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Improvement and Backsliding after Chronic-disease Self-management Education in Japan: One-year Cohort Study

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Purpose: In people who have chronic diseases, disabilities, and rehabilitation needs, self-management education can improve health and health-related behavior, and it can reduce the utilization of healthcare services. The purpose of this research was to assess the long-term effects of chronic-disease self-management education in Japan. **Methods:** This study included 184 adults living with various chronic medical conditions who participated in the Chronic Disease Self-Management Program (CDSMP) in Japan. Data were collected before the program began, and then collected 3 more times over 1 year. **Results:** Healthcare-service utilization was low at baseline, and it did not change. Self-evaluated health status, health-related distress, coping with symptoms, communication with doctors, and self-efficacy to manage symptoms all improved after the program. However, there was backsliding in all of the outcomes that had improved. **Conclusion:** Some benefits of this program can last for at least 1 year, but interventions to prevent attenuation may be needed. For economic evaluations, research should focus on populations with higher baseline levels healthcare-service utilization, including use of rehabilitation services. Also, more attention should be focused on the longer-term decay or persistence of the program's benefits, particularly regarding on preventing and reducing disabilities and with regard to rehabilitation needs.

Key Words: Chronic Illness, Self-management, Education of patients, Backsliding, Decay of impact

INTRODUCTION

The burden of chronic diseases and disabilities is increasing worldwide. People affected by chronic diseases and disabilities can benefit from learning specific techniques for self-managing their conditions. The Chronic Disease Self-Management Program (CDSMP) (Lorig et al., 1999a) is a behavioral intervention that has been implemented in at least 36 countries (Lorig, 2015).

Evidence from English-speaking countries indicates that the CDSMP is useful, with beneficial effects on psychological health and on some health behaviors (Brady et al., 2013; Ory et al., 2013). In Chinese populations (in Shanghai) (Fu et al., 2003) and Hong Kong (Siu, Chan, Poon, Chui, & Chan, 2007), short-term benefits of the CDSMP included maintenance or improvement of health status and health-related behavior, less utilization of health-care services, better self-management skills, and positive psychological changes (e.g., greater self-efficacy and less depression). In South Korea, the CDSMP increased self-efficacy and physical activity (Kim & Youn, 2015). In Japan, a 6-month follow-up study also showed the CDSMP's positive outcomes: increased self-efficacy and skills for coping with health problems, improvements in self-management behaviors and health status, and the possibility of enhanced quality of daily life (Yukawa et al., 2010).

Interventions to help people with chronic conditions should of course have benefits that persist. In some previous studies, at least a few of the benefits of self-management education for people with chronic conditions persisted for one year or longer (Barlow et al., 2009a; Brady et al., 2013; Lorig et al., 2001a, Lucas et al., 2001, Yip et al., 2008). One study of an arthritis-specific program found that some benefits persisted for at least 3 years without re-

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inforcement (Lorig, Ritter, Laurent, & Fries, 2004), and another found that some might be maintained for as long as 8 years (Barlow et al., 2009a). In contrast, in other studies the benefits of such programs decayed over time (Caplin & Creer, 2001; D'Souza et al., 2000; Lorig, Lubeck, Kraines, Seleznick, & Holman, 1985; Norris, Lau, Smith, Schmid, & Engelgau, 2002). Also among some CDSMP participants in Japan, such decay has been found with regard to anxiety and depression (Park, 2013a). The present study addresses the question of whether similar patterns of improvement and decay also occur with other important outcomes: self-evaluated health status, coping with symptoms, self-efficacy to manage symptoms, etc. Also included here are 1-year follow-up results regarding healthcare utilization, and implications for further research.

METHODS

1. CDSMP Workshop in Japan

The nonprofit organization "Japan Chronic Disease Self-Management Association (J-CDSMA, www.j-cdsm.org/)" offers CDSMP workshops throughout Japan. Each workshop comprises six sessions, and each session lasts 2.5 hours. There was one session per week for six weeks. Each workshop had 10 to 12 participants of mixed ages and with various diagnoses, and two lay leaders (facilitators). The Japanese-language versions of the CDSMP textbook and leader's manual were used (Lorig et al., 1993, Lorig et al., 1999b).

Each workshop had two facilitators. Some were registered nurses (although that is not required by the original developers of the CDSMP) and most of them had some personal experience with a chronic medical condition, either their own or in a family member. As specified by the original developers of the CDSMP, each facilitator underwent training for at least 30 hours (Lorig et al., 1999b). Their role was not to give instructions or medical information, rather it was to promote and manage discussions among the participants, on the basis of the textbook (Lorig et al., 1993).

