

Effective intervention of Team Skills Training Model on Medication Adherence in Male Schizophrenia Patients: A Preliminary Study

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ABSTRACT

Objective: Poor adherence to medication in individuals with schizophrenia has a series of adverse consequences. The aim of this study was to explore the efficacy of Team Skills Training Model (TSTM) on medication adherence in individuals with schizophrenia.

Methods: Sixty individuals with schizophrenia from Tongde Hospital of Zhejiang Province were divided into a Research Group and a Control Group. The Research Group completed a TSTM intervention and the Control Group completed a Psychological Education program. The Medication Adherence Rating Scale (MARS) and Rating of Medication Influences (ROMI) were used to evaluate medication adherence, and the brief psychiatric rating scale (BPRS) was used to measure severity of disease. T-tests statistical method was used to compare the score of scales before and after the intervention, and Pearson correlation coefficient to analyze correlations between the MARS, ROMI and BPRS scores.

Results: After 5-week intervention, both the Research Group and Control Group exhibited significant improvements in MARS (2.5 ± 1.10 , 4.1 ± 1.78 , $t=6.649$, $P=0.000$; 2.4 ± 0.93 , 3.7 ± 1.42 , $t=6.547$, $P=0.000$, respectively) and BPRS (47.2 ± 3.68 , 40.4 ± 4.25 , $t=-15.827$, $P=0.000$; 45.7 ± 2.73 , 42.3 ± 3.96 , $t=-6.774$, $P=0.000$, respectively). Research Group had significant improvements in ROMI scores in terms of perceived benefit from medication (1.03 ± 0.19 , 1.45 ± 0.51 , $t=4.446$, $P=0.000$), positive influence of a clinician (1.02 ± 0.17 , 1.93 ± 0.46 , $t=9.878$, $P=0.000$), positive relationship with a therapist (1.04 ± 0.18 , 1.62 ± 0.49 , $t=6.298$, $P=0.000$), positive family belief (1.03 ± 0.19 , 1.48 ± 0.51 , $t=4.770$, $P=0.000$), and fear of rehospitalization (1.37 ± 0.49 , 1.83 ± 0.60 , $t=4.780$, $P=0.000$). We found no correlations between changes in MARS, ROMI and BPRS scores.

Conclusions: The TSTM may improve medication adherence in individuals with schizophrenia through increased adherence-related attitudes and integration of interpersonal communication.

Keywords

Schizophrenia, Medication adherence, Social Skills Training, Tai-Chi.

Introduction

Adherence to medication is essential to the efficacy of antipsychotic treatment in patients with schizophrenia (SP). However, approximately 75% of SP discontinue their antipsychotic medication treatment within 18 months [1]. Further, of the

individuals who discontinue treatment, 50% had responded well to medication [2]. Poor adherence to medication is linked to a series of adverse consequences, such as an increasing risk of relapse of psychosis, suicide attempts, and assault behaviors [3]. Studies have shown that treatment nonadherence in SP is significantly associated with increased use of medical resources and a heavier caregiver burden [4,5]. Therefore, maintaining adherence to medication is crucial for individuals with SP.

A large number of interventions to improve medication adherence in SP have been implemented. The most common of these is cognitive-behavioral therapy (CBT), which aims to improve their insight and negative perceptions regarding medication [6]. Motivational interviewing (MI), which is another type of intervention, focuses on resolving ambivalence towards medication and addresses perceptions regarding taking medication regularly [7]. Several studies have indicated that positive therapeutic relationships can play a role in improving medication adherence by positioning SP as co-managers of their own illness [8,9]. Thus, such therapeutic alliances have been considered to be a positive factor [10]. However, a recent survey by Saba [11] showed that even among SP with better medication adherence, only 40% had insight regarding their illness and only 23% had a positive attitude regarding medication. Granholm et al. [12] also reported that CBT did not improve attitudes regarding social disinterest, indicating that CBT may have limitations in terms of enhancing medication adherence and social function. Barkhof et al. [13] found that an MI intervention did not significantly improve medication adherence compared with health education at 26-week and 6-month follow-up assessments. Recently, Chang et al. [14] conducted a detailed investigation of the role of therapeutic alliance in medication adherence. They found that the strength of a individuals' therapeutic alliance was weakly associated with their medication adherence. Among the components of a therapeutic alliance, "affective bond" was associated with adherence, while "collaborative bond" was not. The most likely reason for the heterogeneity of these results is that current interventions are generally centered around the symptoms of SP, such as insight regarding the disease or perception of medication, as opposed to focusing on the individuals as a socialized individual [15,16].

