CASE REPORT

Body Posture Adjustment During the Weight Loss Program: A Case Report

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ABSTRACT

A 32-year-old woman with class I obesity completed 6 weeks eight-loss program. Prior to the exercise program, she was found with an abnormal weight distribution on both her feet that impacting her body posture. Strengthening exercises for certain muscles were included in her exercise training to correct her body posture. After 6 weeks of exercise training, her estimated VO_{2max} was increased from 21.87 ml/kg/min to 25.20 ml/kg/min. This patient had never been injured during 6 weeks of exercise training and has lost 3.1 kg of body weight, 1.3% body fat, and gained 0.5% skeletal muscle. Integrated posture correction exercises in a weight loss program tended to facilitate the effectiveness of the program.

Keywords: Posture, Obesity, Exercise, Woman, Weight Loss

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INTRODUCTION

While exercise is beneficial in producing positive results after a weight loss program, the obese population faces numerous obstacles on the path to weight loss exercise, especially limitations in posture and biomechanics during exercise training (1). Body mass index (BMI), body weight, and body fat are all linked to poor body alignment. Abnormal distribution of body fat in the abdominal tends to shift the center of gravity to the medial side and thereby increasing the mechanical stress to the musculoskeletal structures (2). Muscle pain falls and instability caused the muscle to become fatigued and the weakening of skeletal muscle strength was further reducing the capability to involve themselves in the weight loss training. Due to these reasons, this case study aims to report the efficiency of weight reduction exercise training combined with posture correction exercise for obese woman.

CASE REPORT

This was a case report of a 32 years old woman (height: 164 cm) who has been diagnosed with class I obesity (BMI is 31.32 kg/m^2). She has been diagnosed with obesity for the past 5 years. She was referred to an exercise clinic at the Advanced Medical and Dental Institute, Universiti Sains Malaysia, located in Bertam, Penang, Malaysia. Her baseline body weight was 83.8 kg. Her blood test results also revealed cholesterol levels of 5.76 mmol/L (borderline high), HDL levels of 1.73 mmol/L (negative risk of coronary heart disease), high LDL levels of 3.59 mmol/L (borderline high), and normal triglyceride levels of 0.98 mmol/L. She also has the thalassemia trait, which causes her HbA1c value to be unreliable in estimating her glucose level (3). The result of the fasting blood test showed that her fasting glucose was normal (5.7 mmol/L). Her mother has diabetes, and her father has hypertension, so she is at a moderate risk of metabolic disease. She is a non-smoking, married woman with three children in terms of social background. This patient has been sedentary for about three years.

We were told that she had unilateral knee pain for three months since her last pregnancy. Therefore, before starting the exercise program, we assessed the patient's musculoskeletal structure. However, there was no swelling, redness, tenderness, and warmth on her knee. Interestingly, we found that she had an abnormal weight distribution on both her feet which could be resulted from in irreversible loss of the medial foot arch during pregnancy. Besides, we also assessed her whole-body posture by observation. An abnormal posture was found which were forward head, rounded shoulder, kyphosis, hyper lordotic, genu valgum, and pronated foot. Most of her weight is on the medial side of both her legs during standing and normal walking. However, no malalignment of Achilles tendons and scoliosis was found. We had done specific special tests to confirm her musculoskeletal condition included the Trendelenburg test, Faber's test, and the Piriformis test. The results showed weak bilateral gluteal medius, no hip pathology,

and SI joint dysfunction but with bilateral piriformis tightness. In addition, manual muscle testing was done on some muscles including upper limb, trunk muscle, and lower limb muscle. In this test, we used Daniels and Worthingham's muscle scale as the references. From the test, we conclude that she had weak neck flexor, hip abductor, hip adductor, hamstrings, and abdominal muscle.

After all these assessments, blood pressure and cardiac rest were taken. Body composition was done by using a body impedance analyzer (Omron HBF-206IT, Omron Healthcare, Inc, Japan). Pre-exercise testing and a one-rep max strength test were performed to assess baseline health and muscle strength. A Lode bike (Lode BV, Netherlands) was used to determine maximal oxygen consumption (VO_{2max}) during the pre-exercise evaluation. This patient was told to ride a Lode bike on three separate loads which are 50 watts, 75 watts, and 100 watts. She was unable to complete the final stage of the pre-exercise test due to a technicality.

