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EFFECT OF LOW-IMPACT AEROBIC DANCE EXERCISE ON PSYCHOLOGICAL HEALTH (STRESS) AMONG SEDENTARY WOMEN IN MALAYSIA

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ABSTRACT: The present study investigated the effect of twelve weeks of low-impact aerobic dance exercise intervention ("aero-mass" dance exercise) on psychological health (stress) among sedentary working women, specifically in Malaysia. Sedentary participants (age range = 40 – 55 years; N = 40: BMI > 25) were randomly assigned to two groups: an intervention treatment of "aero mass aerobic dancing" and conventional low-impact aerobic dancing. Classes were held for 50 minutes, 3 days per week, for 12 weeks. Repeated measures were examined at week 1, week 8 and week 12. Mixed repeated ANOVA revealed statistically significant time effects for Total Stress Scores ($p < 0.01$) with eta square =0.59 (large effect) at week 8 and week 12. Furthermore, the time by group interaction was also statistically significant for total stress score ($p < 0.05$) with eta square = 0.18 (large effect). In addition, the result for between-subject effects indicates significant $F(1, 38)=7.74$, $p < 0.05$, eta = 0.17, and therefore there was a significant difference in the stress level scores in the intervention group compared to the control group. Subjects of the intervention group, "aero mass aerobics dancing", experienced the most benefits.

KEY WORDS: total stress score, aerobic dancing, "Aero-Mass" dance exercise, low impact

INTRODUCTION

Aerobic exercise and physical activities provide the individual with a number of lasting benefits as not only do they help to reduce depression and anxiety, but they also improve both physiological and psychological well-being, enhance work and recreation, and improve health [7,10,20,24,33]. Aerobic dance exercise is one of the most common exercise practices in the world [14]. Presently, aerobic dance in Malaysia is a popular activity, performed by small groups of all ages, and is more popular among middle-aged women than men. Music with slow or fast rhythm cadences helps to control and pace the movement of selected body segments [6], allowing for an overall body workout. As with other forms of aerobic exercise, aerobic dance performed within a target heart rate of between 60% and 70% of the maximal heart rate (MHR) has demonstrated cardiovascular and metabolic benefits such as increased maximal oxygen consumption ($\dot{V}O_2max$), improved aerobic endurance capacity, and increased energy production via the mitochondrial respiration system [2].

In addition, the World Health Organization has projected that mental ill-health, specifically depression and stress, will be second only to cardiovascular diseases as the world's leading cause of death and disability by the year 2020 [23,33]. Although people typically deal with these mood disturbances through psychological counselling, drug therapy, or both, more and more individuals are looking to exercise and physical activity to promote their psychological well-being. In fact, many researchers, clinicians, and layperson have observed that exercises and physical activity enhance feelings of well-being, particularly in reducing depression and stress and increasing vigour and improved self-esteem [18,33]. In addition, with structured regular exercise and physical activity, they will contribute positively to physical and psychological health [24,31,32]. The investigation into the relationship between physical activity and psychological well-being is not new, but questions remain as to what frequency, intensity, and duration of physical activity is most feasible and effective for affecting both physiological and psychological well-being [10].

However, the question was, at what impact and frequency will aerobic dance exercise benefit both physiological and psychological well-being? Aerobic exercise is a subdivision of physical exercise that improves cardiovascular and respiratory health. During aerobic exercise, a person rhythmically contracts his large muscle groups to move his body against gravity [22]. At the moderate level, a person will produce a slight increase in his breathing and heart rate. At the vigorous level, a person will produce a large increase in his breathing and heart rate. The amount of exercise required to produce health benefits according to Haskell [12] has to do with a dose response relationship. According to this theory, it is necessary to expend approximately 300 calories per exercise session every two to three days at a moderate level of intensity to receive substantial benefits from exercise. Exercise of a lesser dose will provide fewer to no benefits, and exercise of a greater dose will provide additional benefits.

