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RESEARCH

DO PILATES AND YOGA AFFECT QUALITY OF LIFE AND PHYSICAL PERFORMANCE OF ELDERLY LIVING IN A NURSING HOME A PRELIMINARY STUDY

ABSTRACT

Introduction: This study investigated whether Pilates and yoga affect quality of life and physical performance of elderly living in a nursing home.

Materials and Methods: Out of 58 elderly living in a nursing home, 36 subjects were randomized to Pilates or yoga groups and 22 subjects served as a control group. Study subjects attended three classes per week for 8 weeks. Health-related quality of life and physical fitness were assessed before, immediately after and 6 months after training.

Results: Nottingham Health Profile total scores were significantly different among all groups (p=0.007). Sleep (p=0.026) and emotional reaction subscores (p=0.037) decreased in both intervention groups. Hand grip strength (p=0.017) and sit and reach test scores (p=0.019) were improved immediately after yoga. However, none of these effects persisted after 6 months.

Conclusion: Yoga improved sleep quality, strength and flexibility in seniors living in a nursing home only immediately after training, in this preliminary study with a small sample size. No improvements were observed in the investigated parameters 6 months later.

Key Words: Aged; Exercise; Nursing Homes; Yoga.

ARAŞTIRMA

HUZUREVİNDE YAŞAYAN YAŞLILARDA PİLATES VE YOGA YAŞAM KALİTESİNİ VE FİZİKSEL PERFORMANSI ETKİLİYOR MU? ÖN ÇALIŞMA

ÖZ

Giriş: Bu çalışmada huzurevinde yaşayan yaşlılarda Pilates ve yoganın, yaşam kalitesi ve fiziksel performansı etkileyip etkilemediği incelenmiştir.

Gereç ve Yöntem: Huzurevinde yaşayan 58 yaşlıdan 36'sı Pilates ve yoga gruplarına rast gele dağıtıldı ve 22'si de kontrol grubu olarak çalışmaya alındı. Çalışma grubundaki kişiler, haftada 3 gün 8 hafta süre ile egzersiz eğitimine alındı. Egzersiz eğitimi öncesi, eğitimden hemen sonra ve 6 ay sonra; sağlıkla ilişkili yaşam kalitesi ve fiziksel zindelik değerlendirildi.

Bulgular: Üç grup arasında Nottingham Sağlık Profili toplam puan farkı anlamlı farklı idi (p=0.007). Her iki egzersiz grubunda uyku (p=0.026) ve emosyonel reaksiyon (p=0.037) altskorları azaldı. Yoga grubunda el kavrama kuvveti (p=0.017) ve otur-uzan test puanları (p=0.019) eğitimden hemen sonra artış gösterdi. Ancak bu etkilerin hiçbirisinin 6 ay sonra devam etmediği görüldü.

Sonuç: Bu ön çalışmada; yoga huzurevinde yaşayan kısıtlı sayıda yaşlıda, sadece eğitimden hemen sonra uyku kalitesi, kuvvet ve esnekliği geliştirmiştir. 6 ay sonra incelenen parametrelerde değişiklik olmadığı görülmüştür.

Anahtar Sözcükler: Yaşlı; Egzersiz; Huzurevi; Yoga.

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Introduction

Mind-body exercise interventions have become increasingly popular in the management of various medical conditions over the last decades. Chronic low back pain, depression, cancer, cardiopulmonary disorders, multiple sclerosis and stroke are among the disorders investigated (1-5). The evidence supporting the benefits of these interventions on health status is growing.

Mind-body exercise interventions are also addressed in geriatric populations. Yoga, Pilates, tai chi chuan and qi gong are reported to be safe and feasible mind-body interventions for the elderly (1, 6, 7).

Yoga is a movement-based philosophy that involves gentle stretching, postural training, breath control and meditation (4). Literature is accumulating about different types of yoga with seniors. Laughter yoga for depression and late life satisfaction (2), silver yoga for sleep disturbances (3) and Iyengar yoga for chronic obstructive lung disease (8) are some examples. These are modified types of hatha yoga, consisting of posture and breathing exercises.

