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The Effects of Problem-Solving Skills Training on Self-control Behaviors and Psychotic Symptoms Among Community-Dwelling Patients With Schizophrenia

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Abstract

Purpose: Our aim was to evaluate the effects of problem-solving skills training (PSST) on self-control behaviors and the positive and negative psychotic symptoms of schizophrenia in community-dwelling patients.

Method: This quasi-experimental study was conducted in 63 adult community-dwelling outpatients with schizophrenia in Taiwan. The control group (n=28) received routine life skills training alone, while the experimental group (n=35) received both routine life-skills and problem-solving training. The data were collected at four time points (at baseline, and at week 6, 12, and 16 [4 weeks after training ended]). This study measured outcome variables including problem-solving skills (using the Self-control Schedule [SCS]), and psychiatric syndromes (using the Positive and Negative Syndrome Scale [PANSS]).

Results: Our generalized estimating equation (GEE) model showed a significant improvement in the self-control behavior score in the experimental group at week 12 and 4 weeks after training ended, compared with the control group. In addition, the negative symptoms score was significantly improved at week 12 and 4 weeks after training end, compared with baseline.

Conclusion: These results demonstrated that PSST and routine living skills training have a positive impact on the negative symptoms of schizophrenia patients and could improve their problem-solving capacity and skills for dealing with daily life and health problems and could moderate negative psychotic symptom severity.

Keywords: schizophrenia, problem-solving skills training, self-control behavior, positive symptoms, negative symptoms

1. Introduction

Chronic schizophrenia is usually associated with poor functioning, insufficient social skills, limited relationships within community settings. The poor functioning in daily life that is associated with poor problem-solving capacity may be due to psychotic symptoms or cognitive impairments. Moreover, patients with schizophrenia typically display deficits in attention, working memory, and many other functions of neurocognition, which also highly correlate with severity of negative symptoms, low self-esteem, and poor community functioning (Brüne, Schaub, Juckel, & Langdon, 2011; Bowie & Harvey, 2006; Fett, Viechtbauer, Dominguez, Penn, van Os, & Krabbendam, 2011).

Eskin (2013) points out that problem-solving treatment is an effective method for psychological problems or distress. Although they receive psychiatric rehabilitation therapies, patients with chronic schizophrenia are still incapable of solving or effectively overcoming the problems they face in daily life. As a result of poor functioning in daily life, patients experience a range of negative quality of life outcomes, unemployment,

dependence on family or other social networks, and limited interaction with the community (Couture, Penn, & Roberts, 2006; Green et al., 2008). Many computer-based problem-solving tasks for psychosis therefore focus on improving neurocognitive function and decreasing the severity of psychotic symptoms. However, computer-simulated situational training is out of step with actual life situations and problems in community patients. Although studies have shown that cognitive and negative symptoms may be ameliorated, there is no significant effect on enhancing patients' ability to return to daily life, solve problems, and function in the community (Langdon, Connors, Still, Ward, & Catts, 2014). Moreover, patients with chronic schizophrenia cannot easily articulate their own problems, concentrate on and analyze their problems. Likewise, their strategies and abilities to solve problems of daily life are limited, so they often make unwise decisions when problems are encountered (Couture, et al., 2006; Knolle-Veentjer, Huth, Ferstl, Aldenhoff, & Hinze-Selch, 2008; Zalla, Posada, Franck, Georgieff, & Sirigu, 2001).

Because many problems in patients' daily lives are not effectively managed, patients generally feel disempowered and lack self-confidence and self-efficacy. In spite of this, most community-dwelling patients want to overcome their difficulties and look forward to increasing their independence and improving their functioning in daily life (Byrne, Davies, & Morrison, 2010). Therefore, a problem-solving intervention plays a very important role in the functional recovery of individuals with psychiatric problems. In this study, we provided PSST to schizophrenia outpatients and examined its effects on problem-solving capacity, self-control behavior, and psychotic symptoms.

2. Literature Review

2.1 Schizophrenia Patients' Psychotic Syndromes and Problem-Solving

Schizophrenia is a disorder that affects many aspects of thinking, emotion, perception, and behavior. Chronic schizophrenia is marked by repeated episodes of inpatient treatment and increased caregiver burden. Even when they are on regular medication, patients with chronic schizophrenia can still be symptomatic (Ballon & Lieberman, 2010).

The psychotic symptoms of schizophrenia are categorized as positive, negative, or cognitive. Positive symptoms include delusion, hallucination, and abnormal behavior. Negative symptoms of schizophrenia include reduced verbal and nonverbal expressivity, as well as limited engagement in constructive, pleasurable, and social activity (Beck, Rector, Stolar, & Grant, 2009). Expressive deficits and avolition for daily life and social activities are among the most important negative symptoms of schizophrenia. Cognitive symptoms include disorganized speech, thought, and/or attention and so on. Generally speaking, positive symptoms can be controlled by drugs, and negative symptoms persist in many cases despite pharmacological treatment. Neurocognitive functions, especially episodic memory and executive control processes, are worse in patients with schizophrenia than in normal comparison subjects (Heinrichs, 2005; Reichenberg & Harvey, 2007). They have reduced ability to select information from the environment, have greater susceptibility to distraction by internal and external stimuli, and struggle to sustain concentration and generate and implement plans (Perivoliotis & Cather, 2009).

