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Effect of combining social rhythm therapy to treatment of bipolar disorder versus treatment as usual: a comparative study on a sample of Egyptian patients

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Abstract

Background Bipolar disorder (BD) is a common mental illness that is usually associated with significant morbidity causing critical impairment in socio-occupational functioning and even mortality. Social rhythm therapy (SRT) has been suggested as an adjunctive psychotherapy in BD treatment protocols, with its proposed benefits of accelerating recovery from bipolar episodes, delaying relapses, and upgrading patients' functioning. This study aimed to investigate the outcomes of combining SRT with pharmacological treatment, as compared to pharmacotherapy alone, in a sample of Egyptian BD patients. Sixty eligible bipolar patients were enrolled in this comparative study by convenience sampling and randomly divided into two groups for comparison; group I included 30 BD-I patients treated as usual (TAU) with pharmacological treatment only, while group II included 30 BD patients treated with social rhythm therapy in addition to the traditional psychotropic medications. Manic and depressive symptoms as well as socio-occupational functioning were assessed at baseline and after 3 months of treatment using the Mood Disorder Questionnaire (MDQ), Hamilton Depression Rating Scale (HDRS), and Socio-occupational Functioning Assessment Scale (SOFAS).

Results Patients treated with SRT therapy showed significant improvement in their manic and depressive symptoms as well as socio-occupational functioning after 3 months of treatment by 65.76%, 55.87%, and 52.5%, respectively. Linear regression analysis showed that the gender and age of the patient could significantly predict improvement of MDQ% in group II, while none of the studied variables could significantly predict the percentage of change in HDRS or SOFAS.

Conclusion SRT could be a promising adjunctive therapy promoting early recovery of BD patients compared to standalone pharmacological treatment.

Keywords Bipolar disorder, Social rhythm therapy, Early recovery, Treatment strategy

Background

Bipolar disorder (BD) is a serious mental illness that leads to worldwide disability and morbidity [1]. It has been frequently related to serious medical and psychiatric co-morbidities, high levels of functional disability with poor quality of life, and early mortality [2]. In many cases of BD, the use of standalone pharmacological treatment was found to be unable to induce

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remissions or prevent relapses. For this reason, adjuvant therapies are strongly required [3].

Many biological processes, including sleep/wake rhythm, regulation of body temperature, neurotransmitter release, and hormonal secretion, follow circadian rhythms and are regulated by a central pacemaker in the suprachiasmatic nucleus located in the anterior hypothalamus [4]. In bipolar patients, irregular circadian rhythms are strongly suggested to contribute to episodes of mania and depression. This is currently explained by disturbance in the melatonin hormone, which regulates the sleep/wake cycle through providing information about light in the surrounding environment [5]. Inder et al. [6] acknowledged that mood episodes arise chiefly from dysregulated neurotransmitter systems and/or the irregular circadian rhythm system.

The idea of social rhythm therapy grows from the chrono-biological model of BD which suggests that individuals with BD have genetic vulnerability to both circadian rhythm and sleep–wake cycle irregularities and that these irregularities may be responsible, at least partially, for illness manifestations. Life events may cause disruptions in patients' social rhythms that upset circadian rhythms and sleep–wake cycles and trigger bipolar symptoms. The application of SRT together with classical psychotropic medications is proposed to help BD patients in adjusting their daily routines and making them more adherent to prescribed drugs. SRT is deemed helpful in regularizing both the biological and psychosocial factors in BD patients to amend their circadian rhythm and sleep–wake cycle, as well as for rising patients' functioning [7]. The impact of SRT has been observed not only on the management of acute episodes but also on the long-term survival without a new mood episode [8].

Social rhythm therapy is a simple, more action-oriented, and behaviorally focused intervention [9, 10]. In SRT, patients develop a daily schedule and observe the changes in their routine with a daily diary called the social rhythm metric [11]. SRT refers to the day-to-day variability of habitual behaviors [12]. The following five behaviors account for the majority of variability in the daily routine of SRT: get out of bed, first contact with another person, start work (school, family care, etc.) have dinner, and go to bed [13].

