مجلة سيناء لعلوم الرياضة

ACE and Some Biological Variables for the Selection of Short Distance Swimmers

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مستخلص البحث باللغة الاجنبية

The research aims to study ACE and some biological variables to select short-distance swimmers, It is hypothesized that ACE and some biological variables might help select short-distance swimmers, The researcher used the descriptive method of a sample of short distance swimmers, no.=15, from Port Said clubs, aged 18.6, height 181.2 cm, and weight 78.3 kg. Angiotensin-converting enzyme, heart rate, lactate, respiratory rate, and vital capacity together with growth hormone and testosterone. Elisa technique was used for ACE and hormones detection, ACU sport for lactate, and spirometer for solid ability. It was considered to detect heart rate and respiratory rate, According to the lab reports, the results indicated that the data of the different variables overwhelmed the average levels of ordinary persons, It is concluded that ACE and some biological variables of this study might be good indicators for selecting short-distance swimmers.

Introduction :

Angiotensin I Converting Enzyme (ACE, also known as peptidyl-dipeptidase A or CD 143) is a Zinc metallopeptidase essential for blood pressure control and water and salt metabolism (Corval, Willams, 2008).

It cleaves vasopressor. Angiotensin I Converting Enzyme inactivates bradykinin and a potent vasodilator by sequential removing two C-terminal dipeptides from various oligopeptides with a free C-terminus. Because of its location and specificity. ACE plays additional roles in immunity, reproduction, and neuropeptide regulation. For Example, ACE degrades Alzheimer's amyloid β-peptide (Aβ), retards Aβ aggregation, deposition, fibril formation, and inhibits cytotoxicity. (Hu 2009) used clinically to treat hypertension, congestive heart failure, myocardial infarction, endothelial dysfunction, and renal disease, including diabetic nephropathy (Turner, Hooper 2002).

As a type I membrane protein is subjected to shedding using certain secretases, ACE becomes soluble in many biological fluids such as serum, plasma, seminal, amniotic, and cerebrospinal. Two ACE isoforms are transcribed from a single gene using alternative promoters.

Somatic ACE (sACE), found in endothelial, epithelial, and neuronal cells, comprises two highly similar active domains called N- and C-domains, each containing the HExxH consensus sequence for Zinc binding. Germinal ACE (gACE), found exclusively in the testes, comprises a single catalytically active domain identical to the C-domain of sACE except for an N-terminal 67 amino acid residue gACE-specific sequence. The physiological functions of the two tissue-specific enzymes are sACE factor. Natural human ACE showed dose-response curves parallel to the standard curves obtained using the recombinant Quantikine kit standards, indicating that the Quantikine kit can be used to determine relative levels of natural human ACE. (CracKower 2002).

(Li 2003) added that the highest level of ACE occurs in subjects with genotype DD.

The anterior pituitary gland secretes several hormones, which lead to hormones from other endocrine glands; for example,, the adrenocorticotrophic hormone stimulates cortisol secretion from the adrenal cortex. Also, growth hormone is related to Insulin growth factor (1) (somatomedin), gonadotrophins stimulate testosterone secretion from the testis (sex hormone), and the hypothalamus plays an essential role in regulating anterior pituitary gland secretion ***(Barrett et al. 2010).***

not interchangeable. For Example: sperm-specific expression of the gACE, not the sACE, in ACE knockout male mice, restored fertility (Kessler 2000).

The human genome encodes ACE-2, also known as ACE homolog or ACEH, a structurally related but functionally diverse protein. ACE-2 is a type I membrane protein but contains only a single active domain, with approximately 42% amino acid sequence identity to the N- and C- parts of sACE. ACE-2 has been shown to act as an essential regulator of heart function and a functional receptor for the SARS coronavirus, respectively.

The Quantikine Human ACE Immunoassay is a 4.5-hour solid-phase ELISA designed to measure ACE in cell culture supernates, serum, plasma, and saliva. It contains the NS0-expressed ectodomain of the recombinant human offloading of the joints ***(Maglisho, 2003)***.

Testosterone is the male sex hormone secreted in the testis and adrenal gland, it is responsible for a masculine feature, and its functions can be summarized in the:

1. Development of secondary sexual characters.
2. Cause growth of body hair.
3. It induces a masculine voice.
4. Develops protein formation and muscles.
5. It induces bone matrix and calcium retention.
6. Increases basal metabolism.
7. Increase red blood cells compared to females.
8. It increases electrolytes and blood and extracellular fluid volumes by 5 to 10 percent ***(Riggs et al., 2002) (Peter et al., 2006)***. Testosterone is a derivative of cholesterol, testosterone promotes protein anabolism, and cortisol is increased by stress and exerts a catabolic effect and is essential for

Growth hormone affects growth and produces a positive nitrogen balance, an increase in lean body mass, a decrease in body fat together with stimulation of metabolism, and a decrease in plasma fat ***(Ayuk and Sheppard, 2006)***.

