

The Effects of Mixed Exercise (ABOXERCISE) on Cardiovascular Endurance, Muscular Endurance and BMI level in 30- to 40-Year-Old Obese Males

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ABSTRACT

This study was done to determine the effects of combining abdominal exercise and boxing movements (ABOXERCISE) on cardiovascular endurance, muscular endurance, and BMI level. The pre–post experimental design was used and participants consisted of 20 inactive males aged 34 to 39 years, who participated in this study, having a BMI level of more than 30. All participants took part in the Aktifkan Orang Muda program in Petaling Jaya 2016. They were engaged three times a week for 24 weeks of ABOXERCISE interventions. All participants completed the tests (step test, sit-ups test, and BMI) before and after the intervention. The results showed that the cardiovascular endurance and muscular endurance increased after 24 weeks of intervention. The BMI level as well as body weight of the participant also decreased. The present study recommends ABOXERCISE as another approach for exercise practitioners. In conclusion, this study finding suggests the effectiveness of ABOXERCISE on cardiovascular endurance, muscular endurance, and BMI level of obese male communities. Future researchers may want to investigate the effectiveness of ABOXERCISE with different types of exercise or aerobic dance. It is also to find any association with physiological and psychological states of the participants.

Keywords: Abdominal exercise, boxing movements, health related fitness, obese

INTRODUCTION

Inactive lifestyle has become more common today and is very harmful to the health of every individual (James, Leach, Kalamara, & Shayeghi, 2001). World Health Organization (WHO 2003) stated that obesity is one of the major concerns of inactive lifestyle and requires immediate action to curb it.

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The WHO has stated that obesity is one of today's most neglected public health problems, affecting every region of the globe and it is still increasing in both industrialized and developing country (Andrew, 2006). As for Malaysia, one out of three Malaysian people are obese. In fact, 44.5 % are more than 25% of BMI (Noor Hasliza, Mohd Azli, & Mohd Hafizi, 2016). Therefore, the best preventative method for obesity is by being actively involved in physical activity levels and exercise that helps to improve body composition and decrease body fat and body weight (Dishman & Washburn, 2004).

Aerobic training activities are used to decrease body weight and body fat, and thus to change body composition (Jorgic, Pantelic, Milanovic, & Kostic, 2011; Milanovic, Sporis, Pantelic, Trajkovic, & Aleksandrovic, 2011, 2012). Apart from walking and running as a means of aerobic exercise used to decrease body weight and change body composition, various other exercise to music models are used that includes steps, hops, turns, jumps, and other body movements (Milanovic et al., 2012). Aerobic exercise to music or dance aerobics was especially popular during the last few years of the 20th century, primarily among women. A characteristic of this kind of exercise is that all of the people who are participating in the exercise to music program realize certain movements in the same rhythm and tempo, activating different muscle groups at the same time. Aerobic dance exercises have typically been developed as an aerobic exercise to reduce body compositions, improve physical fitness

performance and cardiorespiratory demand (Grant, Todd, Aitchison, Kelly, & Stoddart, 2004; Kimura & Hozumi, 2012; Pantelic, Milanovic, Sporis, & Stojanovic-Tosic, 2013).

The specific muscle exercise like abdominal exercise becomes more popular among the exerciser to increase the shape and strength of the abdominal parts (Szasz, Zimmerman, Frey, Brady, & Spaletta, 2002). For example, previous researchers found that aerobic endurance and strength of the muscles were increased after completing three times per week for 3 weeks of 20-min supine abdominal crunches (Petrofsky, Morris, Jorritsma, Bonaci, & Bonilla, 2003).

Another type of popular exercise is martial arts and combat sports that can increase health wellbeing and fitness (Cox, 1993; Woodward, 2009). These exercises are popularly investigated among youth by the researchers (Fukuda et al., 201; Violan, Small, Zetaruk, & Micheli, 1997), adolescents (Fong & Ng, 2012; Melhim, 2001), and elders (Brudnak, Dundero, & Van Hecke, 2002; Pons Van Dijik, Lenssen, Leffers, Kingma, & Lodder, 2013). As a result, significant improvement in balance and favor of the antero-posterior direction can be seen. Another study conducted by Tsang, Kohn, Chow and Singh (2009) found that body fat of the participants is better after the kung fu session compared to tai-chi chuan group. In addition, a different study reported karate session group had an increase in cardiovascular endurance after four times per week of session (Yoshimura & Imamura, 2010).

