

The Effectiveness of Combining Aerobic Dance and Hatha Yoga on Catecholamine and Beta-Endorphin Hormones and the Level of Performance in Motor Expression

By

Dr. Hager Abdel Hady Al-Sayed Abdel Latif

Lecturer Dept. of Training Motor Expression and Motor Rhythm
, Faculty of Physical Education for Girls
, Cairo Helwan University.

Abstract

The academic study is an important phase in forming the individuals' future life where girls meet stressful studying events leading to anxiety, tension and low studying attainment and consequently studying at the college becomes disliked.

Several scientists agreed that when the individual met a stressful situation a signal was sent via sympathetic nervous system to secrete catecholamine from the adrenal gland. Adrenalin is secreted by 80% and noradrenalin by 20% to help body face emergencies and physical stress positively.

Practicing sports regularly helps increase producing some chemical substances and support their effects on the body. Such substances include endorphin which reduces the effect of adrenalin and hence assisting in removing tension and upgrading moral spirit and feeling positivity and happiness.

Having reviewed Arabic and foreign researches in this field, the researcher noticed that aerobic dance and yoga programs were used separately to identify their effect on some psychological physiological and the level of performance in girls and hence, she decided to consider this research to combine benefits of aerobic dance and yoga in one program to know its effect on the level of adrenaline and beta-endorphin hormones and the level of physical and skill performance in motor expression in girls.

The researcher used the experimental method to achieve the research objective and its hypotheses through a layout of the pre and post-measurements of one experimental group and a control group to suit the nature of the research. The research sample was selected intentionally from girls in the 3rd grade and included (30) girls by (54.9%) forming (10) girls as the experimental group, (10) girls as the control group and (10) girls for the pilot study.

The program of combining aerobic dance and hatha yoga was applied for (10) weeks including (30) training units by (3) training units per week. Time of the training unit was graded from (30 to 60) min. The training load was increased from the lower limit of 65% to the upper limit of 85% of pulse rate.

The results showed that the program of combining aerobic dance and hatha yoga had a positive effect on the level of adrenaline and beta endorphin hormones, the level of performance in motor expression and elements of flexibility and muscular strength. It was recommended that aerobic dance and hatha yoga be used within training programs for athletics in different sports and for male and female students at faculties of physical education to upgrade the level of performance.

The academic study is an important phase in forming individuals' future life as it qualifies them to be good members and producers in their society. Ali Badran and Farouk Al-Sayed thought that psychological stresses girls met at colleges due to stressful studying events; however, it represented an introductory period to know themselves, it led to anxiety, distress, depression, lack of ability to concentrate attention and low academic attainment (13:28) (14: 30).

Several scientists agreed that when the individual met stressful situations a signal is sent via the sympathetic nervous system leading to secrete catecholamine from the adrenal gland and adrenalin is secreted by 80% and noradrenalin by 20% (2: 83).

Increasing adrenalin leads to several physiological variations such as increasing the number of heart beats and blood pressure due to contracting arteries and veins that may cause brain hemorrhage or stroke or may effect on eye blood vessels leading to sudden blindness as well as increasing blood sugar and consequently the power of the body is increased. Raising muscle tension is considered one of the factors that hinders the speed of motor performance and causes movements to slow down with the result that the method of physical performance will be imperfect. This extra power can be released by physical exercises (17: 155) (29).

Practicing sports regularly helps secrete beta endorphin hormone that is increased in blood after performance thus reducing the effect of adrenalin and regulating several physiological functions such as body temperature lowering pains and tension and the sense of fatigue resulting from effort or injury and consequently, moral spirit and the sense of positivity and happiness are increased (22: 254) (30).

Beta-endorphin is secreted in response to the physical effort of moderate intensity lasting 20 min. and more like aerobic dance or the low intensity effort like yoga (29).

