerment has gained a pivotal role in nursing and medical research. It is now regarded as an essential component of nursing practice [8, 9], necessitating efforts to enhance individuals' intrinsic understanding and awareness of the aging process [7]. Additionally, some studies have conceptualized empowerment through a social lens, emphasizing the importance of social connections and services in fostering a sense of control and agency. Effective intervention designs require a thorough understanding of the sociocultural contexts and characteristics of the target population. From this perspective, participants are considered active agents in the empowerment process. Interventions are less about modifying participants' behaviors and more about unlocking human potential to achieve desired outcomes. The empowerment process is context-dependent, rooted in the environmental and social framework, and is inherently a collective process facilitated through collaboration with others [10].

Studies examining the empowerment of older adults have yielded valuable insights. For instance, Musavi *et al*. identified seven dimensions of empowerment in the context of receiving social support: obtaining information from family and others, receiving guidance from healthcare professionals, managing disease risk factors, adhering to medication regimens, achieving functional and mental independence, establishing meaningful relationships, and attaining goal satisfaction [11]. Similarly, Khezri *et al*. developed a self-management competency questionnaire tailored to older adults with hypertension, focusing on three domains: knowledge, attitudes, and practices [12]. Figar *et al*. introduced an empowerment tool grounded in the concepts of resource enhancement, capacity building, and knowledge acquisition, which demonstrated efficacy in reducing systolic blood pressure [13]. DeCoster & George incorporated elements such as control, self-efficacy, vitality, and competence in designing their empowerment instrument [14].

Numerous factors have been explored as indicators of successful aging, with optimism emerging as a significant variable influencing individuals' beliefs and experiences. Optimism, as a positive mediator, exerts its impact through effective coping mechanisms, problem-solving strategies, information-seeking behaviors, and positive reframing within psychological domains, including social support and perceived control over life circumstances [15]. Seligman *et al*. define optimism as a trainable cognitive pattern that equips individuals to confront challenging situations more effectively [16, 17]. Additionally, optimism is considered an inter-individual characteristic, reflecting the degree to which individuals hold favorable and general expectations about their future. From a psychological standpoint, this distinction among individuals is of considerable importance [18].

Research indicates that older adults tend to exhibit less optimism about their future compared to younger adults; however, optimism and positive expectations increase significantly in later life, particularly around the age of 80 [19]. Optimistic individuals display adaptive behaviors, including psychological resilience [20], enhanced psychological well-being [21], higher self-esteem [22], lower levels of stress and exposure to negative events [23], and reduced mortality rates associated with cardiovascular disease [24].

Reminiscence, one of the most widely utilized psychosocial interventions, has demonstrated effectiveness in enhancing older adults' well-being. This process involves recalling past memories and sharing life experiences to foster positive emotions and coping strategies [5, 25]. A notable advantage of reminiscence is its ability to bolster older adults' self-worth and identity through the recollection of past experiences [26]. Moreover, reminiscence is a cost-effective and accessible intervention that can improve cognitive functioning, social engagement, positive emotions, personal identity, and overall quality of life. Reminiscence sessions typically involve the use of evocative tools, such as old songs, photographs, and newspapers, to stimulate memory recall [27].

Numerous studies have advocated for reminiscence-based interventions as an effective strategy to enhance self-esteem [4, 27-30], alleviate anxiety [31, 32], reduce depressive symptoms [31-36], mitigate loneliness [31, 37], improve insomnia and sleep quality [38], increase happiness [39], foster spiritual well-being [38], promote positive self-concept [40], and support emotional well-being [4]. These interventions have also been shown to enhance mental health in older adults [27-30], elevate life satisfaction [33-35, 41, 42], and improve quality of life [42, 43]. Reminiscence offers a compelling alternative to traditional psychotherapies for promoting mental health among older adults and has been utilized as an effective psychosocial intervention for over three decades [26, 44]. In a very recent study, Eryılmaz *et al*. highlight the efficacy of group reminiscence therapy in non-clinical elderly populations [45].

Environmental factors are another crucial determinant of mental health and its related parameters, which are key indicators of quality of life [46]. Empirical evidence highlights the potential synergy between the psychological benefits of physical activity and the restorative effects of exposure to natural environments. Physical activity conducted in natural settings may yield greater mental health benefits compared to activities performed elsewhere. Substantial research and policy initiatives emphasize the role of natural environments in safeguarding and enhancing human mental health [47]. Longitudinal studies have identified social support from family or friends and interpersonal interactions as pivotal social factors influencing mental health in older adults [48, 49].