The above psychotic symptoms can affect patients' self-care functioning, cognitive and behavioral reactions, and social functioning. They can cause emotional depression, reduce levels of goal-oriented mobility, social interaction, social skill, interpersonal interaction, and lead to relationship withdrawal and loss of ability to plan new things and activities (Kirkpatrick, Fenton, Carpenter, & Marder, 2006; Kitchen, Rofail, Heron, & Sacco, 2012; Messinger et al., 2011; Patel, Cherian, Gohil, & Atkinson, 2014).

2.2 Schizophrenia Patients' Self-control Behavior and Problem-Solving

The majority of chronic schizophrenia patients have at least one psychiatric syndrome that can reduce their ability to take care of themselves or deal with problems of community life (American Psychiatric Association [APA], 2000). Cognitive and reality disorders may manifest in schizophrenia patients as a result of the gap between the individual's problem-solving competence and the individual's sense of self-control when dealing with problems of community life.

The problems of community life related to chronic schizophrenia include difficulty with psychiatric treatment; psychotic symptoms; environmental stress and interpersonal relationship stress, and financial concerns (Beebe, 2002, 2010; Beebe & Tian, 2004). The lower level of self-control or of problem–solving skills suggests that such patients may not be able to remain and live independently in the community.

Self-control affects the coping process and behavior of people in stressful situations and involves cognitive behavioral skills that are used to maintain independence in daily tasks despite adverse situations (Rosenbaum, 1990; Zauszniewski, Eggenschwiler, Preechawong, Roberts, & Morris, 2006). In addition, the self-control

behaviors must be learned through a series of cognitive processes, including noticing a disruption in habitual ways of thinking, evaluating this disruption to adapt psychologically, and fostering the belief that self-control behaviors will lead to a target behavior (Rosenbaum, 1990).People can apply self-control strategies to solutions of behavioral and chronic health problems (Rosenbaum, 1990; Zauszniewski & Chung, 2001). The components of self-control behavior are problem-solving, positive self-talk, coping with emotional and physiological responses, delaying immediate gratification, and self-efficacy.

Individuals with high self-control skills are not likely to become anxious or depressed because of environmental or cognitive factors (Rosenbaum, 1990) and are capable of performing self-control activities that solve problems and achieve target outcomes (Rosenbaum, 1990). Persons with self-control skills have also been reported to have better adaptive functioning (Zauszniewski, 1997), psychological adjustment (Braden, Mishel, & Longman, 1998), healthy living habits (Kennett & Nisbet, 1998), drug adherence (Kennett, Worth, & Forbes, 2009; Zauszniewski & Chung, 2001), stress management (Akgun & Ciarrochi, 2003), success in various self-management programs (Kennett, Morris, & Bangs, 2006; Kennett, O'Hagan, & Cezer, 2008), less aggressive behavior (Ronen, 2004; Ronen & Rosenbaum, 2010), greater impulse control (Chapman, Shedlack, & France, 2006), and better emotional regulation (Paschke et al., 2016). Likewise, it is important for community-dwelling patients with schizophrenia to have a stable life and good self-control skills (SCS) to function in their communities. Empirical studies show that cumulative self-control experience contributes to the development of new health habits and has a positive impact on other skills in daily life (Kennett, Worth, & Forbes, 2009; Levesque, Gauvin, & Desharnais, 2003; Ronen & Rosenbaum, 2010); however, few studies have examined the effect of SCS training on schizophrenia. Therefore, the goal of our study was to design a treatment program for chronic schizophrenia that can help patients accumulate self-control experience, improve problem-solving skills, and cope with psychotic symptoms.

2.3 Problem-Solving Skills Training

Psychiatric patients undergo problem-solving training to learn to deal with problems and stressful experiences in community living situations, control psychotic symptoms, and promote functioning in the community (Eskin, 2013). In problem-solving, there are five steps. These include 1) identifying the problem; 2) analyzing the problem; 3) suggesting possible solutions; 4) suggesting the best possible solution, and 5) testing and implementing the solution. Two essential components of problem-solving training are taking action and reflection (Kolb & Stuart, 2005). People need to know how to take action and how to reflect on that action in learning to resolve their problems; moreover, through these steps, people can gain more confidence in dealing with future problems.

Empirical evidence shows that chronic schizophrenia patients may have cognitive or behavior skill dysfunctions, which impact their ability to solve problems; consequently, learning problem solving and practicing problem resolution may help promote problem-solving skills. Problem-solving training (PST) is a cognitive behavioral therapy. Through PST, the therapist provides schizophrenia patients with direct instruction using 6 steps methods, including define the problem, use brainstorming to generate possible solutions, identify the advantages and disadvantages of each possible solution, select the best solution or combination of solutions, plan how to carry out the solution(s) and follow up on the plan at a later time (Bellack, Mueser, Gingerich, & Agresta, 2004). Twamley et al. (2012) designed a 12-week problem-solving training program for psychiatric outpatients, and they did not use computers. The results showed a significantly greater improvement in negative symptoms severity at post-test and 3 months follow-up in the experimental group than in the control group. In addition, a study reported by Veltro et al. (2011) showed that a 12-month PST intervention for schizophrenia patients was only able to decrease the severity of general psychotic symptoms. Empirical studies of strategies and outcomes of problem-solving interventions are still not clear enough to suggest their clinical usefulness for improving self-control behavior and controlling psychotic symptoms in patients with schizophrenia.

