The Effects of Aerobic Exercise on Neuro-Related Hormones in Community Dwelling Women

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Abstract—**Moderate exercise that causes maximal oxygen consumption between 50% and 70% has long been shown to promote cardiopulmonary functions and perceptional health. It remains to be determined whether different moderate exercises have different effects on neuro-related hormones (ACTH, AGPR, CNFT, FSH, GH and LH levels). This study was conducted to investigate whether a regular music aerobic exercise (MAE) had similar or different effects on neuro-related hormones before and after a 12-week exercise. Forty middle-age women were recur ited for this study, thirty eligible for regular weekly MAE schedule were enrolled into the experimental group and completed pre- and post-test. The other 10 participants who were not eligible to the MAE schedule were enrolled into the parallel control group without exercise. Results showed that the MAE exercise for 12 weeks did not change ACTH, AGRP, CNTF or LH, but selectively improved FSH ($p = .07$) and GH ($p < .001$). The parallel control group without exercise revealed insignificant change of ACTH, AGPR, CNFT, FSH, GH and LH levels. This study shows that music aerobic exercise increases blood FSH and GH levels. It may be worthwhile to encourage MAE exercise for middle-age adults to promote neuro-related hormones.**

Index Terms—**Music aerobic exercise, neuro-related hormone, middle aged and elder women, randomized clinical trial, community.**

I. Introduction

Most studies evaluating the effects of exercise on mental health have been done with short-term exercise, small sample size, college students, and school settings in Taiwan. Few studies have been done using randomized trial, intention to treat the sample, or measurement of physiological indices. The effects of aerobic exercise on neuro-related hormone have not been well studied, and few studies have been applied to community dwelling and long-term care middle aged and elder women. How and what mechanism does exercise improve neuro-related hormone requires further studies. Our previous studies found that regular Tai-Chi chuan exercise for 12 weeks could promote functional mobility and health perception [1], enhance ulnar nerve conductivity [2], and enhance immunity [1-3]. This study involves another moderate form of exercise "music aerobic exercise" (MAE) which is easy to learn and practice [4]. The aim of this study address the effects of MAE on neuro-related hormones (ACTH, GH, AGPR, TSH, FSH and LH levels) in community dwelling middle aged and elder women.

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II. Research Design and Sampling

The experimental research design was utilized to examine the effect of MAE on neuro-related hormones. We recruited 34 community participants for randomly assigned into MAE and control groups. The experimental group received a regular schedule of MAE, while the control group followed up their original life style without regular exercise. One pre-test and one post-exercise test on neuro-related hormones were done. All participants signed an informed consent form prior to participating in this study.

III. Measures

The participants had blood drawn (10 ml) to measure hormone levels and assessments of demographic characteristics before exercise, 12 weeks after the MAE to detect the changes of outcomes indicators.

A. Luminex^{100} Assay

The neuro-related hormones were measured by Luminex^{100} assay. A standard capture sandwich assay was developed with the Luminex Flowmetrix system (Luminex, Austin, Tex.) to determine the levels of chemokines in serum. Each capture antibody was coupled to a different bead set (#HBDP- 33K, Milliplex® MAP, U. S. A.). The assay was performed by our co-investigator's laboratory where they routinely measure the cytokines and other serum factors using 25ul for measurement of 8 to 20 parameters [5]. The precision of the Luminex 100 measurement was reported as misclassification of microspheres < 0.5%.

B. Music Aerobic Exercise

MAE is referred to "rhythm exercise through music temperament" [4]. Each MAE session was given to 60 minutes with a warm-up stage including rhythm exercise during 2 soft music songs, an active exercise with 6 faster tracks, and a cool-down stage with 2 slow music songs. The MAE sessions were given three times a week from 7:30 PM to 8:30 PM. The exercise intensity of the MAE session was classified into moderate exercise as estimated by relation to percentage of maximal oxygen consumption (VO_2max)

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based on the percentage of maximal heart rate (HRmax, 220-age beats/min), corresponding to percentage of the heart rates (HR) in MAE practicing period versus age-adjusted HRmax [6]. In the beginning of the study, we measured the heart rates of 10 participants in resting (before MAE exercise) and the peak exercising HR during the MAE practicing period using a wireless HR monitor (Polar FT4™ Training Computer, Polar Electro Inc., Finland). The mean resting HR was 83.6 beats/min, the mean peak exercising HR was 137.2 beats/min and the age-adjusted HRmax was 166.3 beats/min. As calculated from these data, the mean percentage of HRmax was 64%, corresponding to VO_2max 55% and classified into moderate intensity exercise [6,7].

