

Physical Activity and Cognitive Function Among Mild Cognitive Impairment Community-Dwelling Elderly Adults: The Transtheoretical Model

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Background

Mild cognitive impairment (MCI) is a common clinical syndrome that identifies people at high risk of developing dementia, and the prevalence range from 7.7 to 51.7%. Although treatments for MCI are currently unavailable, preliminary evidence has identified potential neuro-protective effects of physical activity (PA), which may lead to improved outcomes. However, the design and delivery of an appropriate programme for people with MCI is challenging for having physical, psychological, cognitive, and social barriers.

Aims

The purposes of this study are to develop and examine physical activity program, on primary outcomes (cognitive function & IADL), and secondary outcomes (physical fitness, QOL, social support and depression) among community-dwelling elderly adults with MCI.

Methods

We developed a PA stage-matched intervention (SMI) base on the Transtheoretical Model of Change (TMC), literature and our previous findings, then, 81 elderly adults with MCI were recruited in to a 2-group pretest-posttest randomized controlled trial for 6 months to examine its effectiveness among community-dwelling elderly with MCI. The 24-week SMI consist of 3 components:

- The stage-matched counseling strategies base on main constructs derived from the TMC
- Exercise behavior training: we provided a 24-week, 2 times group-based (8-12 participants with 2 instructors at community centers, 60' each) and one home-based (with the PA program VCD and manual to bring home, 30')
- Telephone counseling each week.

Table 1 Demographic characteristic at baseline

Variable	Total(N=65)		PA group(n=28)		Control group(n=37)		χ^2	p
	Frequency	%	Frequency	%	Frequency	%		
Gender *								1.000
Female	60	92.3%	26	92.9%	34	91.9%		
Male	5	7.7%	2	7.1%	3	8.1%		
Age							.155	.694
65-74	32	49.2%	13	46.4%	19	51.4%		
≥75	33	50.8%	15	53.6%	18	48.6%		
Education (years)								.644
≤6 years	60	92.3%	25	89.3%	35	94.6%		
>6 years	5	7.7%	3	10.7%	2	5.4%		
Religious belief *								.380
Yes	60	92.3%	27	96.4%	33	89.2%		
No	5	7.7%	1	3.6%	4	10.8%		
Marital							2.209	.137
Married	28	43.1%	15	53.6%	13	35.1%		
Single	37	56.9%	13	46.4%	24	64.9%		
Living condition							.075	.784
Live with family	50	76.9%	22	78.6%	28	75.7%		
Live along	15	23.1%	6	21.4%	9	24.3%		
Chronic disease							.908	.878
No	7	10.8%	2	7.1%	5	13.5%		
1	20	30.8%	9	32.1%	11	29.7%		
2	26	40.0%	11	39.3%	15	40.5%		
≥3	12	18.5%	6	21.4%	6	16.2%		

Note: χ^2 , *Fisher

Results

After this 24-week PA SMI, the PA group participants showed significantly better MMSE than those in the comparison group ($t=2.585$, $p=.012$); however, Mixed model analysis showed significantly on group effect only ($F=8.846$; $p=.004$). Also, the PA participants demonstrated significantly better mobility (interaction effects $F=5.325$; $p=.024$).

Table 2 Primary outcomes: cognitive function

Variable	PA group n=28		Control group Pre n=37 Post1 n=34		t	p	F		
	mean	SD	mean	SD			group	time	group* time
MMSE							8.846**	.762	.864
Pre	24.14	3.15	22.78	3.48	1.623	.109			
Post 1	24.18	3.33	21.65	4.21	2.585	.012			
Orientation							1.361	1.306	.172
Pre	9.04	1.26	8.81	1.31	.697	.489			
Post 1	8.82	1.39	8.35	2.33	.979	.332			
Attention							7.694**	.117	.332
Pre	5.82	1.81	5.16	1.74	1.488	.142			
Post 1	5.89	1.64	4.88	1.59	2.454	.017			
Memory							.016	.620	1.075
Pre	1.82	.82	1.95	.82	-.609	.545			
Post 1	2.07	.66	1.91	.75	.876	.384			
Language							1.977	1.691	.007
Pre	3.75	.44	3.62	.55	1.049	.298			
Post 1	3.64	.49	3.50	.56	1.054	.296			
Language and Praxis							14.157**	.328	.328
Pre	2.57	.69	2.19	.78	2.061	.043			
Post 1	2.57	.57	2.06	.49	3.744	.000			
Construction							3.328	.472	.003
Pre	.96	.19	.86	.35	1.478	.145			
Post 1	.93	.26	.82	.39	1.268	.210			

Note: t-test, mixed model analysis: * $<.05$, ** $<.01$, *** $<.001$

Table 3 Secondary outcomes

Variable	PA group n=28		Control group Pre n=37 Post1 n=34		t	p	F		
	mean	SD	mean	SD			group	time	group* time
Mobility (Tinetti)							4.147*	.173	5.325*
Pre	25.86	3.67	27.65	.63	-2.555	.016			
Post 1	27.00	2.39	26.85	1.91	.270	.788			
Gait							2.948	.415	2.311
Pre	11.29	1.487	11.86	.536	-1.966	.058			
Post 1	11.68	1.02	11.71	.87	-.114	.910			
Balance							3.590	.043	6.372*
Pre	14.57	2.43	15.78	.42	-2.616	.014			
Post 1	15.32	1.49	15.15	1.40	.475	.637			
Self-efficacy							23.874**	.371	.096
Pre	48.89	15.91	34.54	19.67	3.157	.002			
Post 1	51.64	14.57	35.47	16.95	3.981	.000			
DS (GDS-15)							1.866	.084	3.262
Pre	2.0	2.51	1.95	2.17	.216	.830			
Post 1	1.29	1.30	2.50	2.43	-2.511	.015			
Quality of life (SF-12)							.001	1.202	.609
Pre	47.54	7.11	48.41	6.11	-.527	.600			
Post 1	49.71	4.43	48.78	6.06	.671	.505			
Physical							.035	.001	.102
Pre	44.42	6.60	44.61	7.93	-.102	.919			
Post 1	44.82	6.98	44.13	8.90	.331	.741			
Mental							.003	2.067	.564
Pre	50.67	10.50	52.21	7.83	-.679	.500			
Post 1	54.59	7.32	53.43	9.87	.516	.608			

Note: t-test, mixed model analysis: * $<.05$, ** $<.01$, *** $<.001$

Conclusion

A 24-week PA SMI could improve cognitive and mobility ability among MCI elderly adults. However, more participants and physical activity other non-pharmacological interventions (such as cognitive training) may boost the effects on cognitive function among MCI elderly.