In recent decades, the importance of the social and physi-

cal environment in shaping mental health has garnered increasing attention. Residential neighborhoods play a significant role in influencing health outcomes. Independent of individual or family characteristics, neighborhood socioeconomic disadvantages are associated with premature mortality and poorer physical and mental health outcomes [50-54]. Understanding the mechanisms linking these associations is critical for improving public health and testing hypotheses about the influence of broader social and contextual factors on psychological and biological functioning [55]. Neighborhood environments may impact health across the lifespan through diverse pathways, including the provision of social services, promotion of health behaviors, exposure to physical or material conditions, and social factors such as social support, social capital, and social dysfunction [52-57]. Positive perceptions of neighborhood social capital (*e.g.*, social cohesion, interpersonal trust, and norms of reciprocity) are consistently linked to a lower prevalence of mental health disorders, as evidenced by cross-sectional and longitudinal studies conducted in the general population [58]. Although the relationship between neighborhood physical + environmental factors and mental health has been less explored, studies suggest that perceptions of safety, access to parks, and favorable neighborhood aesthetics are strong predictors of positive environmental attributes. While most findings in this area are derived from cross-sectional studies, some longitudinal evidence supports causal links between perceived safety, residential density, and mental health [59, 60].

Given the critical role of the environment in shaping mental health and its implications for well-being, as well as the principles of imagery in sports psychology—which advocate for imagery practices to be conducted within sports environments for optimal effectiveness—it can be posited that the unique characteristics of sports settings, including specialized equipment, facilities, and social interactions, may contribute to enhancing individuals' empowerment and sense of optimism. Considering the aforementioned factors, aging is often accompanied by heightened vulnerability and challenges that can diminish life satisfaction and exacerbate psychological difficulties. To better prepare older adults to navigate these transitions successfully, research such as the present study is essential for identifying factors that influence attitudes toward aging and its associated challenges. Hence, we hypothesized that structured reminiscence therapy would significantly improve cognitive empowerment and optimism in older adults. It is anticipated that the findings will provide actionable insights to facilitate successful aging and help older adults overcome the challenges associated with this stage of life more effectively.

Methods

Procedure

Men and women aged 60 to 79 years old took part in the present study. All participants were fully informed about the study's objectives and the anonymous data collection procedures, and they provided written informed consent. Participants were randomly assigned to one of three groups: the reminiscence in a sports environment group (8 men and 5 women), the reminiscence in a non-sports environment group (7 men and 5 women), and the control group (7 men and 4 women). A quasi-experimental pretest-posttest design was employed; involving 36 older adults selected via convenience sampling. The study was executed in accordance with the rules laid down in the Declaration of Helsinki and its later amendments. Also, this study was approved by the ethics committee of Islamic Azad University of Iran (Sari branch) (IR.IAU.SARI.REC.1403.409).

Participants

Eligibility criteria required participants to: age between 60 and 79 years old. Not engage in regular physical exercise (defined as any structured activity designed to improve or maintain physical fitness, with guidelines recommending at least 150 minutes per week of moderate-intensity aerobic activity along with muscle-strengthening exercises on two or more days per week [61]). Obtain written permission from a doctor. Score below a predetermined cut-off point on the baseline questionnaires. Have been registered in a nursing home or been a regular park attendee for at least one year. Possess adequate cognitive, visual, and auditory health. Not have experienced the loss of a relative or loved one during the past six months.

Exclusion criteria were as follows: A diagnosis of Alzheimer's disease. Presence of mental disorders such as substance use disorder, dementia, Major depressive disorder (MDD), or post-traumatic stress disorder (PTSD). Neurological disorders including seizures, Multiple sclerosis (MS), or Parkinson's disease. Significant cognitive, visual, or hearing impairments. Attendance in less than 80% of the structured group reminiscence sessions. In total, 36 older adults met these criteria and were able to comply with the study conditions.

Sample size calculations

A power analysis conducted with G*Power 3.1 software indicated that to detect a moderate effect size (f = 0.25) with an α-error of 0.05, power of 0.80, three groups, two measurement points, and an assumed correlation of 0.50 among repeated measures, at least 36 participants were required (*i.e.*, 12 per group).

