*Original Article*

# Comparative Effectiveness of Active Group Music Therapy in Major Depressive Disorder Compared to Standard Group Psychotherapy: A Randomized Controlled Trial

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***Objective:*** To find the influences of active group music therapy approach and compare them with standard treatment outcomes.

***Materials and Methods:*** Prospective randomized control trial was conducted on two treatment groups (n = 8 for active group music, n = 11 for control group) for seven-week. Depression-related parameters consisted of Montgomery-Åsberg Depression Rating Scale [MADRS] Thai version, Pittsburgh Sleep Quality Index-Thai version [Thai-PSQI], Hospital Anxiety and Depression Scale-Thai version [Thai-HADS], Thai-Perceived Stress Scale-10 [T-PSS-10], Rosenberg self-esteem Thai version, and the World Health Organization Quality of Life [WHOQOL] Thai version were collected before and after both treatments.

***Results:*** Active group music had statistically significant improvement of better depressive rating scale, sleep quality, perceived stress scale, and quality of life ($p$ = 0.001, 0.010, 0.001, and 0.008, respectively). Depression improved and there was significant difference when both treatments were compared.

***Conclusion:*** Active music group intervention improves depression, sleeps quality, stress, and quality of life, and could decrease impact of daily-life stress and lower severity of depressive symptoms.

***Keywords:*** Group music therapy, Group psychotherapy, Depression, Sleep quality, Thai-MADRS, Thai-PSQI, Thai-HADS, T-PSS-10, Thai- WHOQOL, Thai-Rosenberg self-esteem

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Major depressive disorder [MDD] is one of the most frequent psychiatric disorders nowadays. A co-study between WHO and Harvard School of Public Health found that MDD was ranked fourth global burden of disease in 1990 and would climb to second in 2020[1]. Even though depression can be easier diagnosed and treated, the possibility of recurring is relatively high. Alarmingly, around 2.5% to 15% of suicide is caused from depression[2]. Psychiatric medication is a conventional treatment, but it has undesired consequences, side effect for example. Psychotherapy is a useful treatment for patients with MDD[3].

Group music therapy is an interesting alternative and has been used to counter many illnesses effectively. Listening to music could reduce pain and stress, promote calmness, and improve sleep quality[4,5]. Moreover, many studies showed music, when utilized with a conventional treatment, could treat depression better than giving a conventional treatment alone[6,7].

Active group music therapy techniques, which are conducted in this research, may include engaging patients in singing, music composition, and instrument playing. Its core purpose is to stimulate responses between the therapist and patients through music improvisation (the creative activity of immediate musical composition, which combines performance with communication of emotions and instrumental technique as well as spontaneous response). Active music therapy can encourage many parts of patients' brain to work together and consequently reduce depression[8-10].

From our finding, the studies of using active group

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music therapy to treat depression are very limited in Thailand[11]. As a result, this study is aimed to find the impacts of active group music therapy approach on depressive symptoms both before and after treatment group programs and compare its usefulness with standard group psychotherapy.

## Material and Method

### *Study design*

The study was a prospective randomized control trial conducted between January and October 2017. Subjects were recruited through an advertisement posted at Ramathibodi Hospital and on a social media. Inclusion criteria were age 18 to 60 year, and diagnosis of MDD by the criteria of DSM-V. The subject with psychiatric disorders, cognitive impairment, substance abuse, ECT treatment or changing of treatment during group therapy were excluded from the study.

All the participants underwent two assessments before the enrollment. The first one was a telephone screening for eligibility. The second assessment was a visit for definite diagnosis of MDD. At this process, the applicants with exclusion criteria were ruled out.

The block randomization (block of two) was utilized to generate the two treatment groups i.e., active group music therapy (experimental group) and standard group psychotherapy (control group), with 8 to 11 subjects for each group[12]. Duration for group therapy was 1.5 hours per session per week[13], lasting for seven consecutive weeks. If a subject was absent for more than two sessions, it was counted as "discontinue", as shown in Figure 1. The ethical approval for the study was obtained from the Ethic Committee, Faculty of Medicine, Ramathibodi Hospital, Mahidol University (IRB ID08-59-06).

