



Research Article

Role of Exercise, Relaxation, Yoga and Music Therapy in the Comprehensive Management of Diabetes Mellitus

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Abstract: Background: Diabetes mellitus requires long-term management involving medication, physical activity, nutrition and psychological well-being. Exercise, music therapy and relaxation may provide complementary benefits in diabetes management. **Objective:** To investigate the effects of a combined exercise, music therapy and relaxation programme on glycaemic control and selected psychological and lifestyle measures in people with type 2 diabetes mellitus. **Methods:** The present study is a 6-month prospective observational study carried out on twenty type 2 diabetic mellitus patients attending District hospital, Palakkad and their community. Patients were subjected to individualized exercise, music therapy and relaxation therapy. The FBS, PPBS and HbA1c were studied at base line, 3 months and 6 months. Changes in stress, mood, sleep, energy, motivation and physical activity and diabetic peripheral neuropathy were also evaluated. **Results:** The mean FBS was 203.0mg/dl at baseline, decreasing to 179.2mg/dL at 3 months and 149.25mg/dL at 6 months. Mean PPBS was 243.3, decreasing to 204.5 and 175.5mg/dL, respectively. Mean HbA1c was 9.39%, decreasing to 8.69 and 8.02%. Patients reported improved stress relaxation mood sleep energy levels, motivation and overall quality of life. 11 diabetic peripheral neuropathy symptoms were reported, all improving. The enjoyment of exercise was better with music and so motivation. **Conclusion:** When used in combination exercise music therapy and relaxation programs were related to a number of beneficial effects like: Improvements in self-report measures of psychological and lifestyle variables. These interventions could be used as adjuncts to conventional diabetes management still further larger controlled studies are necessary to assess their efficacy.

Keywords: Type 2 Diabetes Mellitus, Exercise Therapy, Music Therapy, Relaxation Therapy, Glycaemic Control, Quality of Life

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INTRODUCTION

Diabetes mellitus as a classical endocrine disease is a group of chronic metabolic disease with longstanding abnormal glucose homeostasis and is connected to multi-organ progression complications. Management of diabetes is not only on medication use but also on the long-term attention of life style, physical activity, psychological feeling, nutrition and self-management as well. Modern day life style, a sedentary life style, less physical activity, work pressure, food style alters and change in modern day life has led a difficult metabolic health status. That resulted lifestyle based and complementary therapies gaining more attention and inclusion in standard diabetes treatment.

Physical activity is an integral aspect of the management of diabetes, mainly in those with type 2 diabetes mellitus. Exercise results in an increased use of glucose by skeletal muscle, increases insulin sensitivity, increases control of weight and decreases cardiovascular risk factors. Glucose homeostasis during exercise is generally maintained by complex mechanisms in which there is involvement of the sympathoadrenergic and endocrine responses via insulin, cortisol and growth hormone [1].

Besides short-term benefits, regular physical activity reduces the burden of diabetes related complications and long-term prognoses in people with diabetes [2,3]. Because of this, the use of exercise should be not only as an adjunct, but also as an integral part of long-term management of people with diabetes.

Still, both aerobic and resistance forms of exercise have shown positive effects on metabolic health. Resistance exercise, on top of reversing skeletal muscle atrophy, seems to improve glucose disposal and insulin sensitivity. Studies also suggest that combining aerobic and resistance exercise can confer greater metabolic advantages than either category alone. A meta-analysis performed by Snowling and Hopkins has found that there are significant positive effects on glycaemic control from various forms of exercise training, emphasizing the efficacy of combined training with significant decreases in glycated Haemoglobin (HbA1c) [4].

It has also been shown that exercise training can much improve body composition and cardiovascular risk factors, with potential long term training benefits in diabetic peripheral neuropathy [5,6]. This evidence strongly supports inclusion of an individually tailored physical activity program into the management of diabetes. The advantages of exercise also have to be weighed in the complications of diabetes that may be present and the degree to which they are manifest. The type and amount of physical activity may be limited by the existence of retinopathy, peripheral neuropathy, foot lesions, autonomic neuropathy, cardiovascular disease or other comorbidities.

