Efficacy of Health Coaching and an Electronic Health Management Program: Randomized Controlled Trial

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BACKGROUND: For chronic disease management, self-management strategies are essential to achieve sustained improvement.

OBJECTIVE: Our study evaluated the efficacy of health coaching and a self-management strategy–based electronic program on self-management strategies for patients with osteoporosis, chronic respiratory disease, or arthritis.

DESIGN: Three-arm randomized controlled trial, pilot study

PARTICIPANTS: Fifty-four participants

INTERVENTIONS: The first intervention group (n = 53) received a self-management strategy–based electronic program and 12 weeks of health coaching (20 sessions). The second intervention group received the information and communications technology (ICT) program; the control group received usual care and an educational booklet about self-management of chronic diseases.

MAIN MEASURES: The primary outcome was the difference in the change of the mean of self-management strategy scores. Secondary outcomes included depression (PHQ-9), physical activity (Godin Leisure Exercise Questionnaire), and health habit maintenance (transtheoretical model) after 12 weeks in the program.

KEY RESULTS: The combination of health coaching and ICT was superior to control group (change 18.5 vs. − 2.6, adjusted difference = 24.5, $p < 0.001$); however, the ICT alone group was not superior to the control group (change 8.0 vs. − 2.6, adjusted difference = 8.0, $p = 0.156$). As a result of evaluating the change in the percentage of people with positive stage changes in the transtheoretical model of health habits, regular exercise ($p = 0.008$), a balanced diet ($p = 0.005$), helping others ($p = 0.001$), and living with loved ones ($p = 0.038$) showed significant differences. There was no significant difference in the changes in percentage of patients with depressive symptoms in comparison with control group; however, there was in comparison with control group among groups ($p = 0.033$). Compared to the control group, the proportion of patients who achieved an exercise amount of 12.5 MET or higher was significantly higher ($p = 0.028$) in the health coaching and ICT group.

CONCLUSIONS: The combination of ICT + health coaching led to improvement in self-management as well as in increasing exercise, and several healthy behaviors.

TRIAL REGISTRATION: https://clinicaltrials.gov/ct2/show/NCT03294057

INTRODUCTION

Chronic disease is a major cause of mortality and morbidity[1] and has significant personal and socio-economic impact on the lives of patients.[2] In chronic disease, self-management is a critical element in successful disease control and improving outcomes. In order to improve self-management, numerous health coaching interventions have been developed.[3, 4] However, these health interventions were mostly targeted to patients with diabetes, cardiovascular disease such as hypertension, and cancer, and most of them are based on patient education.[3]

Long-term health outcomes depend on sustaining self-management strategies.[5, 6] A number of interventions have been tested using mobile health (mHealth) or telehealth interventions.[7, 8] Health coaching has been shown to improve patient self-management[9] and is cost-effective.[10, 11] Health coaching can improve use of ICT programs.[12] There is a need to test the concurrent effects of health coaching and ICT programs using rigorous methods. Our study's purpose is to conduct a randomized controlled trial to evaluate the efficacy of health coaching and a self-management strategy–based electronic program for patients with osteoporosis, chronic respiratory disease, or arthritis.

METHODS

Study Population

From November 2017 to May 2018, we recruited patients (1) aged ≥ 19 years; (2) diagnosed with osteoporosis, chronic pulmonary disease, or chronic arthritis; (2-1) osteoporosis: had been diagnosed with osteoporosis through bone mineral density (BMD) test within 1 year, (2-2) chronic pulmonary disease: diagnosed with chronic obstructive pulmonary disease (COPD) or asthma, (2-3) chronic arthritis: patients diagnosed with osteoarthritis or rheumatoid arthritis. The exclusion criteria were as follows: (1) unwilling or unable to use smart phones and personal computer (those who could not use ICT-based health care programs) including those with visual or hearing limitations, (2) people with comorbid conditions that limited participation (e.g., severe dyspnea difficult to perform coaching, schizophrenia, or severe depression), (3) those who were not able to speak, comprehend, or write Korean.

Physicians from the two study hospitals reviewed medical records to determine potential eligibility. A clinical research coordinator at each hospital explained the study details to eligible participants. All participants provided informed consent. The institutional review boards at both hospitals approved the study (Nos. 1707-084-870 and B-1802-453-401). The trial was performed in accordance with the Good Clinical Practice guidelines and the Declaration of Helsinki.