As with the CDSMP workshops in other countries, the workshops in Japan were designed to help the participants learn and practice skills for managing their chronic conditions. The program is intended to be useful to people with many different chronic medical conditions. Activities in the CDSMP are based on self-efficacy theory, and through those activities the participants learn and practice a range of skills to deal more effectively with their chronic conditions (Lorig et al., 1999a). Thus, the aims of the CDSMP are to increase the participants' self-efficacy with regard to managing their chronic conditions. This entails focusing on nutrition, physical exercise, ways of evaluating new treatments, effective communication with health professionals as well as with family and friends, using medications appropriately, and ways of dealing with pain, fatigue, isolation, and frustration.

Through their discussions, the participants come to understand how other people have experienced and responded to various challenges similar to those that they themselves face. This is effective even between people with different diagnoses. As the developers of the CDSMP concluded from their research "… it is possible to educate patients with different chronic diseases successfully in the same intervention at the same time"(Lorig et al., 1999a).

The discussions also focus on how problems and challenging situations can be managed. Some specific self-management skills are introduced in the textbook and others are taught by participants to other participants. As new skills are practiced, the focus is not on difficulties but rather on possibilities.

2. Participants

As indicated above, the participants were adults with various chronic medical conditions. They were recruited using an announcement on the internet homepage of the J-CDSMA, and by referrals from flyers left in public service centers. Family members were also allowed to participate, but data from family members were excluded from the analyses (as described below). Approximately 2 months before the workshop, an explanatory meeting was held for those who had expressed interest. A total of 324 people registered their interest in the workshop, but 8 of those 324 people did not participate in any workshop sessions. Of the remaining 316 people, 20 identified themselves as family members and 43 identified themselves as health-care workers; their data were excluded from analysis for this study. Two people participated in more than one series of CDSMP workshops, and for those 2 only the data from the first series were used. Thus, baseline data from 253 participants were available for analysis.

3. Data Collection

Time 1 (baseline) data were collected immediately before the first workshop session (n=253), Time 2 data were collected 3 months after the last workshop session (n=202), Time 3 data were collected 3 months after Time 2 (n=198), and Time 4 data were collected 6 months after

Time 3, i.e. 12 months after the last workshop session (n=184). Thus, of the 253 participants who provided baseline data, 184 also provided data at Time 4. Those 184 provided data even at the completion of the follow-up period, so they are referred to here as "completers." The 69 who provided data at baseline but not at Time 4 are referred to as "non-completers"(Table 1).

4. Outcome Measures

Outcome variables were measured with the Japanese version of the questionnaire of CDSMP measures developed by Lorig et al.(1996). This report is focused on 14 outcome variables. These outcome measures have been used in many previous studies of the CDSMP, before which they underwent validation testing and reliability testing. Those validation tests and reliability tests were successful, and their results have been documented by Lorig et al. (1996). Further testing of internal-consistency reliability was done for the present study, and the results of those tests of reliability (all successful) are reported below.

The 14 outcome variables included 5 measures of health status: Overall health status was self-evaluated on a 5-point scale (1=excellent and 5=poor). Fatigue and pain during the previous 2 weeks were measured separately, using two 11-point scales, with 0 indicating no fatigue or pain and 10 indicating severe fatigue or pain. Health-related distress in the past month was measured using 4 items with 6-point scales to measure health-related discouragement, fear of the future, worries, and frustrations (coefficient α=.92). Disability in daily life was measured with the Modified Health Assessment Questionnaire, which had 8 items asking about difficulties doing basic daily activities (0=no difficulty and 3=unable to do; α=.96).

Social/role activity limitations in the past month were measured using 4 items with 5-point scales to measure health-related impediments to activities with family, friends, etc.; to hobbies; to household chores; and to shopping and doing errands (α=.87).

There were 3 measures of self-management behavior: On a 5-point scale, participants indicated the amount of time they spent doing 6 different kinds of physical exercise (for each kind of exercise, 0=not at all and 4=more than 3 hours per week). The use of 6 different cognitive techniques to cope with symptoms was measured with a 6-point scale (0=never and 5=always; α=.72). The use of 3 different proactive methods for improving communication with medical doctors was measured with a 6-point scale (0=never and 5=always; α=.82).

Self-efficacy to manage chronic conditions was measured with 6 questions (α=.92). Four of those 6 questions asked about participants' confidence in their ability to do things they want to do despite chronic disease symptoms. The other 2 questions asked about managing their chronic conditions in order to reduce the number of doctor visits, and about reducing the effects of their chronic conditions on daily life without taking medicines.