The effects that different levels of aerobic exercise have on psychological well-being are less clear. However, the majority of research demonstrates that aerobic exercise produces similar psychological effects in people who participate in aerobic exercise at moderate levels, vigorous levels, or moderate and vigorous levels combined [30]. In this study, the researchers were interested in the effects that low-impact aerobic dance exercise has on physiological and psychological well-being variables, such as frequently studied general self-esteem, physical self-esteem, stress level, heart rate, and blood pressure. Much of the exercise literature related to psychological stress focuses on running [7,21,23], while possible psychological benefits of other types of exercise remain little known. Berger and Owen [3,4] examined the causal versus associative issue in the relationship between exercise and stress reaction. They found that swimming and jogging have similarities and that psychological results from each activity were similar. Both swimming and jogging promote abdominal breathing and they are both performed at competitive and recreational levels, are repetitive and rhythmical, and temporally and spatially predictable, that is, they are similar motor skills [17].

Generally, there are various approaches to physiological and psychological well-being. For this research, the study focused on the effects of low-impact aerobic dance exercise on psychological well-being in terms of total stress score while physiological well-being measures anthropometric variables in terms of BMI. This study will apply a quasi-experimental pre and post design to compare the effectiveness on psychological health of the low-impact aerobic dance exercise intervention among women.

MATERIALS AND METHODS

Quasi-experimental design were used to examine the effect of aerobic dance exercise on the total stress scores and BMI measured at three interval time pretest (week 1), posttest 1 (week 8) and posttest 2 (week 12) control group designs. In addition, quasi experiment design provides as much control as possible under the existing situation [8,267].

Study was carrying out in Universiti Tenaga Nasional (UNITEN) Malaysia. The research was performing on a sample of 40 overweight and sedentary working people (women) in Universiti Tenaga Nasional and Tenaga Nasional Berhad (TNB). Further to that, their age range from 40-55 years of age, subjects (n=20) were randomly assigned in control group and (n=20) were in the intervention group. The subjects of participants were chosen based on the criterion, that was, the total score stress in pre-test (TSS) had to be above its mean for the overall sample and body mass index (BMI) score in fitness test evaluation should be above 25. A fish bowl technique were use to determine assignment of intervention and control groups. The intervention group meets 3 times a week on Monday, Wednesday, and Friday at 4.30pm until 5.30pm in aerobics room while the control group met similar day and venue but at 5.30pm to 6.30pm. Group 1, the intervention group, receives treatment between the pre-test and post-test where subjects have to go through 36 sessions, 50 minutes each, 3 times per week for 12 weeks period of a new intervention low impact aerobic dance exercise (later called "Aero-mass") program as their treatment. On the other hand, Group 2, the control group, receives a conventional hi/lo aerobic exercise as their treatment. Subjects in both the experiment and control group were measured at week 1, week 8 and week 12.

The Derogatis Stress Profile (DSP) was use in this study. It is a 77-item multidimensional self-report inventory that measures stress [9]. Each item is rated on a 5-point scale ranging from zero to four. This inventory was base on the transactional model of stress. According to this model of stress, the level of stress experienced by an individual is determine by the interaction between environmental events that are stressful, his or her personality characteristics in dealing with stressful events, and his or her emotional response to the stressful events [19]. Based on this conception of stress, the DPS has been designed to assess the three major domains of stress namely, environment events, personality mediators, and emotional responses. In the environment domain, domestic satisfaction, vocational satisfaction, and health posture were asses. In the personality mediator domain, the focus is on perceived time pressure, driven behavior, attitude posture, relaxation potential, and role definition. Lastly, in the emotional domain, general hostility, anxiety, and depression were asses. The cumulative scores for all these domains, the Total Stress Score provides a quantitative estimate of the subject's current level of stress.

In addition, the items in DSP are relatively high in their consistency and stability through time . The test-retest reliability of DSP ranged from 0.72 to 0.92 for a time interval of seven days. The internal consistency coefficient of DSP ranged from 0.79 to 0.93 [9]. Reliability test for DSP has been done using the actual sample of this research. The Cronbach's alpha reliability coefficient for Total Stress Score was 0.80.

RESULTS

Results are presented in two sections. The first section focuses on the exploratory data analysis (EDA) describing the descriptive data on the independent variables, namely age, level of education, job and race, during pre-test. The second section is more directly concerned with the test of the hypothesis of the study in an attempt to answer the research questions.