Study Design and Randomization

This study was a prospective randomized controlled trial with randomization (1:1:1) to three groups: ICT and coaching group, ICT group, or a control group. We used the Centers for Disease Control and Prevention's Internet-based Clinical Research and Trial Management System (iCReaT) to randomize subjects. We randomized within each disease group (osteoporosis, pulmonary disease, and osteoarthritis).

Intervention group 1 received a self-management strategy–based electronic program and health coaching, whereas intervention group 2 received only the self-management strategy–based electronic program. Coaching proceeded for 12 weeks, with a total of 20 sessions (for intensive use, coaching was conducted twice a week for the first 8 weeks, a total of 16 times, and coaching was conducted once a week for the latter 4 weeks, and a total of 4 times). The patients using the ICT program received daily health educational content and could create their own health management weekly plan and monitor their progress and health. The 12-week ICT program, Smart Management Strategy for Health (SMASH), includes an application and a web-based program.[9] This ICT program consisted of four areas: self-assessment, self-planning, self-learning, and self-monitoring by automatic feedback. Program targets included positive thinking, a balanced diet, physical activity, and medication adherence. The control group (group 3) received a basic educational pamphlet providing information about their specific disease as well as a health educational booklet about the importance of self-management of chronic disease.

Study Outcome Measurement

The primary outcome was the difference in the change of the mean of self-management strategy scores among the groups; patient's self-management strategy was measured with the short form of SMASH Assessment Tool (SAT-SF), which is a three-set, 16-factor, 30-item questionnaire. In this tool, 10 items focus on core self-management strategies, 10 items on preparation strategies, and 10 items on implementation strategies.[10, 11]

The secondary outcomes included depression, physical activity, and health habit maintenance after 12 weeks in the program. Depression was assessed with the Patient Heath Questionnaire-9 (PHQ-9).[13] Physical activity was measured with a revised version of the Godin Leisure Exercise Questionnaire.[14] This questionnaire assesses the average time and frequency of light, moderate, and strenuous exercise per week. Based on the transtheoretical model, health habit maintenance of the participants was measured with 5 scales: (1) precontemplation, (2) contemplation, (3) preparation, (4) action, and (5) maintenance.[15]

Statistical Analysis

Baseline participant characteristics were compared among study arms and tested for significance using analysis of variance (ANOVA). Outcomes were assessed by group assignment (in comparison with control group) using generalized linear models with a normal distribution with identity link for continuous outcomes and binomial distribution with logit link for binary outcomes. p values less than 0.05 were considered statistically significant, limiting intervention participants to those who received a minimal quantity of the intervention, defined as at least 12 health coach sessions, and adjusting for educational status as well as baseline variables that differed between study arms at p value < 0.05. All statistical tests were two sided and performed using SAS 9·4 (SAS Institute Inc., Cary, NC), and R software (version 3·5·1).

RESULTS

A total of 54 patients were randomly assigned to the three groups: controls (21 patients, book only), the ICT-only intervention group (19 patients), or the health coaching + ICT group (14 patients) (Table 1). Table 1 shows the baseline characteristics of the three study groups. Of the health coaching + ICT group, all patients completed 20 coaching sessions in 3 months. Baseline characteristics of the participants were similar among the study groups, with the exception of the educational status.

Table 1 Demographic and Clinical Characteristics of Participants

	Group 1, ICT + coaching (N = 14)		Group 2, ICT only (N = 19)		Control, book only (N = 21)		p value
	No.	%	No.	%	No.	%	
Age (mean ± SD)							
	58.0 ± 7.1		58.6 ± 6.0		59.1 ± 10.1		0.358
Sex							
Male	3	21.4	4	21.1	6	28.6	0.583
Female	11	78.6	15	78.9	15	71.4	
Marital status							
Married	11	78.6	18	94.7	15	71.4	0.146
Unmarried	0	0.0	0	0.0	1	4.8	
Separated/ bereaved	3	21.4	1	5.3	5	23.8	
Educational status							
High school or less	7	50.0	4	21.1	12	57.1	0.032
≥ College or university	7	50.0	15	78.9	9	42.9	
Religion							
Yes	11	78.6	18	94.7	16	76.2	0.236
No	3	21.4	1	5.3	5	23.8	
Residence							
Metropolitan	8	57.1	11	57.9	12	57.1	0.864
Urban or rural	6	42.9	8	42.1	9	42.9	
Monthly income (1000KRW/month)							
≤ 3999	6	42.9	7	36.8	11	52.4	0.284
4000–4999	2	14.3	1	5.3	3	14.3	
≥ 5000	6	42.9	11	57.9	7	33.3	
Employment status							
Employed	10	71.4	9	47.4	11	52.4	0.782
Unemployed/ retired	4	28.6	10	52.6	10	47.6	
Disease							
Osteoporosis	10	71.4	14	73.7	10	47.6	0.225
Chronic pulmonary disease	2	14.3	0	0.0	3	14.3	
Arthritis	2	14.3	5	26.3	8	38.1	