3. Method

A quasi-experimental, pre-test post-test design with repeated measures was used to examine the effectiveness of PSST. Both the control group and experimental group received routine life skills training; in addition, the experimental group received PSST. Data were collected before the start of the intervention, at week 6 and 12 of training, and 4 weeks after training ended.

3.1 Participants

3.1.1 Recruitment

Participants were outpatients and recruited (February–June 2013) from a municipal psychiatric hospital located in the north of Taiwan. Participants received psychiatric medication regularly in the referred hospital as well as lived and received routine life skills training in six psychiatric rehabilitation facilities. These facilities cooperated with this psychiatric hospital by providing participants with similar rehabilitation activities. Inclusion criteria were as follows: (a) chronic schizophrenia, (b) Mini-Mental State Examination (MMSE) score of more than 18 prior to recruitment, (c) age from 21 to 65 years, (d) willingness to sign the consent form and share life experiences, emotions, and thoughts, and (e) mentally alert with ability to communicate at least for 20–30 minutes, and (f) able to speak a Taiwanese dialect or Mandarin. Patients were excluded if they had hearing problems, organic brain disease, or substance abuse.

3.1.2 Procedure

Ethical evaluation and approval for this study was obtained from the Institutional Review Board (IRB) of our psychiatric hospital. The study was advertised in our outpatient departments. Outpatients who were interested in participating were asked to contact us via their care coordinator. In addition, we visited the psychiatric rehabilitation facilities and talked to mental health professionals about the study, asking them to identify any outpatients who might meet the inclusion criteria and want to participate. Written informed consent was obtained from the patient before proceeding with the study. Participants were informed about the assessments, PSST sessions, their roles and activities. They understood that they would be assigned to either the intervention or control group and were informed about their responsibilities as participants. The recruitment lasted until both groups had more than 30 members each. All participants were on a stable antipsychotic medication regimen throughout the 16-week study period.

3.2 Data Collection

The same method was used to collect data from both groups. Participants underwent face-to-face structured interviews, while study variables were measured using various instruments. They were interviewed in a quiet room or office, given sufficient time for completion of the questionnaires without interruption, and received compensation on completion of the interview. Sociodemographic status, clinical profile, level of self-control behavior (SCS), and psychotic symptom severity (PANSS) were determined. Sociodemographic status included age, gender, marital status, education level, and living situation. Clinical profile information included age of onset, duration of illness, and level of cognitive function (MMSE). Psychometric measurements were taken at four time points in the study, including baseline (T1), week 6 (T2), week 12 (T3), and 4 weeks after training ended (T4). Assessment variables are discussed below.

3.2.1 Self-control Behavior

This study used Rosenbaum's Self-control Schedule (Rosenbaum, 1990) to measure the level of self-control behavior. The schedule captures the use of self-control skills as well as belief in one's ability to manage adversity (Rosenbaum, 1990). Each item on the 36-item self-report instrument was rated from 0 to 5 (from 0 [=not at all like me] to 5 [=very much like me]). Total score ranged from 0 to 180 with a higher score indicating greater self-control. The reliability and validity of the Chinese version of the Self-control Schedule were acceptable, with a previously reported Cronbach's of .80 (Wang, Rong, Chen, Wei, & Lin, 2007) and a presently reported Cronbach's of .91, indicating good internal consistency reliability. Construct validity of the self-control schedule was supported by a significant correlation between the level of self-control and severity of stress (as measured on the Holmes and Rahe Stress Scale) in the expected direction ($r = –.35$, $p<.01$) (Wang et al., 2007). Relevant studies confirm that SCS can effectively assess the level of individuals' self-control behavior (Kennett et al., 2008; Ngai, Chan, & Ip, 2009; Zauszniewski et al., 2006)

3.2.2 Psychiatric Syndrome Severity in Schizophrenia

In this study, we used the Positive and Negative Syndrome Scale (Kay, 1991) to measure symptom severity in schizophrenia. The 30-item instrument was comprised of three psychopathology subscales, including positive symptoms (7 items), negative symptoms (7 items), and general psychopathology symptoms (16 items). Each item was rated from 1 to 7 (with 1 = absent; 7 = extremely), and total score ranged from 7 to 210 with a higher score indicating more serious psychotic symptoms. Symptoms were assessed by investigators who were trained to measure the level of psychotic symptoms at four time points. ICC (intra-class-correlation) value greater than .7 was considered acceptable.

3.3 Intervention

The patients in the experimental group received problem-solving skills training and routine life skills training, while those in the control group received routine life skills training alone.