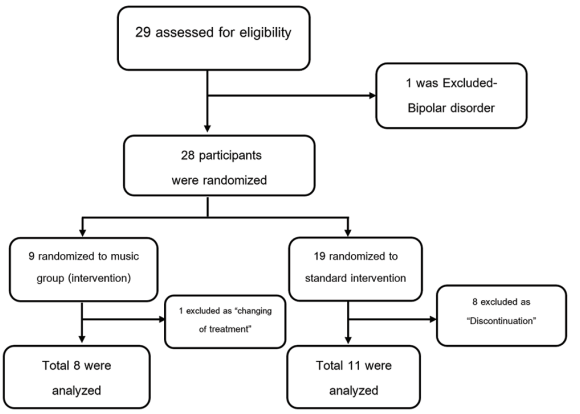


**Figure 1.** Flow of study.

### *Outcome and assessments*

Self-assessment questionnaires were administered before and after the seven-week program in both groups of participants. It was composed of three domains, demographic data, depressive data, and collateral data. Demographic data consisted of age, sex, status, graduation, job, income of less than 10,000 bath per month, history, age onset of depression, duration of treatment for depression greater than 1 year. The depressive profile was described by sadness, inner tension, sleep disturbance, reduced appetite, concentration difficulty, lassitude, inability to feel, pessimistic thought, and suicidal thought. The collateral data included sleeps quality, stress level, anxiety level, self-esteem level, and quality of life.

The primary outcome was derived from Montgomery-Åsberg Depression Rating Scale [MADRS], a questionnaire translated by Kongsakon et al[14]. It was composed of 10-item clinician-rated scale assessing symptoms of depression that were selected to be responsive to treatment[15]. Sad mood was assessed by two items that captured the observers' perspective and reported subjective experience. The other eight items assessed tension, sleep, appetite, concentration, lassitude (activity), inability to feel (anhedonia), pessimism, and suicidal thoughts. Each item was rated on a 7-point (0 to 6) ordinal scale. A total score was computed as the sum of the 10 items and could range from 0 to 60. Higher scores reflected more severe depression. Score of 0 to 6 was considered normal[16] or symptom absent[17], 7 to 19 was considered mild depression[16,17], 20 to 34 was considered moderate depression[16], and score above 34 was considered severe depression. Thai-MADRS was declared to have the internal consistency reliability (Cronbach's alpha co-efficiency) of 0.95 and test-retest reliability (intraclass correlation coefficient) of 0.80[14]. This study also used clinician-rate severity of depression in MADRS to evaluate how well the subject's depression was. The scoring was based on a scale of 0 to 6, whereby 6 reflected the poorest depression.

Questionnaires for the secondary outcome were derived from Pittsburgh Sleep Quality Index-Thai version [Thai-PSQI], Hospital Anxiety and Depression Scale-Thai version [Thai HADS], Thai-Perceived Stress Scale-10 [T-PSS-10], Rosenberg self-esteem, and the World Health Organization Quality of Life [WHOQOL].

Thai-PSQI, a questionnaire translated by Sitasuwan et al[18], was composed of nineteen self-rated questions in seven factors, namely sleep quality,

sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleep medication, and daytime functioning. The score was calculated by summarizing scaled points in each factor. A subject was labeled as "poor sleep quality" if its score was higher than 5[19].

Thai-PSQI was declared to have the internal consistency reliability (Cronbach's alpha co-efficiency) of 0.84 and test-retest reliability (intraclass correlation coefficient) of 0.89[18]. This study also used self-rate sleep quality in PSQI to evaluate how well the subject's sleep quality was. The scoring was based on a scale of 0 to 3, whereby 3 reflected the poorest sleep. Thai Hospital Anxiety and Depression Scale (Thai HADS), translated by Nilchaikovit et al[20], was used for evaluating mood symptoms in each subject. It contained two domains, HAD-D for depressive symptoms and HAD-A for anxiety symptoms, seven items for each section. Each section had full 21 score range and a cut-off point was above 11[21].