Previous researchers interestingly found that combination of different types of exercise improve some selected health-related fitness components. For example, Ossanloo, Zafari and Najar, (2012) investigated the three sessions a week for 12 weeks combination of aerobic dance, step exercise and resistance training on body composition in inactive females. The results showed that levels of BMI decreased after 12 weeks of training. Another study conducted by Hosiso, Rani and Rekonine (2013) found that 12-week aerobic exercise improved 12-m runs, push-ups, sit-ups, and flexibility performance in 22 to 28 years old of inactive female. In fact, the results also revealed that BMI and body weight decreased tremendously (Hosiso et al., 2013).

The WHO (2003) clearly suggests that both males and females need to exercise regularly in any circumstances. Prasanna (2014) found that the fun element in 60 min for 12 weeks of aerobic dance helps to reduce the stress on the cardiovascular system of 30 to 40 years old male obese adults. There is still lack of published study that focuses on exploring the effects of combining abdominal exercise and martial arts movements with music. Thus, this study aims to investigate the effects of combining abdominal exercise and boxing movements (ABOXERCISE) on selected health-related fitness components (i.e., cardiovascular endurance, muscular endurance, and BMI) among 30- to 40-year-old inactive obese males.

METHODS

Sample and Participant Selection

Twenty males aged 34 to 39 years, ($M = 36.45$, $SD = 1.43$) participated in this study with different weights ($M = 94.05$, $SD = 4.32$). They were also inactive participants that had only performed some physical activity that was less than an hour per week. All participants were recruited purposively from a special training program that focuses on 30- to 40-year-old youth and having a BMI level more than 30 known as Aktifkan Orang Muda, which was conducted by Healthy Generation Malaysia.

Assessments and Measures

ABOXERCISE is a new approach of exercise accompanied by music. It is a 40-min (not including warm-up and cool down session) combination of abdominal exercise and selected boxing techniques (Table 1). As recommended by the American College of Sports Medicine (2014), the participants in this study had engaged in three times per week for 24 weeks of exercise program conducted by a sports science and certified instructor. The Faculty of Sports Science, Universiti Teknologi MARA Ethics Committee has approved the study. Participants provided written informed consent. Approximately 65% to 85% was the maximal target heart rate for the age (Cakmakci, Arslan, Taskin, & Cakmakci, 2011; Jakubec et al., 2008; Leelarungrayub et al., 2010; Skelly, Darby, & Phillips, 2003). The Carvonien method was used to determine the intensity of ABOXERCISE.

Each participant used a polar device and performed according to the target heart rate and exercise. In addition, there was no nutrition restriction or modification during the intervention program. Boxing movements consists of jab, uppercut, and hook. All these techniques were assisted by the step variations (i.e., step touch, V steps, and shuffle, lunges, and squats). Overall, the ABOXERCISE covered 60

min including warmup and cool down session or approximately 40 min only for ABOXERCISE (Table 1). As recommended by the previous researchers, high beat music (135 to 155 beats per min) was used in this study (Karageorghis & Terry, 2001; Pantelic et al., 2013). Meanwhile, the abdominal exercise consisted of crunches, knees up crunch, crisscross, legs lower, alternate toe touches, and crunches claps.

