The Effect of head punches on Some Physiological and Psychological Responses of Boxers

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Abstract: This research aims to identify the effect of strong and frequent head punches on some of the physiological and psychological responses of boxers, and the possibility of getting Alzheimer's disease and some physical and psychological diseases. The study was conducted on (6) six boxers. Experimental method was used through using the design of (Pre- posttest) for a single experimental group. The average of effort head punches in the match were (20+6). The variables of heart rate, blood pressure, hemoglobin, hematocrit, blood lactate, catecholamine, Prolactin and Dopamine hormones were measured before and after training session. The results showed significant increase of all physiological variables after training session, furthermore increase in the level of catecholamine, Dopamine and Prolactin hormones was obtained. The author concludes that the pressure loaded on the boxers as a result of exposure to strong and frequent head punches during exercise periods leads to a dysfunction of neurons, the secretion of neurohormone in brain, increase in the level of dopamine and the prolactin hormone, the formation of protein deposits on the internal parts of the brain, and the significant deterioration in Neuromodulation, which increases the risk of Alzheimer's disease or some physical, psychological diseases.
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1. Introduction

Boxing is characterized by dynamic work saturated with strength, speed, and different boxers' movements during different punching or defend the body against rival's punches.

Advanced boxers characterized by high level of fitness, and high functional efficiency for all the vital body organs to efficiently implement motor, technical and cognitive skills throughout the rounds of the match. [1, 2]

Strong and frequent punches during the box match and training can cause several type on injuries for example as the head and face areas are the most targeted areas of the body fractures and wounds in face or loss of balance are likely results of box match. Also because of strong punches in the lower jaw area; the impact of trauma moves to the middle ear, causing loss of balance or disruption in brain function result of concussion, which leads to the player's feeling of visual disorder and vertigo and may be fainting. Moreover, most boxers have damage in the brain, whether symptoms appear on them or not, Finaly brain damage in boxers caused by head punches is being linked to Alzheimer's disease. [3, 4, 5]

The head injuries are much more serious than those in the body are. The complications occurring to the boxer are often because of exposure to a blow or series of strong and sequenced head punches, which may lead to serious injuries such as traumatic brain injury or internal bleeding and nerve fibers injury. The use of protective gear may reduce these injuries. [6, 7, 8]

The disturbances accompanied the boxers as a result of exposure to many shocks or blows affecting the brain may lead to damage some brain cells and cerebral sudden concussions and disrupting neural functioning in brain, Parkinson's disease, and Alzheimer's. Boxers are more susceptible to head injuries due to their years of continuous training, and the possibility of avoid punches to the head during training does not prevent the possibility of getting strong and influential punches to the head during the actual match. [9, 10]

Although the mechanisms for Alzheimer's disease are not clear, many researches confirming that people who are exposed to strong and repeated head punches and face, such as boxers, are more likely to have Alzheimer's. [11, 12]

The observations and studies conducted to identify the effects of knockouts and violent punches directed to the head confused many scientists since it is difficult to know what happens within the boxer's body in the long term because of being blown repeatedly in the bones of the jaw and skull, which make the player lose consciousness temporarily. They have reached to the bad effects that occur to the boxer in the long term, such as Alzheimer's or Parkinson's and possibly permanent handicaps. [13, 14]

Alzheimer's disease is a condition affecting nerve cells in the brain and leads to its destruction, shrinkage of brain size, memory, and speech loss, As well as several other dysfunctions witch largely affects every days activities. [15]

Table (1) The arithmetic mean, standard deviation, median and the value of skewness coefficient of the age, height and weight for a group of boxers

Variables	Post	Pre	Median	Least value	Highest value	Skewness	
						value	Standard error
Age (y)	28.00	1.265	28.50	26.00	29.00	-0.89	0.85
Height (cm)	170.50	9.50	173.00	154.00	179.00	-1.18	0.85
Weight (kg)	75.62	8.75	78.85	61.20	82.80	-1.03	0.85

Table (2) The arithmetic mean, standard deviation, median and the value of skewness coefficient of the average of effort head punches in the match for a group of boxers

Variables	Post	Pre	Median	Least value	Highest value	Skewness	
						value	Standard error
effort head punches	25.23	0.82	24.5	20	26	-0.96	0.85