The findings of the pre-exercise test and the 1 RM power test were used to prescribe exercise training. Strengthening exercises for certain muscles, including gluteal medius, gluteal maximus, hip abductor, and core muscles, were included in her exercise preparation to correct her body posture in order to avoid musculoskeletal injuries during exercise. The duration of her exercise training was set at 6 weeks. The initial strengthening exercise included were clamshell, straight leg raises side with hip abduction, bird dog, bridging, adjusted plank, and abdominal crunch. At the same time, other exercises included were shoulder press, chest press, leg extensions, and leg curls, as well as aerobics workout on a cross-trainer. All exercise intensities were based on 50% to 70% of her heart rate reserve, 30% to 50% of 1 RM, and a rating of perceived exertion (RPE). However, the intensity of the initial strengthening exercise was set progressively from bodyweight to 1 kg sandbag according to her muscle strength. All these strengthening exercises were prescribed for 10 repetitions and 2 sets. Active stretching for the big muscle group was carried out at the end of every exercise training to increase muscle flexibility and induce muscle relaxation. Whereas bilateral piriformis, hamstrings, calf, upper trapezius, and levator scapulae were passively stretched by the therapist. Every muscle was stretched for 30 seconds and repeat for 2 repetitions per muscle group. Throughout the training, this patient has never been hospitalized and has never missed an exercise session during the 6 weeks of exercise training.

Table I shows the pre- and post-training result of hemodynamic, body composition, blood glucose, and strength of this patient. By evaluating her body composition at week 6, she was able to lose 3.1 kg, 1.3% body fat, and gain 0.5% skeletal muscle. Her most recent fasting blood glucose reading was 5.3 mmol/L. In addition, after 6 weeks of training, her lower body 1 RM strength was substantially increased from 33 kg to 61 kg indicated that her skeletal muscle strength had improved.

Table I: Pre- and post-training results of hemodynamic, body composition, blood glucose, lipid profile and lower body 1 RM strength

Variables	Pre-training	Post-training
Oxygen consumption (VO_2) (ml/kg/min)	16.89	20.42
Maximal oxygen consumption (VO_{2max}) (ml/kg/min)	21.87	25.20
Resting heart rate (bpm)	78	73
Heart rate reserve (bpm)	110	106
Blood pressure (mmHg)	126/84	126/81
Body weight (kg)	83.8	80.7
Body fat (%)	45.2	43.9
Body age	52	50
Body mass index (kg/m^2)	31.2	30.0
Skeletal muscle (%)	24	24.5
Visceral fat (%)	6	6
Resting metabolic rate (kcals)	1548	1514
Hip circumference (cm)	114	110
Waist circumference (cm)	99	85
Fasting blood glucose (mmol/L)	5.7	5.3
Lower body 1 RM strength (kg)	33	61
Triglyceride (mmol/L)	0.98	1.38
Total cholesterol (mmol/L)	5.76	5.47
High density lipoprotein (mmol/L)	1.73	1.66
Low density lipoprotein (mmol/L)	3.59	3.18

The calculated VO_{2max} measured during pre-assessment was 21.87 ml/kg/min. The calculated VO_{2max} during the post-training test was also increased from 21.87 ml/kg/min (Fig 1) measured during pre-assessment to 25.20 ml/kg/min (Fig 2), indicated that her aerobic fitness had improved. VO_{2max} of pre-exercise training is obtained from the formula shown in the graph (Fig 1) by using her maximum heart rate which is 188 bpm whereas VO_{2max} of after exercise training is obtained from formula of another graph as shown in Fig 2. Table II demonstrates the results of sub-max test obtained during the pre- and post-training assessments.