Improvements in quality of life and mood after yoga practice in elderly people have shown promise in a limited number of studies (8-10). The long-term effects of yoga on elderly persons living in nursing homes should also be evaluated.

Pilates is an exercise system developed by Joseph Pilates during the 1st World War (11). Pilates developed his method after studying yoga, Zen, ancient Greek exercise regimes, gymnastics and dance, and it is also called "contrology" (12). Pilates emphasizes core strengthening, flexibility, postural awareness and breathing. Focus on breathing and concentration during the exercises comprises the mental component. Pilates is recommended in the management of chronic low back pain, fibromyalgia and cancer pain (1, 13, 14). Few studies have investigated the effects of Pilates on the elderly (7, 15).

Our aim was to investigate whether Pilates and yoga affect quality of life and physical performance of elderly subjects living in a nursing home.

Methods

This prospective controlled study was approved by the Gazi University Research Ethics Committee (056/23.06.2010) and Administrative Board of Nursing and Care Facility. Informed consent was obtained from the participants. The study was conducted in the 75. Yıl Nursing and Care Facility. The medical staff of this institution includes a general practitioner, a physiotherapist, a social worker and nurses.

Residents were recruited via local announcements in the nursing home. All volunteers were enrolled into the study unless any contraindication to physical training was present. Exclusion criteria were unstable cardiopulmonary disease, joint instability, active joint inflammation, fracture or orthopedic surgery in the last 6 months, severe cognitive impairments (MMSE scores below 24) and inability to follow directions. None of the participants had engaged in yoga or Pilates before.

Subjects completed questionnaires that covered demographic characteristics and medical conditions. Before the study, physical activity level was assessed using the Turkish version of the International Physical Activity Questionnaire (IPAQ) short form (16). Physical activity level was categorized as low, intermediate or high. The Turkish version of the mini-mental state examination (MMSE) was performed (17). Higher MMSE scores show higher cognitive performance.

Assessments, including health-related quality of life and physical measures, were performed three times: at baseline, at the end, and 6 months after the training. Anthropometric measurements were assessed only before and immediately after the study.

To assess health-related quality of life, the Turkish version of Nottingham health profile (NHP) was used (18). It contains 38 items that address pain, physical mobility, emotional reactions, energy, social isolation, and sleep dimensions. Scores range from 0 to 100 and higher scores indicate worse quality of life. The geriatric pain measure (GPM) was performed for multidimensional pain assessment. The GPM consists of 24 items (19). Scores range from 0 to 100 (Scores <30; mild pain, 30-69; moderate pain, >70; severe pain). The Geriatric Depression Scale-Short Form (GDS), a 15-item questionnaire with scores ranging from 0 to 15, was also administered (20). A score higher than 5 is suggestive of depression.

The Physical Functioning Questionnaire (PFQ) was used to measure self-reported disability status (21). Scores range between 0 and 57. Higher scores show a higher disability level. Grip strength of the dominant hand was measured three times using a vigorimeter (Riester, Dynatest dynanometer, Jungingen, Germany). The best measurement of the three was used for analysis. Scores range between 0 and 1.0 bar. The Berg balance scale was used to measure balance ability, with scores ranging between 0 and 56 (22). Subjects with better balance ability attained higher scores. Functional capacity was measured using the Senior Fitness Test (23). This battery comprises 6 tests evaluating muscle strength and flexibility of the upper and lower body, and endurance. The individual tests are chair-stand, arm curl, chair sit-and-reach, back scratch, 8-foot up-and-go and 2-minute step tests.

Measures of body composition included body weight, height, body mass index (BMI), body fat percentage and fat free mass, measured using the body composition analyzer (Tanita BC-418 Segmental Body Composition Analyzer).