Table (3) The arithmetic mean and standard deviation of the physiological variables under study in the pre and post test of the boxers

variables	Pre-test		Post-test	
	Post	Pre	Post	Pre
Catecholamine (mg/L)	4.27	0.38	14.09	0.76
Dopamine (ng/mL)	84.00	1.78	118.16	1.94
Prolactin (ng/mL)	65.18	2.68	202.17	32.48
Blood Lactate (mmol/L)	1.12	0.15	3.60	0.31
Heart rate (P/M)	63.17	3.06	163.33	3.14
SYS (mm/Hg)	117.83	2.14	176.00	3.79
DIAS (mm/Hg)	73.83	1.17	84.83	8.59
Hemoglobin (g/dL)	12.97	0.41	14.17	0.66
Hematocrit (count)	40.83	0.75	45.17	2.32

Table (4) differences between pre and post tests of the variables under study for the group of boxers n =6

Variables	Number		Total ranks		Mean of ranks		The value of tabular (z)	
	-	+	-	+	-	+		
Catecholamine	6	0	21.00	.00	3.50	.00	-2.20	*
Dopamine	6	0	21.00	.00	3.50	.00	-2.21	*
Prolactin	6	0	21.00	.00	3.50	.00	-2.20	*
Blood Lactate	6	0	21.00	.00	3.50	.00	-2.21	*
Heart rate	6	0	21.00	.00	3.50	.00	-2.21	*
SYS	6	0	21.00	.00	3.50	.00	-2.20	*
DIAS	4	2	12.00	9.00	3.00	4.50	-.32	*
Hemoglobin	6	0	21.00	.00	3.50	.00	-2.20	*
Hematocrit	6	0	21.00	.00	3.50	.00	-2.21	*

The value of tabular (Z) = 2.00 at the level of significance 0.05

2-Research procedures

The Author used the experimental method by using (pre and post) design for one experimental group. The sample consisted of six male boxers (age,height,weight) from Ismailia and Ittihad El-Shorta clubs that are holding tournaments of Republic champions and their ages range between (26 to 28 years) and their weights range between (60 to 80 kg) and their height range between (170 to 179m), The average of effort head punches in the match were (20+6), Tests were conducted from 22/05/2010 to 10/06/2010 during the preparation period for the championship of the Republic, Variables of heart rate, blood pressure, and blood lactate were measured.

The heart rate (P/M), systolic and diastolic blood pressure (mm/Hg) were measured by using a blood pressure digital monitor (produced by Omron M10 IT) to identify the efficiency of the heart and blood circulation. The hemoglobin (g/dL) and hematocrit (%) also were measured, The blood lactate value (mmol/L) was measured by using (Accusport) device as an indicator of the extent of physical and

physiological efficiency, The catecholamine hormones (ms/L) in urine, Prolactin (ng/ML) and Dopamine (ng/L) in the blood were measured as an evidence of the stress. The boxers experienced and as an important index for the brain's functional state, the transmission of neural signals, many biological processes, and the probability of Alzheimer's and some physical and psychological diseases. Urine and blood samples were examined in Al-Nour laboratory and clinilab for Medical Examinations in Cairo. The arithmetic mean, standard deviation test, and Wilcoxon Test of the Significance of Differences were used in statistical operations.

3-Discussion

The results indicate that there is a clear increase in post-tests rather than pre-tests for all research variables. The differences in the heart rate value was (63.17 → 163.33), systolic blood pressure value was (117.83 → 176.00), diastolic blood pressure value was (73.83 → 84.83), hemoglobin value was (12.97 → 14.17), the value of hematocrit concentration was (40.83 → 45.17), blood lactate value was (1.12 → 3.60), the value of prolactin hormone was (65.18 → 202.17), the value of catecholamine hormones was (4.27 → 14.08), and the value of dopamine hormone was (84.00 → 118.16). [16]

Regarding the high heart rate and blood pressure after the boxers' performance of physical exertion are due to an increase in the amount of blood driven from the heart and the muscle's increased need to oxygen carried by hemoglobin inside red blood cells to continuously produce energy for performance. The heart rate is an important indicator of the extent of the improvement in fitness level, efficiency of working muscles, the ability to continuity in the performance of muscular work and endure the exerted physical effort. [17]

The blood pressure is an important indicator of the efficiency of cardiac cycle. The natural rise and fall in blood pressure resulting from the practice of physical performance is an indicator of the health status and the efficiency of the heart unless it exceeds the normal limits. While the imbalance in the fall or rise in blood pressure means disorders of the heart action, which may cause in heart disease in the long term and may lead to death. [18]

