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Effectiveness of Autogenic Training in improving motor performances in Parkinson's disease

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KEYWORDS
Parkinson's disease;
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Summary
Background: Relaxation training can be an important adjunct in reducing symptoms associated with Parkinson's disease (PD). Autogenic Training (AT) is a simple, easily administered and inexpensive technique for retraining the mind and the body to be able to relax. AT uses visual imagery and body awareness to promote a state of deep relaxation.
Objective: To investigate whether AT when used as an adjunct to Physiotherapy (PT) improves motor performances in PD in comparison with a control group receiving PT alone.
Design: Randomized, controlled, single blinded trial.
Setting: Movement Disorder Clinic and Department of Physiotherapy, Sree Chithira Thirunal Institute of Medical Sciences and Technology in Trivandrum, Kerala, India.
Participants: Patients with PD of grade 2 or 3 of Hoehn & Yahr (H&Y) scale ($N = 66$).
Interventions: AT group or control group. The techniques were administered by Physiotherapists trained in AT and consisted of 40 sessions per patient over 8 weeks.
Main outcome measure: Motor score subscale of Unified Parkinson's Disease Rating Scale (UPDRS) was used to measure the motor performances.

The primary outcome measure was the difference in Motor score subscale of UPDRS scores between Week 1 (pretest score), Week 8 (posttest score), and follow-up at Week 12 after randomization.

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Results: The simple main effects analysis showed that the AT group performed better than the control group in weeks 8 and 12 ($P < .005$). Patients in the AT and control groups reported a 51.78% and 35.24% improvement, respectively, in their motor performances in Week 8 compared with that in Week 1, which persisted, in the follow-up (Week 12) as 30.82% in the AT group and 21.42% in the control group.
Conclusions: This study provides evidence that AT when used as an adjunct to PT is more effective than PT alone in improving motor performances in PD patients.

Introduction

Patients with Parkinson's disease (PD) are usually treated with dopaminergic medication.[1] To cope with motor control problems many patients are also treated by a Physiotherapist, even in early stages of the disease. The therapy is targeted at improving, maintaining, or delaying problems with gait, transfers, posture, balance, and general physical condition.[1] Cognitive deficits are also common in patients with PD.[2,3] Physiotherapy (PT) helps to improve, maintain, or delay problems with motor control.[1,4] Relaxation training can be an important adjunct in reducing symptoms associated with PD.[1,5,6] Autogenic Training (AT) is a simple, easily administered and inexpensive relaxation technique assisting the mind and body to relax.[7] Autogenic, which means self-regulated or self-generated refers to the way in which our mind can influence the body to balance the self regulative systems that control circulation, breathing, heart rate, stiffness and so on.[8] AT uses visual imagery and body awareness to promote a state of deep relaxation.[7] AT is being used to treat patients with various medical and psychological conditions,[9–11] but few formal reports document its efficacy. The primary objective of this study was to investigate whether AT when used as an adjunct to PT improves motor performances in PD in comparison with a control group receiving PT alone.

Methods

This study was carried out in the Movement Disorder Clinic and Department of Physiotherapy, Sree Chithira Thirunal Institute of Medical Sciences and Technology in Trivandrum, Kerala, India. Inclusion criteria for this study included male and female patients diagnosed and referred by a neurologist as PD of stage 2 or 3 according to Hoehn and Yahr (H&Y) scale of 2—4 years duration, aged 55—65 years, those with a 30—40% severity in the motor subscale of Unified Parkinson's Disease Rating Scale (UPDRS), with a Mini Mental State Examination (MMSE) score of more than/equal to 27, a constant medication regime for 3 months before the trial, stable responders to medication without fluctuation or dyskinesias and those without a previous exposure to PT or exercise. Those with auditory impairments, akathesia, depression, attention deficit disorders, secondary Parkinsonism, Parkinsonism plus syndromes, young and juvenile onset Parkinsonism, uncontrolled hypertension and patients with other neurological disorders, cardiovascular and musculoskeletal problems were excluded from the study. The Research Ethics Committee of the Sree Chithira Thirunal Institute of Medical Science and Technology and Medical Research wing of Mahatma Gandhi University, Kerala, India, reviewed the study and raised no objections from an ethical point of view. Between May 2009 and November 2011, 75 patients with PD were referred to the Physiotherapy department with a diagnosis of stage 2 or 3 PD as per H&Y staging. Of these, 66 patients who met the inclusion criteria and provided written informed consent were randomized to the AT or the control arm of the study. Participants were asked to maintain a medication diary to record any change in medication or adverse events during the treatment period with date and time. Two neurologists blinded to the group to which the participants belonged evaluated and analyzed the scores from the UPDRS scale before the treatment (baseline), after the treatment (Week 8) and after 12 weeks (follow-up).