To measure utilization of medical services in the previous 3 months, participants were asked to write the number of times they visited a physician, went to an emergency room, were admitted to a hospital, and the number of nights they spent in the hospital. The results for each type of medical service are reported separately.

5. Analysis

The completers were compared with the non-completers using x^2 tests and Mann-Whitney U tests (Tables 2, 3).

The data on health status, self-management behaviors, and psychological changes from Time 1 through Time 4 were analyzed with the paired t-test. The data on disability, social/role limitations, and utilization of medical

Table 1. Patterns of Questionnaire Return (*N*=253)

Items	Time 1	Time 2	Time 3	Time 4	Number
Returned at T1 and at T4 (completers)	Y†	Y	Y	Y	155
	Y	n‡	Y	Y	14
	Y	Y	n	Y	8
	Y	n	n	Y	7
		Total number analyzed=184			
Returned at T1 but not at T4 (non-completers)	Y	Y	Y	n	23
	Y	n	n	n	23
	Y	Y	n	n	16
	Y	n	Y	n	7
		Total number excluded=69			

† Returned the questionnaire; ‡ Did not return the questionnaire.

Table 2. Demographic and Clinical Characteristics, Including Comparisons between Completers and Non-completers

Variables	Categories	Completers (n=184)	Non-completers (n=69)	U or $x^{2\dagger}$	*p*
		n (%)	n (%)		
Age (year)	M±SD	48.6±13.6	46.6±15.1	6,865.5	.253
	Range	19~83	21~82		
Gender	Male	134 (72.8)	48 (69.6)	0.264	.639
	Female	50 (27.2)	21 (30.4)		
Education	Middle school	10 (5.4)	8 (11.6)	11.325	.079
	High school	37 (20.1)	20 (29.0)		
	Technical school	33 (17.9)	17 (24.6)		
	2-year or 3-year college	33 (17.9)	6 (8.7)		
	4-year college	56 (30.4)	13 (18.8)		
	Graduate school	8 (4.3)	4 (5.8)		
	Other	5 (2.7)	1 (1.4)		
	Missing data	2 (1.1)	0 (0.0)		
Marital status	Single	53 (28.8)	30 (43.5)	6.378	.173
	Married	106 (57.6)	30 (43.5)		
	Separated	6 (3.3)	2 (2.9)		
	Divorced	12 (6.5)	4 (5.7)		
	Widowed	7 (3.8)	3 (4.3)		
Duration of disease (year)	M±SD	13.2±11.3	14.4±12.1	5,272.5	.559
	Median (min, max)	10.0 (0.5, 54)	10.0 (0.4, 57)		
Specific chronic condition‡	Diabetes	49 (21.2)	16 (23.2)	0.117	.734
	Vascular	42 (23.0)	24 (33.3)	1.422	.264
	Rheumatic	38 (20.7)	9 (13.0)	3.277	.081
	Allergic	38 (20.7)	16 (23.2)	0.192	.731
	Others	70 (38.0)	34 (49.3)	2.615	.116
Multimorbidity status	Only one diagnosis	109 (59.2)	32 (46.4)	3.365	.067
	More than one diagnosis	75 (40.8)	37 (53.6)		

† Test statistic (U) of the Mann-Whitney U test for age and duration of disease only, and test statistic (chi-squared) of the chi-squared test for all other variables, and their *p* values; ‡ Including multiple chronic conditions.

services from Time 1 through Time 4 were analyzed with the Wilcoxon signed-rank test, because the frequency distributions of those data were very strongly right-skewed. For each outcome measure there were three comparisons: Time 1 to Time 2, Time 1 to Time 3, and Time 1 to Time 4. To minimize the possibility of Type-1 errors in the three comparisons, the Bonferroni correction was used and thus for statistical significance the α was set at .017 rather than at .05 (because .05/3=.017).

For the data that were approximately normally distributed, the means of the changes from Time 1 to Times 2, 3, and 4 were divided by the standard deviation of the Time 1 data, to obtain standardized effect sizes. Unstandardized effect sizes can be computed from the results shown in Table 4.

The data were analyzed with version 20 of SPSS. As described above, for statistical significance in the comparisons between completers and non-completers the α value was 0.05 (Tables 2, 3). Also as described above, for statistical significance in the comparisons between baseline measurements and follow-up measurements the α value after Bonferroni correction was 0.017 (Table 4).

6. Ethics

This study was approved by the Institutional Review Board of the Graduate School of Medicine of The University of Tokyo (IRB#: 1472-2).

The participants were informed of the study's purpose and methods, they were informed that their privacy would be strictly protected, they were informed of any likely problems and how those would be dealt with, they were informed that if they chose not to participate in the study then there would be no adverse consequence, and they were also informed that they would be allowed to withdraw from the study at any time. After being in-

formed of those facts, and before the first workshop session, all participants gave their written informed consent to be in this study.

