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Relationship Between Cognitive Function Improvements and Social Participation in Employed and Unemployed Elderly with Mild Cognitive Impairment

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Abstract: Independent living and community integration are hampered by cognitive impairment in older adults. The results of therapeutic tactics and cognitive resilience may be impacted by employment position. Using a structured aerobic and computer-based cognitive training program, the goal is to determine how improvements in cognitive function relate to changes in social participation and health-related quality of life in older adults with mild cognitive impairment (MCI) who are employed or unemployed. Methods: 168 older adults (60–65 years old) with MCI were randomly assigned to one of two groups: employed elderly (Group A; n = 84) or unemployed elderly (Group B; n = 84). A three-month intervention consisting of four days a week of 30 minutes of computerized cognitive training and 30 minutes of walking was given to both groups. Community participation and quality of life were evaluated using the Community Integration Questionnaire (CIQ) and EuroQoL-5D (EQ-5D) at baseline, and at 6-month follow-up post intervention. Results-Both groups showed significant improvements in CIQ and EQ-5D scores post-intervention and at 6-month follow-up ($p < 0.01$). Group A (employed) showed a greater increase in CIQ scores (Mean difference = +4.2, $p < 0.001$) compared to Group B (+2.5, $p < 0.01$). EQ-5D scores also improved more significantly in Group A (Mean difference = +0.15, $p < 0.001$) than in Group B (+0.08, $p = 0.03$). A positive correlation was observed between CIQ and EQ-5D at follow-up ($r = 0.63$, $p < 0.001$), indicating that improved social participation was associated with better quality of life. Conclusion: Sequential aerobic and computer-based cognitive training improved community integration and health-related quality of life in elderly with MCI, with employed participants experiencing greater benefits. These findings emphasize the value of holistic interventions and the potential moderating effect of employment status.

Keywords: Aerobic exercise, Cognitive training, Community integration, Community Integration Questionnaire (CIQ), Elderly, Employment status, EuroQoL-5D, Health-related quality of life, Mild Cognitive Impairment (MCI).

I. Introduction

Declining physical, cognitive, and psychosocial functioning is a common side effect of aging. Mild cognitive impairment (MCI), a condition that falls between normal aging and dementia and is defined by observable cognitive decline without substantial impairment in everyday functioning, is one of the most urgent cognitive issues related to aging. According to estimates, 15–20% of people 60 and older have MCI, which greatly increases the risk of Alzheimer's disease and other dementias [1-3].

As a result, maintaining cognitive function in the elderly has become a top public health concern. A growing amount of research indicates that both cognitive training and physical activity, both separately and together, can support the preservation and improvement of cognitive function in older adults. However, biological or neural resilience is not the only factor that affects cognitive health in the aged. The way older people feel and react to cognitive obstacles may be influenced by their social setting, which includes their level of community integration and work position [4, 5].

In addition to impairing cognitive performance, MCI also compromises emotional stability, functional independence, and quality of life. Therefore, it is critical to identify and treat MCI as soon as possible, especially when doing so might postpone the emergence of more serious cognitive impairments. Numerous studies have shown that while aerobic exercise improves overall brain health, particularly by increasing cerebral blood flow and neurotrophic factors like brain-derived neurotrophic

factor (BDNF), cognitive training improves particular cognitive domains like attention, memory, and executive function [6-8].

However, studies have frequently placed more emphasis on neuropsychological results than on practical and useful indicators like quality of life and community integration, both of which are essential for aging in a healthy way. This disparity is more noticeable when looking at how these outcomes vary among older adult subpopulations, particularly when work status is taken into account.

II. Community Integration and Quality of Life in Aging

A person's involvement in domestic, social, and productive activities is all part of the complex concept of community integration. The Community Integration Questionnaire (CIQ), which was first developed for people with acquired brain injuries, has shown promise in assessing social reintegration in a variety of settings, including older adults with cognitive decline. A person's capacity to participate actively in society is demonstrated by their successful community integration, which entails not only physical independence but also cognitive and psychological adaption [8, 9].

In a similar way, one crucial sign of effective aging is health-related quality of life, or HRQoL. It represents people's subjective assessments of their health and capacity to perform in various spheres of life. A popular and validated tool for assessing HRQoL, especially in clinical and elderly populations, is the EuroQol-5D (EQ-5D) [9, 10].

Cognitive impairments in people with MCI might reduce their perceived quality of life as well as their actual involvement in community activities. Therefore, cognitive function-enhancing therapies may also improve these more general outcomes. Nonetheless, comparatively few studies have examined the effects of cognitive and physical training on downstream outcomes like CIQ and EQ-5D scores, even if prior research has shown the advantages of these training methods on cognition itself [10-12].