Table 1
ABOXERCISE choreography

Basic techniques of choreography	Repetition	Duration
First stage	20 × (each techniques)	
<ul style="list-style-type: none"> • Warming up – jab (step touch), upper cut (step touch), hook (step touch) • Stretching 	Upper body and lower body	10 min
Second stage	10 × 3 sets	
<ul style="list-style-type: none"> • Step touch - Jab (left / right) + Upper cut (left / right) + hook (left / right) • Crunches • V step - Jab (left / right) + Upper cut (left / right) + hook (left / right) • Knees up crunch • Shuffle lateral - Jab (left / right) + Upper cut (left / right) + hook (left / right) • Criss cross • Jab (left / right) + Upper cut (left / right) + hook (left / right) + lunges (left / right) • Alternate toe touches • Jab (left / right) + Upper cut (left / right) + hook (left / right) + squats • Crunches claps • Step touch - Jab (left / right) + Upper cut (left / right) + hook (left / right) • V step - Jab (left / right) + Upper cut (left / right) + hook (left / right) • Crunches + knees up crunch + crisscross • Jab (left / right) + Upper cut (left / right) + hook (left / right) + lunges + squats (left / right) • Alternate toe touches + crunches claps 	20 × 3 sets 10 × 3 sets 20 × 3 sets 10 × 3 sets 20 × 3 sets 10 × 3 sets 20 × 3 sets 10 × 3 sets 10 × 2 sets 10 × 2 sets 10 × 3 sets 10 × 2 sets 10 × 3 sets 10 × 3 sets	40 min
Third stage	20 × (each steps)	
<ul style="list-style-type: none"> • Cool down – step touch + v step • Stretching 	Upper body and lower body	10 min

The YMCA 3-min step test is suitable for all age levels from 18 to 65 years and above (Miller, 2002). The test is also accepted because of linear relationship between workload, heart rate, and VO₂ max. According to Miller (2002), all test performers should have a partner to count the carotid pulse (allow time to practice counting a partner's carotid pulse). On the signal to begin, the test performer steps up a bench 12 inches high, then the other; steps down with the first foot, then other foot. The knees must straighten with the step on the bench. The complete step represents four counts (up, up, down, down). The step is done at a cadence of 96 counts/min or 24 complete step executions/min (one four-count step every 2.5 s). At the conclusion of 3 min, the test performer quickly sits down, and the partner counts the pulse for 1 min. Finally, the score is the total 1-min posttest pulse count.

Sit-ups test (muscular endurance) with hands behind neck is to measure muscular endurance, and suitable for five through adulthood age level (Miller, 2002). The hands are interlocked behind the performer's neck, the elbows are touched to the knees, and the performer must return to the full lying position before starting the next sit-up. The performer should be cautioned not to use the arms to thrust the body into a sitting position. Finally, the score for the test is the number of sit-ups correctly performed during the 60 s. Incorrect performance for the modified sit-ups test includes failure to keep the hands interlocked behind the neck, failure to touch the knees with the

elbows, and failure to return to the full-lying position.

The BMI (body composition) has been found to correlate with health risks (Miller, 2002). In this study, the BMI for each participant is computed with weight in kilograms divided height in meters [BMI = weight (kg)/height (m²)]. In general, a BMI of 20 to 25 is associated with lowest risk of health problems, and health risks increase as the BMI increases. BMI values above 27.3 for females and 27.8 for males are indicators of excessive weight and have been associated with increased risks for several health problems, including high blood pressure and diabetes. Individuals with BMI greater than 30 are considered obese, and anyone with a BMI greater than 40 is considered morbidly obese and in need of medical attention.

Procedure

Apre-post experimental study was conducted to identify the effects of ABOXERCISE on cardiovascular endurance, muscular endurance, and BMI level in 30- to 40-year-old inactive obese (BMI level more than 30) males. All participants were engaged in 3 days per week for 24 weeks of training program. During the initial meeting, the participant underwent a health-screening test before they engaged in this exercise program. All participants were free from any injuries and health problems. They had only performed some physical activities that were less than 1 hour per week for at least a year before intervention program (Ashira, Ratanavadee, Alongkot, &

Katarina, 2010). Next, all participants were asked to complete 3 days per week of ABOXERCISE program conducted by the certified instructor with sports science background. Overall, the ABOXERCISE covered 60 min including warm-up and cool down session or approximately 40 min only for ABOXERCISE.