Dance is considered as the best treatment of numerous daily life problems. It is a temporary exit to a world full of joy on a musical rhythm and it works on occurring physiological variations and the most important of them is removing adrenalin resulting from tension from blood course to muscles where it is consumed during performance and its rate in blood is diminished and thus lowering its effect on the sympathetic nervous system that is responsible for increasing emotion and tension; however, it works on producing beta-endorphin that lowers pain and responsible for the state of cheerfulness and pleasure (9: 2) (30).

Practicing hatha yoga is an excellent means to achieve the individual's internal homogeneity. It is a sensitive mental and spiritual sport that helps mind and body relax and has compound benefits as it develops physical fitness components such as flexibility and strength in addition to achieving muscular relaxation that plays an important role in maintaining the optimal level for physical performance and some physiological variations as it increases the percentage of oxygen and beta-endorphin in blood whereas adrenalin is decreased leading to remove tension and anxiety and to increase the sense of comfort and happiness (12: 103) (16: 64, 67) (17: 155) (31).

Research problem:

The researcher noticed while working in Department of Training Motor Expression and Motor Rhythm as a Lecturer Dr. that girls have a sense of heavy anxiety and tension particularly in last grades due to the study burden and there is no enough time to exercise skills and assigned motor schedules beside the

burden of the graduate project affecting negatively the level of their physical and skill performance.

Having reviewed Arabic and foreign researches in this field, the researcher noticed that aerobic dance and yoga programs have been used separately to study their effect on some psychological and physiological variables with the exception of the research of Mayada Al-Akhdar who introduced their effect on psychological and skill aspects of rhythmic exercises only, in addition, such researches have not discussed their effects on beta-endorphin that encourage the researcher to consider current research to combine benefits of aerobic dance and yoga in one program to know its effect on the level of catecholamine and beta-endorphin hormones and the level of physical and skill performance in motor expression.

Research objective:

The objective of the current research was to identify the extent of the effectiveness of combining aerobic dance and hatha yoga on the level of catecholamine and beta-endorphin hormones and the level of performance in motor expression.

Research hypotheses:

- 1- There are significant differences between the pre and post-measurements of the experimental group in biochemical variables viz. catecholamine and beta-endorphin and the level of physical and skill performance under investigation in favor of the post-measurement.
- 2- There are significant differences between the pre and post-measurements of the control group in biochemical variables viz. catecholamine and beta-endorphin and the level of physical and skill performance under investigation in favor of the post-measurement.
- 3- There are significant differences between the experimental and

control groups in post-measurement in biochemical variables viz. catecholamine and beta-endorphin and the level of physical and skill performance in favor of the experimental group.

- 4- The percentages of improvement of catecholamine and beta-endorphin hormones and the level of physical and skill performance under investigation are increased in the experimental group more than those in the control group.

Scientific terminology:

Aerobic dance:

It is a dynamic activity performed in accompaniment with music of specific melody and consists of a set of successive and repeated exercises for large muscle groups in the form of dancing various steps depending on the aerobic training system.

Hatha yoga:

They are mental exercises in the form of postures accompanied by exercises for regular respiration aiming at occurring mental and muscular relaxation and internal homogeneity for the individual. Such exercises provide the individual with internal strength and they work on achieving balance between the body and thought (16: 19).

Catecholamine:

This hormone is secreted from the marrow of the adrenal gland as it is physiologically associated with the effect of the function of the sympathetic nervous system. It is the adrenalin hormone by 80% and noradrenalin by 20%. Both are called emergency hormones (1: 153) (8: 223).

Endorphin hormone:

This hormone is secreted from the pituitary gland and it works as a chemical carrier and takes part in regulating several physiological functions such body

temperature and blood pressure and reducing pain tension and anxiety (21: 357).

Motor expression:

It is the art of expression using the movement to embody a series of spiritual and psychological transformation the specific personality passes (11: 12).

Level of performance:

It is the mean score the girl gains after making motor statements in the final applied exam at the end of the academic term in the motor expression course (5: 4).

Muscular strength:

It is the ability of muscles to overcome different resistances (18: 152).

Flexibility:

It is the ability of body joints to work on a wide motor range (18: 154).