There is a strong relationship between serious head injuries, heart health, and the possibility of Alzheimer's disease where there are evidences confirming the relationship between heart health and brain health. In addition, the risk of Alzheimer's disease and the speed of the patient's deterioration associated with heart disease, blood vessels, high blood pressure, strokes, diabetes, and high level of cholesterol in the blood. [19]

Dopamine is a neural chemical that transmits signals between nerve cells. It is a precursor to epinephrine, or adrenaline, and norepinephrine. Dopamine is needed in the brain for a wide variety of reasons. It controls the flow of information to the frontal lobe from other parts of the brain, Dopamine, a neurotransmitter, is needed in the brain to help regulate mood and movement. It is required to be in balance. Not enough dopamine in the brain can indicate Parkinson's disease or attention deficit disorder. Too much dopamine in the brain can be indicated Alzheimer's disease or caused a number of factors. [20]

Regarding the high concentration of hemoglobin and hematocrit in blood, it is due to an increase in concentration of blood plasma, resulting from the increased physical effort as well as the body continued need to additional amounts of oxygen and red blood cells to increase the production of energy necessary for the performance. The increase in the proportion of hemoglobin and red blood cells is linked because of the relation between physical effort and endurance component due to their role in transferring oxygen to working muscles. [21]

Regarding the increase in the blood lactate concentration, the increase in the blood lactate concentration within the normal range indicates the boxers' physical, physiological efficiency. The increase in the blood lactate ratio is due to increase in the transformation of muscular glucose and glycogen anaerobically due to increase the time and intensity of physical performance and the lack of efficient oxygen in working muscle. This leads to the consumption of the large amount of energy in light of lack of oxygen needed by the muscles, thus, the muscles' residues of the blood lactate increase. There is a direct relationship between the intensity of physical effort exerted and the increase of blood lactate acid. [22, 23]

Regarding the impact of head punches on the catecholamine, Dopamine and Prolactin hormones, the catecholamine is a group of chemical compounds derived from amino acids, called flying and fighting hormones such as, the most famous ones on the body, adrenaline, noradrenaline, and dopamine. They all work as hormones and neurotransmitters. Dopamine works as a neurotransmitter and is found in a high concentration in the brain. It is necessary to carry out quick movements and its secretion is affected by violent training, shocks and head disorders. [24, 25]

The secretion of catecholamines increases in response to pressure and tension. Dopamine is synthesized by nerve tissue and marrow adrenal gland. Adrenal gland is the basis in the biosynthetic pathway to form adrenaline and noradrenaline. The increase or decrease in the concentration of dopamine into the brain leads to the fluctuation of the natural level of

catecholamines in blood with either rise or decline. [26, 27]

Exposure to intense and frequent head punches during the life sports leads to the loss of top functions of the brain, which may stop functioning normally due to the formation of protein substance called (Beta amyloid), which is deposited in some neurons in the brain, leading to neurons' disorders and increase dopamine and prolactin. In addition, patient's confusion increases, loses the ability to make rational dialogue and then evolution in the emergence of symptoms of Alzheimer's or Parkinson's disease begins. [28, 29]

Frequent head disorders, pressures on the brain and the lack of oxygen connecting to the brain lead to increase dopamine in response to the increased activity of neurons in brain, resulting in a level change of the secretion of catecholamines in blood. And the transmission of nerve signals in brain is affected and brain loses many vital functions such as inability to concentrate and loses the kinetic synergy, so that it becomes unable to control the voluntary movements, resulting in getting physical and mental diseases such as Alzheimer's disease and some movement diseases, such as Parkinson's disease, schizophrenia and attention deficit. [30, 31]

The continued increase in the level of dopamine leads to the confusion in the work of neurotransmitters, which are linked to specialized receptors reside on the cells in order to transfer nerve signals that carry chemical messages between nerve cells in the brain through the ganglia from a cell to another. Although the non-biological rise of the dopamine level leads to Alzheimer's disease and Parkinson's disease, it is necessary to maintain the rate of dopamine in its natural state. The continuous increase of the dopamine hormone also causes in the brain decrease of the neural functioning and the inability to control the voluntary movements. [32, 33]