The Social Skills Group Training (SSGT) is a type of intervention that focuses primarily on developing abilities related to a participant's social interaction, communication, and enjoyment of life [17,18]. The SSGT has been widely used to treat individuals with a variety of mental disorders including Asperger's syndrome [19] and other forms of autism [20], alcoholism [21], social anxiety disorder [22], and other psychiatric diseases [23,24]. Karaman et al. [25] reported that SP who received psychosocial skills training had increased total scores in social functionality scale and social performance scale, suggesting psychosocial skills training had a positive effect on the social functioning of SP. Lim et al. [26] also reported group-based social cognitive skills training improved facial affect recognition, social functioning, and psychiatric symptoms of SP. Several researchers [27,28] have demonstrated that the SSGT can improve self-esteem, social performance, and the ability to handle difficult interpersonal situations. Improvements in social function have been found to enhance individuals' consciousness regarding medicine, as well as self-management of drug treatments [29,30]. Improvements in social function and medication adherence are mutually reinforcing processes. However, addressing patient motivation regarding participation in such programs appears to be critical to success: Tsang et al. [31] reported that higher motivation regarding taking action led to enhanced treatment participation.

Tai-Chi is an Eastern form of exercise that has been practiced in China for hundreds of years. Tai-Chi exercise not only improves physical function, but also benefits cognitive functioning and mental concentration in healthy older adults [32-34]. Studies have demonstrated that Tai-chi is beneficial to interpersonal functioning in SP [35,36]. Ho et al. [35] reported that group Tai-chi exercises enhance interpersonal functioning according to the belief that stronger qi (a positive healing force) can be better cultivated in a group than by a single person alone. They proposed that when performed in a group, the exercises work to strengthen both verbal and nonverbal links among participants [37]. Indeed, participants in Tai-chi group exercises report being happier, more relaxed, able to think more openly, and feeling more regulated. Tai-chi exercise is a valuable traditional form of mind-body exercise.

Previously, we proposed a training model termed the "Team Skills Training Model (TSTM)", which consists of Tai-Chi and SSGT [38]. The advantage of the model is that it is not directly aimed at the individuals' disease or their self-insight regarding their disease, but instead is focused on cultivating their life, social skills, participation in interpersonal communication, and enjoyment of life. Our previous studies [39,40] have shown that the TSTM can improve engagement in social roles and quality of life in SP, and facilitate their integration into society. In the current study, we investigated the effect of the TSTM on medication adherence in SP. Based on the above information, we hypothesized that: (1) the TSTM would effectively improve medication adherence in SP, and (2) that this improvement in medication adherence would be associated with enhanced interpersonal integration.

Participants and methods

Participants

This study was approved by the Human Research Ethics Committee of Tongde Hospital of Zhejiang Province. Individuals with SP were recruited from psychiatric wards at Tongde Hospital. Inclusion criteria were (1) diagnosis of schizophrenia as per The International Statistical Classification of Diseases and Related Health Problems 10th Revision, (2) non-adherence as defined as being off of medications for 1 week [6], (3) aged 18 to 45 years, (4) male, (5) more than 6 years of education, (6) course of schizophrenia ≤ 3 years, (7) more than one month of experience taking oral antipsychotics, (8) score on the Brief Psychiatric Rating Scale ranging from 35 to 50, and (9) an intact family support system. Patients were excluded if they had co-morbid learning disabilities, organic brain disease, or history of substance dependence. Sixty patients were randomly divided into Research Group and Control Group. Research Group took 5 weeks to complete TSTM program, the Control Group completed a psychological education course only.

Interventions TSTM program

First, under the guidance of psychiatric professional and video guidance, the participants of research group completed an easy eight-form Tai-Chi program [41]. The routine included six

movements plus the commencing and closing forms, all of which were derived from the contemporary 24-form simplified Tai-Chi routine. The names of the eight forms are the commencing form, curving back arms, stepping sideways and moving arms, moving hands, diagonal strides, standing on one leg, stepping and pushing, and closing form. The easy eight-form Tai-Chi routine follows a gradual, simple-to-difficult progression with movement execution beginning with upper body motion (involving arm, shoulder, and trunk movements) and minimal demands with respect to postural control. It then moves to forms with increasing postural demands involving whole-body-limb coordination. It is possible to perform the easy Tai-Chi routine while seated, and weekly practice.