3.3.1 Routine Life Skills Training

This included performing daily life activities (household chores, communication, transportation, grooming, meal preparation, eating and so on), taking medication, work training, and leisure activities, and followed informal institution rules for performing daily life activities. In other words, the participants in the control group did not undergo the structured training program to guide their learning and teach them how to deal with life's problems and/or stressful events. Most of the life skills training was carried out by managers within the facilities.

3.3.2 Problem-Solving Skills Training (PSST)

The PSST intervention was used to develop the self-control skills proposed by Rosenbaum (1990), and was designed to improve self-control behaviors and problem-solving skills. PSST teaches subjects to use problem-solving skills including: 1. appraising and accepting one's problem experiences; 2. selecting problematic or stressful life experiences, and 3. practicing to change the problem. The skills are taught in four modules known as: (1) cognitive restructuring; (2) problem analysis; (3) increasing awareness of internal stimuli and behavior; (4) practicing self-control exercises (Rosenbaum & Ronen, 2010, 2018). According to Rosenbaum, individuals acquire problem-solving skills through conditioning, modeling, and other methods of formal and informal instruction. The structured protocol used previous life events as opportunities to identify and discuss past successful coping skills that can be used to solve present problems.

3.3.2.1 The Process and Elements of PSST

3.3.2.1.1 Appraisal and Acceptance of Immediate or Past Problem Experiences

3.3.2.1.2 Selection of One Problem or Stressful Life Experience and Changing this Problematic Experience Using Four Skills

(1) Cognitive restructuring

The major skill of cognitive restructuring has been described as "reframing thoughts / rethinking what are my problems, and the goal that the subject wishes or thinks can be achieved in the problem-solving process". The subjects use self-talk to identify: "what I want to learn about how to solve my problems", and "to apply self-control skills" to solve problems.

(2) Problem analysis

The major skills of problem analysis are "creating an action plan through brainstorming, in particular, developing a plan that the subject can do this week"; "look at each problem-solving option and select the best one to execute", and "set a goal for the consequences of the action plan".

(3) Continual practice of problem-solving skills and activities for increasing awareness of stressful stimuli and problem-solving behaviors.

Continual practice can increase skills for coping with internal and external stressful events and problems of community living. In addition, awareness of emotions and actions can be increased, and whether these actions meet the goal (solution of the problem) can be a source of reflection.

(4) Practicing self-control exercises within problem-solving training

PSST program taught coping strategies, problem-solving, positive self-talk, priority setting, and decision-making. It also taught the problem-solving process, which was then used to manage interpersonal conflict and adhere to medication and treatment and so on. Opportunities for using positive self-talk and priority setting were identified and discussed throughout the sessions.

3.3.2.2 Application

The PSST intervention consisted of 12 weekly 1.5-hour group sessions, held at the daycare centers and provided by two master's-prepared nurse clinicians who were trained and supervised by the corresponding author. This structured, time-limited intervention taught problem-solving through the use of self-control skills including how to appraise and accept one's problem experiences; select problematic or stressful life experiences, and practice to change these problems. The training activities used current physical and psychosocial problems or previous life events as the basis for identifying and discussing problem-solving strategies, defining problems and dividing the problems into sub-problem areas, setting realistic goals, brainstorming options to attain the goals, establishing

and implementing action plans, using positive self-talk, and evaluating the outcomes of action plan execution. These PSST skills helped subjects discard ineffective strategies of reacting to problems. Subjects learned problem solving as a way of coping through explanations, group discussion, skills training, action plan rehearsal, and homework tasks. Homework assignments helped subjects apply newly learned skills or make progress toward goals. Goals were used to facilitate therapeutic engagement. Therapists guided participants in selecting skills needed during the treatment phase to address concerns and achieve goals. Detailed information about PSST can be found in Table 1.

Table 1. Outline of problem-solving skills training (PSST)

Sessions	Goals	Training methods
Sessions 1,2	Improve motivation to change	Motivational strategy
Open a new journey	Raise attention to your own	Appraisal of a problem or experience
Problem-solving	experiences-feelings,	Select problems or experiences
-introduction to PSST	thoughts, and behaviors.	Cognitive restructuring
Problem-solving exercises: Sessions 3-12		
Session 3	Continuous accumulation of	Recall last session's experiences
Control emotional	self-control exercises	
distress		1-1 Cognitive restructuring
Sessions 4,5	1.Define and analyze the	1-2 Problem analysis
Decrease physical	problems	2-1 Discussion, feedback
discomfort	2.Brainstorming options	2-2 Select options can be executed
Sessions 6,7	3.Make goals & action plans	3-1 Select realistic goals & action plan
Manage interpersonal	4.Working out action plan	4-1 Using positive self-talk
conflict	5. Complete and evaluate	4-2 Role play
Sessions 8-10	homework	4-3 Continue to practice problem-solving
Medication and	6. Report, reflect, redesign,	and self-control skills
treatment adherence	and react to exercises 1-5	5-1 Weekly homework: action plan in real life situation
		6-1 Evaluate and react to problem-solving activities.
Sessions 11,12	Organize learning experience	Review past training experience
Evaluation,	Explore tips for maintaining	Set goal to solve future problems
rethinking, and	change	Continue to practice, discuss, and develop
reaction to	Prepare the action plan to	coping strategies.
problem-solving	solve future problems	
strategies		