Nowadays, there is no identified cross-cultural assessment of the relationship between rhythmicity and psychiatric disorders. The majority of research investigating SRT among BD patients has been conducted in European and USA populations [11]. However, there may be some diversities across countries, based on cultural differences, genetic variability, and

expected dissimilarities in the prevalence of mental disorders across nations [14].

This study was conducted to assess the early results of adding a social rhythm program to traditional medications on a sample of Egyptian BD-I patients compared to sex- and age-matched ones treated as usual (TAU) with pharmacological treatment alone. We hypothesized that launching the SRT program in the BD management protocols would improve the outcomes of patients through enhancing their adaptive function and minimizing symptoms' severity compared to TAU patients.

Methods

This prospective study was carried out at Tanta University Hospitals from April 2022 to April 2023 after approval of our Ethical Research Committee under code 35338/3/22. Patients aged 18–45 years of both sexes were included in the present study from those admitted to our Neuropsychiatric wards who were suffering from BD-I as diagnosed by two experienced psychiatric consultants according to the Diagnostic and Statistical Manual of Mental Disorders-Fifth edition (DSM-5). Exclusion criteria included participants not fitting the inclusion criteria as well as patients with history of other psychiatric disorders, or serious neurological/medical illness. Also, uncooperative individuals, illiterate patients, pregnant/lactating females, and those with psychiatric co-morbidities were excluded from the study.

A total of 60 eligible participants were recruited in the current study by convenience sampling and were randomly divided into two groups for analysis and comparison:

- Group I: included 30 BD-I patients who were TAU with medications only (mood stabilizers and antipsychotics).
- Group II: included other 30 BD-I patients (matching group I in their age, sex, residency, education, and illness duration) who were treated with an adjuvant social rhythm therapy in addition to the same pharmacological treatment as in group I.

After obtaining informed written consents, all participants (of both groups) were subjected to psychiatric evaluation using the Mini International Neuropsychiatric Interview (MINI) which is a short structured diagnostic interview that assesses 17 disorders [15]. We used the Arabic version that has been translated, validated and compiled by Churbaji et al., 2020 [16] to be used with DSM-5.

Comprehensive psychometric testing was performed for all patients (group I and group II) following admission and was repeated 3 months after the initiation of treatment. The tests included the following:

- a. The Arabic form of Hamilton Depression Rating Scale (HDRS) [17] to evaluate depressive symptoms as determined by mood, suicidal thoughts, insomnia, guilt feeling, agitation or retardation, anxiety, weight loss, and somatic symptoms [18].
- b. Mood Disorder Questionnaire (MDQ) in its Arabic version [19] to identify mania symptoms for Bipolar Spectrum Disorder [20]. It consists of 15 questions that refer to the most common manic symptoms and their consequences on perceived disease severity regarding family-, financial- and legal-problems. As the scale provides numerical scores, it is useful in comparing the results of the two studied groups at baseline and at follow-up time points in order to monitor the course of manic symptoms after social rhythm therapy (SRT) and treatment as usual (TAU).
- c. Social and Occupational Functioning Assessment Scale (SOFAS) to evaluate exclusively the individual's level of social and occupational performance [21].

Patients of both groups were given general oral instructions to encourage them to develop more regular sleep and activity patterns to improve their mood. Group II patients were additionally subjected to detailed social rhythm strategies as follows: It was applied for the first time in the psychiatric ward during hospitalization by consultant psychiatrists, assisted by well-trained nursing staff, teaching the patients and their families all information about the SRT program. After discharge, patients completed their weekly self-report assessment by the Social Rhythm Metric (SRM), to follow the regularity of their social routines, under the supervision and follow-up of the treating physician.

The SRT program was initiated in group II participants after 2 weeks of admission (to ensure that the patients become more cooperative) and the program passed through 3 successive phases as follows: (a) assessment phase started by exploring the patient's general knowledge about BD and its effect on their lives as well as teaching them steps of SRT program. This interview was done in the psychiatric ward after checking all the inclusion criteria of the participants. (b) implementation phase was conducted to give the patient more precise information about BD and to explain the details and benefits of SRT. The physician evaluated the keys of social rhythms (i.e., sleep pattern, mealtimes, physical and mental activities) to establish a Social Rhythms Metric to be able to assess the relationship between the disturbance in

BD patients' routines and mood disruptions and to identify strategies intended to set up more regular patterns. This was applied through 4 preliminary sessions during hospitalization (twice per week) followed by eight additional sessions on a weekly basis after discharge. Each session took between 45 and 60 min. (c) Evaluation phase for reapplying the study tools (HADR, MDQ, SOFAS), and identification of the effectiveness of SRT strategies.