Interventions

The control and AT interventions were provided 5 times weekly for 8 weeks (weeks 1—8). In the control group, the duration of each treatment session was 60 min with 5 min rest break on every 15 min of treatment session. For the AT group treatment time was 75 min, beginning with a 15 min AT session, followed by a 60 min PT session. All the treatments were scheduled in the morning 1 h after the morning dose of the drug.

Autogenic Training (AT)

The Autogenic Training (AT) used in this study was based on the Schultz-style.[12] Traditionally AT is performed individually with a single session per week.[12,13] Each session normally consists of 40—60 min of full exercise. Few studies describe AT session time between ''a few minutes''[13] up to ''60 min.''[14] The standard session of AT used in this study is shown in Table 1.[13,14] We customized few words with more simple words (e.g.: 'abdomen' instead of 'solar plexus'). Our AT protocol was a 15 min one with 5 sessions per week for 8 weeks (weeks 1—8). We adapted a short time protocol with the observation that PD patients often experience problems with attention span and sleepiness.[15] The AT protocol was with 6 standard exercises after the formula ''I am at peace''. The first exercise aims at muscular relaxation by repetition of a verbal formula, ''My right arm is heavy'' emphasizing heaviness. Subsequent exercises are focused on feeling of warmth, initiated by the instruction ''My right arm is warm'', followed by cardiac activity using the formula ''My heartbeat is calm and regular''. Next segment is on respiratory mechanism with the formula ''I am listening to my breathing'', then on warmth around the abdominal region

Table 1 AT standard exercise.

1. Heaviness in the limbs (''My right (left) arm (leg) is heavy'')
2. Warmth in the limbs (''My right (left) arm (leg) is warm'')
3. Cardiac regulation (''My heart beat is calm and regular'')
4. Centering on breathing (''I am listening to my breathing'')
5. Warmth in the upper abdomen (''My abdomen is warm'')
6. Coolness in the forehead (''My forehead is cool and clear'')
7. Cancelation

with ''My abdomen is warm'' and finally on coolness in the cranial region with ''forehead is cool and clear''[10,16] Patients were allowed to watch a 15 min video demonstration of the AT application for three times before starting of the first session followed by 3 trials of AT. Patients were positioned in full supported half lying in a silent room. The therapist is positioned in standing at the side of the table, at the level of the patient's shoulder and facing the patients face. Any queries from the patients were answered before the beginning and at the end of each session. The patients were asked not to practice the AT protocol other than the programmed sessions during the study and the follow up period.

Physiotherapy (PT)

Patients in the AT group and control group received a PT session for 60 min with 5 min rest on every 15 min session, 5 times weekly for 8 weeks (weeks 1—8).

Warm up session

Jacobson's progressive relaxation exercise (4 min).
Gentle passive rhythmic trunk rocking and rolling with deep breathing (3 min).
Muscular stretching (4 min).
Treadmill training with velocity 3 km/h. (5 min).

Exercise protocol[17]

1. Exercise with different gait types with proper cuing frequencies on different surfaces and steps (forward, backward, lateral, walking on toes, heels) (7 min)
2. Position changes (lying to sitting, sitting to standing) (4 min).
3. Rotational exercise for trunk stiffness (4 min).
4. Functional activity training.
   - With simple motor sequences, progression (4 min).
   - Forming complex and simultaneous movements from simple motor sequences (4 min).
   - Training of large amplitude movements (4 min).
5. Reaching exercise, gym ball exercise and agility training (7 min).
6. Mat activities in supine, prone, quadruped positions, training with small weights for strength (7 min).
7. Cool down phase (3 min).