Thirty-six elderly subjects who volunteered for exercise training were randomized to Pilates or yoga intervention, using stratified randomization. Stratification was used to control the covariates of age and sex. 22 subjects who did not volunteer for exercise training constituted the control group. They were told to follow their usual daily activities. Figure 1 describes the flow of the participants in the study.

Subjects in the yoga and Pilates intervention groups attended three classes per week for 50 minutes per session, for 8 weeks. The protocols were developed collaboratively by the physiatrists and the certified yoga and Pilates instructors. The classes were directed by certified yoga and Pilates instructors under the supervision of one research physiatrist. The exercises were adjusted depending upon individual systemic and musculoskeletal conditions where needed.

Contents of the Pilates program are given in Table 1. The degree of difficulty and level of the exercises were modified according to the performance of the subjects. Exercises were performed on mats, and only exercise bands and free weights were used as equipment.

Contents of the yoga program are shown in Table 2. The degree of difficulty and duration of the asanas was increased gently according to the capacity of the subjects. Each week, an average of 7 poses was taught. Each pose was maintained for 4 seconds at the beginning of the training program and then increased to 12 seconds at the end. Props such as blankets and chairs were used when needed.

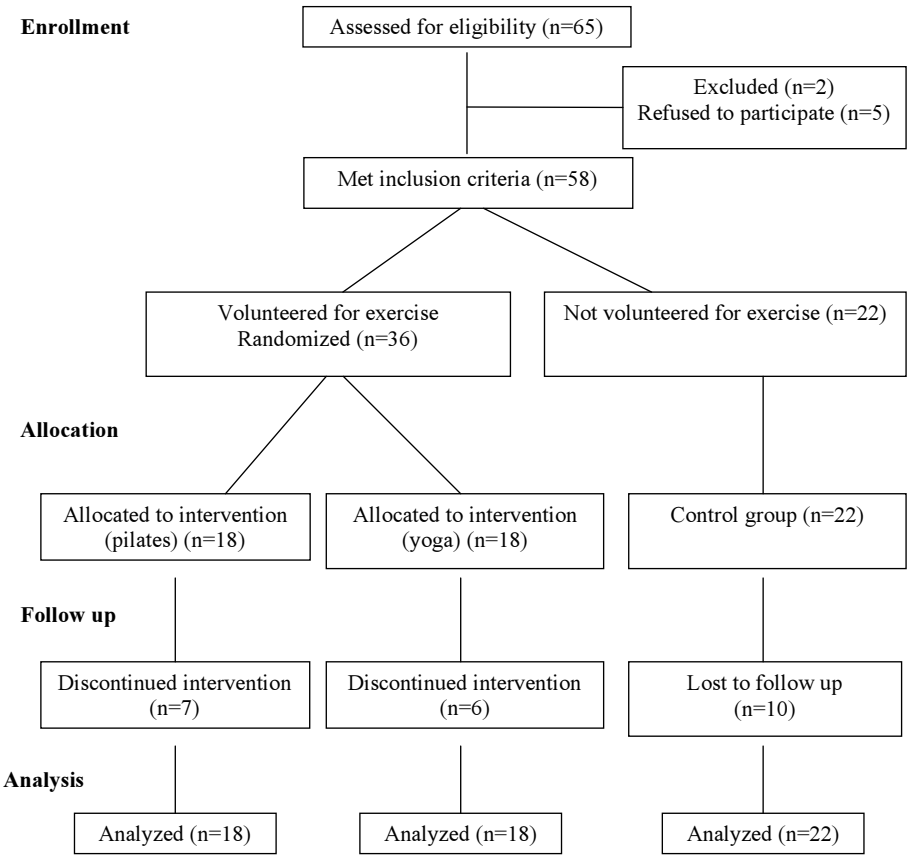

Figure 1— The flow of participants through each stage of the trial.