3.4 Data Analysis

All statistical tests used SPSS 20.0 statistical software. Significance tests were two-tailed, and p was .05. Data are expressed as mean ± SD. The demographic details were summarized with descriptive statistics. Chi-square analysis and independent t-test were used to detect any significant differences in baseline variables between the experimental and control groups. Generalized estimating equations (GEE) with an exchangeable correlation structure were used to analyze experimental efficacy (Zeager, Liang, & Albert, 1988). In this study, the variables of education level and living situation were significantly different between the experimental and control groups (see Table 2). Thus, these variables were considered as covariates in the GEE analysis.

3.5 Ethical Considerations

The Institutional Ethical Committee approved the protocol (TCHIRB-1021106) that stipulated strict adherence to the principles of confidentiality and informed consent. Participants were requested to sign consent forms, allowed to ask questions about the study purpose and procedures, and assured the right of withdrawal from the study.

4. Results

4.1 Participant Enrollment and Drop-outs

Seventy-eight subjects expressed interest; 72 met the study criteria after being interviewed. Of these, 66 signed informed consent forms and 63 entered the study and were assigned to the experimental group or control group. Finally, 31 participants in the experimental group and 23 participants in the control group completed the 16-week study period. The number of participants providing data at Time 1 (baseline), Time 2 (week 6), Time 3 (post intervention / week 12), and Time 4 (4 weeks after training ended) was 63, 61, 60, and 54, respectively. During the study period, two participants from the intervention group and two from the control group withdrew from the study. Reasons for withdrawal included discharge from the rehabilitation facilities, scheduling difficulties, moved to another city, and excessive distance from the study site. The reasons for withdrawal were similar to other similar studies (Szymczynska, Walsh, Greenberg, & Priebe, 2017). The dropout rate was 5.6% (2/35) in the experimental group. Complete assessment rates were 88.57% (31/35) in the experimental group, and 82.14% (23/28) in the control group.