Cognitive empowerment

The Older Adults Cognitive Empowerment Questionnaire was used to assess older adults' physical and mental ability. This questionnaire consists of eight dimensions: 1) physical ability; 2) self-esteem; 3) spirituality; 4) commitment; 5) role performance; 6) situational awareness; 7) self-management; and 8) self-assessment [59]. The items are scored from 0 to 50, in which 0 indicates the worst condition and 50 represents the best. In the present study, a score below 25 was defined as low cognitive empowerment, 25 to 37.5 represented moderate cognitive empow-

Table 1. Mean and SD of cognitive empowerment and optimism in three groups during pre-test and post-test.

Variable	Group					
	Control		Reminiscence (non-sports environment)		Reminiscence (sports environment)	
	Pre-test (M ± SD)	Post-test (M ± SD)	Pre-test (M ± SD)	Post-test (M ± SD)	Pre-test (M ± SD)	Post-test (M ± SD)
Cognitive empowerment	22.96 ± 3.87	26.62 ± 4.63	22.44 ± 4.36	48.36 ± 4.54	23.36 ± 4.43	52.76 ± 3.21
Optimism	8.16 ± 4.21	10.87 ± 5.36	9.35 ± 3.71	18.52 ± 5.69	9.25 ± 4.36	20.78 ± 4.44

Note: M = mean; SD = standard deviation.

erment, and a score above 37.5 denoted high cognitive empowerment [62].

Optimism

The Optimism (Life Orientation) Questionnaire was used to assess older adults' expectations of life outcomes and positive versus negative aspects. This questionnaire consists of two dimensions: 1) pessimism (including 3 items); and 2) optimism (including 3 items); Also 4 items are deviant that were removed during data analysis [63, 64]. The items are scored from 0 to 24, in which 0 indicates the worst condition and 24 represents the best. In the present study, a score below 12 was defined as low optimism, 12 to 18 represented moderate optimism, and a score above 18 denoted high optimism [63].

Intervention: the structured group reminiscence therapy

The structured group reminiscence therapy was performed once weekly for 12 weeks (three months), each session lasted one to one and a half hours. Sessions for the sports environment group were held in an outdoor park, and sessions for the non-sports environment group were held in a nursing house. The intervention that was implemented for the two experimental groups was the structured group reminiscence program used by [65]. In this program, 12 main topics were discussed in 12 weekly sessions. In each of these sessions, stimuli were used to recall memories related to the topic of the session, which, depending on the topic of the session, included photos, work tools, childhood toys, *etc*. The content of the whole structured group reminiscence intervention sessions is described in Appendix A.

Control condition

To control possible effects of social interaction with other participants or study personnel, the participants assigned to the control group gathered at a clinic. During this time, they could talk to each other and medical staff members. During this period, the control group received their usual care; of course, it was ensured that none of the participants in the control group participated in the structured group reminiscence program. It should be noted that during the study, there were no restrictions or changes in the daily life routine of participants in these three groups. They could continue their previous regular activities and programs of personal life.

Data analysis

All calculations were done by the SPSS software version 24. After data collection, the Kolmogorov-Smirnov test was conducted to check the normality of data distribution. Then, using Levene's test, the homogeneity of the variables was investigated in three groups. The multivariate analysis of the covariance (MANCOVA) was performed to identify and compare the effects of the structured group reminiscence program on each dependent variable, given that the influence of pre-intervention values on post-intervention ones was controlled in this study. In all the statistical tests, a *P*-value of 0.05 was considered indicative of significance. The effect size for MANCOVA was calculated using partial eta square (η_p^2), with $0.01 \geq \eta_p^2 \geq 0.059$ indicating small effect, $0.06 \geq \eta_p^2 \geq 0.139$ indicating medium effect, and $\eta_p^2 \geq 0.14$ indicating large effect sizes [63].