Outcome measure

The UPDRS is the most widely used standardized scale to assess the longitudinal course of PD[18] and is the most useful way to maintain an ongoing record of patient function and to assess disability.[19] Introduced in 1987 by a team of PD investigators as an overall assessment scale that would quantify the signs and symptoms of PD, it allows the clinician to assess the worsening or improvement of PD over time, measured as a change from baseline. Total UPDRS consists of four parts, I. Mentation, behavior, and mood, II. Activities of daily living, III. Motor examination, IV. Complications of therapy. Parts I, II, and III contain 44 questions each measured on a 5-point scale (0—4). Part IV assesses for complication to drug therapy. Motor subscales provide a measure of key motor symptoms.[20] It has shown a very good reliability and validity.[21] Intraclass correlation coefficients indicated good-to-excellent agreement for speeded repeated movements, resting tremor, arising from a chair, and gait; moderate agreement for action tremor, rigidity, posture, postural stability and bradykinesia; and poor agreement for speech disorder and facial immobility.

Practitioners who provided AT in this study had been trained in the techniques and had a median experience of 3 months with the technique before the commencement of the study.

Statistics

Participants in both groups were compared at Baseline, Week 8 and Week 12 (follow up). Table 2 shows the summary of baseline characteristics of the two groups. The primary outcome measure was the difference of UPDRS motor scores between Baseline (Pretest score), Week 8 (Posttest score) and follow-up at Week 12. Statistical analysis of the data was done by using a 2×3 (group $\times$ time) analysis of variance (ANOVA) and repeated-measures of 2×3 ANOVAs. The between-groups (group), within-groups (time) and mixed groups (group x time) were examined by using Pillai trace, Wilk λ, Hotelling trace, Roy largest root methods.[22] We used Mauchly's sphericity test for validating the ANOVAs.[22] In accordance with the primary objective of the study, we compared the UPDRS motor score of the AT and control groups at different time. A $P < .05$ was accepted as statistically significant.

Results

Of the 66 individuals recruited into this study, 65 participants (AT group, $n = 32$; control group, $n = 33$) completed the study protocol. One participant from the control group dropped out of the study without providing any specific reason and the data was excluded from the results presented below. Within the study period, no serious adverse events occurred in either of the groups as recorded in the patient diary. All the participants ($n = 65$) attained 100% engagement rate to their allotted sessions. Two patients from the AT group and five from control group reported body pain in the first week after initiation of treatment, and this was

Table 2 Summary of baseline characteristics.

Characteristics	AT group ($n = 32$)	Control group ($n = 33$)
Men:woman	17:15	16:17
Age (y)	61.4 ± 2.6	60.8 ± 2.1
Duration of condition (y)	3.0 ± 0.6	3.1 ± 0.5
Body mass index (kg/m^2)	26.7 ± 1.5	26.9 ± 2.0

Note: Data are expressed as mean ± SD except for Gender, which is expressed as ratio.

reported to have subsided within a week without any medications.

Patients in the AT and control groups reported a 51.78% and 35.24% improvement, respectively, in their motor performances in Week 8 compared with that in Week 1, which persisted, in the follow-up (Week 12) as 30.82% in the AT group and 21.42% in the control group.

The mean differences between the groups vary by time ($P < .001$) (Fig. 1). This indicates the possible existence of their interaction effect (Table 3). We have examined the effect of group and time on the UPDRS motor value by conducting, first, a 2-way ANOVA. The dependent variable, the UPDRS motor value, was normally distributed approximately for the groups, formed by the combination of the group and time because the size of the sample was more than 30 for each group. The test's between-subject effects showed that the AT group significantly performed better than the control group in Weeks 8 and 12 ($P < .001$), but there was no differences between the groups at Baseline ($P = .133$) (Table 3). Multiple comparisons of time intervals at each group were also demonstrated statistically significant changes ($P < .001$) (Table 4)

A 2 × 2 (group x time) repeated-measures ANOVA and a 2 × 3 (group × time) repeated-measures ANOVA were also conducted. There were significant main effects of time, group, and the time × group interaction. We found that the interactions between time and group were significant based on univariate and multivariate method ANOVAs. Significant pairs of AT and control groups vary at Weeks 8 and 12 due to the interaction effect between group type and time. Item analysis of UPDRS Motor subscale at Week 8 showed statistically significant improvements were in Facial Expression, Rigidity, Resting Tremor, Finger Taps, Hand Movements and Rapid Alternating Movements of the AT group than the other (Fig. 2).