RESULTS

1. Completers and Non-completers

Baseline data on completers (n=184) were compared with baseline data on non-completers (n=69). There were some small differences in demographic and clinical characteristics between completers and non-completers, but none were statistically significant (Table 2). The non-completers reported less pain than did the completers (p=.031). The non-completers also had slightly less disability in daily life (p=.014), and lower scores on the scale measuring communication with medical doctors (p=.035) than did the completers (Table 3). For the 3 months before the baseline data were collected, the non-completers reported more hospital admissions (p=.020) and more nights in the hospital (p=.009) than did the completers (Table 3). Completers and non-completers did not differ with regard to any other baseline data.

2. Participants (completers)

Almost three quarters of the completers were women, more than half of whom had some college-level education (Table 2). Slightly more than half of them were married. The most common diagnoses were diabetes, vascular diseases, rheumatic diseases, and allergic diseases. The median time since diagnosis was 10 years. About 40% of them had more than one chronic condition.

Table 3. Comparisons between Completers and Non-completers at Baseline

Variables	Categories	Completers (n=184) M±SD or Median (min, max)	Non-completers (n=69) M±SD or Median (min, max)	U†	p
Health status	Self-evaluated health status (1~5, ↓=improvement)	3.36±0.89	3.36±0.91	6,252.0	.988
	Fatigue (0~10, ↓=improvement)	5.07±2.53	5.28±2.35	6,094.0	.622
	Pain (0~10, ↓=improvement)	3.30±2.94	2.59±3.11	7,447.5	.031
	Health distress (0~20, ↓=improvement)	7.21±5.11	8.36±5.49	6,085.0	.611
	Disability in daily life‡ (0~24, ↓=improvement)	0 (0, 2.0)	0 (0, 0)	7,373.5	.014
	Social/role activity limitations (0~16, ↓=improvement)	3 (0, 7.0)	3 (0, 5.5)	6,779.5	.398
Self-management behavior	Physical exercise (0~24, ↑=improvement)	3.32±3.18	2.72±3.14	7,068.0	.110
	Coping with symptoms (0~30, ↑=improvement)	6.99±4.91	7.58±5.60	6,152.5	.705
	Communication with medical doctor (0~15, ↑=improvement)	6.30±3.80	5.19±3.52	7,398.5	.035
Self-efficacy to manage symptoms	(0~60, ↑=improvement)	33.1±12.1	32.8±13.6	6,433.0	.870
Utilization of medical care services§, ¶	Physician visits	3 (1.5, 6.0)	3 (1.1, 6.0)	6,496.5	.638
	Emergency room visits	0 (0, 0)	0 (0, 0)	6,488.0	.355
	Hospital admissions	0 (0, 0)	0 (0, 0.5)	5,446.5	.020
	Nights in hospital	0 (0, 0)	0 (0, 2.9)	5,357.5	.009

† Test statistic (U) of the Mann-Whitney U test, and its p value; ‡ The modified health assessment questionnaires; § Number of times in the previous three months; ¶ Higher numbers indicate more utilization of medical care services.

3. Changes during the Follow-up Year

From Time 1 to Time 2, three variables had statistically significant changes (all were improvements): self-evaluated health status, health-related distress, and coping with symptoms (Table 4). Those three also had statistically significant improvements between Time 1 and Time 3 and between Time 1 and Time 4. However, those changes were not monotonic. Specifically, between Time 3 and Time 4 the mean values of those variables indicated some decay of impact ("backsliding"(Green 1977)), that is, short-term improvements that were not completely maintained for 1 year (Table 4).

The remaining variables had no statistically significant change with short-term follow-up (from Time 1 to Time 2), and among them there were statistically significant changes with longer-term follow-up in only two variables: communication with medical doctors and self-efficacy to manage symptoms. Those two were the only outcomes that showed possible delays of impact ("sleeper" effect (Green 1977)).

Utilization of health-care services at baseline was very low on all four measures, and there were no statistically significant changes during the follow-up year.

In general, standardized effect sizes were consistent with the results of statistical tests. Differences that were statistically significant also had relatively large effect sizes, and differences that were not statistically significant had smaller effect sizes. Standardized effect sizes were not computed for six variables, because their data were very skewed: social/role activity limitations (coefficient of skewness at baseline=0.88), disability in daily life (3.11), number of physician visits (3.80), number of emergency room visits (5.38), number of hospital admissions (2.88), and number of nights in hospital (6.09).