Primary Outcome

In self-management strategy, the coaching + ICT group was superior to the control group (change 18.5 vs. − 2.6, adjusted difference = 24.5, $p < 0.001$); however, the ICT alone group was not superior to the control group (change 8.0 vs. − 2.6, adjusted difference = 8.0, $p = 0.156$). All three self-management strategies showed the same results. The differences in the core, preparation, and implementation strategies for the health coaching + ICT and control groups were significant (adjusted difference = 26.0, 20.7, and 26.9; $p < 0.001$, 0.002, and < 0.001 respectively; Table 2). However, at the difference between the ICT-only group and the control group, there was no significant difference in the self-management strategy score.

Secondary Outcomes

As a result of evaluating the change in the percentage of people with positive stage changes in the transtheoretical model (Precontemplation-Contemplation-Preparation-Action-Maintenance) of health habits of the pre- and post-intervention, regular exercise (change in group 1 = 100%, group 2 =

66.7%, control = 60.0%, $p = 0.008$), a balanced diet (change in group 1 = 100%, group 2 = 73.3%, control = 70.0%, $p = 0.005$), helping others (change in group 1 = 100%, group 2 = 46.7%, control = 55.0%, $p = 0.001$), and living with loved ones (change in group 1 = 100%, group 2 = 80.0%, control = 70.0%, $p = 0.038$) showed significant differences (Table 3).

The difference in proportions of people with health habit maintenance stage was significant on the pre- and post-intervention (Table 4); three out of a total of 12 health habits showed significant values (a balanced diet, having regular checkups, and helping others). After 3 months, the difference in the proportion of people on maintaining a balanced diet was 21.7% higher in group 1 compared to the control group (adjusted difference = 22.1%, $p = 0.003$). In the case of having regular checkups, the difference in the proportion of people on maintaining was 29.0%; however, that was lower in group 1 compared to the control group (adjusted difference = 28.0%, $p < 0.001$). The difference in the percentage of people on maintaining helping others was 23.6% higher in group 1 compared to the control group (adjusted difference = 25.1%, $p = 0.002$).

In the case of depression, the difference of ICT and coaching and ICT-only group in comparison with control group (Table 5) was not significant (adjusted difference in group 1 = 17.9, $p = 0.133$; adjusted difference in group 2 = 22.8, $p = 0.053$). Though, comparing the three groups by ANOVA, there was a significant difference ($p = 0.033$). Compared to the control group, the proportion of patients who achieved an exercise amount of 12.5 MET or higher was significantly higher in the coached intervention group (adjusted difference = 20.1%, $p = 0.028$; Table 6). However, there was no significance difference in the ICT-only group in comparison with control group.

DISCUSSION

A combination of telephone coaching and ICT programs was more effective than ICT alone or usual care in promoting self-management strategies. The combination of coaching and ICT programs improved several of our secondary outcomes, compared to both control and ICT alone groups for increasing exercise and several healthy behaviors.

As the prevalence of chronic diseases increases, it is important to evaluate the effectiveness and cost-effectiveness of numerous treatment methods. Several previous studies have evaluated health coaching and ICT programs. For health coaching intervention, the results have been mixed. Coaching is effective in weight management for people with chronic diseases[16] and increases physical activity[16, 17]; it also improves blood pressure control.[18] Self-reported health status[19, 20] quality of life, and depression all improve after health coaching.[19, 21] Health coaching reinforces self-management behaviors,[21] promotes lifestyle changes,[22] and reduces risky behavior.[18] While several studies have shown health coaching improves self-management (25, 26), we found improvement