DISCUSSION

The above findings have demonstrated that the corrective exercise of body posture has contributed to the weight loss program. We discovered that in our case, patient's gluteal muscle strength had improved as a result of the clamshell and side straight leg raises. During exercise and walking, her knee coordination, hip adductor, and hip internal rotator had improved. All findings observed in this case have shown that gluteal strengthening

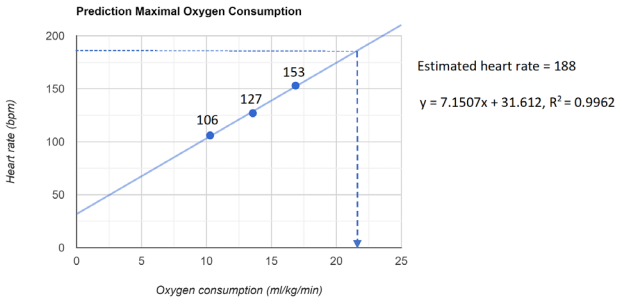

Figure 1: Estimation of VO_{2max} from heart rate values measured during the submaximal test before an exercise program

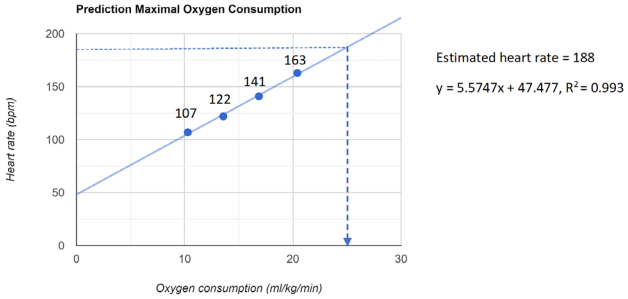

Figure 2: Estimation of VO_{2max} from heart rate values measured during the submaximal test after an exercise program

exercise is capable of restoring muscle recruitment and improving exercise efficiency.

Our limitations were that less aerobic exercise was done, making it difficult to meet the ACSM requirement of at least 3 days of moderate aerobic exercise intensity per week in the past 6 weeks. Despite that, the patient was able to complete her post-training sub max test. Obese individuals have more energy expenditure and higher heart rate achieved during exercising with a cycle ergometer. This is because obese persons have to deal with heavier legs and stabilizing of the trunk during pedaling on the cycle ergometer results in the production of lower venous return and higher lactic acid in the muscle. Reveal to the results of sub-max of post-training, we can conclude that the major reasons associated with this patient to successfully completed all 3 stages of sub-max test were increase the comfortability during pedaling on a cycle ergometer. At the same time, an increase in legs muscle strength and trunk stabilizing while reducing the muscle tension, lactic acid and improve venous return.

CONCLUSION

Correct posture during exercise training is very important for the prevention of musculoskeletal injuries during exercise training. Strengthening the gluteal muscle allows an individual to achieve better and more accurate body coordination, which can help them train more efficiently. Furthermore, aerobic exercise must not be overlooked in order to achieve optimal fat loss.

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REFERENCES

1. Mohamad Nor NS, Ambak R, Mohd Zaki N, Abdul Aziz NS, Cheong SM, Abd Razak MA, Yusof M, Ahmad MH, Baharuddin A, Megat Radzi MR, Wan Kozil WNK, Ishak IH, Aris T. An update on obesity research pattern among adults in Malaysia: A scoping review. BMC Womens Health. 2018;18(Suppl 1).
2. Chougala A, Phanse V, Khanna E, Panda S. Screening of Body Mass Index and Functional Flatfoot in Adult: an Observational Study. Int J Physiother Res. 2015;3(3):1037–41.
3. Mian FJ, Jacob K. HbA1c is not always reliable in estimating glycaemic control. Pract Diabetes. 2016;33(9):317–9.

Table II: Sub-max test at pre and post-training

	Stage	Work Rate (kg.m/min)	Workload (watt)	Heart Rate (bpm)	RPE			VO_2 (ml/kg/min)
					Breathing	Muscles	Overall	
Before Training	**Warm Up**	153	25	106	7	7	7	10.28
	1	306	50	127	13	15	13	13.57
	2	459	75	153	15	17	17	16.86
	3	612	100	177	20	19	19	20.15 (incomplete)
	Cool Down	0	0	123	15	15	15	
	Stage	**Work Rate (kg.m/min)**	**Workload (watt)**	**Heart Rate (bpm)**	**RPE**			**VO_2 (ml/kg/min)**
					Breathing	**Muscles**	**Overall**	
After Training	**Warm Up**	153	25	107	7	7	7	10.29
	1	306	50	122	8	15	13	13.57
	2	459	75	141	10	17	17	16.86
	3	612	100	163	13	19	19	20.41
	Cool Down	0	0	102	15	15	15	