DISCUSSION

As an overall summary of these results, it is noteworthy, first, that self-evaluated health status, health-related distress, and coping with symptoms all improved after the program. Second, it is equally important to note that those improvements were followed by some decay. The use of medical services did not change. Below these results are compared with some results from other countries, and then the short-term and long-term outcomes are discussed in more detail.

Comparing the 1-year results with those from other countries, it is noteworthy that health-related distress decreased and self-efficacy increased, both in this study and in the US (Lorig et al., 2001a, 2001b). Three other measures showed no significant improvements either in this study or in the US: fatigue, social/role limitations, and disability (Lorig et al., 2001a). With no intervention, disability scores can worsen by as much as 0.03 per year (Leveille et al.1998), but after the Japanese CDSMP disability scores did not worsen over 1 year. This suggests that the Japanese CDSMP prevented deterioration in the ability to do common daily activities.

Results of this study are different from previous research with regard to 3 measures. Self-evaluated health status improved in this study, but it did not change in the US (Lorig et al., 2001a, 2001b). On two other measures, there were no significant changes in this study, but there were improvements in the US: physician visits (Lorig et al., 2001a, 2001b) and ER visits (Lorig et al., 2001a, Lorig et al., 2001b). In the US, the CDSMP has been shown to reduce healthcare costs through decreases in ER visits and hospitalizations (Ahn et al., 2013). The lack of decreases in utilization of medical services in Japan is a noteworthy difference from the results in the US. This might be related to differences between healthcare insurance systems in the two countries, but another quite likely explanation is that the participants in this study used medical services very rarely even at baseline. The median number of physician visits was only 3 per 3 months at baseline. All of the other utilization data at baseline already had median values of 0 times per 3 months, so there was no possibility for any improvement (i.e. for decreases from 0). Thus, the potential for the CDSMP to reduce healthcare expenditures in Japan is still unknown. The economic effects of the Japan CDSMP should be studied in people with higher levels of healthcare-service utilization at baseline. They should be studied among people who have chronic conditions and are likely to require hospitalization due to an exacerbation that might be prevented by better self-management.

Regarding now the short-term and long-term outcomes, statistically significant short-term (less than 1 year) benefits were seen in 4 measures: self-evaluated health status, health distress, coping with symptoms, and self-efficacy (starting at Time 3), and statistically significant long-term (1 year) benefits were also seen in those 4 measures. The significant improvement from Time 1 to Time 4 on the scale of "Coping with symptoms" indicates that the participants may have used the skills that they learned in the CDSMP for many months after the program had ended. Future analyses and research could determine whether certain coping skills are particularly useful to certain participants, and which components of the CDSMP have the greatest influence on participants with various chronic diseases.

Table 4. One Year of Follow-up after the Japanese Chronic Disease Self-management Program (*N*=184)

		M±SD or Median, 25% and 75%				Results of statistical hypothesis tests†			Effect sizes††, ‡		
		T1	T2	T3	T4	T1→T2	T1→T3	T1→T4	T1→T2	T1→T3	T1→T4
Health status	Self-evaluated health (1~5, ↓=improvement)	3.36±0.89	3.02±0.99	2.92±0.97	3.11±1.05	4.04, 155 <.001	4.14, 146 <.001	3.02, 176 .003	-0.40	-0.44	-0.29
	Fatigue (0~10, ↓=improvement)	5.07±2.53	5.27±2.43	5.03±2.49	4.97±2.39	-0.92, 161 >.999	0.00, 163 >.999	0.49, 183 >.999	0.07	0	-0.04
	Pain (0~10, ↓=improvement)	3.30±2.94	3.55±2.96	3.33±3.12	3.44±3.01	-1.29, 161 >.999	-0.22, 164 >.999	-0.66, 183 >.999	0.10	0.02	0.04
	Health distress (0~20, ↓=improvement)	7.92±5.11	5.96±4.29	5.65±4.01	5.90±4.71	5.46, 162 <.001	5.60, 167 <.001	5.23, 183 <.001	-0.41	-0.44	-0.4
	Disability in daily life§ (0~24, ↓=improvement)	0 0, 2.0	0 0, 1.0	0 0, 2.0	0 0, 1.5	-1.31 .190	-0.74 .460	-0.48 .629	*	*	*
	Social/role limitations (0~16, ↓=improvement)	3 0, 7.0	3 0, 6.0	3 0, 6.0	3 0, 6.0	-.74 .461	1.18 .238	-.59 555	*	*	*
Self-management behavior	Physical exercise (0~24, ↑=improvement)	3.32±3.18	3.70±2.81	3.82±3.01	3.52±3.13	-1.47, 159 .546	-1.99, 162 .163	-1.02, 179 >.999	0.11	0.15	0.07
	Coping with symptoms (0~30, ↑=improvement)	6.99±4.91	9.04±5.52	9.75±5.47	8.47±5.26	-5.35, 157 <.001	-7.03, 160 <.001	-3.76, 178 <.001	0.41	0.61	0.30
	Communication w/doctor (0~15, ↑=improvement)	6.30±3.80	6.42±3.97	7.00±4.00	6.68±4.23	-0.76, 160 >.999	-2.63, 166 .009	-1.28, 177 .882	0.05	0.20	0.09
Self-efficacy to manage symptoms	(0~60, ↑=improvement)	33.08±12.09	35.24±12.10	36.16±11.78	35.99±13.27	-2.13, 159 .035	-2.95, 166 .004	2.78, 181 .006	0.19	0.26	0.24
Use of medical services§§, ¶	Physician visits	3 1.5, 6.0	3 2.0, 6.0	3 2.0, 6.0	3 1.5, 5.9	-.40, .687	1.61, .108	-.76, .449	#	#	#
	Emergency room visits	0; 0, 0	0; 0, 0	0; 0, 0	0; 0, 0	-0.13, .898	-0.79, .431	-0.74, .456	#	#	#
	Hospital admissions	0; 0, 0	0; 0, 0	0; 0, 0	0; 0, 0	-0.64, .521	-1.32, .185	-0.49, .625	#	#	#
	Nights in hospital	0; 0, 0	0; 0, 0	0; 0, 0	0; 0, 0	-1.28, .202	-2.21, .027	-1.02, .307	#	#	#