Table 2 Changes in Self-management Strategy According to Groups

Changes in self-management strategy											
	Group 1, ICT + coaching (N = 14)					Group 2, ICT only (N = 19)					Control, book only (N = 21)	
	Mean ± SD	Change	Diff	Adjusted diff*	p value[†]	Mean ± SD	Change	Diff	Adjusted diff*	p value[†]	Mean ± SD	Change
SAT total					0.001							
Baseline	61.7 ±16.4					61.7 ±18.1					62.6 ±20.3	
3 months	80.2 ±14.1	18.5	21.1	24.5	< 0.001	66.7 ±14.9	5.0	7.6	8.0	0.156	60.0 ±17.1	− 2.6
Core strategy												
Strategy 1					0.011							
Baseline	56.5 ±22.2					65.8 ±23.7					67.1 ±24.4	
3 months	80.3 ±15.5	23.8	27.9	27.6	0.003	71.1 ±14.4	5.3	9.4	9.4	0.233	62.9 ±23.5	− 4.1
Strategy 2					0.069							
Baseline	72.2 ±19.4					70.2 ±19.6					72.5 ±23.5	
3 months	83.8 ±18.8	11.6	11.3	14.5	0.052	71.9 ±13.8	1.7	1.4	0.9	0.880	72.8 ±18.9	0.3
Strategy 3					0.001							
Baseline	72.6 ±15.5					76.3 ±20.3					81.0 ±19.9	
3 months	90.9 ±11.5	18.3	32.6	31.5	0.002	78.9 ±16.0	2.6	16.9	16.7	0.049	66.7 ±30.1	− 14.3
Strategy 4					0.040							
Baseline	59.5 ±26.7					64.9 ±26.0					55.6 ±30.4	
3 months	90.9 ±21.6	31.4	30.3	30.3	0.018	71.1 ±21.3	6.2	5.1	6.7	0.559	56.7 ±28.8	1.1
Total					0.002							
Baseline	65.2 ±13.3					69.3 ±18.5					69.0 ±19.8	
3 months	86.5 ±12.9	21.3	25.6	26.0	< 0.001	73.2 ±12.4	3.9	8.2	8.5	0.173	64.8 ±21.9	− 4.3
Preparation strategy					0.029							
Strategy 1												
Baseline	65.1 ±23.4					65.5 ±25.1					62.4 ±24.5	
3 months	82.8 ±21.9	17.7	16.9	18.6	0.013	67.4 ±19.9	1.9	1.0	3.1	0.623	63.3 ±23.4	0.9
Strategy 2					0.040							
Baseline	57.1 ±25.9					57.9 ±22.5					60.3 ±23.3	
3 months	75.8 ±24.0	18.6	20.5	25.1	0.016	67.8 ±23.1	9.9	11.8	11.7	0.288	58.3 ±22.6	− 1.9
Strategy 3					0.228							
Baseline	59.5 ±22.4					60.5 ±24.3					58.7 ±27.7	
3 months	74.2 ±21.6	14.7	5.9	11.4	0.196	68.9 ±19.8	8.4	− 0.4	− 2.8	0.683	67.5 ±21.3	8.8
Strategy 4					0.081							
Baseline	56.0 ±28.2					57.0 ±29.0					55.6 ±29.5	
3 months	68.2 ±18.9	12.2	12.7	21.4	0.022	61.1 ±25.7	4.1	4.6	9.4	0.293	55.0 ±23.6	− 0.5
Strategy 5					0.016							
Baseline	57.1 ±24.2					61.4 ±27.8					65.1 ±30.7	
3 months	78.8 ±27.0	21.6	23.3	27.3	0.013	57.8 ±19.8	− 3.6	1.9	− 2.2	0.824	63.3 ±32.3	− 1.7
Total					0.005							
Baseline												

Table 2. (continued)