Statistical analysis

Statistical presentation and analysis of the current study were conducted, using the mean, standard deviation, Student's *t* test, paired *t* test, chi-square test, linear correlation coefficient, and analysis of variance [ANOVA] tests by SPSS V20. The sample size and power analysis were calculated using Epi-Info statistics program for public health professionals (Center for Disease Control and Prevention, Atlanta, GA, USA, 2011). A minimal sample size of 30 was calculated for each group at a confidence interval of 95% and 80% power of the study.

Results

The socio-demographic data of our participants showed no significant differences between the 2 studied groups as regards to age ($P = 0.533$), sex ($P = 0.4366$), occupation ($P = 0.426$), education ($P = 0.426$), residency ($P = 0.795$) and marital status ($P = 0.291$) as illustrated in Table 1. The mean duration of illness in group I was 7.968 ± 5.814 years, while it was 7.123 ± 6.672 years in group II, with no significant difference between both groups ($P = 0.603$).

Regarding HDRS, the mean HDRS at initial assessment was 20.1 ± 5.043 and 20.4 ± 5.082 for group I and group II, respectively with no significant difference ($P = 0.896$) between both groups. After 3-month follow-up, the mean HDRS value declined by 39.5% among group I patients (mean difference 8 ± 2.211), while more decline (55.9%; mean difference 11.3 ± 2.946) was significantly ($P < 0.001$) elicited in group II as shown in Fig. 1a.

The MDQ mean score at initial measurement was 10.2 ± 1.399 and 11.25 ± 1.650 for groups I and II, respectively. While after a 3-month follow-up, the MDQ score decreased by 38.74% among group I patients (mean difference 3.95 ± 0.999) and decreased by 65.76% (mean difference 7.3 ± 0.923) in group II. There was a significant ($P < 0.001$) change in MDQ scores in group II patients compared to their counterparts in group I as illustrated in Fig. 1b.

As regards SOFAS, the mean score at baseline evaluation was 47.667 ± 11.244 in group I and 53.00 ± 11.265 in group II patients, with no significant difference ($P = 0.072$) between both groups. At 3-month follow-up assessment, the SOFAS mean score improved by 52.5% (mean difference 26 ± 6.747) in group II which was

Table 1 Socio-demographic data of both TAU and SRT groups in the study

Variable		Group I (n = 30)	Group II (n = 30)	Test	P
Age (year)	Mean ± SD	29.833 ± 7.996	31.233 ± 9.265	$t = -0.627$	0.533
Female	No (%)	12(40)	15(50)	$\chi_2 = 0.606$	0.436
Male	No (%)	18(60)	15(50)		
Unemployed	No (%)	17(56.67)	20 (66.67)	$\chi_2 = 0.635$	0.426
Employed	No (%)	(43.33)13	10 (33.33)		
Low education	No (%)	10(33.33)	13(43.33)	$\chi_2 = 0.635$	0.426
High education	No (%)	20(66.67)	17(56.67)		
Rural	No (%)	(53.33)16	17(56.67)	$\chi_2 = 0.067$	0.795
Urban	No (%)	14 (46.67)	13(43.33)		
Single	No (%)	19(63.33)	15 (50.00)	$\chi_2 = 2.471$	0.291
Married	No (%)	9(30.00)	9(30.00)		
Divorced	No (%)	2(6.67)	6(20.00)		

TAU treatment as usual, SRT social rhythm therapy, * $P < 0.05$ is statistically significant, SD standard deviation, F one-way ANOVA test, χ_2 Chi-square test.

significantly lesser ($P < 0.001$) than the improvement obtained in group I (21.72%) with a mean difference of 9 ± 9.229 as shown in Fig. 1c.