†Shown are the t values (paired t tests), degrees of freedom, and *p* values, except for disability, limitations, and utilization, which were tested with signed-rank tests. With the Bonferroni correction for multiple comparisons (0.05/3=0.017), in each row only *p* values less than 0.017 indicate statistically significant differences; ††Standardized effect size: The mean of the difference between the later score and the baseline score was divided by the standard deviation of the baseline score; ‡Interpretation of standardized effect sizes: 0.5 or >0.5 indicates moderate-or-greater change, 0.2~0.5 indicates little change, <0.2 indicates no change; §Modified Health Assessment Questionnaire §§Number of times in the previous three months; ¶Higher scores indicate more utilization of medical care services. #Unable to calculate standardized effect size because of extreme skewness.

When evaluating any educational program, it is important to ask whether the benefits of the program are maintained (Green, 1977). Green (1977) used the term "decay of impact" to describe what happens when the short-term benefits of an educational intervention do not persist and instead the participants go back toward their original status. This decay is also called backsliding, attenuation, or, in some contexts, relapse. In the present context, decay of impact would mean going back toward the baseline health status, self-management behaviors, psychological status, etc. As shown by their mean values and standardized effect sizes, for 6 variables (self-evaluated health status, health distress, physical exercise, coping with symptoms, communication with medical doctors, and self-efficacy to manage symptoms) there were improvements from Time 1 to Time 2 and from Time 2 to Time 3, but those improvements were not completely maintained to Time 4 (Table 4). The magnitudes of the attenuations varied between measures, but they occurred on all of the measures for which there was any short-term improvement. That is, all short-term improvements were followed by backsliding. This is consistent with the previously reported results regarding anxiety and depression (Park et al., 2013). It is also consistent with some studies of other health-education interventions (Caplin & Creer, 2001; D'Souza et al., 2000; Norris et al., 2002). There is much literature on relapse in smoking cessation and in rehabilitation from drug and alcohol abuse (Marlatt & Dennis (eds), 2005). Swerissen (2004), referring to Quigley & Marlatt (1999), noted that after beneficial health-related education "there is a high probability that they [the participants] will not maintain the change they make." In the context of self-management education for people with chronic diseases, Lorig et al (2004) wrote that "attenuation of effect is to be expected" and "even long-term longitudinal trials have failed to show significant results beyond 1 year." Almost 10 years later, Brady et al. (2013) meta-analyzed the available results, and they concluded that "small to moderate improvements in psychological health and selected health behaviors" remained even 12 months after the CDSMP, when it is implemented in small groups in English-speaking countries. Those findings are certainly encouraging. Unfortunately, reports of the long-term effects of the CDSMP are relatively rare. Brady et al.'s search in preparation for their meta-analysis found only a few trials with long-term follow up, and it is still unclear to what extent decay of impact is the exception and to what extent it is the rule. More information about persistence or attenuation of the CDS MP's benefits is needed, both to decide how the program should be implemented and to know whether reinforcements (sometimes called "boosters") are useful (Park et al., 2013). This should be another main focus of future research.