Table 1— Content of Pilates Intervention

Phases / Duration	Position	Exercises
Warm up (10 minutes)	Standing / sitting	Neck exercises
		Shoulder exercises
		Stretching
		Breathing exercises
Pilates exercises (30 minutes)	Standing / sitting / supine /side lying	The Hundred
		Roll Down – Roll Up
		Single Leg Circles
		Rolling Like A Ball
		Single Leg Stretch
		Double Leg Stretch
		Spine Stretch Forward
		Criss – Cross
		Saw
		Neck Roll
		Single Leg Kick
		Double Leg Kick
		Side Kicks (Front, Up-Down, Circles)
Cool down (10 minutes)	Supine	Stretching
		Breathing exercises

Table 2— Content of Yoga Intervention

Phases / Duration	Position	Exercises
Warm up (10 minutes)	Standing / sitting	Neck exercises
		Shoulder exercises
		Stretching
		Breathing exercises
	Standing	Simple chest expansion (Ardha Chakrasana)
		Circular motion (half back and front rotation)
		Side stretch
		Mountain pose (Tadasana)
		Triangle pose (Trikonasana)
		Balance posture poses
		Sun salutation
	Seated on chair	Simple spinal twist
		Elbow exercises
		Shoulder raise
		Breathing and diaphragm exercises
	Seated on mat	Easy pose (Sukhasana)
		Child's pose (Balasana)
		Half spinal twist (Ardha Matsyendrasana)
		Full twist
		Knee and thigh stretch (Bhadasana)
		Staff pose (Dandasana)
		The great seal (Mahamudra)

(Devam ediyor)

Table 2— Content of Yoga Intervention *(Devamı)*

Phases / Duration	Position	Exercises
		Head to knee forward bend pose (Janusirsasana)
		Posture clasp - cow face pose (Gomuhasana)
		Adept's pose (Siddhasana)
Hatha Yoga (30 minutes)	Back bend	Half locust
		Cat pose (Bidalasana)
		Cobra pose (Bhujangasana)
		Dog pose (Adho Mukha Shvanasana)
		Spinal balance poses
		Bridge pose (Setu Bandha Saryangasana)
	Supine	Single leg raises
		Double leg raises
		Side raises
		Reclining hand to big toe pose (Supta Padangusthasana)
		Wind relieving pose (Pavanamuktasana)
		Revolved abdomen pose (Jathara Parivartanasana)
		Apana pose (Apanasana)
		Curl up breathing (Kapalabhati)
Finishing poses (10 minutes)	Supine	Deep relaxation
		Corpse Pose (Savasana)

Statistical Analysis

All statistical procedures were performed using SPSS for Windows version 11.5. The data were analyzed on an intention-to-treat basis. Missing post-intervention data were replaced using the last observation (baseline measurements) carried forward, but the missing data at the 6-month follow up were not replaced. The distribution of the data was investigated with the Shapiro-Wilk's test. Differences between the groups' baseline characteristics were compared using either analysis of variance (ANOVA) or Kruskal-Wallis tests for continuous variables when appropriate; in the case of any difference, post hoc analyses (Tukey or Mann Whitney U test, respectively) were applied. Proportions were compared using chi-square or Fisher exact tests when appropriate. To investigate whether the exercise interventions affected the outcome parameters, mean difference values ([mean values after intervention minus mean values before intervention], [mean values at 6 months post-intervention minus mean values before intervention] and [mean values at 6 months post-intervention minus mean values after intervention]) were analyzed by ANOVA or Kruskal-Wallis tests, with appropriate post hoc analyses. Mean differences in general physical activity subscale of PFQ, GPM and chair-stand and 2-minute step tests of the Senior Fitness Test were analyzed by ANOVA. The rest of the measurements were analyzed by Kruskal-Wallis test. According to the distribution plots of the data, Wilcoxon or paired-T tests were applied in order to explore the significance in change due to interventions. Two-tailed significance tests were used throughout the analyses. The statistical significance value is <0.05.