The correlation between socio-demographic data and the percentage of improvement in the studied scales in group II showed that the percentage of improvement in HDRS, MDQ, and SOFAS were significantly higher in females, employed participants, and highly educated patients (Supplementary Tables S1–S3). Furthermore, there was a significant negative relationship in group II between each of the ages and the duration of illness with the percentage of improvement in the studied psychometric scales (HADR, MDQ, and SOFAS) as illustrated in Table 2.

Multiple linear regression analysis was done to determine variables that could predict the degree of improvement of HDRS, MDQ, and SOFAS in both groups. We tested a model using a degree of improvement of HDRS, MDQ, and SOFAS scores as dependent variables while the age, gender, occupation, education, and duration of illness were used as independent variables and medications used were regarded as co-variance (Table 3). The results of this analysis showed that both gender and age of the patient could significantly predict MDQ% of improvement in group II (as shown in Table 4) while none of the studied variables could significantly predict HADR or SOFAS % of change in both groups.

Only 43.3% of patients in group I were adherent to pharmacological treatment, compared significantly ($P < 0.001$) to a 90% adherence rate among group II participants. Figure 2 summarizes these findings.

Discussion

Social rhythm therapy has been specifically developed with the proposed objectives of improving the disruptions of social/circadian rhythms and increasing patients'

adherence to medications. It aims to ameliorate sleep disturbances, encourage healthy lifestyle behaviors, and monitor mood swings with early detection of patients' warning signs [22].

The efficacy of adjuvant SRT on the outcome of BD patients has been tested only in a handful of studies [23]. The majority of previous studies pertaining the role of SRT in BD patients have been carried out in USA and Europe [11]. Interestingly, several studies [14, 24, 25] delineated the existence of ethnic differences in the care pathways and treatment response of people with BD. Moreover, cultural diversity, genetic inconsistency, and dissimilar prevalence of mental illness among countries may influence the disease outcomes. Therefore, studying the role of SRT programs in different societies is considered imperative and crucial, especially in Arab countries which have different cultural issues.

To the best of our knowledge, this is the first comparative research on a sample of Egyptian population that aimed to evaluate the early outcomes of applying SRT programs with pharmacological therapy as compared to pharmacological therapy alone for BD-I patients.

Apart from gender and residency, other socio-demographic characteristics of our patients (age, occupation, marital status, and education) were in line with the long-established socio-demographic profile of BD-I in the literature [13, 26–28]. The majority (60%) of TAU patients and half (50%) of the SRT group in the present work were males, which was harmonious with a recent study [29] in Egypt. This may reflect our cultural tendency to give more attention to complaints from males than from females or due to the stigma related to visiting psychiatric hospitals in rural areas, especially for women, rather than the actual higher prevalence of BD among males. Also, the majority of BD patients in the current study were country-side