IV. Data Analysis and Saatistics

Data from this study were coded, double checked, and analyzed using descriptive analysis and t-test. Differences of neuro-related hormones before and after MAE were analyzed by using the Statistical Package for Social Sciences (SPSS Inc., Chicago) version 17.0 for Windows. A p value of 0.05 or less was considered statistically significant.

V. Research Results

A. Demographic Characteristics of the Participants in Two Groups

Forty women were recruited for this study. Thirty accessible to the exercise schedule were enrolled into the experimental group and 22 completed the pre- and post- tests. The other 10 participants who were not eligible to the MAE schedule were enrolled into the parallel control group and 9 completed the pre- and post- tests. For the experimental group, the average age was 48.59 ± 9.82 (36y-75y) years, the average height was 159.3 ± 5.27 cm, average weight was 59.83 ± 11.05 Kg, and the BMI was 23.51 ± 3.83. For the control group, the average age was 50.44 ± 11.52 years, the average height was 157.33 ± 4.72 cm, average weight was 55.83 ± 9.21 Kg, and the BMI was 22.50 ± 3.16.The age, height, weight or BMI was insignificantly different between both groups ($p > .05$).

B. Neuro-Related Hormones between Experimental Group and Control Group before Study

Neuro-related hormones (ACTH, GH, AGPR, TSH, FSH and LH) were not significantly different between experimental group and control group before exercise (See Table 1).

C. Comparison of Neuro-Related Hormones between Pre-Test and Post-Test among Experimental Group and Control Group

After the 12- week MAE, we found that GH was significantly increased ($p < 0.01$) in the experimental group (Table 2). The FSH levels also revealed a borderline increase ($p = 0.07$) in experimental group. In contrast, other hormones including ACTH, AGPR, TSH, and LH levels were insignificantly changed after MAE exercise ($p > 0.05$).

TABLE I: The Comparison of Neuro-Related Hormones between Experimental Group and Control Group before Study

Items	Group	N	Mean	Std. Deviation	Std. Error	*p* value
ACTH	Control	9	17.80	25.55	8.52	
	Experimental	28	64.78	241.65	45.67	0.57
AGRP	Control	9	34.93	13.69	4.56	
	Experimental	28	31.87	13.71	2.59	0.56
CNTF	Control	9	744.67	887.34	295.78	
	Experimental	28	1110.87	3081.45	582.34	0.73
FSH	Control	9	71.27	52.18	17.39	
	Experimental	28	62.67	68.80	13.00	0.73
GH	Control	8	325.01	785.76	277.81	
	Experimental	28	595.63	1189.53	224.80	0.55
LH	Control	9	11.80	7.97	2.66	
	Experimental	28	10.32	9.47	1.79	0.68

TABLE II: The Comparison of Neuro-Related Hormones between Pre-Test and Post-Test among Experimental Group and Control Group

Parameters	Control group				
	pre-test		post-test		
	Mean	SD	Mean	SD	*p* value
ACTH (pg/mL)	17.80	25.55	22.91	36.32	0.26
AGRP (pg/mL)	34.93	13.69	32.75	14.17	0.37
CNTF (pg/mL)	744.67	887.34	740.44	803.08	0.99
FSH (mIU/mL)	71.27	52.18	52.65	41.52	0.16
GH (pg/mL)	325.01	785.76	790.57	1105.1	0.40
LH (mIU/mL)	11.80	7.97	10.27	7.85	0.36
Parameters	Experimental group				
	pre-test		post-test		
	Mean	SD	Mean	SD	*p* value
ACTH (pg/mL)	64.78	241.65	43.89	150.86	0.26
AGRP (pg/mL)	31.87	13.71	32.24	13.19	0.82
CNTF (pg/mL)	1110.87	3081.45	1024.91	2724.6	0.45
FSH (mIU/mL)	62.67	68.80	71.78	76.62	0.07
GH (pg/mL)	617.43	1206.5	1616.0	1795.8	0.00
LH (mIU/mL)	10.32	9.47	12.05	10.33	0.12

VI. Conclusion

This study found that a regular MAE three times a week for 12 weeks which presented 64% of HRmax (55% VO2max) caused an increase in FSH and GH, but not ACTH, AGRP, BDNF, CNTF or LH. The parallel control group without exercise revealed insignificant change of neuro-related hormones. This study model and outcomes of music aerobic exercise will be applied and extended to encourage middle aged adults to regularly exercise and

improve neuro-related hormones.

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