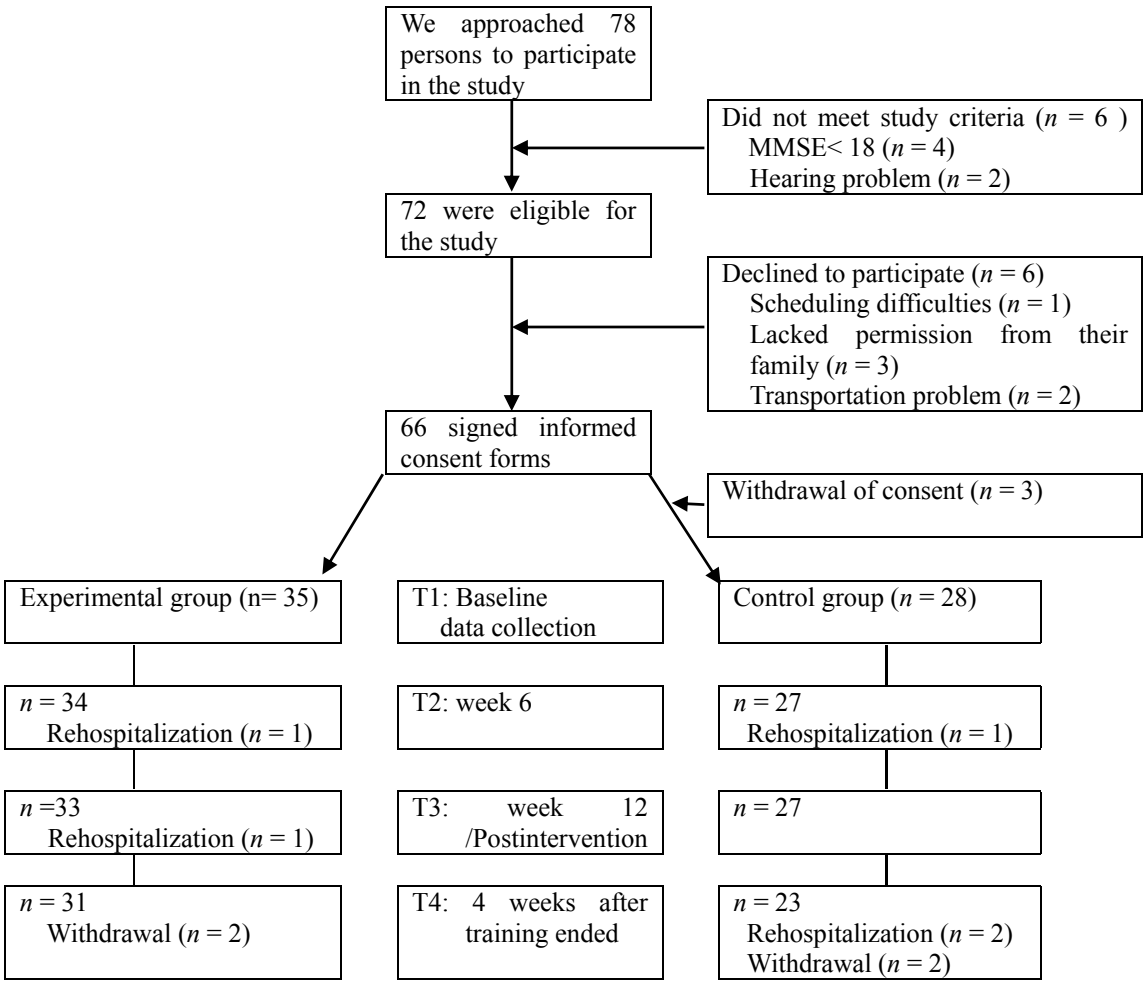

Figure 1. Flow diagram of the enrollment and dropout of participants

4.2 Basic Analysis of Baseline Data

4.2.1 Demographic Characteristics of All Subjects

At baseline, 63 patients (38 males [60.3%] and 25 females [39.7%]) were included. About 55.6% reported completing high school or beyond, and 44.4% reported not completing high school. Eighty-eight percent of the subjects were single. Seventy-nine percent of the subjects reported living in a facility, and 20.6% lived at home with family. The respondents had mean age of 45.49 years (SD=11.3; range 25–64 years), mean number of years of illness of 21.08 (SD=10.75; range 2–47), MMSE score of 22–29, and mean SCS, positive symptom, negative symptom, and general symptom values at baseline of 99.75, 17.87, 19.48, and 36.22, respectively (see Table 2).

4.2.2 Comparability of the Groups

Although the between-group difference in gender (χ^2 = .33, p = .57), marital state (p = .45), age (t = 1.11, p = .27), illness duration (t = –.04 , p = .97), and MMSE score (t = .64 , p = .52) were not significant, the groups did differ significantly in education level (χ^2 = 5.14, p = .02) and living situation (χ^2 = 5.6, p = .02). Participants in the experimental group were less educated than those in the control group (Table 2). Prior to the intervention, there was a significant between-group difference in self-control behavior score (t = –2.90, p = .01) but not in psychotic symptom scores (including total scores and positive symptom, negative symptom, and general psychopathology symptom scores) at baseline. Patients in the experimental group had higher psychotic symptom scores. The means of the study variables for the two groups are presented in Table 2.

Table 2. Baseline data on patients who were included in final analysis (n = 63)

Variables	Experimental group (*n*=35)		Control group (*n*=28)			Inferential statistics
	n (%)		*n* (%)		χ^2	*(p-value)*
Gender					0.33	*.57*
Male	20 (57.1)		18 (64.3)			
Female	15 (42.9)		10 (35.7)			
Marital status						.45
Single	30 (85.7)		26 (92.9)			
Married	5 (14.3)		2 (7.1)			
Education					5.14	.03*
Junior high school	20 (57.1)		8 (28.6)			
High school	15 (42.9)		20 (71.4)			
Living situation					5.6	.02*
At home with family	11 (31.4)		2 (7.1)			
In facility	24 (68.6)		26 (92.9)			
	M (*SD*)	*Range*	*M* (*SD*)	*Range*	*t*	*p-value*
Illness duration (yr.)	21.03 (10.21)	4-1	21.14 (11.57)	2-7	-.04	.97
Psychotic symptoms	77.2 (19.20)	42-09	69.04 (15.28)	49-04	1.92	.06
Positive symptoms	18.80 (7.26)	7-3	16.71 (5.87)	7-0	1.23	.22
Negative symptoms	20.40 (5.13)	10-1	18.32 (4.68)	9-9	1.66	.10
General psychopathology	38.00 (8.89)	24-1	34.00 (8.17)	21-3	1.84	.07
Self-control behavior	93.26 (19.68)	41-29	107.86 (19.83)	67-49	-.90	.01*

*p＜.05, **p＜.01, ***p＜.001.

4.3 Outcomes and Estimation

4.3.1 Effect of PSST on Self-control Behavior

Figure 2 shows the between-group difference in trends of self-control behavior level. Self-control behavior level gradually increased in patients who received PSST and gradually decreased in the control group.

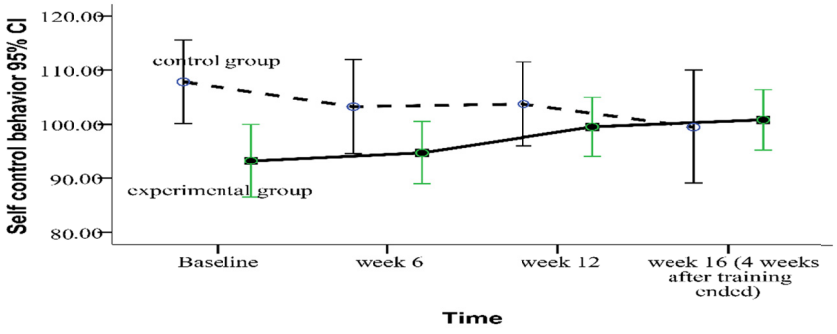

Figure 2. The difference in self -control behavior level between the two groups

Table 3 illustrates the differences level of self-control behavior between the two groups during the different phases of training. After controlling for education level and living situation, the GEE results indicated a significant between-group difference at baseline (p = .03), with the SCS score being lower in the experimental group. Although, at baseline, the score of SCS was lower in the experimental group than control group, it exceeded the score in the control group at T2, T3 (after intervention) and T4 (at follow up). In addition, the interaction (group by time) effect on self-control behavior was significantly greater in the experimental group. The self-control behavior score was significantly more increased in the experimental group at week 12 (B = 10.55, Waldχ2 = 5.50, p = .02) and 4 weeks after the training ended (B = 14.29, Waldχ2 = 10.62, p < .001).