Results

The experimental and control groups were homogeneous

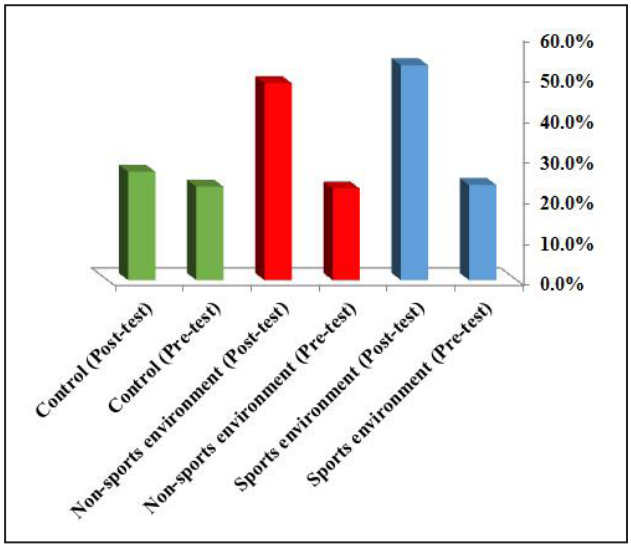

Figure 1. Results of groups' means based on cognitive empowerment in the pre-test and post-test.

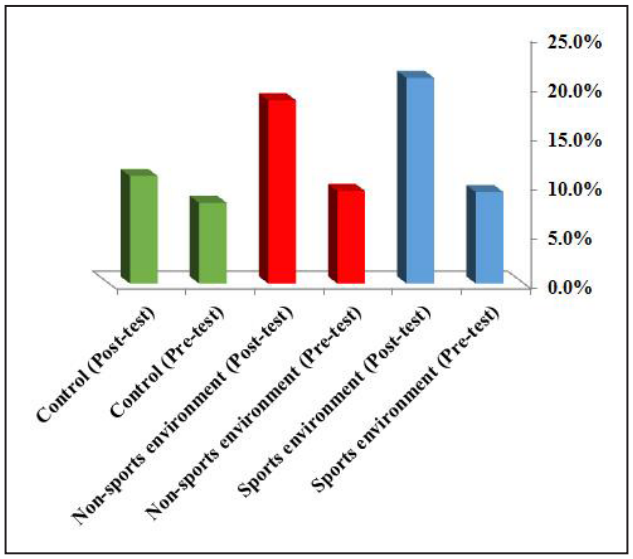

Figure 2. Results of groups' means based on optimism in the pre-test and post-test.

regarding age, marital status, and employment status. The mean age in the reminiscence in the sports environment, reminiscence in the non-sports environment, and control groups were 71.66, 70.89, and 71.32, respectively. Table 1 shows the mean and standard deviation of cognitive empowerment and optimism in the three study groups during the pre-test and post-test.

As can be seen in Table 1, cognitive empowerment and optimism improved in both the sports and non-sports environment groups in the post-test compared to the pre-test, with these changes being more noticeable in the sports environment group. Also, to gain a clearer understanding of the groups' results in the pre-test and post-test, the comparisons of the groups' means based on cognitive empowerment and optimism are presented in Figure 1 and 2.

Next, to investigate the role of reminiscence therapy in sports and non-sports environments on cognitive empowerment and optimism in the participants, a multivariate analysis of the covariance (MANCOVA) was used. The use of this test requires compliance with statistical assumptions such as: 1) normality of data distribution; 2) homogeneity of variance between groups; 3) the observations are independent of one another, there is not any pattern for the selection of the sample, and that the sample is completely random; 4) the independent variables are categorical and the dependent variables are continuous or scale variables; and 5) absence of multicollinearity *i.e.* the dependent variables cannot be too correlated to each other [63]. Also, the Kolmogorov-Smirnov test was used to examine the normality of data distribution, and the results showed that the distribution of cognitive empowerment ($Z = 1.28$, $sig = 0.15$), and optimism ($Z = 1.76$, $sig = 0.411$) in the group of reminiscence in a sports environment, and the distribution of cognitive empowerment ($Z = 1.66$, $sig = 0.253$), and optimism ($Z = 1.17$, $sig = 0.12$) in the group of reminiscence in a non-sports environment, was normal. Based on the results of Box's M test, which was not significant for any of the variables, the condition of homogeneity of the variance/covariance matrices was properly met. The results showed that the variance/covariance matrices were homogeneous ($P = 0.22 > 0.05$, F = 1.36, Box's M = 17.53). Based on the results of Levene's test, the variance of the scores of the reminiscence group in the sports environment in the post-test for the cognitive empowerment ($F_{1.426} = 0.345$) and optimism ($F_{1.211} = 0.296$) and the variance of the scores of the reminiscence group in the non-sports environment in the post-test for the cognitive empowerment ($F_{1.512} = 0.345$) and optimism ($F_{1.318} = 0.296$) were significant in both variables, considering that the significance level is greater than 0.05. Therefore, it can be said that the variance of the variables in the post-test is homogeneous. Also, the results of the Wilk's lambda showed that the effect of group on cognitive empowerment and optimism is significant ($P < 0.001$, F = 18.20, Wilk's lambda = 0.118). The above test allows the use of multivariate analysis of the covariance (MANCOVA). According to the results of the regression homogeneity test, since the calculated F for the interaction between the group and pre-test is not significant at a level less than 0.05, the data support the regression homogeneity assumption.