Research procedures:

Method:

The researcher used the experimental method to achieve the research objective

and hypotheses by applying a layout of the pre and post-measurements of one experimental group and a control group to suit the nature of the research.

Community and sample:

The research community was girls in the 3rd grade at Faculty of Physical Education for Girls, Cairo in (2015/2016) academic year including (183) girls. The research sample of (30) girls was selected intentionally representing (54.9%).

Homogeneity was carried out for the sample individuals in growth variables, physical tests, bio-chemical variables and the level of performance as shown in Table (1).

The pilot sample was drawn randomly including (10) girls from the total research sample, hence, the research sample became (20) girls who were divided into two groups to represent the experimental and the control groups of (10) girls each. Equivalence was made for the two groups in all measurements under investigation as shown in Table (2).

Table (1)
Homogeneity of the research sample in growth, physical, biochemical variables under investigation and the level of performance (n=30)

variables	Units	\bar{x}	SD	M	Skewness coefficients
Age	Yrs.	19.23	0.73	19.00	1.10
Height	cm.	162.60	7.87	158.50	1.06
Weight	kg	60.50	11.06	60.00	0.14
Strength of backs	kg	7.93	6.74	5.00	1.30
Strength of legs	kg	18.03	16.62	15.00	0.50
Strength of abdomen	sec.	22.27	22.87	26.50	0.90
Strength of arms	Rep.	22.53	8.05	20.00	0.94
Flexibility of back	cm.	11.07	6.18	10.00	0.52
Flexibility of legs	cm.	83.17	11.26	85.00	0.49
Catecholamine	mg/day	4.56	1.05	4.80	0.76
Beta endorphin	Beco-Mol/l	9.89	24.0	9.82	0.01
Level of performance	Score	2.30	0.84	2.00	0.36

Data in Table (1) show that all skewness coefficients of variables under investigation of the total research sample range from (± 3) indicating that all the

sample individuals fall within the normal curve and hence, the total research sample in such variables are homogenous.

Table (2)
Significance of differences between the experimental and control groups in growth, physical, biochemical variables and the level of performance
(n1=n2=10)

variables	Experimental group		Control group		2x ⁻ - difference	t values and sig.
	x ⁻	SD	x ⁻	SD		
Age	19,00	0,71	19,20	0,07	0,30	1,00
Height	109,70	0,73	162,70	9,71	3,00	0,81
Weight	70,20	8,40	70,80	7,43	0,9	0,20
Strength of backs	7,20	3,00	7,70	4,93	0,70	0,30
Strength of legs	17,20	7,20	10,90	0,77	0,30	0,11
Strength of abdomen	31,40	17,48	30,00	19,70	0,90	0,11
Strength of arms	22,80	8,43	23,90	9,89	1,10	0,20
Flexibility of back	10,70	7,93	11,00	4,77	0,40	0,14
Flexibility of legs	81,00	0,30	87,00	14,07	0,00	1,07
Catecholamine	4,42	1,11	4,07	0,99	0,14	0,82
Beta endorphin	9,31	0,19	9,24	1,12	0,07	0,19
Level of performance	2.60	1.07	2.20	0.42	0.40	0.95

Tabulated t value at 0.05 level of significance = 2.10

Data in Table (2) illustrate that there are no significant differences at 0.05-significance level between means of the experimental and control groups in the biochemical variables under investigation indicating that the two groups are equivalent in such variables.

Tools of collecting data:

The researcher used the following tools:

- Restameter to measure height.
- Medical balance to measure weight.

- Tools of taking blood samples such as cotton, white alcohol, test tubes containing heparin to maintain the blood from coagulation, syringes, tubes to keep samples and ice box to keep samples to identify the level of beta endorphin.
- Sterilized medical cups for urine sample to know the level of catecholamine hormone.
- Cassette player and loudspeakers.

Measurements used:

- Body measurements (height and weight).
- Biochemical measurements.