The physiological effect of aquatic exercise on hormonal, neural, and circulatory functions is vast and could potentially affect the executive function of swimmers. The physical attributes of the marine environment drive the requirement for the variance of muscular contraction and coordination and the increase in circulatory function, which has been seen to promote hormonal and neural structure maintenance and growth. Studies support a higher level of exercise continuation when exercise is performed in water due to the sensation of security and the reduction in pain by hydrostatic pressure or

5. To direct the training processes from the effectiveness and regulatory point of view.

The selection of talented athletes depends on several principles, as ***Zakia Fathi (2006); and Mohamed Taha (2002).*** They reported the fundamental purpose of selection by:

1. Biological principles.
2. Psychological principles.
3. Special principles.

As for the biological factors, selection depends on:

a) Genetic characteristics.
b) Stage of growth.
c) Biological ages and duration of training.
d) Body composition,
e) Basic physical properties.
f) Physiological properties.
g) Health state.

Psychological factors depend on:

I. Mental abilities, including intelligence.
II. Visual, auditory, and motor perceptions.

resisting pressure. ***(Tietz, 1995; Wasserman, 1996; Ying et al. 2008)***.

(Gastin, 2001; Guyton and Hall, 2006) added that sports selection is a continuous dynamic process by which the best athletes, males or females, are chosen depending on principles and basic scientific elements.

Abou El Ella (1986) reported the fundamental purpose of selection by:

1. Exploring the talented athletes possessing the highest qualifications to reach the highest physical performance.
2. To direct the players to the fair play that suits them.
3. To point out the ideal characteristics of the selected sport.
4. To concentrate different means from the effort to economic in learning and training to reach the highest athletic performance in the future.

reach a higher level in short-distance swimming. For example, use the most critical and necessary hormones, primarily metabolic and growth promoters, to get this target. For example, there is a need for growth hormones, testosterone, and ACE. All these hormones and enzymes play an essential role in providing the swimmers with the energy needed to reach a higher level in short distance swimming competency and develop the Egyptian record level in a short distance.

This study aimed to investigate ACE and some biological variables to select short-distance swimmers.

It is hypothesized that ACE and some biological variables might help in the selection of short-distance swimmers.

Research procedure:

III. Moods.
IV. Courage and self-confidence.

The particular factors depend on the ability of the athlete to gather a particular type of efficiency due to interest in a special sport and given suitable training.

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Research problem:

Swimming is a competitive sport that appears a high-speed development in international scoring concerning the low Egyptian record level. So, there is a need to use the updated method of selection and prepare the swimmers physically, mentally, and physiologically through new techniques and know-how and provide the trainers and coaches. Moreover, it needs information that may help to

The researcher used the descriptive method for its suitability for the research aim.

The research sample:

Fifteen healthy male swimmers aged (18.6 y), height (181.2 cm), weight (78.3 kg), with a practical swimming history of (8 y), were participating in the study of high-level swimmers from different clubs of Port Said.

All participants were asked to fill out their health history, and they were free from contagious diseases. They refrained from caffeine medications and supplements.

Their basic characteristic feature are reported in Table (1)

VARIABLES	MEAN	SD	SKEWNESS
Age (year)	**18.6**	**0.25**	**1.4**
Height (cm)	**181.2**	**3.8**	**-0.26**
Weight (Kg)	**78.3**	**3.1**	**0.19**
BMI (Kg/m^2)	**23.8**	**0.53**	**0.56**

Table (1): indicated that the Skewness ranged between (±3) indicating that the samples are homogeneous.

Data collection tools:

Height using (Restameter).

Weight using (Medical Scale).

Body Mass Index: (BMI=weight/height2).

Lactic acid using (Accusport).

Pulse rate using pulse meter, syringes, test tubes, centrifuge, vortex, alcohol, hormonal determination using 5 ml, spirometer for vital capacity determination.

Blood containing anticoagulant EDTA for evaluation of hormones using commercial kits and ELISA technique:

- Growth hormone.
- Testosterone.

The hormones were determined in a specialized lab (Clinical.)

- Blood was transported in iced Coleman.

- Put in deep refrigerator.

- ACE was determined using immunoassay.

with preservatives for cell culture supernate and saliva samples.

Calibrator Diluent RD6-45 – 21 mL of a buffered protein base with preservatives for serum/plasma samples.

Wash Buffer Concentrate – 21 mL of a 25-fold concentrated solution of buffered surfactant with preservatives.

Color Reagent A – 12.5 mL of stabilized hydrogen peroxide.

Color Reagent B – 12.5 mL of stabilized chromogen (tetramethylbenzidine).

Stop Solution – 6 mL of 2 N sulfuric acid.

Plate Covers – 4 adhesive strips.