Exercise programs should so be individualized to the age, physical ability, metabolic control, complications and health status of the person with diabetes. Assessments and supervision of the exercise program should be emphasized when beginning an exercise program in persons with longstanding diabetes or known complications. The effects of physical activity on various aspects of diabetes management and outcomes have been also established in prospective studies, underscoring the importance of regular physical activity for the development of diabetes complications [3,7].

Beyond physical activity, psychological stress is also an issue to consider in comprehensive diabetes management; effects on stress on self-care behaviors sleep diet and physical activity, as well as the direct effects on metabolic regulation, have attracted interest in the use of mindbody approaches such as yoga, breathing exercises, meditation and relaxation techniques. Yoga in particular, including posture, breathing exercises and relaxation, might meet the challenge of both physical and psychological stress. Already, *in vitro* studies, clinical studies show that inclusion of yoga-based techniques as a part of daily life-style among individuals with diabetes may be tied to beneficial effects on glycaemic measures, body composition and cardiovascular risk factors and that such principles could be effective beyond, rather than as a replacement for, established medical and lifestyle strategies.

And, music therapy could be another useful complementary protocol for inclusion within an integrated model of diabetes care. Music has a complex role as a sensory stimulus and can evoke different sensations and responses, including emotional, cognitive, autonomic and behavior responses. As such music therapy interventions, which are relaxing and/or have some personal significance may be effective in decreasing stress and anxiety for example, where subsequent benefits gained through music would include relaxation and mood improvement, this way not only resulting in increased cooperation with prescribed behaviours like physical activity, but also including other healthy behaviours. To date, the use of music intervention has been evaluated in a range of clinical settings for possible effects on psychological and physiological responses.

That means, incorporating exercise into relaxation-focused interventions may extend the scope of diabetes management practice by targeting both the physical and mental effects of the condition. Exercise can bring about positive changes in glucose uptake and metabolism, insulin sensitivity, body composition diet blood circulation and the functioning of the cardiovascular system, although yoga meditation relaxation procedures and listening to music could all reduce feelings of stress and improve psychological health. Rather than supplanting medications, they could form an integral part of conventional treatment and motivate people with diabetes to make long-term healthy lifestyle choices.

The positive effects of lifestyle modification have been demonstrated in recent literature. Still, most of the positive effects of regular exercise and relaxation are not readily translated into routine use in daily life of diabetics because of different barriers, such as a lack of motivation, work commitments, sedentary lifestyles stresses lack of knowledge and fear of exercise-related complications. A personalized and practical lifestyle approach incorporating physical activity, relaxation and mindbody methods may have some relevance in long term self-management of diabetes.

In the present article, because of this, the attention will be on the roles of exercise, relaxation, yoga and music therapy in the overall management of diabetes mellitus, including its possible positive influences on diabetes mellitus control fitness heart condition, depression and quality of life. The relevant suggestion will be to carry out the customized physical exercise and other stress-relief activities (for example yoga meditation music therapy, hobbies and other techniques, for the promotion of relaxation) simultaneously. Such an integrated approach might give the manageable approach for tackling the physical and psychological aspects of diabetes and some other diseases, while encouraging the practice of long-lasting active healthy lifestyle approach.

MATERIALS AND METHODS

Study Design and Setting

A 6-month prospective (observational intervention) study was performed to assess the potential impact of a well-designed programme involving exercise, music therapy and relaxation in type 2 diabetes mellitus patients. The investigation was performed among type 2 diabetic mellitus patients attending the District Hospital, Palakkad as outpatient and inpatient as well as the diabetics in the community under follow up. The exercise, music and relaxation sessions were carried out among these diabetics at the District Hospital and a hall situated near the investigator's residence.

Study Population

Since 20 patients with type-2 diabetes mellitus were included in this study. Patients were recruited from those attending the District Hospital, Palakkad and from diabetic patients who were available for follow up studies in the investigator's local community. All willing patients for regular participation in exercise, music and relaxation programme were included in the study. It was made individually as the physical condition and capacity of the test person.

Eligibility Criteria

The options of taking part in exercise sessions, music therapy and relaxing sessions were offered to all patients with diabetes mellitus who agreed to take part. Patients were not recruited for the study if they were aged over 70 years of age.