Thai HADS studied was declared to have the internal consistency reliability (Cronbach's alpha co-efficiency) of 0.86 for anxiety and 0.83 depression section[20]. This data was collected by trained staffs who did not know about each group's assignment. T-PSS-10 translated by Wongpakaran and Wongpakaran[22], was used for evaluating perception of stress in each subject[23]. This 10-item questionnaire had scale rating for each item, from 0 (never) to 4 (very often). T-PSS-10 studied was declared to have the internal consistency reliability (Cronbach's alpha co-efficiency) of 0.80 for perception of stress[22].

Rosenberg self-esteem scale Thai version was translated by Wongpakaran and Wongpakaran[24], questions consisted of 10-item scale that measures global self-worth by measuring both positive and negative feelings about the self. The scale was believed to be uni-dimensional. All items were answered using a 4-point Likert scale format ranging from strongly agree to strongly disagree[25]. Thai version of Rosenberg self-esteem Scale studied was declared to have the internal consistency reliability (Cronbach's alpha co-efficiency) of 0.85 for self-esteem level, and the Pearson's correlation between it and the self-esteem visual analog scale was 0.62[24].

WHOQOL-BREF-THAI translated by Mahatnirunkul et al[26], the WHOQOL-BREF consisted of twenty-six items including twenty-four items for four domains (physical, psychological, social, and environmental), one item for general quality of life, and one item for health-related quality of life [HRQOL][26]. There were seven items in the physical domain, six items in the psychological domain, three items in the social domain, and eight items in the environmental domain. The WHOQOL-BREF-THAI contained the twenty-six original items[27]. The patients were required to rate their HRQOL in the past two weeks. The item scores ranged from 1 to 5, with a higher score indicating a better HRQOL. Because the numbers of items were different for each domain, the domain scores were calculated by multiplying the average of the scores of all items in the domain by 4. Thus, the domain scores would have the same range, from 4 to 20. WHOQOL-BREF-THAI 26 studied was declared to have the internal consistency reliability (Cronbach's alpha co-efficiency) of 0.84 for quality of life[26].

### *Statistical analysis*

The interested variables with normal distributions were determined using Shapiro-Wilk test for normality. They were reported as mean (standard deviation) if normal distributed data, and reported in median and ranges if data was non-normal distribution. The baseline demographic and depressive features were compared across the groups, between before and after intervention, using t-test. The analysis of differences after the treatment was processed by paired t-test. Differences were considered significant at *p*-value of less than 0.05. All statistical analysis was performed by Stata Data Analysis and Statistical Software version 15 (College Station, TX: StataCorp LP).

## Results

The number of interested participants from advertised media was 35, 29 of which were selected for an in-person assessment. One participant with bipolar disorder was excluded before the intervention begun and one participant was excluded during the intervention because of change in the treatment, according to the screening criteria. Eight patients were in the active music group and all the patients completed the entire seven-week schedule (100%). Nineteen patients were in control group and eleven completed the entire seven-week schedule (57.89%) while eight participants were excluded later during the intervention because of their discontinuation. Therefore, nineteen participants were included in this study.

The demographic data are shown in Table 1. The mean age, sex, marital status, education level, employment status, income, underling disease, age of MDD onset, and duration of MDD treatment longer than one year showed no significant difference between the two groups. The mean age was 40.83 years old.

