

Effect of integrated exercise program on posture in adolescent Idiopathic Scoliosis (case study)

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ABSTRACT

Purpose: To investigate the effect of integrated exercise program on posture in adolescent idiopathic scoliosis. **Participant(s) and Methods:** 10 Adolescent idiopathic scoliosis female participants with average thoracic Cobb's angle (36 degrees \pm 4.1) with average age (14.6 years \pm 1.2), weight (48.3 kg \pm 5.9), height (1.52 cm \pm 0.1). Participants underwent an integrated exercise program consists of Schroth exercises, manual therapy, myofascial release, core stability exercises, Yoga and Pilates for 6 months with an average of 2 sessions per week. Each session was 120 minutes. Participants were assessed using Posture Screen mobile software before and after treatment from back view. **Results:** There was a significant difference in the 11 variables used in Posture Screen Mobile assessments using paired t-test. The mean difference indicated improvement in Head Shift, Head Tilt, Shoulder Shift, Shoulder Tilt, Ribcage Shift, T1-T4 Shift, T1-T4 Tilt, T4-T8 Shift, T4-T8 Tilt, T8-T12 Shift, T8-T12 Tilt. **Conclusion:** There was a significant improvement in posture after applying integrated exercise program for 6 months.

Keywords: Adolescent Idiopathic Scoliosis, Posture Screen Mobile, Integrated Exercise program.

Introduction

Scoliosis is a deformity of the spine that encounter the 3 planes where there is a lateral bending of the spine in the frontal plane, rotation of vertebrae in the horizontal plane and flattening of the spine in the sagittal plane [1]. These skeletal changes are normally reflected by a cosmetic change in the back, the unattractive state of which is commonly to a greater degree a worry to the patient than is the basic skeletal deformation. The condition whenever left untreated leads to changes in body mechanics and degeneration results in pain, loss of spinal flexibility, and loss of function or disability [2]. Adolescent Idiopathic Scoliosis (AIS) emerges generally in young people at puberty [3, 4], and occurs in 2% to 3% in the

general population [5]. Practically 10% of patients with AIS will require some type of treatment, and up to 0.1% will inevitably require surgery [6].

AIS is more common in females with a ratio of 7 females:1 male. The general appearance can cause psychological problems especially to females [7].

Schroth exercises are consisting of activity of daily living exercises with rotational breathing for derotation and deflexion of the vertebrae aiming to correct spinal deformity. The exercises encourage neurodynamic of the patient to change motor control [8].

The aim of manual therapy is to improve range of motion (ROM), mobilize soft tissues and joints, and decrease muscle tone and pain which are affected in AIS [9]. Yoga offers a self-restorative, all-encompassing way to deal with wellbeing and has been demonstrated to be successful in a few perpetual ways of life related illnesses. Yoga poses utilize asymmetrical positions, in which your body's weight is upheld by arms, hips, or trunk muscles working against each other's to achieve strengthening [10].

The Pilates exercises includes cognizant utilization of trunk muscles to balance out the lumbo-pelvic area [11], and the technique was intended to improve mobility and general body

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wellbeing by accompanying coordination, strength and respiratory exercises^[12].

Core stabilization (CS) improves balance and control posture in both static and dynamic exercises^[13-15].

Myofascial Release improve posture, pain and quality of life by removing fascial restrictions and thus increase flexibility of the body^[16].

PostureScreen Mobile® (PostureCo, Inc., Trinity, FL) is an inexpensive mobile application used to detect postural deviation in a timely manner^[17].

Participants and Methods

10 Adolescent idiopathic scoliosis female participants with average thoracic Cobb's angle (36 degrees ±4.1) with average age of 14.6 years ±1.2, weight of 48.3 kg±5.9, height of 1.52 cm ±0.1 were included. A written informed consent was obtained from each participant. Participants underwent an integrated exercise program consists of Schroth exercises, manual therapy, myofascial release, core stability exercises, Yoga and Pilates for 6 months with an average of 2 sessions per week. Each session was 120 minutes.

Schroth exercises include symmetric mobilizing exercises to improve thoracic kyphosis and lumbar lordosis, postural correction, and activity of daily living postural exercises with rotational angular breathing.

Manual therapy included Thoracic and Lumbopelvic Mobility Exercises, Scapular Passive Mobilization, Rib mobilization, Rib Bucket-Handle Passive Motion and Manipulation, Rib Forward Rotation Passive Motion Test and Manipulation, Thoracic Rotation Manipulation in Prone, stretching of concave side muscles and strengthening of weak convex side muscles.

Myofascial release techniques included Cross-Hand Release of the Diaphragm, Lateral Chest and Axilla, Lateral Thoracic Cage and Lateral Shoulder and Side-Lying Arm and Leg Pulls.

Core stability exercises included plank on hand and on elbow, blank with ball, bridging with lateral pelvic shift, push up on ball, basic crunch, oblique crunch and bird dog.

Yoga exercises included yoga poses to stretch fascial lines such as superficial frontal superficial back, superficial lateral, lateral arm and spiral lines. Mountain posture on the floor with shoulders elevated holding a block, Traction with ropes while holding a chair, downward facing posture with chin on a block, stabilization of the shoulder blades using a pole, Pilates exercises included spinal stretch, plank on ball, Leg Pull Prone and lateral spine movement.