Exclusion criteria included other significant co-morbid illness, which could be contraindication to participation in exercise programme including coronary artery disease, cerebrovascular disease, abnormality of spine or joints, severe diabetic retinopathy, lower limb injury or open sores and autonomous neuropathy. These inclusion/exclusion criteria were selected to minimize the potential hazards related to activity and to the exercise program.

Exercise, Music and Relaxation Programme

Exercises were demonstrated and monitored daily and the help of hospital staff and volunteers from the exercise and music sessions were also used. In the first month exercises were daily then after that two per week with each session lasting around two hours. The exercises were appropriately adapted to match the physical capability of the participants.

Music therapy was used in the exercise and relaxation classes. Live vocal music was provided by the investigator; friends and family and keyboard and other musical instruments were used. The music was slow relaxing nature inspired, relaxing lullabies, images of village life, homes and loved ones and used nostalgic imagery to induce relaxation and lift positive mood. Exercise often accompanied the music to improve enjoyment and motivation for exercise. Sharing life stories, humour and laughter occurred in the group sessions. Guided imagery and relaxation techniques were used to aid mental relaxation.

Assessment and Follow-up

Subjects were followed up periodically at different intervals during the entire duration of six months in the study. Fasting Blood Sugar (FBS), Post Prandial Blood Sugar (PPBS) and HbA1c were assessed initially and during the 3rd. and 6th month follow-up periods for each of the subjects. Stress questionnaire was given to assess for stress and perceived effects of exercise, music therapy and relaxation were assessed at the mid and final follow up periods.

Outcome Measures

The main outcomes measured were the change in FBS, PPBS and HbA1c during the 6 months trial. Other outcomes noted were the reported change in perceived stress anxiety sleep, physical activity energy motivation, general well-being and symptoms of diabetic peripheral neuropathy; changes in selected lifestyle factors, such as alcohol and tobacco consumption, were also recorded when reported by the participants.

Data Analysis

Twenty subjects were studied and changes from baseline to three and six months were followed for FBS, PPBS and HbA1c longitudinally. The distribution of the subjects as age sex duration of diabetics and, treatment pattern, lifestyle and selected diabetes related complications were tabulated. The changes in stress and other subjective parameters were assessed from the questionnaires and follow up observations. The results were mostly interpreted descriptively due to small sample size and observational study design.

Ethical Considerations

The intervention consisted of typical lifestyle and relaxation activities, with physical activity component tailored to each participant's physical ability and medical condition. Patients with specific medical conditions that could have increased potential risks with physical activity were excluded. Patients willing to participate in the programme were admitted and continued their usual pharmaceutical treatment and follow-up while on the study. The exercise and supplements were regarded as adjunctive therapies and not as a substitute for other standard medical treatment or the use of prescribed anti diabetic medications.

RESULTS

Twenty patients with type 2 diabetes mellitus completed the 6 months of exercise, music and relaxation programme. The patients ranged in age from 42 to 69 years with a mean age of 55.85 years. Of the 20 patients 14 (70%) were male and 6 (30%) were female. Five patients were aged 40-50 years, 11 patients were aged 50-60 years and 4 patients were aged 60-70 years (Figures 1 and 2). The duration of diabetes mellitus was from 2 to 23 years. The baseline characteristics of the patients are described in Table 1.

About medication, 4 had insulin (20%), 9 oral hypoglycaemics (45%), 7 both insulin and oral hypoglycaemics (35%). Eleven (55%) of the group had symptoms suggestive of diabetic peripheral neuropathy. Only 3 patients (15%) considered themselves to be free of high stress levels, with the remaining 17 experiencing varying degrees of stress. About 4 patients (20%) had reported symptoms of depression. About 13 patients (65%) lead active lives with 7 (35%) leading sedentary lives. About 4 patients have reported drinking alcohol with 3 report smoking (Table 2 and Figure 3). All three parameters of blood glucose demonstrated a progressive reduction over the period of the six month follow up. The mean FBS was 203.0 mg/dL at baseline, 179.2 mg/dL at three months and 149.25 mg/dL at the end of the study. The mean PPBS was 243.3 mg/dL, 204.5 mg/dL and 175.5 mg/dL at baseline, three month and six-month interval respectively. The mean HbA1C was 9.39, 8.69 and 8.02% at baseline, three months and six months (Table 3).