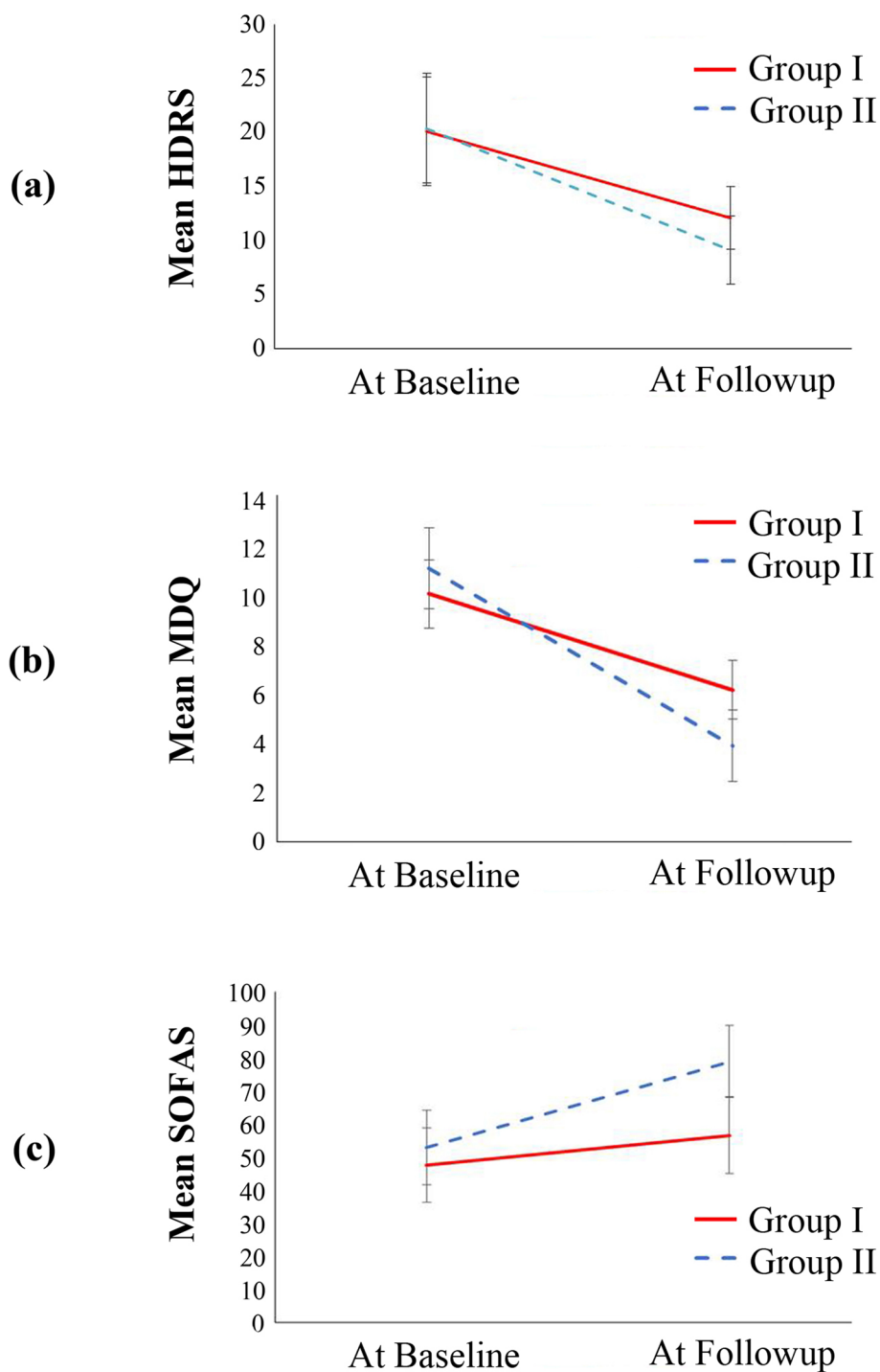


Fig. 1 Comparison of both studied groups regarding the mean scores of (a) HDRS, (b) MDQ and (c) SOFAS at baseline (before treatment) and at follow-up (3-month post-treatment)

residents which could be attributed to serving a wide range of surrounding rural areas in the inpatient psychiatric units of Tanta University hospitals. Likewise, a number of studies [30–32] have documented that rural residents are

more likely than urban ones to experience circumstances and conditions that may increase risks of mood disorders, including living in poverty, having lower levels of educational achievement, and reporting poor health services.

Table 2 Correlations between the degree of improvement in psychometric scales and each of the age and duration of illness in both groups

Groups		Age (years)		Duration of illness (years)	
		R	P value	R	P value
Group I	HDRS % of change	-0.782	0.007*	-0.697	0.025*
	MDQ % of change	-0.568	0.009*	-0.600	0.005*
	SOFAS % of change	-0.283	0.130	-0.331	0.074
Group II	HDRS % of change	-0.847	0.002*	-0.698	0.025*
	MDQ % of change	-0.743	< 0.001*	-0.616	0.004*
	SOFAS % of change	-0.636	< 0.001*	-0.527	0.003*

*P < 0.05 is statistically significant, HDRS Hamilton Depression Rating Scale, MDQ Mood Disorder Questionnaire, SOFAS Socio-occupational Functioning Assessment Scale

The present study demonstrated that manic and depressive symptoms as well as socio-occupational functioning in group II were improved by 65.76%, 55.87%, and 52.5% respectively after 3 months of treatment compared significantly (P < 0.05) to 38.74