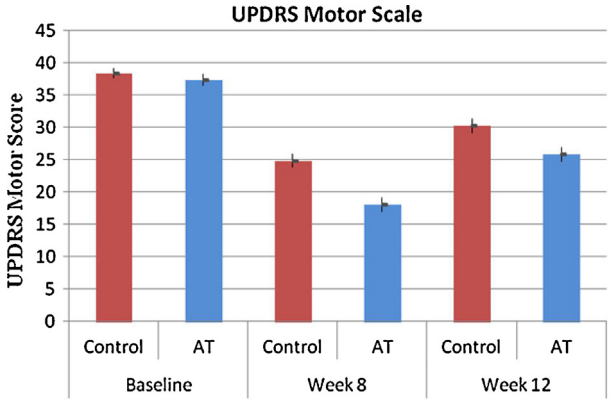

Figure 1 Effects of time on UPDRS motor score (95% CI).

Discussion

The principal finding of this study is that the AT when used as an adjunct to PT is more effective than PT alone in improving motor performances in PD patients. Item analysis indicated that the significant improvements are in Facial Expression, Rigidity, Resting Tremor, Finger Taps, Hand Movements and Rapid alternating Movements when compared to the control group.

Relaxation training can be an important adjunct in reducing symptoms associated with PD[1]; its beneficial effects on muscle rigidity and associated symptoms have been demonstrated by Schenkman et al. (1989).[23] Guided rehearsals of a relaxation protocol has a positive effect in PD.[17] In Autogenic therapy, achievement of a detached but alert state of mind called ''Passive Concentration'' is thought to bring about the physical changes.[24] AT may operate in a highly differentiated field of body relaxation and that with the help of Autogenic principles it is possible to use one's mind to influence certain bodily and mental functions effectively.[7] It has been suggested that it works in ways similar to

Table 3 UPDRS motor scores of AT and Control groups and mean group differences at different intervals.

Time	AT group mean ± SD (95%CI)	Control group mean ± SD (95%CI)	Mean difference 'AT-control' (95%CI)	*P value*[*]
Baseline	37.3 ± 2.4 (36.4—38.2)	38.4 ± 2.2 (37.6—39.2)	1.0 (—0.3—2.3)	0.13
Week 8	18.0 ± 3.0 (16.9—19.1)	24.9 ± 2.9 (23.8—25.9)	6.8[f] (5.2—8.5)	0.00
Week 12	25.8 ± 3.0 (24.7—27.0)	30.2 ± 3.1 (29.1—31.3)	4.3[f] (2.5—6.0)	0.00

Note: Standard Deviation (SD) and Confidence Intervals (CI) of the mean.
[f] The mean difference is significant at the .05 level.
[*] Adjusted by using Holm—Bonferroni procedure.

Table 4 Multiple comparisons of different time at each group.

Time (comparison)	AT group mean difference (95%CI)	*P value*[*]	Control group mean difference (95%CI)	*P value*[*]
Baseline-Week 8	19.3[f] (17.7 to 21.0)	0.00	13.5[f] (11.9 to 15.2)	0.00
Baseline-Week 12	11.5[f] (9.8 to 13.2)	0.00	8.2[f] (6.6 to 9.9)	0.00
Week 8—Week 12	−7.8[f] (−9.5 to −6.2)	0.00	−5.3[f] (−7.0 to −3.6)	0.00

[f] The mean difference is significant at the .05 level.
[*] Adjusted by using Holm—Bonferroni procedure.