Table 3. Results of GEE analysis examining changes in the level of self-control behavior in the experimental and control groups (n=63)

			95%Wald CI			
Parameters	*B*	*SE*	Lower	Upper	Waldχ^2	*p* †
Intercept	83.25	15.82	52.24	114.27	27.68	.000
Group (Experimental)§	-11.65	5.24	-21.93	-1.37	4.94	.03**
T2[a]	-4.39	3.68	-11.60	2.83	1.42	.23
T3[a]	-4.07	3.40	-10.73	2.59	1.44	.23
T4[a]	-7.59	2.84	-13.15	-2.03	7.16	.01**
Group (Experimental) ×T2[b]	5.36	4.87	-4.20	14.91	1.21	.27
Group (Experimental) ×T3[b]	10.55	4.50	1.73	19.37	5.50	.02*
Group (Experimental) ×T4[b]	14.29	4.39	5.69	22.89	10.62	<.001***

*p < .05, **p < .01, ***p < .001; CI = confidence interval.

B = estimated parameter; S.E. = standard error; T1: baseline; T2: week 6; T3: week 12; T4: 4 weeks after training ended; covariates: education level and living situation.

†p value: generalized estimating equation (GEE) model used to test the differences between the intervention group and the control group with respect to changes from baseline to week 6, baseline to week 12, and baseline to 4 weeks after training ended, adjusted for the two covariates (education level; living situation).

§ Reference group: Control group

[a] Reference group: T1

[b] Reference group: Group (Control) × T1

4.3.2 Effect of PSST on Psychotic Symptoms

4.3.2.1 Effect of PSST on Positive Symptoms and General Psychopathology Symptoms

There were no significant improvements in the severity of positive symptoms and general psychopathology symptoms in schizophrenia patients who received the PSST intervention and in those who did not (the control group). (see Table 4)

Table 4. Effects of PSST on positive symptoms / general psychopathology symptoms

Positive symptoms	Experimental group		Control group		*Student*
	M (*SD*)	*paired t test*	*M* (*SD*)	*paired t test*	*t test*
T 1	18.80(7.26)		16.71(5.87)		.22
T 2	19.00(7.02)	.51	16.89(4.98)	.40	.18
T 3	17.34(5.66)	.10	16.86(5.25)	.88	.73
T 4	19.50(6.15)	.28	15.91(3.78)	.11	.02*
General psychopathology symptoms					
T 1	38.00(8.89)		34.00(8.17)		.07
T 2	38.41(8.67)	.72	33.59(8.15)	.78	.03*
T 3	36.94(7.75)	.19	33.18(8.20)	.53	.07
T 4	35.87(7.56)	.08	31.57(7.18)	.03*	.04*

*p < .05, **p < .01, ***p < .001.

T1: baseline; T2: week 6; T3: week 12; T4: 4 weeks after training ended

4.3.2.2 Effect of PSST on Negative Symptom Severity

The severity of negative symptoms decreased significantly from baseline to week 6, week 12, and 4 weeks after training ended in the experimental and control groups (Figure 3). Although there was no statistical between-group difference in negative symptom scores (p =.09), both groups showed a gradual decline over time in negative psychotic symptoms severity (Table 5).

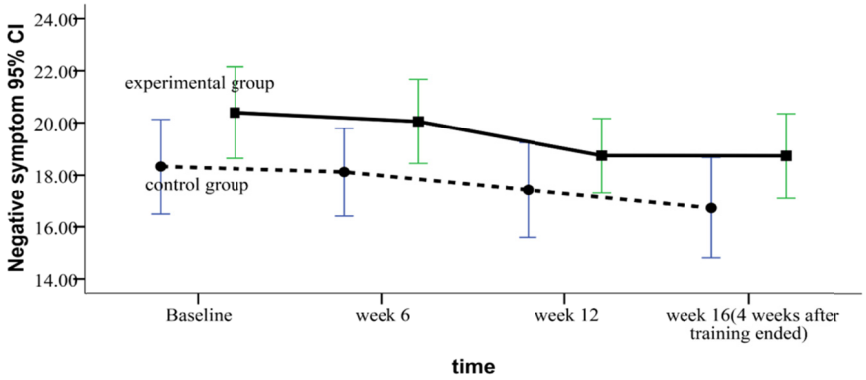

Figure 3. The changes in negative symptoms severity

Table 5. Effects of problem-solving skills training on the negative symptoms at week 6, week 12, and 4 weeks after training ended (n = 63)