The study was approved by ethical committee in the faculty of physical therapy, Cairo University.

Participants were assessed using PostureScreen mobile software before and after treatment. 11 variables of Posture Screen Mobile from Back view include: head shift, head tilt, shoulder shift, shoulder tilt, ribcage shift, t1-t4 shift, t1-t4 tilt, t4-t8 shift, t4-t8 tilt, t8-t12 shift, t8-t12 tilt.

We used Descriptive statistics including Mean and standard deviation as well as paired t-test to compare results using SPSS statistics program ($p < 0.05$).

Results

There was a significant difference in the 11 variables used in Posture Screen Mobile assessments using paired t-test. The mean difference indicated improvement in Head Shift, Head Tilt, Shoulder Shift, Shoulder Tilt, Ribcage Shift, T1-T4 Shift, T1-T4 Tilt, T4-T8 Shift, T4-T8 Tilt, T8-T12 Shift, T8-T12 Tilt as seen in (Table 1 and 2).

Table 1: Descriptive statistics of Posture Screen variables before and after treatment:

Variables	Intervention	Mean	Std. Deviation
Head Shift	Before Treatment	1.3030	.39232
	After Treatment	.9780	.25724
Head Tilt	Before Treatment	1.5900	.78095
	After Treatment	.8000	.29059
Shoulder Shift	Before Treatment	1.8750	.67245
	After Treatment	.9930	.12867
Shoulder Tilt	Before Treatment	2.1200	.89914
	After Treatment	1.1100	.47947
Ribcage Shift	Before Treatment	1.9090	.64058
	After Treatment	1.1180	.21379
T1-T4 Shift	Before Treatment	1.9900	.48021
	After Treatment	1.3290	.28877
T1-T4 Tilt	Before Treatment	6.9400	.87076
	After Treatment	3.3600	1.13549
T4-T8 Shift	Before Treatment	1.4090	.36140
	After Treatment	1.1410	.25186
T4-T8 Tilt	Before Treatment	4.1900	2.26001
	After Treatment	1.8300	.99894
T8-T12 Shift	Before Treatment	2.2020	.80626
	After Treatment	1.2240	.16628
T8-T12 Tilt	Before Treatment	9.5300	4.58840
	After Treatment	9.0600	4.53534

Table 2: Paired t-test of Posture Screen variables before and after treatment:

Variable	t	df	Sig. (2-tailed)
Head Shift	4.711	9	.001
Head Tilt	2.984	9	.015
Shoulder Shift	4.186	9	.002
Shoulder Tilt	3.902	9	.004
Ribcage Shift	4.721	9	.001
T1-T4 Shift	3.683	9	.005
T1-T4 Tilt	6.468	9	.000
T4-T8 Shift	2.528	9	.032
T4-T8 Tilt	4.217	9	.002

	treatment			
T8-T12 Shift	Before and After treatment	4.291	9	.002
T8-T12 Tilt	Before and After treatment	4.138	9	.003

Discussion

This study is the first of its kind to evaluate posture using Posture Screen Mobile in adolescent idiopathic scoliosis before and after intervention. The main finding of this study was that integrated exercise program improved posture and decreased Cobb's angle of the thoracic curvature. It is also the only study that combine these exercises in one intervention. The main aim of conducting this study is the lack of conservative treatment for adolescent idiopathic scoliosis studies. There were many researches that support the use of brace or a single exercise methodology but this study tried to combine most useful exercises to correct posture.

The results of this study agreed with a study of de Araújo, Maria Erivânia Alves, et al. 2012^[18] which showed improvement in Cobb's angle and degree of pain. It is also agreed with the study of Rydeard et al.(2006)^[11], Which concentrated on neuromuscular control and stabilization of the spine. It is also agreed Gouveia and Gouveia (2008)^[19], which stabilized the spine and decreased postural changes through strengthening of transverse abdominal muscle.

Blum (2002)^[20] used Pilates exercises to rebalance muscles and align posture in scoliotic patients.

Another agreement with the study of Oliveiras and Souza (2004)^[21] used stretching and manipulation to gain muscle balance and posture correction and get results of 66.7% correction of scoliosis degree and 16.7% stabilization of the curve. It is also agreed with a case study used stretching, Schroth, and strengthening exercises for 8 weeks and showed 19.3% reduction in Cobb's angle^[22]. Weiss et al.^[23] showed improvement of 53%-70% of scoliotic patients using Schroth exercises. Another agreement with a core stability exercises study showed decrease of 9 degrees in Cobb's angle and improved cosmetic appearance^[24]. Another study used Myofascial release reported improvement in body image and decreased Cobb's angle^[25]. This was agreed with an adult case approach showed improvement in Cobb's angle and wellbeing using Yoga^[10]. Other reviews did not support using Yoga as a treatment for scoliosis as there was a lack in randomized controlled trials^[26, 27].

The study was limited by 2D assessment of the Posture Screen Mobile. Further research on every modality used and effect of these modalities on a longer term and follow up is suggested.

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