%, 39.5% and 21.72% in group I, respectively. Comparable findings were previously achieved by Hlastala et al. 2010 [33] who reported a significant clinical improvement in BD patients after SRT, as the scores of the Mania rating scale reduced by 67.0% and Beck Depression Inventory values reduced by 53.2%. Several other studies [23, 27] revealed that at the end of the SRT intervention on bipolar patients, there was a significant improvement in manic symptoms, depressive symptoms, and global functioning. In the same line, Steardo et al., 2020 [27] confirmed that applying SRT for patients with BD had a significant increase in their response to mood stabilizers compared to controls.

The positive impact of the SRT on all symptom domains of BD can be elucidated by numerous factors, including the strong relationship between the improvement of circadian rhythms and symptomatic remission of patients. In fact, sleep dysregulation is considered a trigger factor for the development of manic or depressive symptoms [34]. The SRT has a specific focus on sleep disturbances through the monitoring of daily levels of energy, thus contributing to better daily planning. Another probable clarification for the amelioration of

Table 3 Regression model summary

	Groups	R square	F	df1	df2	P value
HDRS % of change	Group I	0.735	2.221	5	4	0.230
	Group II	0.904	7.522	5	4	0.037*
MDQ % of change	Group I	0.483	2.616	5	14	0.071
	Group II	0.757	8.730	5	14	0.001*
SOFAS % of change	Group I	0.262	1.700	5	24	0.173
	Group II	0.523	5.261	5	24	0.002*

HDRS Hamilton Depression Rating Scale, MDQ Mood Disorder Questionnaire, SOFAS Socio-occupational Functioning Assessment Scale, DF1 degree of freedom of variables, DF2 = degree of freedom of cases, *P < 0.05 is significant

Table 4 Predictors of MDQ % of change using linear regression analysis

Groups		Un-standardized coefficients		Standardized coefficients Beta	t	P value
		B	Std. error			
Group I	Gender	-1.367	3.463	-0.085	-0.395	0.699
	Occupation	-1.079	3.456	-0.069	-0.312	0.759
	Education	5.238	3.458	0.319	1.515	0.152
	Age (years)	-0.331	0.397	-0.329	-0.834	0.418
	Duration of illness (years)	-0.272	0.500	-0.214	-0.544	0.595
Group II	Gender	-7.893	2.873	-0.429	-2.747	0.016*
	Occupation	1.862	3.127	0.097	0.596	0.561
	Education	3.775	2.852	0.204	1.324	0.207
	Age (years)	-0.399	0.396	-0.410	-2.007	0.031*
	Duration of illness (years)	-0.119	0.492	-0.093	-0.242	0.812

Dependent variable: MDQ % of change

*P < 0.05 is statistically significant

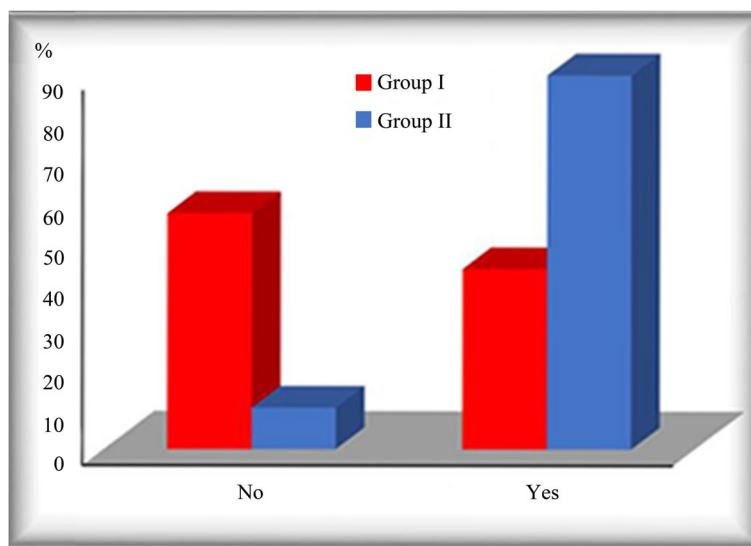


Fig. 2 Adherence to treatment among patients of both groups in the study

psychiatric symptoms in BD is the fact that SRT-integrated sessions are directed at improving patients' compliance with psychotropic medications [35].