Results

Sixty-five subjects were assessed for eligibility and 58 of them were enrolled in the study. The mean age of the total group was 78.0±6.8 years and the majority of them were women (74.1%), unmarried including widowed and divorced (87.9%), retirees (84.5%), had more than 8 years of education (77.6%) and the mean duration of their stay in the facility was 3.5±2.9 years. Most of the participants had a current healthy lifestyle with no smoking (91.4%) or no drinking habits (93%) and more than half of them (54.5%) were moderate to highly physically active, according to IPAQ. The cognitive statuses of the elderly were good, with an MMSE score of 27.7±2.5. Hypertension (77.6%), gastric problems (22.4%) and diabetes mellitus (20.7%) were among the most common comorbidities and the mean number of medications

Table 3— Baseline Characteristics of The Subjects According to Groups.

Characteristic	Pilates Group (n=18)	Yoga Group (n=18)	Control group (n=22)	X^2 value	p value
Age, mean ± SD	76.2 ± 7.5	77.2 ± 6.4	80.0 ± 6.2	-	0.192
Men, n (%)	3 (16.7)	3 (16.7)	9 (40.9)	4.185	0.063
Married, n (%)	1 (5.6)	2 (11.1)	4 (18.2)	1.248	0.409
Education < 8 years, n (%)	3 (16.7)	4 (22.2)	6 (27.3)	0.481	0.529
Positive fall history, n (%)	4 (22.2)	6 (33.3)	9 (40.9)	1.069	0.216
Systemic diseases, n (%)					
Hypertension	15 (83.3)	12 (66.7)	18 (81.8)	0.365	0.747
Diabetes mellitus	0 (0)	4 (22.2)	8 (36.4)	5.307	0.042*
Thyroid disease	6 (33.3)	1 (5.6)	1(4.5)	2.549	0.139
Lung disease	3 (16.7)	3 (16.7)	2 (9.1)	0.296	0.698
Cancer	1 (5.6)	2 (11.1)	3 (13.6)	0.414	0.664
Osteoporosis	10 (55.6)	9 (50)	13 (59.1)	0.056	0.963
Joint prosthesis	3 (16.7)	2 (11.1)	2 (9.1)	0.296	0.698
BMI (kg/m^2)	29.4 ± 3.5	31.5 ± 3.6	31.0 ± 1.9	-	0.299
Physical examination					
Neck tenderness	7 (38.9)	10 (55.6)	6 (27.3)	2.851	0.322
Knee tenderness	5 (27.8)	7 (38.9)	4 (18.2)	1.917	0.230
Low back tenderness	8 (44.4)	11 (61.1)	9 (40.9)	1.198	0.632
Ambulation aid, n (%)	1 (5.6)	4 (22.2)	2 (9.1)	0.338	0.695
MMSE, score	28.2 ± 1.8	27.8 ± 2.1	27.2 ± 3.1	-	0.701
Low IPAQ category, n (%)	3 (16.7)	7 (38.9)	8 (44.4)	9.855	0.280

*: p<0.05

was 3.6±1.9. A previous fall history in the last year was present in 32.8% of the elderly participants.

As shown in Table 3, all baseline characteristics of the participants in the 3 groups were similar, except for diabetes. There were significantly fewer diabetes mellitus patients in the Pilates group. The man/woman ratio was higher in the control group; physical activity levels were higher in the Pilates group and the use of an ambulation aid was higher in the yoga group than the other groups, but none of the differences were statistically significant.

Six subjects (6 women) from the yoga group and 7 subjects (2 men, 5 women) from the Pilates group did not complete the study. The causes of the drop out were unwillingness to attend to exercise classes (n=5 in the pilates group, n=4 in the yoga group) and systemic diseases (n=2 in the Pilates group; acute renal failure, acute gastritis, and n=2 in the yoga group; respiratory infection, metatarsal fracture). There were no differences in sociodemographic characteristics and baseline measures between the subjects who dropped out and those who completed the study. Among the subjects who completed the study, the mean number of classes attended was 19.9±4.2 and 19.6±4.7 for the Pilates and yoga intervention groups, respectively. One participant reported symptom of gastric reflux during the head down positions in the yoga group; he performed modified versions of those postures thereafter. No other signs or symptoms of discomfort occurred during yoga or Pilates sessions.