Catecholamine hormone: it was determined through its decomposition products to vinyl mandelike acid (V. M. A) in urine by the assistance of the medical analyst as an indicator of adrenalin hormone (att. 14). Beta endorphin hormone was determined by analyzing blood samples by the assistance of the medical analyst.

- Measuring the level of performance by motor expression (att. 12 & 13).

Tests used:

- Modified pull ups: to measure the strength of muscles of arms (att. 2).
- Test of strength of muscles of abdomen in prone position (att. 3).
- Test of strength of muscles of back by using dynamometer (att. 4).
- Test of maintaining raising legs to measure the strength of muscles of legs by using dynamometer (att. 5).
- Scott and French standing bending reach test by using the graded cube

to measure flexibility of trunk and thighs (att. 6).

- Test of raising legs forward to measure flexibility of muscles of legs by dynamometer (att. 7).

Form of piloting opinion of experts in the program of combining aerobic dance and hatha yoga:

After the researcher have reviewed scientific references and associated studies in web sites, she established imagination for the proposed program which was presented to experts of experience at least 10 teaching years in the field of specialization. In the light of the experts opinion some contents were omitted and others were added (att. 8 & 9).

The proposed training program: (att. 10 & 11)

It lasted (10) weeks containing (30) training units by (3) training units per week. Time of the training unit was graded from (30 to 60) min. distributed as follows:

Table (4)

Components of the training unit and time distribution of the proposed program

Components of the training unit	Time		What being executed from each part
Initial part	5 min.		- It included general constructive exercises and stretching exercises aiming at conditioning nervous and articular systems for muscular action required.
Main part	50 min	20min	- It included a set of exercises of aerobic dance depending on using large muscular sets having slow, quick strong and flow requirements of performance that help to grade the training load.
		20 min	- It included a set of varied postures of hatha yoga that help relax mentally and physically and increase body flexibility and strength.
		10 min	- Practicing motor skills assigned for motor expression subject.
Final part	5 min		- It included respiratory exercises to bring the body back to its natural state.

Pilot study:

The researcher conducted the pilot study on a sample of (10) girls not from the research sample but from the same research community in the period from 7/2/2016 14/2/2016 to know the following:

- The extent of the validity of tools used.
- The extent of suitability and familiarity of the place of application.
- The extent of suitability of the contents of the program to girls of this grade.
- Conducting scientific treatments for tests used (att. 1).

Executive procedures:

a. Pre-measurement:

The pre-measurements were carried out for the two research groups in all variables under investigation with effect from 15/2/2016 and 16/2/2016 as follows:

- Measuring the level of performance and taking blood and urine samples on 15/2/2016.

- Applying tests of flexibility and strength and measuring height and weight on 16/2/2016.

b. Applying the program:

The program was applied to the experimental group in the period from 17/2/2016 to 28/4/2016 on Sundays, Tuesdays and Thursdays at 2:00 PM to 3:00PM, in hall 8 at Faculty of Physical Education for Girls, Cairo.

c. Post-Measurement:

At the end of the outlined period, the post-measurements were carried out for the two research groups on the selected variables as followed in the pre-measurements with the same sequence from 27/4/2016 to 28/4/2016.

Statistical treatments:

- Arithmetic mean -
- Standard deviation.
- Skewness coefficient -
- Percentages of variation and improvement.

Presentation of results:**Table (5)**

Arithmetic mean, standard deviation, significance of differences, percentages of improvement between the pre and post-measurements of variables under investigation of the experimental group (n=10)

Variables	Pre-measurement		Post-measurement		2x̄ - Difference	t value and sig.	Variation %
	x̄	SD	x̄	SD			
Strength of backs	7,20	3,00	11,10	2,80	3,90	2,07*	04,17%
Strength of legs	16,20	6,20	23,00	6,48	7,30	2,43*	40,07%
Strength of abdomen	31,40	16,48	40,00	0,00	13,60	2,34*	26,04%
Strength of arms	22,80	8,43	23,80	7,42	1,00	0,27	4,38%
Flexibility of back	10,60	6,93	18,90	6,49	8,30	2,63*	78,30%
Flexibility of legs	81,00	0,30	100,00	11,79	23,00	0,34*	28,83%
Catecholamine	4,42	1,11	2,30	0,87	2,12	4,01*	47,97%
Beta endorphin	9,31	0,19	9,89	0,24	0,08	0,80*	7,23%
Level of performance	2,60	1,07	7,80	0,89	0,20	2,68*	20,0%

Tabulated t value at 0.05-significance level = 2.26.