We found that SRT had a positive effect on early recovery from depressive and manic symptoms of BD by the third month of follow-up. In the same line, Miklowitz et al. 2007 [35], underlined that BD patients treated with systematic treatment enhancement programs, including SRT, had shorter times to recover from depression compared to controls. In contrast, Frank et al. 2005 [36] carried out a trial of interpersonal and social rhythm therapy (IPSRT) and intensive clinical management on BD patients and detected no impact of these therapies regarding the time of remission. Nevertheless, they elucidated a positive effect for BD patients assigned to SRT in achieving longer survival without a new affective episode with greater probability of remaining well in the 2-year maintenance phase. The disparities in the early results of the later study compared to ours may be owed to the use of different selection criteria and methodology with dissimilar measuring scales (Bech-Rafaelsen Mania Scale versus MDQ in our study).

Correlations between sociodemographic data and the psychometric profile of our SRT group showed that the percentage of early improvement in HADRS, MDQ, and SOFAS was more significant among females, employed participants, and highly educated patients. In the same line, Frank et al. 2005 [36] clarified that patients who were educated or employed had significantly better long-term outcomes than those who were not. Education allows the person to accomplish more developmental milestones and maturity, therefore enhancing the

adherence to treatment and social daily habits, that are at least partially stabilized by employment and had positive impacts on the outcomes. Conversely, the study of Alam et al. 2022 [29] reported no statistically significant relationship between bipolar patients' socio-demographic features and their disease outcomes after IPSRT. However, the later study had dissimilar inclusion criteria and applied a different methodology with other measures of outcome analysis (psychological adjustment and sleep disorders) than ours.

Our results highlighted a negative relationship between each of the ages and illness duration with the percentage of improvement in the studied psychometric scales (HDRS, MDQ, SOFAS) in BD with SRT augmentation. While in the study of Inder et al. 2015 [23], a significant effect of age on the treatment outcomes could not be detected. Nevertheless, they evaluated the effect of IPSRT using other scales on a sample of young people (15–36 years) which differed greatly from our sample.

To the best of our knowledge, the present work is the first one that applied linear regression analysis to detect if any of the studied disease variables could predict the percentage of improvement of both disease symptoms and socio-occupational functioning after adding SRT programs. We found that both the gender and age of the patient could significantly predict MDQ% of improvement. While none of the studied variables could significantly predict the percentage of change in HDRS or SOFAS.

There is limited to no information accessible on gender-specific outcomes of psychotherapy on BD. Frank et al 2005 reported that bipolar women who were assigned to acute phase IPSRT showed the most rapid and marked

improvement in symptoms, while men overall showed slower changes. They deemed that some behavioral and social discrepancies between men and women with BD could explain the gender effect. In the same view, Garg et al. 2017 [37] established that females with bipolar manic episodes had significantly better responses to treatment than males and they referred this finding to the higher severity of manic episodes in men than women. Similar to our findings, studies of major depression have generally failed to show a clear differential response between men and women to psychotherapy [36, 38].

The current study pointed to the patient's age as a significant predictor of symptom improvement among the social rhythm group and these findings may be related to the fact that older adults are often worse than younger in adapting to changes in situational demands, which is commonly attributed to an age-related decline in acquiring and updating information [39].

It is noteworthy that adherence to pharmacological treatment is a keystone for improving the treatment results of BD patients. Only 43.3% of patients in group I in this study were adherent to treatment, while adherence has significantly increased to comprise 90% of group II subjects. Parallel to our results, Hoberg et al. 2013 [40] showed that the participants who completed SRT had higher medication adherence and didn't differ significantly at 12 weeks of follow-up. Moreover, Alam et al. 2022 [29] posited that after the implementation of SRT, about 88% of the included BD patients were adherent to medication. The SRT teaches bipolar patients skills that make them more compliant to instructions and the social rhythm metric allows patients to keep track of medications and helps them to make the timing of such routine more regular.