It is also important to note that all studies of the CDSMP uniquely contribute to professional nursing expertise and nursing research. The program's original developer created the CDSMP from her nursing background (Lorig, 2015), the CDSMP textbook (Lorig et al., 1993) was translated into Japanese by a nurse, and nurses are welcome as CDSMP workshop facilitators. In addition, nursing care involving adults must be concerned with issues of chronic diseases and patient education, and the CDSMP has been extremely influential in the worldwide movement toward a greater role of patients in the management of their chronic conditions. Understanding of both the benefits and the limitations of chronic-disease self-management education is essential for adult-nursing practice. Exploration of the CDSMP's challenges and potentials is an excellent focus for further contributions of nursing research to patients' well-being and to population health.

CONCLUSION

The findings of this study should not be generalized to the non-completers, and the lack of a control group limits cause-effect inferences. Those limitations notwithstanding, one conclusion from this study is that some of the improvements seen after the CDSMP in Japan can last for at least 1 year. Also noteworthy was the decay of impact that was seen with regard to self-evaluated health status, health distress, physical exercise, coping with symptoms, communication with medical doctors, and self-efficacy to manage symptoms. Additional interventions to prevent that decay are likely to be needed. The outcomes on which there was no decay also had no noteworthy improvement: fatigue, pain, disability in daily life, social/role limitations, and utilization of medical services.

Further studies of the CDSMP in Japan should include randomized controls for as long as is feasible (as has already been done frequently in the US and elsewhere). In addition, studies of the economic impact of the CDSMP in Japan should enroll participants with higher baseline levels of healthcare-service utilization, including use of rehabilitation services. Those studies should use longer follow-up, longer recall periods for the baseline values, or both. Finally, the decay or persistence of the program's benefits should be an object of study in itself, particularly with regard to preventing and reducing disabilities and with regard to rehabilitation needs. That might require follow-up well beyond one year and is important not only in Japan.

REFERENCES

Ahn, S., Basu, R., Smith, M. L., Jiang, L., Lorig, K., Whitelaw, N., et al. (2013). The impact of chronic disease self-management programs: Healthcare savings through a community-based intervention. *BMC Public Health, 13*, 1141.

Barlow, J., Turner, A., Swaby, L., Gilchrist, M., Wright, C., & Doherty, M. (2009a). An 8-yr follow-up of arthritis self-management programme participants. *Rheumatology, 48*, 128-133.

Brady, T. J., Murphy, L., O'Colmain, B. J., Beauchesne, D., Daniels, B., Greenberg, M., et al. (2013). A meta-analysis of health status, health behaviors, and health care utilization outcomes of the chronic disease self-management program. *Preventing Chronic Disease, 10*, 1-14.

Caplin, D. L., & Creer, T. L. (2001). A self-management program for adult asthma. III. Maintenance and relapse of skills. *Journal of Asthma, 38*, 343-356.

D'Souza, W. J., Slater, T., Fox, C., Fox, B., TeKaru, H., Gemmell, T., et al. (2000). Asthma morbidity 6 yrs after an effective asthma self-management programme in a Maori community. *European Respiratory Journal, 15*, 464-469.

Fu, D., Fu, H., McGowan, P., Shen, Y. E., Zhu, L., Yang, H., et al. (2003). Implementation and quantitative evaluation of chronic disease self-management programme in Shanghai, China: Randomized controlled trial. *Bulletin of the World Health Organization, 81*, 174-182.

Green, L. W. (1977). Evaluation and measurement: Some dilemmas for health education. *American Journal of Public Health, 67*, 155-161.

Kim, S. H., & Youn, C. H. (2015). Efficacy of chronic disease self-management program in older Korean adults with low and high health literacy. *Asian Nursing Research, 9*, 42-46.

Leveille, S. G., Wagner, E. H., Davis, C., Grothaus, L., Wallace, J., LoGerfo, M., et al. (1998). Preventing disability and managing chronic illness in frail older adults: A randomized trial of a community-based partnership with primary care. *Journal of the American Geriatrics Society, 46*, 1191-1198.

Lorig, K. R. (2015). Chronic disease self-management program: insights from the eye of the storm. *Frontiers in Public Health, 2*, 253. https://doi.org/10.3389/fpubh.2014.00253

Lorig, K. R., González, V., & Laurent, D. (1999b). *The chronic disease self-management workshop leaders' manual* (Rev. ed.). Stanford, CA: Stanford Patient Education Research Center, Stanford University.