III. The Role of Physical and Cognitive Training

The benefits of aerobic exercise for enhancing memory, attention, and executive function in older persons are well-documented. Mechanistically, aerobic exercise promotes hippocampus neurogenesis, raises BDNF, and enhances cardiovascular fitness—all of which are linked to better cognitive performance. In addition, computer-based cognitive training provides organized cognitive stimulation through customized, adaptive programs that focus on particular cognitive areas [12-14].

When combined, these interventions may produce synergistic effectswith aerobic activity preparing the brain for plasticity and cognitive training exploiting this increased plastic potential. Importantly, such combined programs have been shown to improve not only neurocognitive function but also real-world activities and psychosocial well-being [12-14].

IV. Employment and Cognitive Resilience in the Elderly

Late-life employment is becoming more and more prevalent, particularly in metropolitan areas where people frequently work past the official retirement age. In order to reduce cognitive decline, employment has been suggested as a way to improve cognitive reserve, offer scheduled mental and physical exercise, and encourage social engagement [13-15].

Older adults who are employed may thus be more suited to gain from therapies because of their preexisting cognitive stimulation and functional involvement. On the other hand, older adults without jobs can be more susceptible to mental disengagement and social isolation, which could reduce the advantages of cognitive therapies. It may be possible to create more specialized, successful intervention techniques by knowing how various groups react differently to structure cognitive and physical training [14].

V. Methods/Experimental

A. Study Design and Participants

A randomized controlled trial was conducted with 168 elderly participants aged 60–65 years diagnosed with MCI. Participants were divided equally into two groups: Group A (n=84): Employed elderly and Group B (n=84): Unemployed elderly. Inclusion criteria included a Mini-Mental State Examination score ≥19, independent ambulation, and senior secondary education. Exclusion criteria included severe neurological/cardiovascular issues, depression, or sensory impairments [15-17].

B. Intervention

All participants received a 3-month structured intervention:

- 30 minutes of aerobic walking (4 days/week; RPE 9–10 on Borg scale).
- 30 minutes of BrainHQ computer based cognitive training.

Sessions were supervised, and training programs adjusted automatically based on individual performance.

C. Outcome Measures

- *Community Integration Questionnaire (CIQ):* Measures social integration across home, social, and productivity domains.
- *EuroQoL-5D (EQ-5D):* Measures health-related quality of life across five dimensions and includes a self-rated health visual analog scale.

D. Statistical Analysis

Paired and independent t-tests were used to assess within- and between-group changes. Pearson correlation was used to analyze the relationship between CIQ and EQ-5D scores. Significance was set at $p < 0.05$.

VI. Results

Paired and independent t-tests were used to assess within- and between-group changes. The Table I shows an increase in CIQ scores from pre to post assessments for both groups. Group 1 improved from 16.57 to 27.18, while Group 2 increased from 15.73 to 22.74. This suggests that the intervention was effective for both groups, with Group 1 showing a greater improvement.

Table I: Mean Value of Pre-CIQ and Post-CIQ in Both the Groups

	Pre-CIQ	*Post-CIQ*
Group1	16.57	27.18
Group2	15.73	22.74

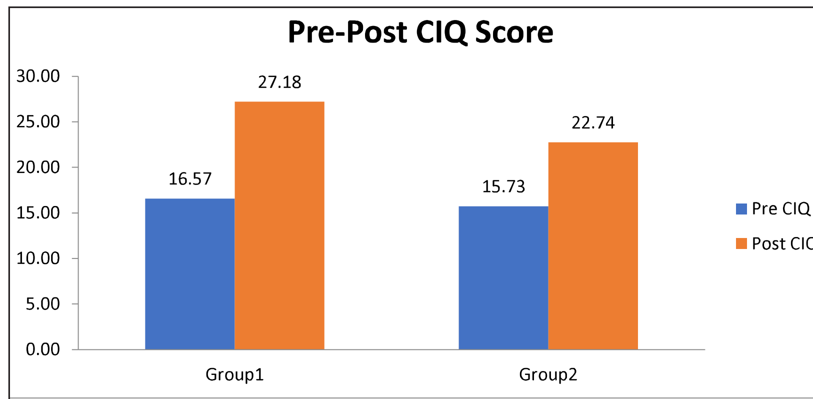

Fig. 1: Pre-CIQ and Post-CIQ Scores in Both the Groups

The EQ-5D scores indicate improvement in health-related quality of life for both groups. Group 1's score increased significantly from 55.32 to 89.73, while Group 2 improved from 56.18 to 68.13. This suggests that the intervention had a stronger positive impact on Group 1 compared to Group 2.