The findings presented in Table 2 show that after removing the pre-test effect, there is a significant difference between the three groups in all the above indicators. It should be noted that considering the average correlation coefficients between the variables of this hypothesis, all variables were analyzed in this hypothesis.

Next, to investigate the role of reminiscence-based therapy in sports and non-sports environments on cognitive empowerment and optimism in the participants, a multivariate analysis of covariance (MANCOVA) test was used, the results of which are shown in Table 3.

As can be seen in Table 3, assuming control for pre-test effects, reminiscence-based interventions in sports and non-sports environments improved cognitive empowerment and optimism in the participants ($P < 0.001$). The results show that there is a significant difference between the two experimental and a control groups regarding cognitive empowerment and optimism, and the experimental groups are more effective than the control group. However, to accurately determine the difference between groups and compare the means pairwise, the Bonferroni post hoc test was used, the results of which are presented in Table 4.

As can be seen in Table 4, there is a significant difference between the three groups in the cognitive empowerment and optimism at the level of ($P < 0.001$). The results indicate that there is a significant difference between the indi-

Table 2. Multivariate analyses of covariance statistics.

Test	Value	*F*	*df*	*Sig.*
Pillais trace	1.25	17.49	33	0.01
Wilk's lambda	0.26	32.98	33	0.01
Hotelling's trace	10.46	58.26	33	0.01
Roy's largest root	11.66	122.46	33	0.01

Note: *F* = Fischer; *df* = Degree of freedom; *Sig.* or *P*-value = $^{*}P < 0.05$.

Table 3. Multivariate analysis of covariance (MANCOVA) test to compare the means of variables in three groups.

Dependent variable	Source	Sum of squares	*df*	Mean of squares	*F*	*Sig.*	Eta coefficient
Cognitive empowerment	Pre-test	234.35	1	234.35	214.80	0.059	0.76
	Group	1702.12	2	715.16	519.81	0.001	
Optimism	Pre-test	351.22	1	351.22	47.13	0.36	0.73
	Group	1627.19	2	637.55	191.14	0.001	

Note: *F* = Fischer; *df* = Degree of freedom; *Sig*. or *P*-value = $^{*}P < 0.05$.

Table 4. Least significant difference test between the three groups in cognitive empowerment and optimism.

Groups	Compared to the group	Variable	MD	*Sig.*
Reminiscence (sports environment)	Reminiscence (non-sports environment)	Cognitive empowerment	4.4	0.000
		Optimism	2.26	0.001
	Control	Cognitive empowerment	26.14	0.001
		Optimism	9.91	0.000
Reminiscence (non-sports environment)	Control	Cognitive empowerment	21.74	0.001
		Optimism	7.65	0.001

Note: MD = mean difference; *Sig*. or *P*-value = $^{*}P < 0.05$.

cators of the experimental groups (reminiscence in sports environment and reminiscence in non-sports environment) and the control group. Therefore, according to the aforementioned findings, it can be said that reminiscence in sports environment and reminiscence in non-sports environment improved and promoted indicators (cognitive empowerment and optimism) in the participants, and the intervention based on reminiscence in sports environment had a more effective role than reminiscence in non-sports environment.

Discussion

The study aimed to investigate the effect of structured group reminiscence in sports and non-sports environments on cognitive empowerment and optimism in older adults. Based on the findings, it was determined that reminiscence training in sports and non-sports environments affects the cognitive empowerment of older adults. This finding is consistent with the results of Musavi *et al*. [11], Khezri *et al*. [12], Figar *et al*. [13], DeCoster and George [14], and Tarighat *et al*. [62], all of which examined empowerment in the older adults and pointed out its importance. However, no study was found that directly examined the effect of reminiscence intervention on individuals' empowerment.