RESULTS AND DISCUSSION

The preliminary assumption was normally distributed and a paired samples *t*-test was conducted to evaluate the effects of 24 weeks of ABOXERCISE on BMI level, muscular endurance with number of sit-ups and cardiovascular endurance as measured by heart rate measurement with step test in 30- to 40-year-old obese males. Table 2 shows that there was a statistically significant decrease in BMI level from pretest ($M = 33.00$, $SD = 1.21$) to posttest ($M=29.46$, $SD=1.05$), $t(19) = 17.80$, $p < 0.001$ (two tailed). The mean decrease in BMI level was 3.54 with a 95% confidence interval ranging from 3.13 to 3.96. The eta-squared statistic (.94) indicated a large effect size.

Table 2 shows that there was a statistically significant increase in number of sit-ups test scores from pretest ($M = 25.05$,

$SD = 7.19$) to posttest ($M=35.40$, $SD=2.70$), $t(19) = -6.22$, $p < 0.001$ (two tailed). The mean increase in number of sit-ups test scores was 1.66 with a 95% confidence interval ranging from -13.83 to -6.87. The eta-squared statistic (.60) indicated a large effect size.

There was a statistically significant decrease heart rate measurement with step test scores from pretest ($M = 126.00$, $SD = 15.34$) to posttest ($M=98.00$, $SD=2.70$), $t(19) = 7.85$, $p < 0.001$ (two tailed) in Table 2. The mean decrease in heart rate levels was 3.57 with a 95% confidence interval ranging from 20.54 to 35.46. The eta-squared statistic (.76) indicated a large effect size.

The results particularly showed that the BMI level reduced tremendously for the participants. Moreover, the cardiovascular endurance as measured by heart rate measurement with step test and muscular endurance as measured by the number of sit-ups correctly performed were increased significantly from pretest to posttest. The results have confirmed that using high beat music during variety of exercise like boxing and abdominal exercise improves physical and health performance (Karageorghis & Terry, 2001; Pentelic et al., 2013; Petrofsky et al., 2003; Szasz et al., 2002).

Table 2
Comparison of body mass index levels, number of sit-ups and heart rate measurement with step test for pretest and posttest

Measure	Pretest		Posttest		<i>t</i>	<i>p</i>	ES
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
BMI Level	33.00	1.21	29.46	1.05	17.80	<0.001	0.94
Number of Sit- ups	25.05	7.19	35.40	2.70	-6.22	<0.001	0.60
Heart Rate	126.00	15.34	98.00	5.29	7.85	<0.001	0.76

Note: ES = Eta Squares

CONCLUSION

The present study revealed that the combination of abdominal exercise and boxing movements (ABOXERCISE) improved the cardiovascular endurance, muscular endurance, and BMI level in 30- to 40-year-old obese males. The results particularly showed that cardiovascular endurance (as measured by YMCA step test) and muscular endurance (as measured by sit-ups test) increased significantly from pretest to posttest. Moreover, the BMI also reduced tremendously for the participants. The results have confirmed that using high beat music during exercise improves physical and health performance (Karageorghis & Terry, 2001; Pentelic et al., 2013). The benefits to combine the abdominal exercise (e.g., Petrofsky et al., 2003; Szasz et al., 2002) and boxing movements accompanied by the music seems to be not only another approach to improve BMI level, cardiovascular and muscular endurance but also to learn some of self-defence techniques (Brudnak et al., 2002; Fong & Ng, 2012; Fong et al., 2012; Fukuda et al., 2013; Hosiso et al., 2013; Jackson, Edgington, Cooper, & Merriman, 2012; Melhim, 2001; Ossanloo et al., 2012; Pons Van Dijik et al., 2013; Tsang et al., 2009; Violan et al., 1997; Yoshimura & Imamura, 2010). Therefore, exercise practitioners and aerobics dance instructors may consider suggesting ABOXERCISE to their clients as an effective approach to promote health wellbeing and decrease the percentage of obese people in Malaysia (Noor Hasliza et al., 2016).

In conclusion, this study finding suggests the effectiveness of ABOXERCISE on cardiovascular endurance, muscular endurance, and BMI level of obese male communities. Therefore, future researchers may differ from other samples, study designs that compares between two groups, number of exercises and duration of the intervention. In fact, the physiological and psychological state of the participants may also be considered for future studies in order to find the effectiveness of ABOXERCISE intervention.