Table 1: Baseline Characteristics of the Study Participants

Characteristic	No. of patients	Percentage
Age group (years)		
40-50	5	25
50-60	11	55
60-70	4	20
Sex		
Male	14	70
Female	6	30
Duration of diabetes		
≤5 years	7	35
6-10 years	5	25
11-15 years	4	20
16-20 years	2	10
21-25 years	2	10
Total	20	100

Table 2: Clinical and Lifestyle Characteristics of the Study Population

Parameter	No. of Patients	Percentage
Insulin therapy	4	20
Oral hypoglycaemic agents	9	45
Insulin + oral agents	7	35
Symptoms of peripheral neuropathy	11	55
No reported neuropathic symptoms	9	45
Reported stress	17	85
Stress-free	3	15
Depression	4	20
Active lifestyle	13	65
Sedentary lifestyle	7	35
Alcohol consumption	4	20
Smoking	3	15

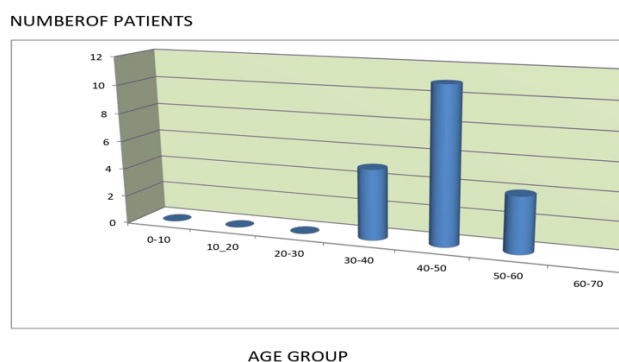


Figure 1: Who Attended Music and Exercise Therapy?

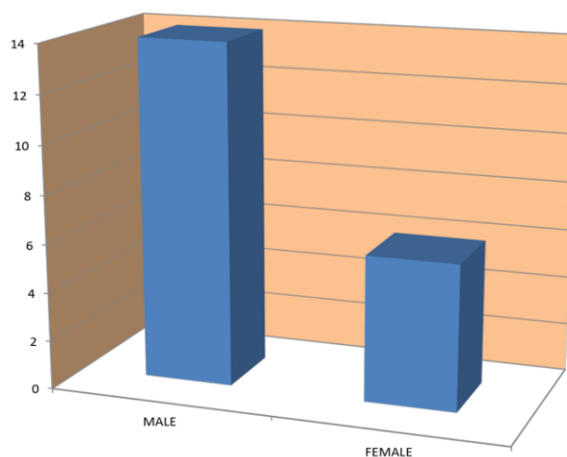


Figure 2: Distribution of Patients According to Sex

Table 3: Changes in Glycemic Parameters during the Six-Month Intervention

Parameter	Beginning of study Mean	3 months Mean	End of study Mean
FBS (mg/dL)	203.0	179.2	149.25
PPBS (mg/dL)	243.3	204.5	175.5
HbA1c (%)	9.39	8.69	8.02