Descriptive data analysis

The first set of analyses examined the impact of the descriptive data through exploratory data analysis. The purposes of examining the data in detail were to detect errors in coding during the data entry, to screen out any unusual values, to identify outliers, and to assess the normality of distribution and homogeneity of variance of the population from which samples were drawn. Forty subjects (n=40), working women between 40 and 55 years of age and not engaged in any exercise programme for a period of more than 6 months before the experiment, were identified. From a population of 74 participants who turned up to take the pre-test, only 40 participants were chosen for this study. The subjects were assigned randomly to two groups, that is the control (n=20) and the treatment group (n=20). Subjects chosen for this study were those who obtained a Total Stress Score (TSS) above the mean and those who were overweight and above according to BMI measurement. The distribution is shown in Table 1 where 25% of subjects were not married, 57.5% were married and 5% divorced. Age groups were categorized according to 3 ranges: 40–45, 32.5%; 40–45, 17.5%; and the majority of subjects were in the age range 51–55, 50%.

TABLE 1. FREQUENCY DISTRIBUTION OF MARITAL STATUS, AGE CATEGORY, JOB CATEGORY AND ACADEMIC LEVEL OF SUBJECTS

Variables	Frequency	Percentage
Martial status		
Single	10	25.0
Married	23	57.5
Divorce	5	17.5
Age Category		
40 – 45	13	32.5
46 – 50	7	17.5
51 – 55	20	50.0
Job Category		
Academician	12	30.0
Managerial/Administrator	14	35.0
Support	14	35.0
Academic Level		
PhD / Masters	11	27.5
First Degree	8	20.0
Diploma (Post Secondary School)	10	25.0
SPM/MCE (GCE O-level)	11	27.5
Race		
Malay	31	77.5
Chinese	6	15.0
Indian	3	7.5

From the total number of subjects involved in this research, 30% were Academics, 35% were Managerial/Administrators, and 35% were Support staff, who came from private, and government organizations. Subjects with a PhD / master degree made up 27.5%, those with a first degree 20%, Diploma 25.0 %, and SPM/MCE (GCE O-level) 27.5%.

Scores were classed as follows: Body Mass Index (BMI) > 30 = Obese, 24–29 = Overweight, 19–24 = Healthy range and < 19=Underweight. Total Stress Score (TSS) was used to reflect the level of stress among the subjects before the treatment. The variable is quantitative in nature and summarized using mean and standard deviations. The descriptive statistics for the Total Stress Score is in Table 2. The lowest possible score for each item is zero whereas the highest possible score for each item is four. Since there are 77 items in the Derogatis Stress Profile (DSP), the total possible scores from the data collected can range from zero to 308.

The distribution of the mean is clearly described in Figure 1 for both BMI score and TSS during the pre-test. Mean BMI was 28.85 for the treatment group and 28.95 for the control group at week 1.

Table 3 shows the percentage of all dependent variables, their normality and homogeneity. All variables were found to be statistically non-significant in the Kolmogorov-Smirnov test of normality therefore; it is significantly normal on the entire body mass index (BMI) and total stress score (TSS) variable. In addition, it is apparent from Table 3 that the percentage of all the dependent variables in the test for homogeneity using the Levene statistic is non-significant ($p > 0.05$); therefore all the variances were equal.

Statistical analysis

To examine both the research questions, mixed between-within subjects ANOVA design was used [29] “Mixed between-within subjects ANOVA” was used because it includes more than one measure for each person. Thus, covariance, which involves deviations from

TABLE 2. DESCRIPTIVE STATISTICS SCORES FOR DEPENDENT VARIABLES DURING PRE-TEST FOR BOTH TREATMENT AND CONTROL GROUP

VARIABLES	CONDITION	n	Mean	5% Trimmed Mean	Median	Skewness Std Error	Kurtosis Std Error
Pre BMI							
	Experimental	20	28.85	28.83	28.50	0.512	0.992
	Control	20	28.95	28.88	29.00	0.512	0.992
Pre TSS							
	Experimental	20	161.90	161.83	161.00	0.512	0.992
	Control	20	162.05	161.94	162.00	0.512	0.992

Notes: n = no. of subjects; BMI = body mass index standard score, TSS = total stress scores.