**Table 1.** Demographic characteristics between music group and control group

| Characteristics | Music group n (%) | Control group n (%) | *p*-value |
|---|---|---|---|
| Age (years), mean (SD) | 37.75 (10.14) | 43.91 (14.26) | 0.312 |
| Female | 5 (62.5) | 10 (90.9) | 0.178 |
| Single | 6 (75.0) | 8 (72.7) | 0.904 |
| Bachelor | 8 (100) | 10 (90.9) | 1.000 |
| Unemployed | 3 (37.5) | 5 (45.5) | 0.549 |
| Income (<10,000 bath/month) | 4 (50.0) | 5 (45.5) | 0.145 |
| Underlying disease | 4 (50.0) | 4 (36.4) | 0.658 |
| Age of MDD onset, mean (SD) | 34.00 (10.85) | 30.09 (16.28) | 0.564 |
| Duration of MDD treatment >1 year | 4 (50.0) | 3 (27.3) | 0.171 |

MDD = major depressive disorder

**Table 2.** Depressive and collateral data between music group and control group

| | Music group mean (SD) | Control group mean (SD) | *p*-value |
|---|---|---|---|
| MADRS | 19.75 (10.33) | 22.00 (10.47) | 0.648 |
| PSQI | 11.88 (3.14) | 11.82 (4.81) | 0.977 |
| HAD-anxiety | 11.50 (4.24) | 13.36 (5.09) | 0.411 |
| HAD-depression | 9.50 (3.67) | 8.36 (4.03) | 0.537 |
| T-PSS-10 | 25.63 (4.41) | 22.55 (7.58) | 0.320 |
| Rosenberg self-esteem | 23.50 (3.70) | 25.27 (3.70) | 0.471 |
| WHOQOL | 75.63 (8.11) | 73.64 (15.88) | 0.751 |

MADRS = Montgomery-Åsberg Depression Rating Scale; PSQI = Pittsburgh Sleep Quality Index; HAD = Hospital Anxiety and Depression Scale; T-PSS-10 = Thai-Perceived Stress Scale-10; WHOQOL = World Health Organization Quality of Life

Populations in both groups were mainly female.

The demographic data is shown in Table 2. The mean scores of MADRS, PSQI, HAD-A, HAD-D, T-PSS-10, Rosenberg self-esteem, WHOQOL showed no significant difference between the two groups before the intervention.

The data from Table 3 demonstrated the comparisons between before and after active group music therapy. After interventions, MADRS, with a statistical significance, was decreased by 12.25 (*p*-value 0.001). Mean Thai-PSQI score was lowered significantly from 11.88 to 9.88 (*p*-value 0.010). Anxiety symptoms were improved but their differences were not statistically significant. T-PSS score and WHOQOL, with a statistical significance, were decreased by 6.88 points (*p*-value 0.001) and 13.87 points (*p*-value 0.008), respectively. Rosenberg self-esteem score was improved but differences were not statistically significant.

In control group (Table 3), there were significant improvements in Thai-MADRS (*p*-value 0.003), HAD-A (*p*-value 0.001), T-PSS score (*p*-value 0.001), Rosenberg self-esteem score (*p*-value 0.029), and WHOQOL (*p*-value 0.003). Thai-PSQI was decreased by 1.18 though not statistically significant.

For the comparative profiles of final results between music group and control group (Table 4), Mean Thai-MADRS score was decreased significantly by 12.25 points and 4.73 points in music group and control group, respectively (*p*-value 0.004). There was no significant difference between the two groups in other parameters.

## Discussion

This study shows effectiveness of active group music therapy when it was compared with the standard group psychotherapy. The authors evaluated primary outcome by MADRS and found that both approaches reduced depressive symptoms with statistical significances. However, when looking into detail, the authors found that active group music therapy reduced depression (primary outcome) with a