Data in Table (5) show that there are significant differences at 0.05- significance level between the pre and post-measurements of the experimental group in physical and biochemical variables and the level of performance in favor of the post-measurement with the exception of the test of strength of arms. Percentages of variation between the pre and post-measurements range from (4.38% to 200%).

Table (6)
Arithmetic mean, standard deviation, significance of differences, percentages of improvement between the pre and post-measurements of variables under investigation of the control group (n=10)

Variables	Pre-measurement		Post-measurement		2x ⁻ - Difference	t value and sig.	Variation %
	x ⁻	SD	x ⁻	SD			
Strength of backs	7,70	4,93	7,80	2,20	1,20	0,77	18,18%
Strength of legs	10,90	0,77	17,10	0,84	1,20	0,44	7,00%
Strength of abdomen	30,00	1,07	31,20	3,30	0,70	0,70	2,30%
Strength of arms	23,90	9,89	24,80	7,20	0,90	0,22	3,77%
Flexibility of back	11,00	4,76	12,10	3,07	1,10	0,06	10,00%
Flexibility of legs	87,00	4,07	94,00	7,76	7,00	0,38	8,00%
Catecholamine	4,06	0,99	3,18	1,01	1,38	2,94*	30,26%
Beta endorphin	9,24	1,12	9,72	1,70	0,38	0,06	4,11%
Level of performance	2,20	0,42	7,40	0,70	4,20	10,06*	190,91%

Tabulated *t* value at 0.05-significance level = 2.26.

Data in Table (6) show that there are no significant differences between the pre and post-measurements of the control group in variables under investigation with the exception of the level of performance and the level of catecholamine hormone in favor of the post-measurement and percentages of improvement range from (2.30% to 190.91%).

Table (7)
Arithmetic mean, standard deviation, significance of differences, between the post-measurements of the experimental and control groups in variables under investigation (n1=n2=10)

Variables	Experimental group		Control group		2x ⁻ - Difference	t value and sig
	x ⁻	SD	x ⁻	SD		
Strength of backs	11,10	2,80	7,80	2,20	3,30	2,70*
Strength of legs	23,00	6,48	17,10	0,84	6,40	2,21*
Strength of abdomen	40,00	0,00	31,20	3,30	13,80	6,01*
Strength of arms	23,80	7,42	24,80	7,20	1,00	0,29
Flexibility of back	18,90	6,49	12,10	3,07	6,80	2,70*
Flexibility of legs	100,00	11,79	94,00	7,76	11,00	2,34*
Catecholamine	2,30	0,87	3,18	1,01	0,88	2,03
Beta endorphin	9,89	0,24	9,72	1,70	1,27	2,22
Level of performance	7,80	0,89	6,40	0,70	1,40	3,68*

Tabulated *t* value at 0.05-significance level = 2.101

Data in Table (7) illustrate that there are significant differences at 0.05- significance level between the experimental and control groups in physical variables and the level of performance in the post-measurement in favor of the experimental group. Computed *t* values range from 2.22 as a low value to 6.51 as a higher value). However, there is no significant difference between the two groups in the test of strength of two arms.

Discussion of results:

- Data in Table (5) show that there are significant differences between the pre and post-measurements of the experimental group in all variables under investigation in favor of the post-measurement as the computed *t* value ranges from 2.336 to 10.739 except the test of strength of arms.
- The researcher attributed this improvement to the program of combining aerobic dance and exercises of hatha yoga as the program combined features and benefits of both of them. As inserting exercises of varied and graded intensities and accompanied with music led to increase stimulation of performance, to reduce the sense of fatigue causing the level of physical fitness to

upgrade in addition to exercises of motor skills assigned and improving the neuromuscular response that helped the skill level upgrade.