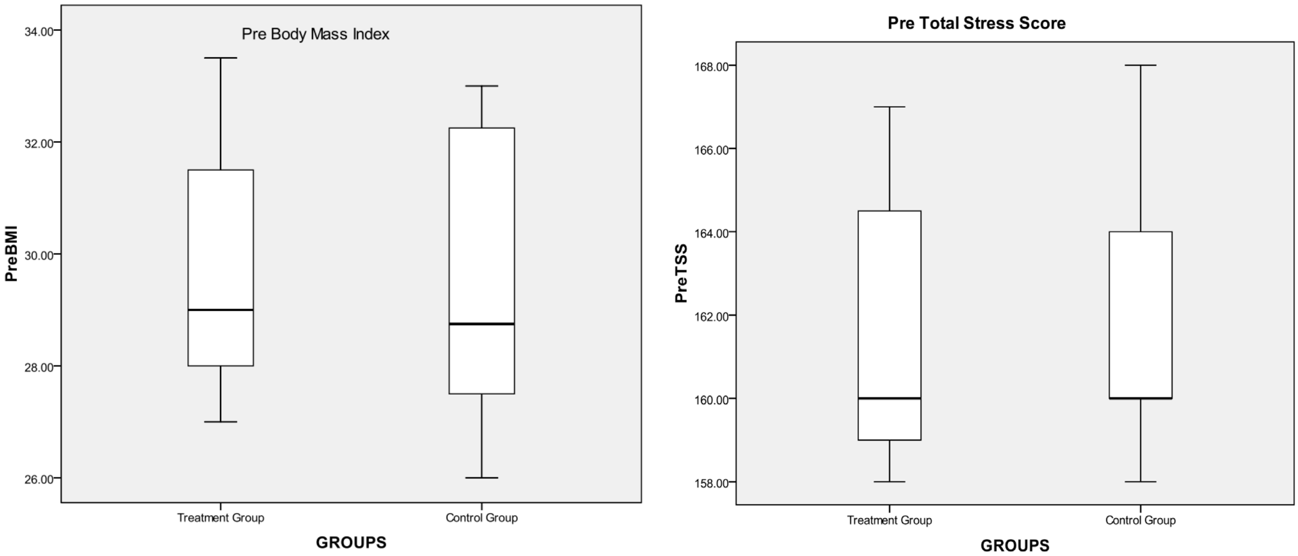

FIG. 1. BOX PLOT OF MEAN BMI AND TSS (DEPENDENT VARIABLES) DURING PRE-TEST FOR BOTH TREATMENT AND CONTROL GROUP

TABLE 3. TEST OF NORMALITY AND HOMOGENEITY OF VARIANCE OF DEPENDENT VARIABLES DURING PRE-TEST FOR BOTH TREATMENT AND CONTROL GROUP

		TEST OF NORMALITY			TEST OF HOMOGENEITY OF VARIANCE			
VARIABLES	CONDITION	Kolmogorov-Smirnova			Levene Statistic			
		Statistic	df	Sig	Statistic	df 1	Df 2	Sig
Pre BMI	Treatment	0.168	20	0.14	0.758	1	38	0.39
	Control	0.158	20	0.20				
Pre TSS	Treatment	0.174	20	0.11	0.495	1	38	0.49
	Control	0.134	20	0.20				

TABLE 4. DESCRIPTIVE STATISTICS ON TOTAL STRESS SCORE BETWEEN TIME (PRE-TEST, POST-TEST 1 AND POST-TEST 2) AND GROUPS (TREATMENT AND CONTROL GROUP)

Measure	GROUPS	TIME	Mean	Std. Deviation	N
PRE-STRESS (TSS)	Treatment Group	1	161.90	2.85	20
	Control Group	1	162.05	2.61	20
Posttest 1 STRESS (TSS)	Treatment Group	2	156.45	2.63	20
	Control Group	2	158.90	3.53	20
Posttest 2 STRESS (TSS)	Treatment Group	3	151.75	2.73	20
	Control Group	3	156.45	3.44	20

TABLE 5. MIXED BETWEEN-WITHIN SUBJECTS ANOVA: STRESS LEVEL BETWEEN TIME (PRE-TEST, POST TEST 1 AND POST TEST 2) AND GROUPS (TREATMENT AND CONTROL)

STATISTIC	Value	F	sig.	Eta square
Multivariate Test (Within Subject Effect) Wilks' Lambda				
Time	0.066	263.79	p<0.001	0.93
Time*Subject	0.432	24.29	p<0.001	0.56
Between-Subject Effect		8.04	p<0.01	0.175

the mean of each of two measures for each person, also exists, and these covariances need to meet certain assumptions as well. The homogeneity assumption for repeated measure designs, known as sphericity, requires equal variances and covariance for each level of the within subjects variable.