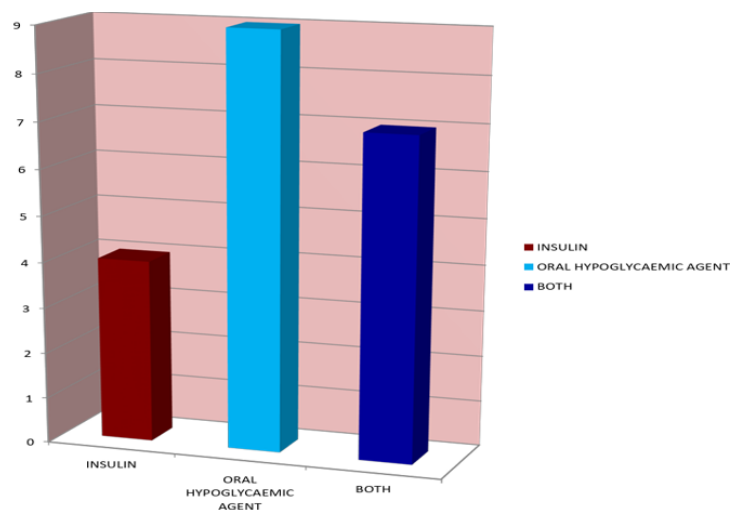


Figure 3: Medications

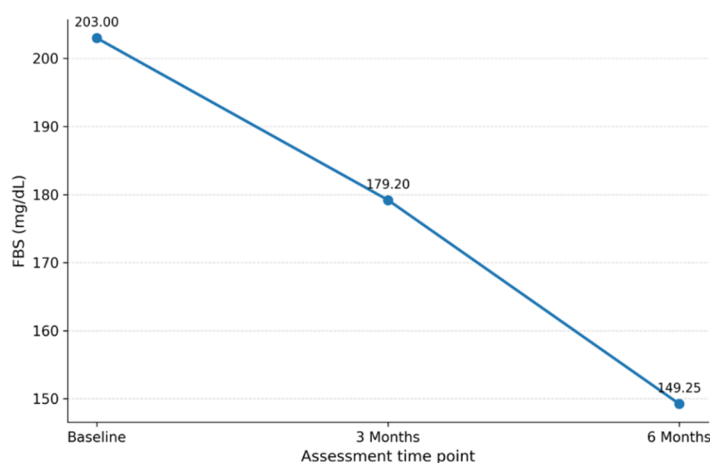


Figure 4: Mean Fasting Blood Sugar (FBS) at Baseline, 3 Months and 6 Months

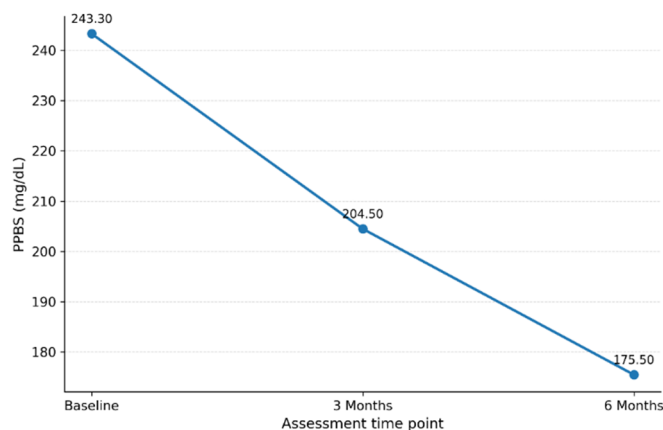


Figure 5: Mean Postprandial Blood Sugar (PPBS) at Baseline, 3 Months and 6 Months

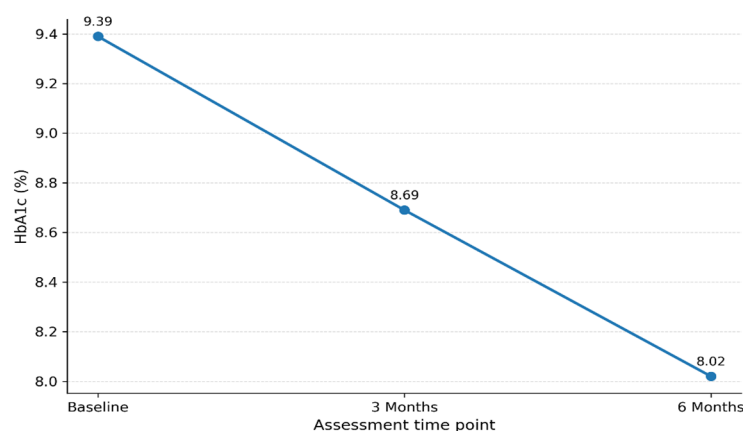


Figure 6: Mean HbA1c at Baseline, 3 Months and 6 Months

A decrease in glycaemic variables was seen in all twenty subjects but the degree of change varied from person to person. The 69- and 65-year-olds recorded relatively small reduction and could only carry out simple forms of exercise due to their physical limitations. The most significant overall change was seen from base line to the six-month measurement (Figures 4-6).

Among participants, subjective effects of the combined exercise and music program continued to be high. Group exercise was reported to improve motivation to exercise and make activity more enjoyable. Participants commented that music led to longer exercise sessions and aided with body movement. Better flexibility and liveliness were observed within the few initial sessions to be maintained with continued practice.