Then, SSTG sessions was carried out. 10 individuals as a group conducted by psychiatric professional, once a week for 1 hour. The SSTG was clearly described in a study on generalized social phobia by van Dam-Baggen [42]. There are three main components, as follows. (1) The first activity involves introducing the rules of the activities, engaging in self-introduction, and learning about the group members. This step focuses on the ability of patients to accept, process, and provide feedback about information. (2) The 2nd to 4th activities mainly comprises social skills training. Each session begins with the participants greeting one other with "Hello", and then engaging in various scenarios and role-playing tasks that were designed to improve the effective interpersonal communication ability of patients. The problem-solving difficulty is gradually increased throughout the sessions. Through the team activities, the patients are able to experience different roles, engage in peer communication, and receive encouragement and support from medical staff. (3) In the 5th session, the participants are asked to conduct a self-evaluation regarding the SST training. Specifically, each patient was asked to spend 3 to 5 minutes expressing his or her experience of participating in the team skills training program. The goal of this step was to enable the members of the training group to share the gains of team SST training.

Psychological education

The 30 individuals of control group received psychological education. The psychological education element of the intervention included the following steps [43]: (1) Review patient history and conceptualize the problem; (2) focus on symptoms, adverse events, risks/benefits of medication, patient ambivalence regarding pharmaceutical treatment, beliefs regarding medication; (3) weigh stigma associated with medication against improvements in quality of life; (4) explore contradictions between patient's thoughts and behavior; and (5) discuss beliefs and concerns about medication. This was conducted once weekly (for 20–60 minutes).

Clinical assessments

Assessments were conducted by psychiatric professional. We included three scales designed to evaluate medication adherence and clinical symptoms. First, we used the Medication Adherence Rating Scale (MARS) to evaluate adherence-related attitudes and behaviors. The MARS is a 10-item self-reported measure ranging from 0 to 10 with a high score being associated with better adherence [44]. Second, we used the Rating of Medication

Influences (ROMI), which is based on the model of health-related beliefs. The ROMI is divided into two subscales: reasons for adherence (ROMI-A) and reasons for non-adherence (ROMI-NA). Each item is scored from 1 to 3, and a higher score indicates better adherence [45]. Third, we assessed clinical symptoms in patients using the 20-item brief psychiatric rating scale (BPRS) with scores of 1–7 for each item. The total score reflects the severity of the disease such that a higher total score indicates worse symptoms [46].

Statistical Method

All data are expressed via mean \pm standard deviation. T-tests statistical method was used to compare the changes in scores before vs after the intervention and examine the differences between the two groups. We also used the Pearson correlation coefficient to analyze the correlation between the scores of medication adherence and clinical symptoms. A $P < 0.05$ indicated a significant difference. All data were processed using SPSS 19.0 software.

Results

Neuropsychological results

Sixty subjects completed the study and none of them fell off. The Research Group and Control Group were well matched in terms of age ($t = -0.274$, $P = 0.785$), years of education ($t = -0.441$, $P = 0.661$), and disease duration ($t = -0.181$, $P = 0.857$). We found no differences between the total scores of the three scales obtained by the two groups at baseline ($t = 1.835$, $P = 0.077$; $t = 0.453$, $P = 0.654$; $t = 2.037$, $P = 0.051$). Detailed demographics and psychological characteristics are summarized in Table 1.

Table 1: Demographics and neuropsychological data.

	Research Group	Control Group	t	P value
Age, years	29.8 \pm 6.1	30.2 \pm 5.1	0.274	0.785
Education, years	8.8 \pm 2.6	9.1 \pm 2.7	0.441	0.661
Disease duration	2.0 \pm 0.6	2.1 \pm 0.7	0.181	0.857
BPRS	47.2 \pm 3.68	45.7 \pm 2.73	-1.835	0.077
MARS	2.5 \pm 1.10	2.4 \pm 0.93	-0.453	0.654
ROMI-A	7.4 \pm 0.56	7.0 \pm 1.08	-2.037	0.051

Abbreviations: BPRS Brief Psychiatric Rating Scale, MARS Medication Adherence Rating Scale, ROMI-A Rating of Medication Influences - reasons for Adherence.

Scores before vs after the intervention

After 5-week intervention, the BPRS scores in both the Research Group and Control Group had significantly decreased (47.2 ± 3.68 , 40.4 ± 4.25 , $t = -15.827$, $P = 0.000$; 45.7 ± 2.73 , 42.3 ± 3.96 , $t = -6.774$, $P = 0.000$). The changes in MARS scores were similar to those for BPRS. We found a difference between the two groups in terms of ROMI-A scores. Specifically, ROMI-A scores in the Research Group were significantly higher after 5 weeks (7.4 ± 0.56 , 10.5 ± 1.68 , $t = 12.294$, $P = 0.000$), and ROMI scores in the Control Group were also changed (7.0 ± 1.08 , 7.5 ± 0.90 , $t = 3.525$, $P = 0.001$). However, at the end of the intervention, the ROMI-A scores in the Research Group were significantly higher than those in the Control Group (10.5 ± 1.68 , 7.5 ± 0.90 , $t = 8.023$, $P = 0.000$) (Table 2).