The strength of the present study lies in its prospective comparative nature. However, it should be regarded in the context of some limitations like the heterogeneity of our cases regarding their age and type/duration of pharmacological treatment; some of these factors could not be avoided due to ethical reasons. Another shortcoming of this work is that it did not focus on categorizing the symptoms according to their severity and their correlations to other confounders. Yet, our sample was small and all of our patients reported that their symptoms caused at least moderate functional impairment on admission, while cases who presented with severe disruptive symptoms that interfered with their communication and cooperation (i.e., uncooperative participants) were excluded from the study because they were not able to participate in the study scales. The numerical scores of the applied scales in this work were used to track the % of

the change in patient's symptoms as treatment progresses over time regardless of their severity. Future studies on a larger sample size are recommended to correlate different categories of symptom severity with other variables.

One more limitation was in using the MDQ for tracking changes in manic symptoms over time, which is a self-administered questionnaire that may be subject to bias by the participants. Nevertheless, it was crucial to apply a scale using straightforward questions and available in a culturally sensitive Arabic version to be easier for our respondents to understand and complete. To the best of our knowledge, the MDQ was the only scale available in a validated Arabic version [19] during the designing of our study's protocol (in March 2022) and was therefore chosen to follow the course of mania in the current work.

We may also be criticized for reporting our results in a very short-term follow-up period (3 months only), which was attributed to the time limit of the study, where previous researchers recorded their results at a minimum of 6 months and thereafter. However, the present study is the first to highlight the crucial role of SRT in promoting early patient improvement which mirrors a shortened time to recovery. A larger sample with longer follow-ups (i.e., at 12 months, 18 months, and thereafter) is needed to evaluate the long-standing efficacy of SRT on the reduction of BD relapses. Further studies are also needed to evaluate patients' expectations, levels of acceptance, and satisfaction with the SRT.

Conclusions

This study supported the literature evidence of the fundamental role of SRT as an effective adjunctive treatment delivered by experienced psychiatrists for BD patients. By the end of the 3rd month of treatment, participants who received SRT course experienced significant improvement in their manic and depressive symptoms as well as global functioning and their adherence to medications in comparison to those with TAU. In view of our results, SRT is a promising psychosocial treatment for BD particularly among young employed females.

Abbreviations

BD	Bipolar disorder
DSM-5	Diagnostic and Statistical Manual of Mental Disorders-Fifth edition
HADRS	Hamilton Depression Rating Scale
HADS	Hospital Anxiety and Depression Scales
MDQ	Mood Disorder Questionnaire
MINI	Mini International Neuropsychiatric Interview
SOFAS	Socio-occupational Functioning Assessment Scale
SRM	Social rhythm metric
SRT	Social rhythm therapy
TAU	Treated as usual
IPSRT	Interpersonal and social rhythm therapy

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s43045-024-00393-x>.

Additional file 1: Supplementary Table S1. Correlations between socio-demographic data and percentage of improvement in HDRS results in group II. **Supplementary Table S2.** Correlations between socio-demographic data and percentage of improvement in MDQ results in group II. **Supplementary Table S3.** Correlations between socio-demographic data and percentage of improvement in SOFAS results in group II.

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Authors' contributions

E.D.: literature search, psychiatric assessment of all participants, data acquisition, data analysis, statistical analysis, manuscript preparation. A.M.: conception and design of the work, reviewing data analysis, reviewing the statistical analysis, and critical revision of the manuscript. M.E.: conception and design of the work, reviewing data analysis, reviewing the statistical analysis, and revision of the manuscript. R.A.: conception and design of the work, literature search, reviewing data analysis, manuscript writing, editing, and manuscript review. All authors certify that the submission to this work is original and that they have reviewed and confirmed the accuracy of the whole manuscript and have approved the submitted version.

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Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

The study was approved by the Ethical Research Committee of the Faculty of Medicine, Tanta University under the code 35338/3/22. An informed written consent was obtained from all participants to be included in this study.

Consent for publication

Each of the participants was given a code number and his anonymity was preserved (his individual person's data was omitted and not included in the submitted manuscript).

Competing interests

All authors declare that they have no competing interests.

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