In this regard, successful intervention designs must also pay attention to understanding the socio-cultural perspectives and characteristics of the population under study. In this perspective, the participant is an active agent in the empowerment process, and interventions emphasize less on changing behavior and more on bringing human potential to a desirable and appropriate state. The empowerment process is dependent on the social environment and is a social process that is achieved with the participation of others. Therefore, as it was determined, the reminiscence intervention in the present study, in both sports and non-sports environments, led to the improvement and increase of cognitive empowerment of the participants and caused these individuals to improve and enhance in eight areas of physical ability, self-esteem, spirituality, commitment, role performance, situational awareness, self-management, and self-assessment through the use of this intervention and the tools used.

Thus, it can be said that this intervention made the participants aware of changes in memory and thinking, changes in sleep, irritability and feelings of anger, causes of incontinence and urinary frequency, symptoms of the onset of Alzheimer's disease, physical and mental problems resulting from retirement, a proper diet to protect the body against diseases, efforts to achieve a sense of peace in their living environment, appropriate decision-making in dealing with problems and ambiguous life situations, efforts to maintain relationships with their loved ones, improving patience in sensitive life situations, setting goals for the rest of their lives, prioritizing those goals and trying to achieve them, and improving financial management and spending in their lives, and other such things, and made them become more capable and independent people in life, which in turn can improve life satisfaction and increase life expectancy in these people.

The findings also showed that reminiscence training in sports and non-sports environments resulted in improving optimism in older adults. This finding is consistent with

the results of Majzoubi *et al*. [39], Saleh Manige *et al*. [66], Kae-Hwa and Gyeong-Ju [67], Boojari *et al*. [68], Sheykhi *et al*. [69], Ren *et al*. [70], and Sales *et al*. [71].

Majzoubi *et al*. showed that structured reminiscence interventions can significantly increase the happiness of older adults and promote positive emotions in this group [39]. Saleh Manige *et al*. stated that the presence of optimism in older adults can lead to better perceptions of aging [66]. Also, Kae-Hwa and Gyeong-Ju suggest that the use of a group reminiscence program can positively affect the life satisfaction of older adults living in nursing homes as an effective intervention [67]. Boojari *et al*. also state that structured group reminiscence therapy can improve psychological aspects of the quality of life of older adults [68]. Sheykhi *et al*. concluded that reminiscence can improve happiness and vitality in retired older adults [69]. Ren *et al*. also stated that group reminiscence intervention combined with exercise and physical activity led to the development and improvement of spiritual well-being in older adults [70]. Also, Sales *et al*. stated that the reminiscence program can improve the meaning of life, sense of coherence, and coping strategies in older women living in nursing homes [71].

Therefore, according to the findings of the study and the results of other studies, it can be observed that, in general, structured reminiscence intervention can lead to the improvement and development of positive characteristics such as happiness and vitality, life satisfaction, life expectancy, and the reduction of negative characteristics such as death anxiety, depression, stress, *etc*., and ultimately, increase the level of optimism towards life in older adults. Using the structured group reminiscence in the present study resulted in the participants improving and upgrading their expectations for the best in uncertain situations, being optimistic about the future, and expecting good things to always happen to them. They also improved in areas such as expecting bad things to happen to them, expecting things to usually go according to their wishes, having low expectations for good things to happen to them, and being less pessimistic about the rest of their lives.

Finally, the findings showed that reminiscence intervention in a sports environment played a more effective role in increasing cognitive empowerment and optimism in older adults compared to non-sports environments. This finding is consistent with the results of studies by Ludwig *et al*. [50], Diez Roux and Mair [52], Ross and Mirowsky [57], Beard *et al*. [60], Fannon [72] and Craig *et al*. [73], which have pointed out and confirmed the effect of the environment on improving or impairing the psychological characteristics of individuals.

Ludwig *et al*. suggested that living in a better neighborhood leads to long-term improvements in adult physical and mental health and subjective well-being [50]. Diez Roux and Mair stated that features of neighborhoods or residential environments may affect health and contribute to social inequalities in health [52]. Ross and Mirowsky found that residents of disadvantaged neighborhoods have worse health (worse self-reported health and physical functioning and more chronic conditions) than residents of more advantaged neighborhoods and it is not mediated by limitation of outdoor physical activity. The daily stress associated with living in a neighborhood where incivility is common, damages health [57]. Beard *et al*. stated that an older adult's neighborhood of residence is an important determinant of his or her mental health. Those making efforts to improve mental health among the elderly need to consider the role of residential context in improving or impairing mental health [60]. Fannon by comparing exercise environment and its effect on changes in mood: indoors *vs.* outdoors, stated that only the feelings of elatedness and energized were significantly shown to be more enhanced by exercising in a green outdoor environment [72]. Craig *et al*. by exploring the effect of the environment on physical activity, stated that the environment was positively associated with physical activity [73].