Changes in self-management strategy

	Group 1, ICT + coaching (N = 14)					Group 2, ICT only (N = 19)					Control, book only (N = 21)	
	Mean ± SD	Change	Diff	Adjusted diff*	p value†	Mean ± SD	Change	Diff	Adjusted diff*	p value†	Mean ± SD	Change
Baseline	59.0 ±21.7					60.5 ±21.8					60.4 ±24.3	
3 months	76.0 ±19.0	17.0	15.9	20.7	0.002	64.6 ±17.1	4.1	3.0	3.5	0.553	61.5 ±19.5	1.1
Implementation strategy												
Strategy 1					0.062							
Baseline	54.8 ±19.5					58.3 ±21.7					57.5 ±24.7	
3 months	72.7 ±20.8	18.0	18.0	20.7	0.027	65.6 ±18.3	7.2	7.2	5.4	0.522	57.5 ±20.4	0.0
Strategy 2					0.089							
Baseline	63.1 ±27.9					57.9 ±21.8					62.7 ±26.3	
3 months	74.2 ±20.2	11.1	16.3	20.2	0.027	58.9 ±19.8	1.0	6.2	8.3	0.331	57.5 ±26.2	− 5.2
Strategy 3					0.162							
Baseline	64.3 ±38.0					56.1 ±29.5					58.7 ±34.8	
3 months	66.7 ±29.8	2.4	4.5	7.1	0.197	68.9 ±19.8	12.7	14.8	20.6	0.112	56.7 ±28.8	− 2.1
Strategy 4					0.010							
Baseline	59.5 ±23.3					47.4 ±33.9					52.4 ±34.3	
3 months	90.9 ±15.6	31.4	40.4	40.0	0.003	51.1 ±37.5	3.7	12.7	8.9	0.484	43.3 ±24.4	− 9.0
Strategy 5					0.263							
Baseline	69.0 ±27.6					54.4 ±16.5					52.4 ±24.9	
3 months	81.8 ±27.3	12.8	8.5	16.5	0.138	62.2 ±24.8	7.8	3.5	9.4	0.320	56.7 ±24.4	4.3
Strategy 6					0.001							
Baseline	54.8 ±24.8					57.9 ±33.0					66.7 ±29.8	
3 months	81.8 ±22.9	27.1	42.1	46.7	< 0.001	66.7 ±21.8	8.8	23.8	20.0	0.071	51.7 ±20.2	− 15.0
Total					0.001							
Baseline	60.9 ±20.9					55.3 ±19.8					58.4 ±20.8	
3 months	78.0 ±16.2	17.1	21.6	26.9	< 0.001	62.2 ±17.7	6.9	11.4	12.1	0.074	53.9 ±14.2	− 4.5

*Adjusted for baseline educational status
†In comparison with control group
Diff difference

in several self-management strategies. In our study results, combining ICT and coaching had significant effects in all core-preparation-implementation stages of self-management strategies. Previous studies evaluating ICT programs found high rates of participant utilization and retention with improved weight loss[23] and other clinical indicators.[24] Our study looks at the impact of combining these modalities.

Our study has a number of strengths and weakness. All patients completed the 20 coaching sessions with 100% follow-up. However, our study was small, and potentially clinically meaningful differences, particularly between group 2 and controls, were not sufficiently powered. Secondly, our intervention was intensive, with 20 sessions. It is unclear how many sessions are needed to have benefit. Third, our intervention was short, only 3 months. It is unclear whether our results would be sustained over a longer time horizon. This is important, given that chronic disease is a lifetime process. Fourth, we limited our focus on only a few diseases and including more than one chronic disease meant that we had very few of any specific disease. Hence, we cannot determine if this intervention was more effective in one disease than the others. Finally, we have no measures on whether our intervention improved patient outcomes for these diseases.

We found that the combination of health coaching with ICT was more effective than ICT alone or usual care in self-management. It also improved health habits. Future studies

Table 3 Percentage of People Who Maintain Health Habits and Changes in Percentage of Patients with Positive Stage Changes in the Transtheoretical Model According to Groups

	Changes in health habit maintenance									*p* value
	Group 1, ICT + coaching (*N* = 14)			Group 2, ICT only (*N* = 19)			Control, book only (*N* = 21)			
	Percentage of people who maintain health habits		Change (%)*	Percentage of people who maintain health habits		Change (%)	Percentage of people who maintain health habits		Change (%)	
	Baseline	3 months		Baseline	3 months		Baseline	3 months		
Habit 1	57.1	81.8	100.0	57.9	80.0	86.7	61.9	75.0	75.0	0.134
Habit 2	42.9	54.5	100.0	31.6	46.7	66.7	38.1	50.0	60.0	0.008
Habit 3	42.9	72.7	100.0	42.1	46.7	73.3	61.9	70.0	70.0	0.005
Habit 4	57.1	63.6	90.9	52.6	73.3	80.0	66.7	70.0	75.0	0.120
Habit 5	78.6	72.7	90.9	57.9	73.3	73.3	61.9	85.0	90.0	0.248
Habit 6	28.6	63.6	100.0	42.1	40.0	46.7	28.6	40.0	55.0	0.001
Habit 7	35.7	54.5	90.9	68.4	66.7	93.3	61.9	65.0	70.0	0.144
Habit 8	78.6	72.7	81.8	89.5	100.0	100.0	85.7	85.0	90.0	0.312
Habit 9	50.0	63.6	81.8	79.0	93.3	93.3	81.0	85.0	95.0	0.091
Habit 10	64.3	72.7	90.9	52.6	53.3	60.0	76.2	70.0	75.0	0.201
Habit 11	78.6	72.7	100.0	73.7	66.7	80.0	81.0	70.0	70.0	0.038
Habit 12	85.7	81.8	100.0	79.0	80.0	80.0	85.7	85.0	85.0	0.119