Table 2: Test scores before vs after the intervention.

	Baseline	5 weeks	t	P value
BPRS				
Research Group	47.2 ± 3.68	40.4 ± 4.25	-15.872	0.000
control group	45.7 ± 2.73	42.3 ± 3.96	-6.774	0.000
MARS				
Research Group	2.5 ± 1.10	4.1 ± 1.78	6.649	0.000
control group	2.4 ± 0.93	3.7 ± 1.42	6.547	0.000
ROMI-A				
Research Group	7.4 ± 0.56	10.5 ± 1.68*	12.294	0.000
control group	7.0 ± 1.08	7.5 ± 0.90*	3.525	0.001

* < 0.05 . BPRS Brief Psychiatric Rating Scale, MARS Medication Adherence Rating Scale, ROMI-A Rating of Medication Influences - reasons for Adherence.

ROMI-A sub-item changes before vs after the intervention

We analyzed the changes in the seven ROMI-A sub-items in the Research Group. After the intervention, we observed a significant increase in the following sub-items: perceived benefit from medication (1.03 ± 0.19 , 1.45 ± 0.51 , $t=4.446$, $P=0.000$), positive influence of a clinician (1.02 ± 0.17 , 1.93 ± 0.46 , $t=9.878$, $P=0.000$), positive relationship with therapist (1.04 ± 0.18 , 1.62 ± 0.49 , $t=6.298$, $P=0.000$), positive family belief (1.03 ± 0.19 , 1.48 ± 0.51 , $t=4.770$, $P=0.000$), and fear of re-hospitalization (1.37 ± 0.49 , 1.83 ± 0.60 , $t=4.780$, $P=0.000$). We found no significant differences in the items measuring relapse prevention or pressure/force before vs after the intervention (**Table 3**).

Table 3: ROMI-A sub-item changes in the Research Group.

ROMI-A	Baseline	5 weeks	t	P value
perceived benefit from medication	1.03 ± 0.19	1.45 ± 0.51	4.446	0.000
positive influence of a clinician	1.02 ± 0.17	1.93 ± 0.46	9.878	0.000
Positive relation with therapist	1.04 ± 0.18	1.62 ± 0.49	6.298	0.000
positive family belief	1.03 ± 0.19	1.48 ± 0.51	4.770	0.000
relapse prevention	1.02 ± 0.18	1.07 ± 0.26	1.000	0.326
pressure/force	1.07 ± 0.26	1.17 ± 0.38	1.797	0.083
fear of rehospitalization	1.37 ± 0.49	1.83 ± 0.60	4.780	0.000

ROMI-A Rating of Medication Influences - reasons for Adherence.

The relationship between changes in medication adherence and improvement of clinical symptoms

We found no correlations between the changes in MARS, ROMI-A, and BPRS scores ($r = -0.209$, $P = 0.268$; $r = -0.268$, $P = 0.152$, respectively).

Discussion

In the current study, we found that TSTM could increase MARS and ROMI-A scores, and decrease BPRS scores. These data suggest that Tai-Chi combined with SSTG improved both medication adherence and the clinical symptoms of SP, which is in line with the previous study by Kang et al. [47]. In that community-based study, the researchers used a global 3-point anchored Likert scale to assess medication adherence and the Positive and Negative Syndrome Scale (PANSS) to measure the severity of psychotic

symptoms. They found that in individuals with SP, an intervention that included social skills training and a Tai-chi routine led to a significantly decreased rate of medication non-adherence (14.4% at baseline to 6.8%). In addition, they found that the total PANSS score also decreased after the intervention. Taking their results together with the data from the present study, it appears that interventions including Tai-chi exercise and social skills training are effective in improving outcomes in patients with SP, including medication adherence and clinical symptoms.