The boxers are the most vulnerable and suffering from the effects of severe injuries in the brain. The risks of boxing are represented in strong and repeated head punches, which results in tissue damage, rupture of cerebral nerve, internal bleeding, fractures, injuries of face and jaw, damage and bleeding in eyes, ears, and frequent concussions. That leads to an imbalance in the function of nerve cells and the secretion of neurohormones in the brain and the increase of dopamine level prolactin hormone, the formation of protein deposits on the internal parts of the brain, and the significant deterioration in neuromodulation. That increases the risk of Alzheimer's disease or some physical, psychological diseases or a lack of professionalism. [34, 35]

Regarding the high level of prolactin, the prolactin hormones is one of pressure hormones which is produced by the pituitary gland and increases as much as physical exertion and has an important role in preserving the work of the neurons to continue to resist the pressure. Chronic nervous tension and anxiety leads to increase the level of prolactin hormone in brain, resulting in an adverse effect on the brain and memory. Prolactin increase in brain is associated with practicing violent sports such as boxing, where boxers exposed to memory disorders and the continued stress and the possibility of Alzheimer's disease. [36, 37]

The dopamine is the first hormonal factor to regulate the secretion of prolactin from the pituitary gland where the nerve endings works to release dopamine as a mediator for the preparation of the pituitary gland to secrete prolactin. The defect in the activity of neurons in the brain resulted from pressure, disturbances, concussions or some neurological diseases leads to increase the concentration of dopamine in the brain, resulting in increase the secretion of nervous prolactin. In spite of the lack of the body's needs for this hormone, whose increase is considered as important indicators of some neurological diseases within the cells of the brain. There is a close relationship between the increase of dopamine and prolactin hormones and the emergence of Alzheimer's disease symptoms. [38, 39, 40]

The high activity of endorphins, the increase of the dopamine and prolactin level, the presence of protein clusters (Amyloid beta) inside and outside the brain cells, the presence of protein clusters inside nerve cells, the reduction of brain size, loss of its natural appearance are of the major signs for the diagnosis of Alzheimer's disease. [41]

When studying the biological factors associated with Alzheimer's disease, hyperactivity in the neurons of the brain and high prolactin nervous system and a lack of acetylcholine in the injured person's brain was discovered. Authors have shown that the use of inhibitors of nerve and anti-prolactin and anti-inflammatory drugs may delay the onset of the rapid development of injury symptoms and stabilize for a period of specified amount of time, but they do not prevent the appearance or treatment of injury. Taking vitamins A, E, K helps to delay the disease progress, protects brain cells from damage caused by exposure to different disorders, and destroys radioactive particles, which are produced by metabolic processes in the body. [42, 43]

The study of Spiegel et al describes the effect of the nervous system on receptors of catecholamines, as well as immune hormones in bone marrow as a result of exposure to the pressures arising from physical activity. They all work to increase stem cell, Mother cells, to produce red, white blood cells and platelets to improve the health status and physical health of the

player. In the event of disorder or confusion in the work of the nervous system, it hinders the work of these stem cells and the mechanism of stem cells' action. When a player is under physical pressure, the nervous system is affected, leading to increase catecholamines and their receptors, which are to be active with the immune system to make these stem cells out of bone marrow into the circulatory system. As a result, the stem-cell is turned from being non-differentiated cells into differentiated ones whether they red, white blood cells or platelets. This cellular therapy is used for the treatment of many neurological diseases such as Alzheimer's and Parkinson's disease. The excessive increase in the secretion of neurohormone may hinder the function of stem cells, which reduce the opportunities of self-treatment of the cells. [44]

Conclusions

The pressure on the boxers as a result of exposure to strong and frequent head punches during practice periods leads to an imbalance in the function of nerve cells, the secretion of neurohormone in the brain, the high level of dopamine and prolactin hormone, the formation of protein deposits on the internal parts of the brain, and the significant deterioration in Neuromodulation, which increases the risk of Alzheimer's disease or some physical, psychological diseases. It can rely on the follow-up of measure the ratio of these hormones continuously to determine the status and extent of development in the probability of the onset of symptoms of Alzheimer's or Parkinson's disease or schizophrenia.

The Author is recommended that there is a necessity to increase preventive measures and comprehensive medical examinations and brain electrical to the boxers on a periodic basis to determine the effect of the cumulative effect of the strong and sequence head punches and the speed of intervention to containment the emergence of potential symptoms.

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