**Table 3.** Music group and control group subjective results

| | Music | | | | Control | | | |
|---|---|---|---|---|---|---|---|---|
| | Before mean (SD) | After mean (SD) | 95% CI | *p*-value | Before mean (SD) | After mean (SD) | 95% CI | *p*-value |
| MADRS | 19.75 (10.33) | 7.50 (6.41) | 7.38 to 17.12 | 0.001* | 22.00 (10.47) | 17.27 (8.26) | 2.02 to 7.43 | 0.003* |
| PSQI | 11.88 (3.14) | 9.88 (3.09) | 0.66 to 3.34 | 0.010* | 11.82 (4.81) | 10.64 (4.25) | -2.32 to 4.68 | 0.469 |
| HAD-anxiety | 11.50 (4.24) | 8.63 (3.54) | -0.36 to 6.11 | 0.074 | 13.36 (5.09) | 7.46 (4.87) | 3.16 to 8.65 | 0.001* |
| HAD-depression | 9.50 (3.67) | 5.13 (3.52) | 0.94 to 7.81 | 0.020* | 8.36 (4.03) | 4.27 (3.67) | 1.57 to 6.61 | 0.005* |
| T-PSS-10 | 25.63 (4.41) | 18.75 (5.29) | 4.07 to 9.68 | 0.001* | 22.55 (7.58) | 16.64 (6.52) | 2.93 to 8.89 | 0.001* |
| Rosenberg self-esteem | 23.50 (3.70) | 26.88 (5.99) | -7.27 to 0.52 | 0.080 | 25.27 (5.99) | 29.00 (4.47) | -6.99 to 0.46 | 0.029* |
| WHOQOL | 75.63 (8.11) | 89.50 (14.86) | -22.73 to -5.23 | 0.008* | 73.64 (15.88) | 87.09 (16.24) | -21.07 to -5.84 | 0.003* |

MADRS = Montgomery-Åsberg Depression Rating Scale; PSQI = Pittsburgh Sleep Quality Index; HAD = Hospital Anxiety and Depression Scale; T-PSS-10 = Thai-Perceived Stress Scale-10; WHOQOL = World Health Organization Quality of Life

* *p*-value <0.05 was statistically significant

**Table 4.** Comparison of results between music and control group after intervention

| | Music, delta (SD) | Control, delta (SD) | 95% CI | *p*-value |
|---|---|---|---|---|
| MADRS | 12.25 (5.82) | 4.73 (4.03) | -12.75 to -2.30 | 0.004* |
| PSQI | 2.00 (1.60) | 1.18 (5.21) | -4.86 to 3.23 | 0.675 |
| HAD-anxiety | 2.88 (3.87) | 5.92 (4.09) | -0.89 to 6.95 | 0.121 |
| HAD-depression | 4.38 (4.10) | 4.09 (3.75) | -4.11 to 3.54 | 0.877 |
| T-PSS-10 | 6.88 (3.36) | 5.91 (4.44) | -4.91 to 2.98 | 0.612 |
| Rosenberg self-esteem | -3.38 (4.66) | -3.73 (4.86) | -5.04 to 4.33 | 0.876 |
| WHOQOL | -13.88 (10.59) | -13.45 (11.33) | -10.40 to 11.24 | 0.936 |

MADRS = Montgomery-Åsberg Depression Rating Scale; PSQI = Pittsburgh Sleep Quality Index; HAD = Hospital Anxiety and Depression Scale; T-PSS-10 = Thai-Perceived Stress Scale-10; WHOQOL = World Health Organization Quality of Life
* *p*-value <0.05 was statistically significant

statistical significance as shown by the sharp drop of MADRS score from 19.75 (moderate depression) to 7.5 (mild depression).

When looking at secondary outcome, which includes PSQI, anxiety level, stress level, self-esteem level, and quality of life, the authors found that participants in the active music group had better sleep quality, less stress, and better quality of life with statistic significances. Similarly, anxiety level and self-esteem level tended to improve.

In the standard group psychotherapy, the authors found that participants also had decreased anxiety level, less stress, higher self-esteem, and better quality of life with statistical significances. Likewise, sleep quality tended to improve.

When comparing results of both group in secondary outcome, the authors found no statistical significances. This showed that both approaches were giving similar results. However, active music therapy generated superior outcome in treatment depression with statistical significance. Interestingly, all participants in the music group attended the treatment until it was finished while 42.11% of participants in standard psychotherapy group left the treatment before it was finished. This showed that music group had better compliance.