There was a significant difference in the NHP total score mean difference (before and immediately after intervention) among the three groups (0.95±14.10; -5.88±8.85; 5.84±11.78 for Pilates, yoga and control groups, respectively; p=0.007). This difference resulted from the significant decrease in the total NHP score of the yoga group. However, this effect was not detected after 6 months. Sleep scores (-2.22±21.57; -6.67±18.15; 10.00±22.04 for Pilates, yoga and control groups, respectively; p=0.026) and emotional reaction subdomains (-2.08±23.19; -6.94±15.59; 6.82±14.29 for Pilates, yoga and control groups, respectively; p=0.037) on the NHP decreased immediately after exercise in both groups, and post hoc analyses revealed that the decrease in sleep and emotional reaction scores reached significance only in the yoga group. These effects also did not persist after 6 months.

There were no statistically significant differences in GDS, PFQ including all the subcategories and GPM scores among

the groups immediately after and 6 months after the interventions.

No improvement was observed in balance scores immediately after intervention in either group (Figure 2). Hand grip strength increased significantly in the yoga intervention group (Kruskal-Wallis p=0.017, Mann Whitney U test between yoga and control p=0.008) but was not sustained after 6 months.

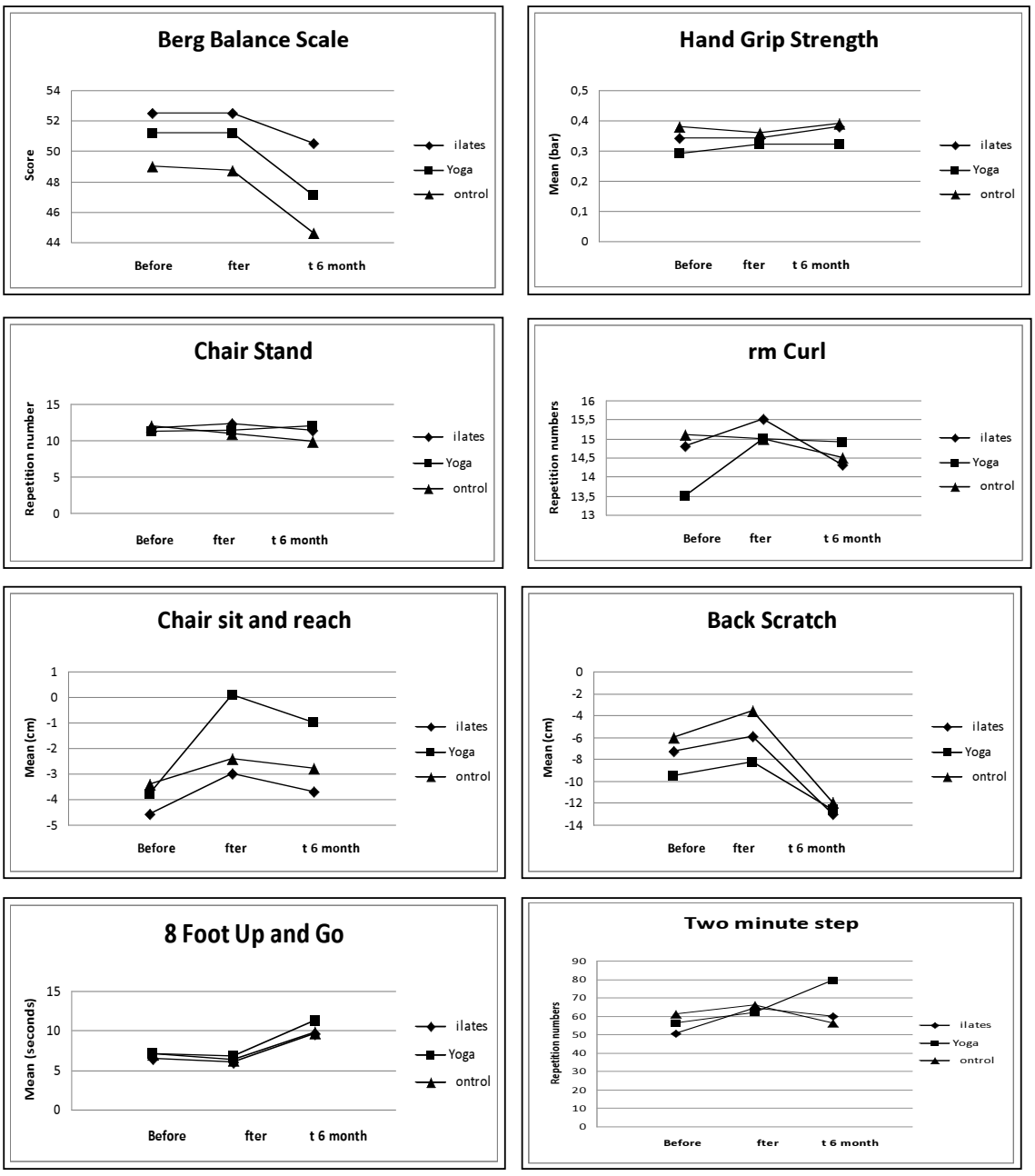

Figure 2— Berg balance scale, hand grip strength and senior fitness test scores before, immediately after and 6 months after the interventions in the 3 groups.
*: p<0.05 for the yoga group.

In the senior fitness test scores, only the results of the sit and reach test were reduced immediately after the yoga intervention (Kruskal-Wallis p=0.019, Mann Whitney U test between yoga and control p=0.031). This effect was no longer observed after 6 months. Improvements seen in chair stand and 8-foot up and go test scores did not reach statistical significance after the interventions (p=0.074 and p=0.083, respectively).

No change in any of the body composition parameters including weight, body mass index, percentage of fat, fat mass and fat free mass was observed after the interventions.

Mean difference measurements between 6 months post-intervention and baseline evaluations were not different among three groups.

Discussion