All 11 participants with symptoms of diabetic peripheral neuropathy experienced a reduction in their symptoms at follow up. Other benefits reported by participants included a reduction in stress and anxiety, improvements in mood and relaxation levels, increased energy levels and improvements in alertness and sleep. Four participants with pre-existing sleep problems reported a significant improvement in the time taken to fall asleep and the duration of sleep.

The programme was also reported to have positive social and behavioural impacts. Participants spoke of making friends and the development of a strengthened sense of social relationships, as a consequence of the programme. All four of the programme participants who reported alcohol use reported decreased alcohol consumption. The three smokers all reported a decrease in the amount that they smoked. One participant, who had been heavily alcohol dependent, reported complete abstinence from alcohol use. These behavioural changes were self-reported and not validated by the investigators.

In general, the participants were very pleased with the programme and found that a combination of exercise, music and relaxation made the sessions more enjoyable and encouraged sustained attendance. They experienced a perceived improvement in quality of life and mood, feel more relaxed and sleep better. And, they found that their bodies moved more easily, they interacted better socially and felt generally improved. After the six-month observation period, the participants wanted the sessions to continue and the exercise and music programme was continued two times per week as a community activity.

Summary of Major Observations

The 6-month programme was connected to a progressive decline in FBS, PPBS and HbA1c and self-reported improvements in stress and relaxation mood sleep, physical movement and perceived quality of life. The addition of music with exercise seemed to improve motivation and enjoyment for physical activity. The authors also proposed that there may be positive effects, with the intervention, on social interactions and certain lifestyle factors. As this was a small pilot study with 20 participants and no control group, all of these results have to be treated as descriptive associations only.

DISCUSSION

The study used a combined programme of exercise, music and relaxation as a complementary treatment for diabetes. The study had 20 subjects who showed a progressive decrease in the mean Fasting Blood Sugar (FBS), Postprandial Blood Sugar (PPBS) and glycated Haemoglobin (HbA1c) over a six-month period. The FBS ranged from 203.0 mg/dL at the beginning to 149.25 mg/dL at six-month point, the PPBS ranged from 243.3 mg/dL to 175.5 mg/dL and the HbA1c ranged from 9.39% to 8.02%. This study demonstrates improvement in the glycaemic index throughout a treatment intervention, though it is limited by its small sample size and lack of a control group so these results should be interpreted as improvements seen with a treatment intervention unlike the treatment itself.

Exercise is a crucial part of diabetes management as it increases body glucose utilization and reduces insulin resistance. Participants in the present study found that exercising in groups was more stimulating and exciting than exercising alone at home. The addition of music not only appeared to make exercise more pleasurable but also helped increased duration. Music may have helped to motivation, relaxation and emotional health by stimulating a number of core processes in the brain, although the present study did not explore this directly [8].

Another potential benefit that emerged from both the relaxation and yoga components was an increase in psychological well-being. Stress and anxiety levels were a lot reduced, with the negative effects on mood that increased stress levels are accustomed to having. Participants experienced more energy sleep peace and happiness. The literature has described yoga as a complementary intervention for diabetes and obesity [9-11]. So, results from this study provide further support in integrating the relaxation and yoga components, with current physical activity and diabetes care.

Eleven subjects reported symptoms consistent with diabetic peripheral neuropathy and all showed an improvement in these symptoms on follow up. No neurological examinations were performed and the patients' perceived improvements should be viewed with caution. Exercise in patients with diabetic neuropathy should be considered on an individual basis, mostly in the presence of foot pathology. Appropriate weight-bearing activities and foot protection are important considerations in exercising patients with diabetic neuropathy [12,13]. Same thing, the intensity and type of exercise should be carefully considered when working with patients with diabetic retinopathy [14].

There were no instances of retained placenta which indicates the longer duration of third stage was not due to significant maternal morbidity.

Also the programme was linked with some favourable behavioural and social findings. Respondents indicated they became more active, better their interpersonal abilities and were more motivated to keep involved. A single participant also claimed to cease alcohol consumption while one or two smokers said they cut down. Although these sole observations are promising the intervention cannot be assumed to have been the causative agent.