Descriptive statistics on Total Stress Level the dependent variables were analysed and it is presented in Table 4. There was a difference in mean for post test 1 and post test 2 between treatment and control groups. Further to that, multivariate test results indicate that there was a significant main effect for time on total stress score (TSS), Wilks' Lambda = 0.406, F (2, 37) = 27.044, p< 0.01, eta square = 0.594. This suggests that there was a change in stress

TABLE 6. PAIRWISE COMPARISON MEASURING TOTAL STRESS SCORE (TSS) FOR THREE INTERVAL TIMES AND TWO GROUPS

(I) TIME	(J) TIME	Mean Difference (I-J)	Std. Error	Sig.
Week 1	Week 2	4.30*	0.38	p<0.001
	Week 3	7.87*	0.41	p<0.001
(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	Sig.
TREATMENT	CONTROL	-2.43	0.85	p<0.001

level of statistic scores across the three different times and results suggest a very large effect size. Further to that, the interaction effect between time and subjects was also statistically significant, where Wilks' Lambda = 0.824, $F(2,37)=3.942$, $p<0.05$, eta square=0.176. Using guidelines proposed by Cohen [5] (0.01=small effect, 0.06=moderate effect, 0.14=large effect) this result suggest a large effect size. This suggests that 17.6% of the variability in the total stress score (TSS) was associated with the treatment after the variability caused by individual differences was removed.

In addition, results for between-subject effects indicate that $F(1,38)=7.74$, $p<0.05$, eta$=0.17$. Since p is less than alpha level 0.05, the interaction main effect between groups was statistically significant. There was a significant difference in the total stress scores for the two groups (treatment and control groups). However, examination of the means suggests that the change in the outcome variable (TSS) only held for the intervention group and the eta-squared value was 0.17, indicating a large effect. This is clearly illustrated in Figure 2, where the treatment group improved significantly during week 12 or post test 2. Further illustration is presented in Table 5, the mixed between-within subjects ANOVA for Dependent Variables TSS.

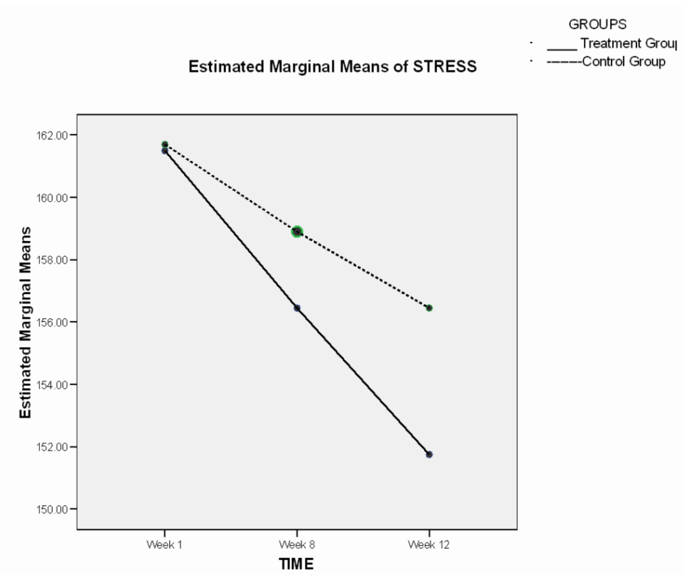

FIG. 2. ESTIMATED MARGINAL MEANS OF TOTAL STRESS SCORE (TSS) DURING THREE TIME INTERVALS AT WEEK 1, WEEK 8, AND WEEK 12

Table 6 presents the pair-wise comparison. Results show a statistically significant difference ($p < 0.05$) at the 3 time intervals, week 1, week 8 and week 12. The mean difference between week 1 and week 8 was 4.30% decrease of the total stress score (TSS) while at week 8 to week 12 total stress score decreased by mean=3.57%. The total mean difference decrease in TSS was 7.87. Results also indicate that the decrease of the TSS showed a significant ($p < 0.01$) linear trend from week 1 to week 12. However, pair-wise comparison between the treatment group and control group shows a statistically significant difference ($p < 0.05$) between the treatment group and control group. The treatment group with aero mass intervention had a mean difference of 2.433 compared to the control group. Therefore, the treatment group benefited more than the control group.

DISCUSSION

The purpose of this study was to determine the effect of low-impact dance exercise intervention on changes in BMI and psychological health, specifically stress on sedentary overweight employed women. It was hypothesized that the group undergoing the low-impact aerobic dance would gain significantly improved psychological health in terms of stress as opposed to the conventional aerobic dance routine in the control group. The results supported the research hypothesis.