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REFERENCES

- American College of Sports Medicine. (2014). *ACSM's guidelines for exercise testing and prescription* (9th ed). Philadelphia, PA: Wolters Kluwer/Lippincott Williams & Wilkins.
- Ashira, Hl., Ratanavadee, N., Alongkot, Ei., & Katarina, T. B. (2010). Effect of once a week endurance exercise on fitness status in sedentary subjects. *Journal of the Medical Association of Thailand*, 93(9), 1070–1074.
- Andrew, M. P. (2006). The emerging epidemic of obesity in developing countries. *International Journal of Epidemiology*, 35(1), 93–99.
- Brudnak, M., Dundero, D., & Van Hecke, F. (2002). Are the 'hard' martial arts, such as the Korean martial art, Taekwondo, of benefit to senior citizens? *Medicine Hypotheses*, 59(4), 485–491.

- Cakmakci, E., Arslan, F., Taksin, H., & Cakmaci, O. (2011). The effects of aerobic dance exercise on body composition changes associated with weight change in sedentary women. *Selcuk University Journal of Physical Education and Sport Science*, 13(3), 298–304.
- Cox, J. C. (1993). Traditional Asian martial arts training. *A Review Quest*, 45, 366–388.
- Dishman, K., & Washburn, A. (2004). *Physical activity epidemiology*. Champaign: HK
- Fong, S., & Ng, G. (2012). Sensory integration and standing balance in adolescent taekwondo practitioners. *Pediatric Exercise Science*, 24(1), 142–151.
- Fukuda, D. H., Stout, J. R., Kendall, K. L., Smith, A. E., Wray, M. E., & Hetrick, R. P. (2013). The effects of tournament preparation on anthropometric and sport-specific performance measures in youth judo athletes. *Journal of Strength Conditioning Research*, 27(2), 331–339.
- Grant, S., Todd, K., Aitchison, T., Kelly, P., & Stoddart, D. (2004). The effects of a 12 week group exercise programme on physiological and psychological variables and function in overweight women. *Public Health*, 118(1), 31–42.
- Hosiso, M., Rani, S., & Rekoninne, S. (2013). Effects of aerobic exercise on improving health related physical fitness components of Dilla university sedentary female community. *International Journal of Scientific and Research Publications*, 3(12), 2250–3153.
- Jakubec, A., Stejskal, P., Kovacova, L., Elfmark, M., Rehova, I., Botek, M., & Petr, M. (2008). Changes in heart rate variability after a six month long aerobic dance or step – dance programme in women 40–65 years old: The influence of different degrees of adherence, intensity and initial levels. *Acta University Palacki Olomuc Gymn*, 38(2), 35–44.
- Jackson, K., Ediginton-Bigelow, K., Cooper, C., & Merriman, H.A. (2012). Group Kickboxing program for balance, mobility, and quality of life in individuals with multiple sclerosis: a pilot study. *Journal of Neurologic Physical Therapy*, 36(3), 131–137. doi:10.1097/NPT.0b013e3182621eea
- James, P. T., Leach, R., Kalamara, E., & Shayeghi, M. (2001). The worldwide obesity epidemic. *Obesity: A Research Journal*, 9(11), 2285–2335. doi:10.1038/oby.2001.123
- Jorgic, B., Pantelic, S., Milanovic, Z., & Kostic, R. (2011). The effects of physical exercise on the body composition of the elderly: A systematic review. *Facta Universitatis, Series: Physical Education and Sport*, 9(4), 439–453.
- Karageorghis, C. I., & Terry, P. C. (2001). The magic of music in movement. *Sport Medicine Today*, 5, 38–41.
- Kimura, R., & Hozumi, N. (2012). Investigating the acute effect of an aerobic dance exercise program on neuro-cognitive function in the elderly. *Psychology Sport Exercise*, 13(5), 623–629.
- Leelarungrayub, D., Saidee, K., Pothongsunun, P., Pratanaphon, S., Yankai, A., & Bloomer, R. J. (2011). Six weeks of aerobic dance exercise improves blood oxidative stress status and increases interleukin-2 in previously sedentary women. *Journal of Bodywork and Movement Therapies*, 15(3), 355–362. doi:10.1016/j.jbmt.2010.03.006
- Melhim, A. F. (2001). Aerobic and anaerobic power responses to the practice of taekwon – do. *British Journal of Sports Medicine*, 35(4), 231–234. doi:10.1136/bjism.35.4.231
- Milanovic, Z., Pantelic, S., Trajkovic, N., & Sporis, G. (2011). Basic antropometric and body composition characteristics in elderly population: A systematic review. *Facta Universitatis, Series: Physical Education and Sport*, 9(2), 173–182.