Subjects in the yoga group showed improvements in quality of life, with predominant changes in sleep and emotional reaction subcategories, increase in hand grip strength and flexibility of lower extremities after 8 weeks of yoga intervention. However none of these improvements could be maintained at 6 months after completion of the intervention. Yoga and Pilates interventions were regarded as safe for this population. A decrease in pain, depression or disability and improvements in balance or body composition were not observed.

Balance ability was expected to improve after both of these interventions. Relatively high BBS scores (52.5; 51.2; 49 in Pilates, yoga and control groups, respectively) revealed that subjects did not experience serious balance problems and exercise interventions might have appeared to be ineffective due to the ceiling effect. Oken et al. reported increments in a timed one leg stance parameter after 6 months of yoga training in community dwelling healthy elderly, (9) whereas Tuzun et al. observed no effect on tandem walk and body sway measures after 12 weeks (24). Kloubec et al. did not find improvement in the balance of healthy younger adults after 12 weeks of Pilates training (11). The 8-week training period of our study might not have been sufficient to obtain benefits in balance; a longer duration might prove efficacious as more challenging postures and exercises would be performed with advancing physical performance.

Earlier studies have investigated the impact of these exercise programs on depression and quality of life more often than on pain, balance and disability. Chen et al. observed decrements in depressive scores in elderly people who were relocated to an assisted living facility after 6 months of yoga training, and this change was not observed at 3 months (3). The initial depression scores in that study were also low, similar to our study. Shahidi et al. showed improvement in depression scores in community dwelling elderly participants with depression after only 10 sessions of laughter yoga (2). However, there is no information about the effects of Pilates on depression in the elderly. In our study, GDS scores were low (2.6; 3.9; 4.5 in Pilates, yoga and control groups, respectively) and did not change after the interventions; however, emotional reaction subscores on the NHP showed a significant decrease immediately after exercise in the yoga group. The NHP also evaluates other emotions like anxiety and anger. Yoga training in this study might have contributed to better control of subjects' emotions. Whether a longer training program would affect GDS scores remains unanswered.