Limitations and recommendations for future studies

Among the limitations of the present study are the problems related to holding sessions due to the COVID-19 conditions, especially for the non-sports environment group who were in a closed environment, the occurrence of stress caused by COVID-19 and its interference with the variables under study, the lack of awareness of the mental and psychological conditions of the individuals when completing the questionnaires and during the program implementation, as well as individual and psychological differences and other disruptive factors that could cause deviations in the findings. We recruited participants who chose to be a volunteer for this program, so these people already have a positive attitude towards intervention, which could influence the results. Unfortunately, we could not report whether the experimental group's improvements would be maintained over time. Also, the sample size was rather small, although we conducted calculations and focused on effect size in the interpretation of the results. It is suggested that further research, the financial situation, and the level of education of the older adults should be additionally investigated, which can be among the components that affect the cognitive empowerment and optimism of the different populations.

Conclusions

The study concluded that both structured group reminiscence in sports and non-sports environments improves cognitive empowerment and optimism in older adults, Also reminiscence intervention in a sports environment played a more effective role compared to non-sports environments. Hence it can be said that structured group reminiscence in both environments can be used to train and achieve desired effect on specific components of psychological characteristics of older adults.

Declarations

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Appendix A: Structured group reminiscence program

Session	Session's Topic	Session's stimulus	Session's target
1	Preparations	Birth certificate, marriage certificate, and anything that identifies the person	Making people feel comfortable, introducing people to each other, starting reminiscence, creating interest and enthusiasm in people, and remembering the people who played a role in naming them
2	Childhood and family life	Family photos, childhood games, jump ropes, marbles, and all the toys of that time	Creating a sense of belonging to the group, reliving the feeling of childhood, working together to remember the past
3	School life	Blackboard, chalk, school bag, school reports, pen, educational globe, school uniform, teacher's name, school location	Continuing to build a sense of belonging to the group, re-experiencing the good and bad aspects of school life, recreating the feelings prevalent during that time
4	Starting a career and working life	Work tools, wooden ruler, old money, educational certificate, work apron	Appreciating one's past skills and achievements, finding memories and common ground among group members, describing the joys of youth
5	Going outdoors and having fun	Open environment, green space, special tourist places in the city	Remembering past pleasures, the feeling of youth, beauty, and good looks, sharing experiences, such as going to the movies, the first romantic relationship, the first perfume used, *etc*.
6	Marriage	Marriage certificate, wedding ring, wedding photos, wedding gift, love letters, engagement period	Remembering the things they did to maintain their marital relationship, paying attention to and remembering the most beautiful moments in life, and sharing shared experiences
7	Home, garden, and pets	Paintbrush and bucket, gardening tools, hammer, old houses, photos of old neighborhoods	Recalling the home environment in which they lived during childhood, adolescence, youth, marriage, and adulthood, recalling related activities and skills, and the individual's home (*e.g.*, gardening, home decoration design)
8	Next generation, infants and toddlers	Old baby bottle, large safety pin, baby bib, doll, baby oil, baby care book, baby naming book, knitting patterns, baby clothes, photos of babies in old clothes	Recalling the time they took care of their baby or child and the memories related to it, the child's smile and emotions, their noises and movements, tickling and following them, kissing them and their mischief
9	Food and cooking	Cookbooks, wooden spoons and mixing bowls, tea trays, photos of various foods	Recalling important discoveries in the field of cooking, providing an opportunity to remember and apply past skills, collaborating with others to do cooking
10	Vacations and travel	Souvenirs, travel luggage, backpacks, maps, vehicles, shells, mementos of each city	Reminiscing about the richness of people's lives and their past accomplishments and adventures, sharing current passions and favorite places, and reminiscing about the joys and misfortunes that have befallen them on trips and vacations
11	Celebrations	Most of the stimuli for this session were provided by families	Creating an opportunity for participants to be together and celebrate togetherness, and acknowledging the people who participated in the sessions
12	Summarizing sessions	Photos of the project, writings and drawings, and activities of individuals, displaying the family diary in the project	Hearing from everyone about what these sessions meant to them, remembering what group members have accomplished during these days, and planning for future sessions