Our results demonstrated that the TSTM significantly improved medication adherence as measured by the MARS scale. This indicates that the TSTM improved attitudes and self-efficacy regarding medication, which is consistent with previous studies [48-50]. When we evaluated the intervention effect of patient's medication adherence using the ROMI scale, we found that ROMI scores in the Research Group had significantly increased after 5 weeks, such that they were higher than those of the Control Group at the 5th week. These results strongly suggest that the TSTM has a stronger impact on health-related beliefs and behavior than psychological education [45,51]. Previous studies [52,53] have shown that Group SST encourages patients to communicate with one another and to express their negative emotions equally, leading to enhanced social adjustment. Interaction between SP can also decrease stigma [54,55], which is closely related to healthy behavior, medication adherence, and social integration [56,57]. Finch et al. [58] reported that SP exhibited improvements in emotional control and assertiveness during both role-playing and spontaneously-enacted interpersonal situations. In addition, as Tai-chi is a mind-body exercise, it is not likely to improve only psychotic symptoms and motor coordination, but also to enhance the generalized sense of overall well-being [36,59]. Taylor Piliae et al. [60] reported that Tai-Chi exercise significantly increased self-efficacy to overcome barriers, confidence, and perceived social support. Changes in self-efficacy are likely to improve exercise adherence [61]. Therefore, we believe that the TSTM is effective for improving patient psychosocial status and healthy behavior.

We further analyzed the sub-item changes in ROMI-A score from baseline to the 5th week in the Research Group, and found significantly increased scores for items associated with positive influence of a clinician and positive relationship with a therapist. A growing number of studies have shown that positive interpersonal relationships play an important role in medication adherence in SP [62,63]. In a cross-sectional study of 81 SP, therapeutic relationships were assessed using the Scale to Assess the Therapeutic Relationship-Patient version (STAR-P), which evaluates both "affective bonds" and "collaborative bonds" in an alliance. The researchers [16] found that "affective bond" was positively correlated with adherence. Nelson et al. [16] also found that a individual's perception of their physician's interest in him or her as a person was the single best predictor of medication adherence among discharged SP. After assessing 134 clinicians and 507 of their patients with SP in a European multi-center study, McCabe et al. [9] reported that a better therapeutic relationship was associated with better adherence to medication. Both patient and

clinician perspectives of the therapeutic relationship are important. Therefore, our result suggests that the TSTM promotes positive interpersonal relationships and improves medication adherence.

In our current study, we did not find a correlation between changes in MARS, ROMI-A, and BPRS scores. This result led us to examine two considerations. The first was whether improvements in clinical symptoms can directly enhance medication adherence. Many previous studies have shown that symptom severity or a higher number of positive symptoms was associated with lower medication adherence [64-66]. However, Jung et al. [67] did not find a difference in disease severity between a medication adherence and a non-adherence SP group. A systematic review of factors influencing adherence demonstrated that positive attitudes towards medication and illness insight were the only factors consistently associated with better adherence, while contradictory results were found for symptom severity [68]. The second consideration was whether increased medication adherence necessarily improves clinical symptoms of the disease. One cross-sectional study by Rettenbacher et al. [69] reported that adherent patients showed significantly more negative symptoms than non-adherent patients, but found no statistical association between adherence and positive symptoms. Anderson et al. [70] reported that patients receiving adherence therapy did not show significant improvements in overall psychiatric symptomatology, assessed using PANSS, when compared with a group that received regular treatment for eight weeks. Staring et al. [71] reported that treatment adherence therapy for SP improved adherence, but not positive symptoms, negative symptoms, or general psychopathology, as measured by PANSS. However, studies have indicated that better adherence to antipsychotic medication improves psychotic symptoms [72,73]. In the present study, we found it remarkable that while both medication adherence and clinical symptoms improved, there was no direct correlation between them. Based on the previous literature, we propose that (1) the TSTM heightens the effectiveness of antipsychotics by improving adherence or directly improving psychotic symptoms, and (2) the benefits of the intervention make patients more willing to participate in the intervention activities, which may have an indirect effect on medication adherence. Therefore, medication adherence is only one of the variables between intervention and clinical efficacy.

When interpreting our results, the following limitations should be considered. First, the sample size was relatively small, which may have limited the power to detect the results of our correlation analysis between adherence and clinical symptoms. Second, to avoid participants withdrawing from the study, we ensured that all participants scored less than 50 on the BPRS. This may, to some extent, have reduced the difference in the effect of the intervention on the two groups. Third, the ROMI is divided into two subscales that separate reasons for adherence (Reasons for Compliance) from reasons for nonadherence (Reasons for Noncompliance). However, in our study, we only used the subscale Reasons for Compliance. This may have affected the overall assessment of adherence. Fourth, in the study, we only take male SP patients as the research objects, and do not include female patients. Therefore, the intervention effect of female patients still needs further study.

Conclusion

In conclusion, the current findings suggest that the TSTM can improve medication adherence in SP through better adherence-related attitudes and integration of interpersonal communication. Thus, the model represents a simple and acceptable intervention method for improving medication adherence.

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