The authors observed that participants in the active music group had better relationship and reaction between the members than those in the control group. Musical instruments induce good relationship and promote bonding between members. These all lead to a motivation to carry out all activities from the beginning to the end of the program[28,29].

The strength of this study is the activities in the active music group such as music improvisation, body movement according to the music, singing, and drawing and painting according to the music. The activities let the participants to release some emotions that cannot be expressed verbally[30]. They also inspired the participants to improve sensation through the up and down of melodies and relate them with internal emotions[28-30]. This, in turn, resulted in better expressions of sub consciousness, decreasing internal conflict, relieved body stiff and stress, and ultimately decrease depression[8-10].

This study compared effectiveness of active music group and control group and it was clear that the results were different with statistical significance. A limitation to this study is a relatively small group of samples. It could not distinguish the differences in many parameters, which seemed to improve. Evaluation after treatment should be repeated for determining the long-term effect of interventions. Studied samples were mainly female, so the results would be varied by other effects such as hormones, menstrual cycles, which were not mentioned in this study. However, the ratio between female to male was not affected since the prevalence in female is higher than that in male in MDD patients[31,32].

## Conclusion

Active group music therapy showed benefits for treating patients with MDD, especially in decreasing severity of depression, stress level, and promoting better sleep quality, and better quality of life. Even though the outcomes from the music therapy and standard group psychotherapy were going in the same direction, the outcome of active music group therapy seemed to have higher effectiveness with statistical significance.

## What is already known on this topic?

Previous studies, conducted outside Thailand, shows active music therapy gives positive results in countering depression. Its effectiveness is closed to that of standard treatment (group psychotherapy).

Therefore, the authors intend to conduct a comparison between both conventions in Thailand and see whether the music therapy approach is as effective as standard treatment.

## What this study adds?

This study compares the effectiveness of active group music therapy with standard treatments. The results show both conventions produce a positive improvement in severity of depressive symptoms, stress level, and quality of life. It also shows that both promote an improvement in depression profiles and daily-life function impact. However, music group therapy seemed to have more favorable results with statistical significance.


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## Potential conflicts of interest

The authors declare no conflict of interest.

## References


1. Murray C, Lopez AD. The global burden of disease: A comprehensive assessment of mortality and disability from disease, injury, and risk factor in 1990 and projected to 2020. Cambridge: Harvard University; 1996.
2. American Association of Suicidology. Depression and suicide risk [internet]. 2014 [cited 2018 Feb 1]. Available from: https://www.suicidology.org/portals/14/docs/resources/factsheets/2011/depressionsuicide2014.pdf.
3. Thachil AF, Mohan R, Bhugra D. The evidence base of complementary and alternative therapies in depression. J Affect Disord 2007;97:23-35.
4. Schmid W, Aldridge D. Active music therapy in the treatment of multiple sclerosis patients: a matched control study. J Music Ther 2004;41:225-40.
5. Maratos A, Crawford MJ, Procter S. Music therapy for depression: it seems to work, but how? Br J Psychiatry 2011;199:92-3.
6. Albornoz Y. The effects of group improvisational music therapy on depression in adolescents and adults with substance abuse: a randomized controlled trial. Nord J Music Ther 2011;20:208-24.
7. Nemeroff CB. Prevalence and management of treatment-resistant depression. J Clin Psychiatry 2007;68 Suppl 8:17-25.
8. Choi AN, Lee MS, Lim HJ. Effects of group music intervention on depression, anxiety, and relationships in psychiatric patients: a pilot study. J Altern Complement Med 2008;14:567-70.
9. Castelino A, Fisher M, Hoskyns S, Zeng I, Waite A. The effect of group music therapy on anxiety, depression and quality of life in older adults with psychiatric disorders. Australas Psychiatry 2013; 21:506-7.
10. Mahoney JF. Interrater agreement on the Nordoff Robbins evaluation scale I: Client-therapist relationship in musical activity. Music Med 2010; 2:23-8.
11. Atiwannapat P, Thaipisuttikul P, Poopityastaporn P, Katekaew W. Active versus receptive group music therapy for major depressive disorder-A pilot study. Complement Ther Med 2016;26:141-5.
12. Cohen SL, Rice CA. Maximizing the therapeutic effectiveness of small psychotherapy groups. Group 1985;9:3-9.
13. Yalom ID. The therapeutic factors: an integration. In: Yalom ID, editor. The theory and practice of group psychotherapy. New York: Basic Books; 1975:284-6.
14. Kongsakon R, Zartrugpak S, Rotjananirunkit A, Buranapichet U. The reliability and validity of the Thai version of Montgomery Asberg Depression Rating Scale (MADRS) Thai version. J Psychiatr Assoc Thai 2003;48:211-9.
15. Williams JB, Kobak KA. Development and reliability of a structured interview guide for the Montgomery Asberg Depression Rating Scale (SIGMA). Br J Psychiatry 2008;192:52-8.
16. Müller-Thomsen T, Arlt S, Mann U, Mass R, Ganzer S. Detecting depression in Alzheimer's disease: evaluation of four different scales. Arch Clin Neuropsychol 2005;20:271-6.
17. McDowell I. Measuring health: A guide to rating scales and questionnaires. 3rd ed. New York: Oxford University Press; 2006.
18. Sitasuwan T, Bussaratid S, Ruttanaumpawan P, Chotinaiwattarakul W. Reliability and validity of the Thai version of the Pittsburgh Sleep Quality Index. J Med Assoc Thai 2014;97 Suppl 3:S57-67.
19. Buysse DJ, Reynolds CF 3rd, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res 1989;28:193-213.
20. Nilchaikovit T, Lotrakul M, Phisansuthideth U. Development of Thai version of hospital anxiety and depression scale in cancer patients. J Psychiatr Assoc Thai 1996;41:18-30.

21. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta Psychiatr Scand 1983;67: 361-70.
22. Wongpakaran N, Wongpakaran T. The Thai version of the PSS-10: An Investigation of its psychometric properties. Biopsychosoc Med 2010;4:6.
23. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. J Health Soc Behav 1983;24:385-96.
24. Wongpakaran N, Wongpakaran T. Confirmatory factor analysis of rosenberg self esteem scale: A study of Thai student sample. J Psychiatr Assoc Thai 2011;56:59-70.
25. Rosenberg M. Society and the adolescent self-image. Princeton, NJ: Princeton University Press. Science 1965;148:804.
26. Mahatnirunkul S, Tuntipivatanaskul W, Pumpisanchai W, Wongsuwan K, Promanajirangkul R. Comparison of the WHOQOL-100 and the WHOQOL-BREF (26 items). J Ment Health Thai 1998;5:4-15.
27. The World Health Organization Quality of Life (WHOQOL)-BREF) [Internet]. 2004 [cited 2018 Feb 1]. Available from: http://www.who.int/substance_abuse/research_tools/en/indonesian_whoqol.pdf.
28. Castillo-Pérez S, Gómez-Pérez V, Velasco MC, Pérez-Campos E, Mayoral MA. Effects of music therapy on depression compared with psychotherapy. Arts Psychother 2010;37:387-90.
29. Erkkilä J, Gold C, Fachner J, Ala-Ruona E, Punkanen M, Vanhala M. The effect of improvisational music therapy on the treatment of depression: protocol for a randomised controlled trial. BMC Psychiatry 2008;8:50.
30. Gaston ET. Dynamic music factors in mood change. Music Educ J 1951;37 4:42-4.
31. Romans SE, Tyas J, Cohen MM, Silverstone T. Gender differences in the symptoms of major depressive disorder. J Nerv Ment Dis 2007;195: 905-11.
32. Wongpakaran T, Wongpakaran N, Pinyopornpanish M, Srisutasanavong U, Lueboonthavatchai P, Nivataphand R, et al. Baseline characteristics of depressive disorders in Thai outpatients: findings from the Thai Study of Affective Disorders. Neuropsychiatr Dis Treat 2014;10:217-23.