There are many studies about the effects of yoga on quality of life in the elderly (8-10, 24), whereas fewer studies have investigated this outcome measure with Pilates (15). Quality of life increased in community dwelling healthy elderly participants immediately after yoga training, but long term effects were not investigated (9, 20, 24). In our study, elderly subjects living in the institution had improvements in quality of life immediately after yoga training, but not after Pilates training, and unfortunately they did not persist 6 months later. Improvements, especially in sleep and emotional reaction, lead to a suggestion that the mental component of yoga might play a role, and the 8-week time interval is enough for this effect, but only for short term. Improvements due to socialization and class participation were unlikely, since most of the subjects were attending the regular social programs. The difference observed in mental components between the yoga and Pilates groups may be a result of different breathing methods: inspiration and expiration through the nose in yoga versus inspiration through the nose but expiration through the mouth in Pilates. This hypothesis should be tested using a study with a different methodology. Deep relaxation performed at the end of the yoga session might also be more effective than the mind intervention offered by the Pilates method.

Flexibility, strength and endurance are expected to improve after both Pilates and yoga training. However, the only increments we observed were in the flexibility of lower extremities and hand grip strength in the yoga group. A small sample size, relatively short duration and intention to treat analysis may have prevented other parameters from reaching statistical significance. The health conditions of the study population, which had a reasonable baseline flexibility and strength, might also be a reason for the lack of measured benefit.

This study is unique in investigating the difference between two mind-body interventions in elderly subjects liv-

ing in a nursing care facility. Long term effects on the quality of life, pain, depression and physical performance, including balance, were evaluated. Favorable attendance rates, safety and feasibility encouraged yoga and Pilates training in the institutionalized seniors. Yoga training improved quality of life, sleep quality, strength and flexibility in seniors living in nursing facilities immediately after the interventions. Incorporating these training programs, especially yoga intervention, into the daily schedule of nursing facilities for a longer duration might aid in obtaining further improvements in other outcome measures and in maintaining the gained benefits in the long term.

Study Limitations

Small sample size, relatively short duration and lack of a precise randomization method were the limitations of our study. Although considerable effort was made to apply random assignment to three groups, motivation of the subjects to participate in the intervention classes in a relatively small population prohibited randomization. This might have introduced selection bias. However, the subjects in the control group explained that the reason for their agreement to be in the control group was that they were already participating in the morning exercise classes of the nursing home and this extra exercise class was considered redundant. The participants in the control group were also physically active, with similar IPAQ scores and all of the baseline parameters to the other subjects in the study. The difference between the yoga and Pilates classes was not affected, since randomization was applied in the intervention groups.

Absence of improvements in quality of life and physical performance 6 months after training should be taken into consideration. Training duration may be lengthened or maintenance programs after training may provide long term benefits.

Future studies with a larger sample size and longer duration of training would provide more information regarding the effects Pilates and yoga on physical performance of the elderly.

The results of this study cannot be generalized to community dwelling elderly subjects. Seniors in this study were from one nursing care facility; we suggest that this limits the extrapolation of the results to all institutionalized elderly. Our study population may be more physically active than subjects in other nursing homes in Turkey, as the socioeconomic status is higher. Our study population did not include fragile seniors with poor balance abilities and neurological disorders, so we can not make recommendations regarding use and safety of Pilates or yoga in these groups. Individualized rehabilitation programs are the effective and safe treatments that are recommended in fragile elderly persons with serious orthopedic and neurologic problems.

Conclusion

Yoga and Pilates training are safe for this small sized study population that are relatively in good health condition. Yoga improved the quality of life, sleep quality, strength and flexibility in seniors living in nursing care facilities only immediately after training. Observed benefits did not persist 6 months after training.

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