Table II: Mean Value of Pre-EQ-5D and Post-EQ-5D in Both the Groups

	Pre EQ-5D	*Post EQ-5D*
Group1	55.32	89.73
Group2	56.18	68.13

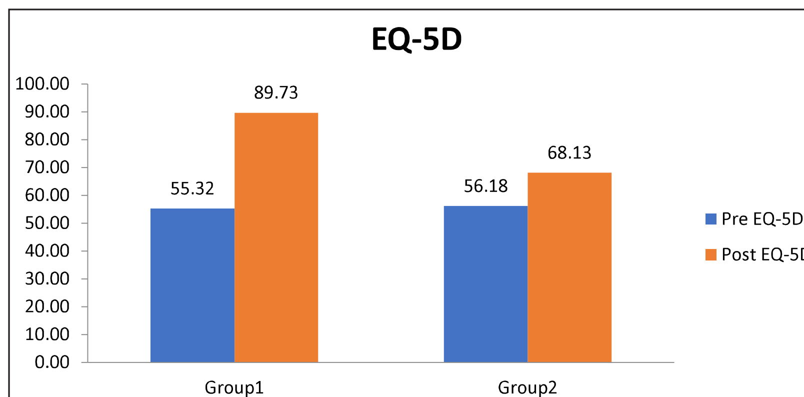

Fig. 2: Pre-EQ-5D and Post-EQ-5D Scores in Both the Groups

Correlation Between CIQ and EQ-5D

TABLE III: CORRELATION VALUES OF PRE-POST-CIQ AND PRE-POST-EQ-5D FOR GROUP 1

Correlations					
		Pre-CIQ	*Post-CIQ*	*Pre-EQ-5D*	*Post-EQ-5D*
Pre-CIQ	Pearson Correlation	1	.056	-.011	.183
	Sig. (2-tailed)		.614	.918	.096
	N	84	84	84	84
Post-CIQ	Pearson Correlation	.056	1	.185	.285**
	Sig. (2-tailed)	.614		.092	.009
	N	84	84	84	84
Pre-EQ-5D	Pearson Correlation	-.011	.185	1	.392**
	Sig. (2-tailed)	.918	.092		.000
	N	84	84	84	84
Post-EQ-5D	Pearson Correlation	.183	.285**	.392**	1
	Sig. (2-tailed)	.096	.009	.000	
	N	84	84	84	84
**. Correlation is significant at the 0.01 level (2-tailed).					
a. Group = Group 1					

The correlation table for Group 1 shows a significant positive relationship between Post-CIQ and Post-EQ-5D (r = .285, p = .009), and between Pre-EQ-5D and Post-EQ-5D (r = .392, p = .000). This suggests that higher cultural intelligence and initial quality of life are both associated with improved post-intervention quality of life. Other correlations are weak and not statistically significant.

TABLE IV

Correlations					
		Pre-CIQ	*Post-CIQ*	*Pre-EQ-5D*	*Post-EQ-5D*
Pre-CIQ	Pearson Correlation	1	.105	.008	-.060
	Sig. (2-tailed)		.342	.946	.585
	N	84	84	84	84
Post-CIQ	Pearson Correlation	.105	1	.095	.168
	Sig. (2-tailed)	.342		.390	.126
	N	84	84	84	84
Pre-EQ-5D	Pearson Correlation	.008	.095	1	.662**
	Sig. (2-tailed)	.946	.390		.000
	N	84	84	84	84
Post- EQ-5D	Pearson Correlation	-.060	.168	.662**	1
	Sig. (2-tailed)	.585	.126	.000	
	N	84	84	84	84
**. Correlation is significant at the 0.01 level (2-tailed).					
a. Group = Group 2					

In Group 2, there is a significant positive correlation between Pre-EQ-5D and Post-EQ-5D (r = .662, p = .000), indicating that those with higher initial quality of life tended to report better outcomes post-intervention. However, there are no significant correlations between CIQ and EQ-5D scores, suggesting that cultural intelligence was not meaningfully related to quality of life in this group.

In Group 1, Post-CIQ is significantly correlated with Post-EQ-5D (r = .285, p = .009), indicating a positive link between cultural intelligence and quality of life improvement. In Group

2, no such correlation exists. However, both groups show a strong, significant correlation between Pre- and Post-EQ-5D scores (Group 1: r = .392, Group 2: r = .662), suggesting consistency in self-reported quality of life over time.