Lorig, K. R., Ritter, P. L., Laurent, D. D., & Fries, J. F. (2004). Long-term randomized controlled trials of tailored-print and small-group arthritis self-management interventions. *Medical Care, 42*, 346-354.

Lorig, K. R., Ritter, P., Stewart, A. L., Sobel, D. S., Brown, B. W. Jr., Bandura, A., et al. (2001a). Chronic disease self-management program: 2-year health status and health care utilization outcomes. *Medical Care, 39*, 1217-1223.

Lorig, K. R., Sobel, D. S., Ritter, P. L., Laurent, D., & Hobbs, M. (2001b). Effect of a self-management program on patients with chronic disease. *Effective Clinical Practice, 4*, 256-262.

Lorig, K. R., Sobel, D. S., Stewart, A. L., Brown, B. W. Jr., Bandura, A., Ritter, P., et al. (1999a). Evidence suggesting that a chronic disease self-management program can improve health status while reducing hospitalization: A randomized trial. *Medical Care, 37*, 5-14.

Lorig, K., Holman, H., Sobel, D., Laurent, D., González, V., & Minor, M. (1993). *Living a healthy life with chronic conditions.* Palo Alto: Bull Publishing Company.

Lorig, K., Lubeck, D., Kraines, R. G., Seleznick, M., & Holman, H. R. (1985). Outcomes of self-help education for patients with arthritis. *Arthritis & Rheumatology, 28*, 680-685.

Lorig, K., Stewart, A., Ritter, P., Gonzalez, V., Laurent, D., & Lynch, J. (1996). *Outcome measures for health education and other health care interventions.* Thousand Oaks: Sage.

Lucas, D. O., Zimmer, L. O., Paul, J. E., Jones, D., Slatko, G., Liao, W., et al. (2001). Two-Year results from the asthma self-management program: long-term impact on health care services, costs, functional status, and productivity. *Journal of Asthma, 38*, 321-330.

Marlatt, A. G., & Dennis, M. D. (Eds.). (2005). *Relapse prevention: Maintenance strategies in the treatment of addictive behaviors* (2nd ed.). New York: The Guilford Press.

Morisky, D. E., Kominski, G. F., Afifi, A. A., & Kotlerman, J. B. (2009). The effects of a disease management program on self-reported health behaviors and health outcomes: Evidence from the "Florida: A Healthy State (FAHS)" Medicaid Program. *Health Education & Behavior, 36*, 505-517.

Norris, S. L., Lau, J., Smith, S. J., Schmid, C. H., & Engelgau, M. M. (2002). Self-management education for adults with type 2 diabetes: A meta-analysis of the effect on glycemic control. *Diabetes Care, 25*, 1159-1171.

Ory, M. G., Ahn, S., Jiang, L., Lorig, K., Ritter, P., Laurent, D. D., et al. (2013). National study of chronic disease self-management: six-month outcome findings. *Journal of Aging and Health, 25*, 1258-1274.

Park, M. J., Green, J., Ishikawa, H., & Kiuchi, T. (2013). Hidden decay of impact after education for self-management of chronic illnesses: hypotheses. *Chronic Illness, 9*, 73-80.

Park, M. J., Green, J., Ishikawa, H., Yamazaki, Y., Kitagawa, A., Ono, M., et al. (2013a). Decay of impact after self-management education for people with chronic illnesses: Changes in anxiety and depression over one year. *PLoS ONE, 8*(6):e65316. https://doi.org/10.1371/journal.pone.0065316

Quigley, L., & Marlatt, A. (1999). Relapse prevention: maintenance of change after initial treatment. In B. S. McCrady & E. E.

Epstein (eds.), *Addictions: A Comprehensive Guidebook* (pp. 370-384). New York: Oxford University Press.

Siu, A. M., Chan, C. C., Poon, P. K., Chui, D. Y., & Chan, S. C. (2007). Evaluation of the chronic disease self-management program in a Chinese population. *Patient Education and Counseling, 65,* 42-50.

Swerissen, H., & Crisp, B. R. (2004). The sustainability of health promotion interventions for different levels of social organization. *Health Promotion International, 19*, 123-130

Yip, Y. B., Sit, J. W., Wong, D. Y., Chong, S. Y., & Chung, L. H. (2008). A 1-year follow up an experimental study of a self-management arthritis programme with an added exercise component of clients with osteoarthritis of the knee. *Psychology, Health & Medicine, 13*, 402-414.

Yukawa, K., Yamazaki, Y., Yonekura, Y., Togari, T., Abbott, F. K., Homma, M., et al. (2010). Effectiveness of chronic disease self-management program in Japan: Preliminary report of a longitudinal study. *Nursing & Health Sciences, 12,* 456-463.