	Control group		(*n* =28)		Experimental group		(*n* = 35)	
	T1 *M* (*SD*)	T2 *M* (*SD*)	T3 *M* (*SD*)	T4 *M* (*SD*)	T1 *M* (*SD*)	T2 *M* (*SD*)	T3 *M* (*SD*)	T4 *M*(*SD*)
	18.32 (4.68)	18.11 (4.25)	17.43 (4.69)	16.74 (4.47)	20.40 (5.13)	20.06 (4.64)	18.74 (4.15)	18.73 (4.35)
t^1		.84				.30		
t^2			.07				.01**	
t^3				.04*				.01**

			95% Wald CI			
	B	*SE*	Lower	Upper	Waldχ2	*p*†
Intercept	14.30	3.63	7.18	21.41	15.49	.000
Group(Experimental)§	2.04	1.19	–0.30	4.37	2.93	.09
T2[a]	–0.24	0.29	–0.81	0.34	0.66	.42
T3[a]	–1.32	0.37	–2.05	–0.59	12.49	<.001***
T4[a]	–1.49	0.38	–2.23	–0.75	15.52	<.001***

*p < .05, **p < .01, ***p < .001; CI = confidence interval

T1: baseline; T2: week 6; T3: week 12; T4: 4 weeks after training ended; Covariates: education level and living situation; t^1: baseline and week 6 comparison. t^2: baseline and week 12 comparison. t^3: baseline and 4 weeks after training ended comparison. Covariates: education level and living situation.

†p value: based on generalized estimating equation analysis adjusted for the two covariates (education level; living situation). The group × time intervention was not significant and was deleted from the model.

§ Reference group: Control group

[a] Reference group: T1

5. Discussion

5.1 Effect of PSST on Self-control Behavior

The present study showed that PSST significantly improved self-control behavior and that the improvement was still present at the 16-week after training. Previous studies have categorized problem-solving training as a form of self-control training (D'Zurilla & Goldfried, 1971; D'Zurilla, & Nezu, 2006; Rehm & Rokke, 1988). According Rosenbaum (1990), self-control skills include problem-solving strategies, belief in coping effectiveness, positive self-instruction, and delay of gratification. In our study, the strategies of PSST were derived from Rosenbaum's self-control theory (1990) and had the goal of improving self-control behaviors and problem-solving skills. Our results showed that PSST increased self-control skills in schizophrenia outpatients, which is consistent with other findings that problem-solving training improves self-control skills in the elderly and others (Kennett et al., 2009; Levesque, Gauvin, & Desharnais, 2003; Ngai et al., 2009; Ronen, 2004; Ronen & Rosenbaum, 2010; Zauszniewski, 1997; Zauszniewski et al., 2006).

The PSST intervention was focused on life issues proposed by participants and was different from routine life skills training. The PSST is more self-directed and encourages patients to participate in their own life decision making and practice problem-solving activities that may improve their self-control and problem–solving skills. However, the participants in the control group only followed the directions of the staff at their facilities.

The results emphasized that PSST (which was derived from the self-control model and designed to specifically make subjects more sensitive to internal stimuli, more able to monitor and control themselves, and more able to transform negative thoughts into positive ones) could change self-control behavior only when problem-solving skills were well developed and repeatedly practiced (Ronen, 2004).

5.2 Effect of PSST on Psychotic Symptom

After receiving PSST and/or routine life skills training, both groups of schizophrenia outpatients showed significant improvements in negative symptom score but not in positive symptoms or general psychopathology scores. The severity of negative symptoms was higher in the experimental group than the control group at Time 1, but decreased over time in the experimental group to its level in the control group. The difference in trends between the experimental and control group was not significant, demonstrating that PSST and routine life skills training both have a positive impact on the negative symptoms of schizophrenia patients. In addition, the change in negative symptom severity may be related to activation of brain information processing by the two interventions and also activation of cognitive processes that lead to the decline in negative symptoms severity.

6. Conclusion

This study found that schizophrenia patients in the experimental group (when compared to those in the control group) had a statistically significantly greater improvement in their self-control behaviors, which persisted four weeks after the PSST intervention. This result shows the feasibility of problem-solving training interventions for outpatients with schizophrenia. Further study of the effects of PSST on problem-solving skills, self-control, and self-management in inpatients or outpatients with schizophrenia is recommended.

7. Limitations and Suggestions

Although this study was limited by the small number of participants, the shared experiences illustrate the richness and diversity of the details of how problem-solving skills and self-control behaviors can be improved in schizophrenia patients. In addition, this study showed the safety and feasibility of PSST and its importance as a nursing intervention to enhance problem-solving skills, enhance self-control behaviors, and ameliorate negative psychotic symptoms in schizophrenia patients. Future larger studies with double-blind designs would be needed to draw more definitive conclusions, and combined with a qualitative design to examine its therapeutic mechanisms. The duration of the intervention is at least 12 weeks. Problem-solving training can be continued by telephone after the problem-solving training is completed.

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