- These results agreed with those of Amal Mohammed Youssef (2004) (4), Milada Krajci (2003) (24), Shima'a Abdullah Attia (2009) (10), Prasad et al (2001) (26) and Maha Al-Attar (1992) (19).

Thus the 1st hypothesis stating, "there are significant differences between the pre and post-measurements of the experimental group in catecholamine and beta endorphin as the biochemical variables and the level of physical and skill performance under investigation in favor of the post-measurement" was achieved.

- Data in Table (6) show that there are significant differences at 0.05-significance level between the pre and post-measurements of the experimental group in the level of performance in favor of the post-measurement. The computed t value is 16.84. Also it is clear that there are no significant differences between the pre and post-measurements the other variables under investigation.
- This improvement in the level of performance was related to that the researcher followed practicing girls in the control group schedules of motor expression 3 times a week after the end of the college day.
- Thus the 2nd hypothesis stating, "there are significant differences between the pre and post-measurements of the control group in catecholamine and beta-endorphin as biochemical variables and the level of physical and skill performance under investigation in favor of the post-measurement" is partially achieved.
- Data in Table (7) illustrate that there are significant differences at 0.05 significance level between the experimental and control groups in variables under investigation in the post-measurement in favor of the experimental group. The computed t values range from (2.31 to 4.69), however, it is clear that there is no significant difference between the two groups in the test of the strength of arms.
- This improvement could be attributed to the effectiveness of the program of combining aerobic dance and hatha yoga that led to benefit from both of them as hatha yoga exercises performed regularly and sequentially together with following a type of successive respiration helped unify the body and mind and remove pressures and improve the level of catecholamine hormone and aerobic dance exercises characterized by variation in motor rhythm and music add joy and happiness and improve the level of beta-endorphin hormone leading to improve the level of physical and skill fitness. As for no significance differences in the strength of arms and as this variable is in-significant in the control group, this indicates that girls are lacking this variable and thus opening another field of research.
- This agreed with those of Malathi and Damodran (2000) (23), Mayada Al-Akhder (2007) (20), Gehad Galal Anis (2002) (6) and Netz & Lidor (2003) (25).
- Thus the 3rd hypothesis stating, "there are significant differences between the experimental and control groups in the post-measurement in catecholamine and beta endorphin as biochemical variables and the level of physical and skill performance in favor of the experimental group" is partially achieved.
- Data in Tables (5 & 6) illustrate that rates of variation i.e. percentages of improvement in the experimental and control groups for the research variables are increased in favor of the experimental group as such percentages in the experimental group range from (4.40% to 200%) whereas in the control group such percentages range form (2.30% to 19.9%).
- The researcher attributed these results to the effectiveness of the program of combining aerobic dance and hatha yoga of graded intensities, varied slow and flow, strong and sharp movements, music accompaniment of performance and continued training

for girls without interruption for the period of the program led to achieve the internal balance for girls and remove emotions and pressures towards happiness.

- These results were in harmony with those of Malathi and Damodran (2000) (23) and Shima'a Abdullah Attia (2009) (9).
- Thus the 4th hypothesis stating, "percentages of improvement of catecholamine and beta endorphin hormones are increased in the experimental group more than that in the control group.

Conclusions:

- Combining aerobic dance and hatha yoga had a positive effect on the level of catecholamine and beta endorphin hormones.

- Combining aerobic dance and hatha yoga had a positive effect on the level of performance in motor expression.
- Combining aerobic dance and hatha yoga had a positive effect on flexibility and muscle strength.

Recommendations:

- Programs of aerobic dance and hatha yoga should be used within physical activities of students to face studying pressures and to upgrade the level of performance.
- Similar studies should be conducted to measure the effect of combining aerobic dance and hatha yoga on the level of performance in different sports.

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