- Milanovic, Z., Sporis, G., Pantelic, S., Trajkovic, N., & Aleksandrovic, M. (2012). The effects of physical exercise on reducing body weight and body composition of obese middle aged people. A systematic review. *Health Medicine*, 6, 2175–2189.
- Miller, D. K. (2002). *Measurement by the physical educator why and how* (4th ed.). New York, NY: McGraw-Hill.
- Noor Hasliza, N., Mohd Azli, A., & Mohd Hafizi, A. (2016, June 21). 1 daripada 3 orang malaysia gemuk. *Kosmo Online*. Retrieved on October 22, 2016 from <http://www.kosmo.com.my>
- Ossanloo, P., Zafari, A., & Najar, L. (2012). The effects of combined training aerobic dance, step exercise and resistance training on body composition in sedentary females. *Annals of Biological Research*, 3(7), 3667–3670.
- Pantelic, S., Milanovic, Z., Sporis, G., & Stojanovic-Tosic, J. (2013). Effects of twelve-week aerobic dance exercises on body compositions parameters in young women. *International Journal of Morphology*, 31(4), 1243–1250.
- Petrofsky, J. S., Morris, A., Jorritsma, R., Bonacci, J., & Bonilla, T. (2003). Aerobic training during abdominal exercise with a portable abdominal machine. *The Journal of Applied Research*, 3(4), 394–401.
- Pons van dijk, G., Lenssen, A. F., Leffers, P., Kingma, H., & Lodder, J. (2013). Taekwondo training improves balance in volunteers over 40. *Front Aging Neuroscience*, 3, 5–10. doi: 10.3389/fnagi.2013.00010
- Prasanna, S. R. (2014). Twelve weeks of aerobic dance impact on cardiovascular parameters of male obese adults. *International Journal of Physical Education, Fitness and Sports*, 3(1), 51–55.
- Skelly, W. A., Darby, L. A., & Phillips, K. (2003). Physiological and biomechanical responses to three different landing surfaces during step aerobics. *Journal Exercise Physiology Online*, 6(2), 70–79.
- Szasz, A., Zimmerman, A., Frey, E., Brady, D., & Spalletta. (2002). An electromyographical evaluation of the validity of the 2-minute sit-up section of the army physical fitness test in measuring abdominal strength and endurance. *Military Medicine*, 167(11), 950–953
- Tsang, T. W., Kohn, M., Chow, C. M., & Singh, M. H. (2009). A randomized controlled trial of kung fu training for metabolic health in overweight/obese adolescents: The martial fitness study. *Journal of Pediatric Endocrinology and Metabolism*, 22(7), 595–607.
- Violan, M. A., Small, E. W., Zetaruk, M. N., & Micheli, L. J. (1997). The effect of karate training on flexibility, muscles strength, and balance in 8 to 13 year old boys. *Paediatric Exercise Science*, 9(1), 55–64.
- WHO (2003) Global strategy on diet, physical activity and health. Retrieved October 20, 2012, from <http://www.who.int/dietphysicalactivity/media/en/gsfspa>.
- Woodward, T. W. (2009). A review of the effects of martial arts practice on health. *Wisconsin Medical Journal*, 108(1), 40–43.
- Yoshimura, Y., & Imamura, H. (2010). Effects of basic karate exercises on maximal oxygen uptake in sedentary collegiate women. *Journal of Health Sciences*, 56(6), 721–726.