So, the overall effect of the exercise, music and relaxation programme may have benefits other than that of diabetes control like motivation, psychological health, social interaction and quality of life perception. The high attendance rate of the patients and the wish to continue with the exercise sessions reflects that the programme was well accepted. Furthermore, controlled trials with large sample size and standardized measures and follow-up for longer duration are needed to evaluate independently and synergistically the effect of exercise, music, yoga and relaxation on outcome measures in diabetes. The present programme may so simply be a supportive adjunct to the existing conventional medical management.

CONCLUSION

The six-month study offers evidence to support the practice of a multi-modal intervention including exercise, music therapy and relaxation as a necessary part of the disease management of type 2 diabetes mellitus. Progressive improvements in FBS, PPBS and HbA1c were observed; and subjective mood, relaxation, sleep, energy, motivation and quality of life data improved. Symptoms of diabetic peripheral neuropathy were also subjectively ameliorated. Music plus exercise does be beneficial for improving mood and motivation and promoting adherence to physical activity. The programme was acceptable and adhered to by the participants even after the end of the trial. Even so due to small sample size and without control group the results cannot be generalized. Larger controlled trials are required to establish the beneficial effects of music therapy, exercise and relaxation as adjuncts to conventional management of diabetes.

REFERENCES

1. Stallknecht, B. *et al.* "Role of the sympatho adrenergic system in adipose tissue metabolism during exercise in humans." *Journal of Physiology*, vol. 536, no. Pt 1, 2001, pp. 283-294.
2. Moy, C.S. *et al.* "Insulin dependent diabetes mellitus, physical exercise and death." *American Journal of Epidemiology*, vol. 137, 1993, pp. 74-81.
3. Waden, J. *et al.* "Physical activity and diabetes complications in patients with type 1 diabetes: The Finnish Diabetic Nephropathy Study." *Diabetes Care*, vol. 31, 2008, pp. 230-232.
4. Snowling, N.J. and W.G. Hopkins. "Effects of different modes of exercise training on glucose control and risk factors for complications in type 2 diabetic patients: A meta-analysis." *Diabetes Care*, vol. 29, 2006, pp. 2518-2527.
5. Balducci, S. *et al.* "Is a long term aerobic plus resistance training program feasible for an effective on metabolic profiles in type 2 diabetic patients?" *Diabetes Care*, vol. 27, 2004, pp. 841-842.
6. Balducci, S. *et al.* "Exercise training can modify the natural history of diabetic peripheral neuropathy." *Journal of Diabetes and Its Complications*, vol. 20, 2006, pp. 216-223.
7. Waden, J. *et al.* "Leisure time physical activity is associated with poor glycemic control in type 1 diabetic women: The FinnDiane study." *Diabetes Care*, vol. 28, 2005, pp. 777-782.
8. Dileo, C. and J. Bradt. *Medical Music Therapy: A Meta-Analysis and Agenda for Future Research*. Jeffrey Books, 2005.
9. Sahay, B.K. "Yoga and diabetes." *Journal of the Association of Physicians of India*, vol. 34, 1986, pp. 645-648.

10. Sahay, B.K. "Role of yoga in diabetes." *Journal of the Association of Physicians of India*, vol. 55, 2007, pp. 121-126.
11. Soria-Urios, G. *et al.* "Music and brain (II): Evidence of musical training in the brain." *Revista de Neurología*, vol. 53, no. 12, 2011, pp. 739-746. Article in Spanish.
12. Lemaster, J.W. *et al.* "Effects of weight bearing activity on foot ulcer incidence in people with diabetic neuropathy: Feet first randomized controlled trial." *Physical Therapy*, vol. 88, 2008, pp. 1385-1398.
13. Vinik, A.I. and T. Erbas. "Neuropathy." In: *Handbook of Exercise in Diabetes*, N. Ruderman *et al.* (Eds.), American Diabetes Association, 2002, pp. 463-496.
14. Aiello, L.P. *et al.* "Retinopathy." In: *Handbook of Exercise in Diabetes*, N. Ruderman *et al.* (Eds.), American Diabetes Association, 2002, pp. 401-413.