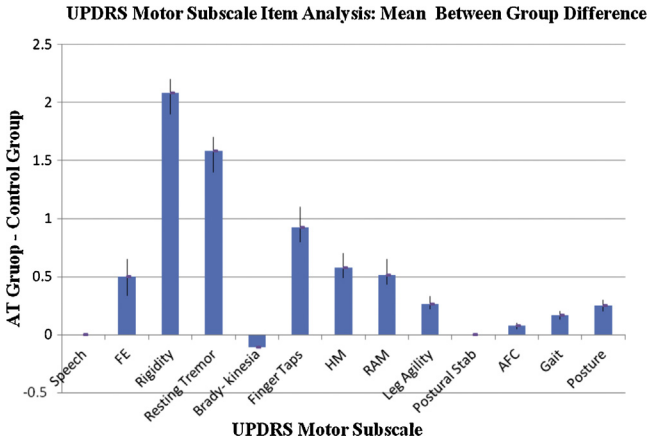

Figure 2 UPDRS Motor subscale: mean between group difference at Week 8 (95% CI). FE: Facial Expression, HM: Hand Movements, RAM: Rapid Alternating Movements, Postural Stab: Postural Stability, AFC: Arising From Chair.

hypnosis or biofeedback.[25] Precisely how these mechanisms are involved in producing the final pattern of responses are yet unclear.[26] Psycho physiologically, AT is based on three main principles: (a) reduction of exteroceptive and proprioceptive afferent stimulation due to focused concentration; (b) mental repetition of psycho physiologically adapted verbal formulas; and (c) mental activity.''[11]

It has been documented that relaxation can reduce stress and anxiety, enhance motor reflexes, increase motor control, increase exercise tolerance, sharpen perceptions, increase awareness, improve concentration, and provides a general positive outlook on life.[27–30] Benson (1975)[31] suggested that the so called 'relaxation response' pattern is common to any relaxation procedure. It is also noted that those who are practicing deep relaxation techniques have an increased exercise tolerance and cardiac workload[32]. The practice of relaxation training decreases muscle reflex time[33,34] and the practice of AT might have helped in decreasing the same; which might be a reason for the improved motor performance skills evident in the AT group. Deep relaxation technique is thought to facilitate the sensitivity of the human central nervous system[35] and suggest a neural mechanism underlying the motor performance improvements seen in the AT group. Studies using spectral analysis and topographic electroencephalographic (EEG) mapping of the relaxation response demonstrate that by changing mental activity we can demonstrate measurable changes in central nervous system activity. These studies demonstrate that mind—body interactions are tangible and can be measured.[36]

Studies have proved that a relaxation training plus general exercise in PD enhances muscle synergies recruitment, flexibility and co-ordination.[37,38] Relaxation reduces daily tensions prior to exercising, heightens awareness of the different parts of their body and starts to decrease rigidity to allow increased flexibility.[38–40] Improvements of motor performance and tremor were seen in PD patients treated with the systematic use of a relaxation training program.[23,41] However, the follow-up at Week 12 has shown that the treatment effects were less evident compared with Week 8 after the treatment. It is more likely that in PD; the treatment is only effective while it is actually being conducted, and does not result in significant long-lasting effects once discontinued.

Study limitations

One limitation of this trial was that practitioners could not be blinded. More precise objective measures could have been used to measure patient's response or ability to undergo relaxation. Another limitation was the inability of the researcher to interpret patients 'subjective experience' during the Autogenic state. Tools should be identified to select patients whose cognitive abilities might allow them to better engage in relaxation protocols in these types of studies. The duration of AT used in this study was of the shorter version; which might have an influence in the result and the technique used was customized to suit the target population. The follow up was done for a brief period of time; it is not known whether the differences observed at post-treatment can be maintained over a long time. We also did not analyze the other components of the UPDRS in this trial. Future studies are recommended to address these issues.

Conclusions

Autogenic Training when used as an adjunct to Physiotherapy was more effective than Physiotherapy alone in improving motor performances in Parkinson's disease patients. A significant proportion of Parkinson's disease patients in the early stages might benefit from the use of Autogenic Training and it might be an effective supplement to traditional medical treatment for improving motor performance. The mechanisms underlying these responses merit further investigation.

Conflict of interest statement

No financial conflicts to disclose.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.ctim.2014.03.013.

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