With respect to psychological health, the intervention group had a greater improvement in total stress level at the end of the 12-week programme than the control group. The success of the low-impact dance routine programme in the present study was likely due to the application of embodiment movement forms (a form of somatic movement), martial arts, breathing arts and dance forms making use of local dance music, for the treatment group. This result can be explained by the fact that a larger amount of total work is accomplished with the link between music and the attainment of flow state during aerobic dance exercise [15]. Flow involves an altered state of awareness during physical activity in which the mind and body function on "auto-pilot" with minimal conscious effort and it is almost trance-like (semi-conscious state, in which the ability to function is voluntarily suspended). Flow has been associated with optimal psychological states and represents complete enjoyment of and immersion in physical activity [14].

The findings of the present study are also important because the inclusion of three-embodiment movement form was introduced into the training regimen without adding extra time to the overall exercise programme. Times devoted to three-embodiment movement form were replaced and implemented during the cardiovascular, muscle conditioning and the cooling down phases by using the aerobic dance exercise manual [1]. Since most exercisers are eager to get the best fitness programme possible for limited time investment, the evidence that a combination programme can improve both fitness and psychological well-being is noteworthy.

It would be reasonable to suggest that the psychological health of the subjects in the current study may have improved because they felt that they were taking positive steps to improve their physical and psychological health. Whether exercise produces increased self-efficacy, thereby improving all aspects of self-esteem, including stress, is open to speculation. While the results of this study do not prove that a decrease in BMI causes psychological well-being to improve, the present results do reveal that the improvements attained after the exercise programme concerned both psychological health and BMI.

Kern and Baker [16,17] compared the effect on women of using a mind/body approach in teaching aerobics classes versus a conventional approach on the following variables: general self-esteem, physical self-esteem, and state-trait anxiety in 68 female college students. The experimental treatment group received a mind/body teaching approach based on the neuromuscular integrative action model while the standard treatment control group received a conventional teaching approach based on current aerobic dance instructional methods. Although in that study there were no significant changes in general self-esteem as a result of the seven-week exercise sessions , several studies have shown improvements in general self-esteem following exercise studies ranging in duration from 12 weeks to one-year programmes [27,28]. The study by Kern and Baker [17] was seven weeks. This indicates that a seven-week treatment period may not be sufficient to result in changes in self-esteem.

Further to the discussion, it would be reasonable to suggest that the psychological health of the participants in the current study may have improved because of the effect of music. Zilonka [34] studied the effect of music programming on walking pace using commercial exercise tapes that purport to be able to programme the speed of walking. The results showed that music does influence stride frequency. This finding corroborates the ideas of Schwartzmiller [25] on the effect of music tempo on aerobic exercise. The researcher varied the tempo of the music played in the background during aerobic exercise. The faster the music's tempo, the higher the power output, and these findings further support the idea of Kapingst [13] on the effect of music components on exercise. Additionally, in the study by Gordon [11] on the effect of music tempo on spontaneous exercise intensity, the beat frequency of music used during a cardiac-rehab chair-aerobics class was experimentally sped up by 33%. The results are consistent with those of other studies and suggest that a higher tempo/beat frequency does motivate the subjects: heart rate increased by 10 to 15 beats per minute and ratings of perceived exertion (RPE) increased significantly with music tempo.

Music can encourage people to exercise harder and can reduce the perception of effort significantly and increase endurance by as much as 15% [15]. Music may have a considerable effect on enjoyment levels during exercise among the intervention group, resulting in good attendance, and selecting the right music may be the key factor in maintaining adherence to exercise among them [14,15].

CONCLUSIONS

In summary, this research will serve as a base for future studies and developments. Studies should focus not only on the benefits of the psychological aspect but also on the methods used to facilitate dissemination of present and future knowledge in Malaysia. Although some inconsistencies still exist and much research remains to be done, the pursuit of exercise therapy to treat high stress levels and overweight among working women is well underway. All of these research efforts work towards improving the future of preventative medicine and achieving better well-being and lifestyle of employed women suffering from high stress levels to improve performance and increase productivity in their career. In short, a low-impact exercise routine is indeed simple and cost-effective. It is a fun and safe way to exercise for people from all lifestyles. Ultimately, a low-impact exercise routine improves the population's physiological and psychological well-being as it promotes quality of life.

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