*The percentage of people with positive stage changes in the transtheoretical model (precontemplation-contemplation-preparation-action-maintenance)
Diff difference

Table 4 Changes in Proportions of People Maintaining Health Habits According to Groups

	Changes in proportions of people maintaining health habits									
	Group 1, ICT + coaching (*N* = 14)				Group 2, ICT only (*N* = 19)				Control, book only (*N* = 21)	
	Change	Diff	Adjusted diff*	*p* value†	Change	Diff	Adjusted diff*	*p* value†	Change	*p* value
Habit 1	24.7	11.6	13.2	0.114	22.1	9.0	8.2	0.332	13.1	0.191
Habit 2	11.6	− 0.3	− 0.1	0.891	15.1	3.2	3.0	0.712	11.9	0.594
Habit 3	29.8	21.7	22.1	0.003	4.6	− 3.5	− 5.0	0.570	8.1	0.043
Habit 4	6.5	3.2	2.0	0.667	20.7	17.4	16.1	0.056	3.3	0.228
Habit 5	− 5.9	− 29.0	− 28.0	< 0.001	15.4	− 7.7	− 7.2	0.457	23.1	0.019
Habit 6	35.0	23.6	25.1	0.002	− 2.1	− 13.5	− 11.2	0.108	11.4	0.008
Habit 7	18.8	15.7	15.1	0.078	− 1.7	− 4.8	− 4.9	0.543	3.1	0.285
Habit 8	− 5.9	− 5.2	− 4.3	0.562	10.5	11.2	11.0	0.172	− 0.7	0.333
Habit 9	13.6	9.6	9.1	0.443	14.3	10.3	13.0	0.188	4.0	0.174
Habit 10	8.4	14.6	15.2	0.092	0.7	6.9	6.0	0.354	− 6.2	0.229
Habit 11	− 5.9	5.1	5.0	0.287	− 7.0	4.0	4.2	0.476	− 11.0	0.452
Habit 12	− 3.9	− 3.2	− 3.2	0.225	1.0	1.7	1.9	0.876	− 0.7	0.654

*Adjusted for baseline educational status
†In comparison with control group
Diff difference

Table 5 Changes in Percentage of Patients with Depressive Symptoms According to Groups

	Changes in percentage of patients with depressive symptoms											
	Group 1, ICT + coaching (*N* = 14)					Group 2, ICT only (*N* = 19)					Control, book only (*N* = 21)	
	Percentage (%)	Change	Diff	Adjusted diff*	*p* value†	Percentage	Change	Diff	Adjusted diff*	*p* value†	Percentage	Change
Depressive symptoms					0.033							
Baseline	7.1					10.5					14.3	
3 months	0.0	− 7.1	17.8	17.9	0.133	0.0	− 10.5	21.2	22.8	0.053	25.0	10.7

*Adjusted for baseline educational status
†In comparison with control group
Diff difference

Table 6 Changes in Proportions of People Who Have Achieved 12.5 METs According to Groups

	Changes in proportions of people who have achieved 12.5 METs											
	Group 1, ICT + coaching ($N = 14$)					Group 2, ICT only ($N = 19$)					Control, book only ($N = 21$)	
	Percentage (%)	Change	Diff	Adjusted diff*	p value[†]	Percentage	Change	Diff	Adjusted diff*	p value[†]	Percentage	Change
Who have achieved 12.5 METs					0.021							
Baseline	85.7					68.4					71.4	
3 months	100.0	14.3	− 19.7	− 20.1	0.028	66.7	− 1.7	− 3.7	− 4.1	0.686	66.0	− 5.4

Adjusted for baseline educational status
[†]*In comparison with control group*
Diff difference

should include a larger number of chronic diseases and assess whether improved self-management reduces the complications and mortality of chronic diseases.

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Declarations:

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