VII. Discussion

The purpose of this study was to assess how a three-month sequential aerobic and computer-based cognitive training program affected the health-related quality of life (HRQoL) and community integration of older adults with moderate cognitive impairment (MCI) who were employed or unemployed. The findings showed that both groups' post-intervention CIQ and EQ-5D scores improved statistically significantly, with the employed seniors showing the biggest increases. In addition to highlighting work status as a possible moderating factor, our findings emphasize the possibility for organized multi-domain interventions to improve social involvement and subjective quality of life in aging populations.

A. Community Integration Improvements

After the intervention, both groups showed a substantial improvement in community integration as measured by the CIQ. These results are consistent with other studies showing the benefits of structured cognitive and physical activity in enhancing older people's social and functional involvement. Originally created for traumatic brain injury populations, the CIQ is now being used to evaluate functional reintegration into society in older groups. Higher CIQ values imply that participants were more capable of taking on new responsibilities in their homes and communities and participating in constructive social activities [18-20].

Enhancements in executive functioning, planning, attention, and mood regulation—all of which are essential for managing social situations—may be among the ways that aerobic and cognitive exercise promotes community integration. Additionally, aerobic exercise has been associated with a decrease in feelings of anxiety and sadness, which are known to be obstacles to community involvement and frequently co-occur with MCI [19].

Interestingly, older individuals who were employed showed higher increases in CIQ levels than those who were jobless. This might be an indication of a type of "cognitive reserve" developed from sustained exposure to challenging job settings. Employment may improve a person's receptivity to further therapies by regularly stimulating cognitive areas including memory, attention, and social cognition. Additionally, regularity, purpose, and scheduled social interaction all essential elements of effective community integration—may be facilitated by employment [20].

B. Health-Related Quality of Life (EQ-5D) Outcomes

Both groups showed substantial increases in EQ-5D scores, indicating improved HRQoL after the intervention, which is consistent with gains in community integration. This is consistent with other research showing that cognitive training and aerobic exercise both independently improve quality of life in older persons with MCI [21–24].

Increased physical health and self-efficacy, in addition to cognitive improvements, may be responsible for improved HRQoL. Improvements in EQ-5D areas including mobility and routine activities have been favourably correlated with the 6-minute walk test, which is utilized as part of a larger functional evaluation. Furthermore, engaging in organized group activities may enhance perceived social support and lessen feelings of loneliness, both of which enhance general well-being [22].

Again, employed elderly participants demonstrated superior improvement in EQ-5D scores, suggesting that the occupational status may influence one's baseline functioning and capacity to benefit from interventions. Being employed typically involves a higher level of daily activity and cognitive stimulation, which may buffer against the detrimental effects of MCI. In contrast, the unemployed elderly, particularly those socially isolated, may have a lower threshold for HRQoL improvement, but their gains may be more limited in magnitude.

C. Correlation Between CIQ and EQ-5D

The study's main discovery was the favourable relationship between CIQ and EQ-5D scores at the 6-month follow-up and after the intervention. This lends credence to the idea that greater subjective health and quality of life are correlated with stronger community integration. The EQ-5D evaluates a person's subjective assessment of their health and functioning, whereas the CIQ measures concrete social involvement. The biopsychosocial paradigm, which holds that social participation, emotional well-being, and physical and mental health are all interconnected, may help to explain the link between the two. [23]

This correlation also reinforces previous findings from neurorehabilitation research, which demonstrate that improved social participation contributes significantly to perceived quality of life. The implications are particularly important for designing comprehensive geriatric interventions that do not narrowly focus on cognitive scores alone, but incorporate broader functional and psychosocial outcomes.

D. Clinical and Policy Implications

The study's findings emphasize the value of comprehensive approaches in the treatment of MCI in senior citizens. Combining computer-based cognitive training with aerobic

exercise provides a scalable, non-pharmacological approach that targets several areas of functioning. Considering the rising incidence of MCI and the aging population, especially in developing nations, these therapies might be included into community centres and public health initiatives [24, 25].

Furthermore, the finding that employed individuals respond more favourably to interventions suggests the need to encourage structured activities and community roles for retired or unemployed elderly. Day programs, volunteering opportunities, or skill-building workshops may serve as substitutes for employment, potentially providing the cognitive and social stimulation necessary for maintaining functional independence

VIII. Conclusion

Sequential aerobic and computer-based cognitive training leads to significant improvements in social participation and health-related quality of life in elderly individuals with MCI. Employment status appears to enhance the impact of these interventions. This highlights the importance of structured programs that extend beyond cognitive metrics to promote meaningful life engagement and well-being.

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