REAGENTS FOR ACE DETECTION

ACE Microplate – 96-well polystyrene microplate (12 strips of 8 wells) coated with a mouse monoclonal antibody against ACE.

ACE Conjugate – 21 mL of polyclonal antibody against ACE conjugated to horseradish peroxidase with preservatives.

ACE Standard – 100 ng of recombinant human ACE in a buffered protein base with preservatives, lyophilized.

Assay Diluent RD1-34 – 11 mL of a buffered protein base with preservatives.

Calibrator Diluent RD5-10 – 21 mL of buffered protein base

STORAGE

Unopened Kit	**Store at 2-8º C. Do not use past kit expiration date**	
Opened/Reconstituted Reagents	Diluted Wash Buffer	May be stored for up to 1 month at 2-8º C.*
	Stop Solution	
	Assay Diluent RD1-34	
	Calibrator Diluent RD5-10	
	Calibrator Diluent RD6-45	
	Conjugate	
	Unmixed Color Reagent A	
	Unmixed Color Reagent B	
	Standard	
	Microplate Wells	Return unused wells to the foil pouch containing the desiccant pack and reseal along the entire edge of the zip-seal. May be stored for up to 1 month at 2-8º C.*

REAGENT PREPARATION:

Bring all reagents to room temperature before use.

Note: high concentrations of ACE are found in saliva. Using a face mask and gloves to protect kit reagents from contamination is recommended.

Wash Buffer – If crystals have formed in the concentrate, warm to room temperature and mix gently until the crystals have completely dissolved. Dilute 20 mL of Wash Buffer concentrate into deionized or distilled water to prepare 500 mL of Wash Buffer.

Substrate Solution – Color Reagents A and B should be mixed in equal volumes within 15 minutes of use. Protect from light. 200 mL of the resultant mixture is required per well.

ACE Standard – Reconstitute the ACE Standard with 1.0 mL of deionized or distilled water. This reconstitution produces a stock solution of 100 ng/mL. Mix the standard to ensure complete reconstitution and allow the bar to sit for a minimum of 15 minutes with gentle agitation before making dilutions.

limit of 1 mmol/L (reach 1.5 mmol/L).

After high-intensity exercise, lactate can go over 20 mmol/L, as ***Mougios (2006) reported*** within one-half min.

Also, other factors affect lactate levels apart from exercise intensity, duration, and program as it depends on heredity, nutrition, training state, and age ***(Greenhaff and Timmons 1998; Biosseau and De La Marche, 2000; Fitts 2004).***

The possible cause of increasing lactate concentration may be oxygen shortage or decreased oxygen concentration. As ***Sorichter et al. (1999)*** reported, muscle fatigue is associated with lactate plus H ion concentration, and chronically stressed skeletal muscle shows abnormally increased biochemical substances like lactate, creatine phosphate, and activated enzymes.

Pipette 200 mL of Calibrator Diluent RD5-10 (for cell culture supernate and Saliva samples) or Calibrator Diluent RD6-45 (for serum/plasma samples) into each tube. Use the stock solution to produce a dilution series (below). Mix each line thoroughly before the next transfer. The 50 ng/mL standard serves as the high standard. The appropriate Calibrator Diluent serves as the zero standard (0 ng/mL).

Statistical Analysis:

Using (SPSS) including:

- Arithmetic mean.
- Median.
- Standard deviation.
- Skewness.

Discussion

Table (2) revealed a lactate concentration of the swimmers at rest around one mmol/L which is the concentration cited by ***Mougios (2006)*** and other researchers, even though in the case of polluted areas like developing countries, lactate concentration may exceed the

Table (2) basic variables of short distance swimmers

VARIABLES	M	SD	Normal Values
Pulse Rate c/m	66.8	3.4	70-80
Lactate mmol/L	1.1	0.4	1-1.5
Respiratory Rate count/min	12	0.7	12-15
Vital capacity L	5.2	0.1	44-4.8

beat of the heart ***(Wilmore and Costill, 1994).***

Table (2) denotes that at rest, swimmers breathe less than 13 times a minute (12 breaths/min) compared to the average (12-15 breaths/min). Their vital capacity exceeded 5.5 L. (average 4.5L), which indicated proper lung function due to the regular swimming, which affects the respiratory muscles leading to better utilization of oxygen and delaying the process of fatigue. This result is by ***Ahmed (2017)***.

This opinion agrees with researchers, as ***Ganong (2000)*** stated that conditioned athletes could inhale more air and sustain the process for more extended periods due to muscle strength surrounding the lungs. Also, the swimmers' lungs may

Table (2) revealed a lower level of the pulse rate of swimmers (66.8 count/min) compared to average values of pulse rate (70-80 count/min). This result is by that of ***Zahran (2016).***

It is suggested that fit persons present a lower pulse rate at rest due to a raised parasympathetic activity ***(Aubert et al., 2001)*** or lower sympathetic activity ***(Chacon et al., 1998).***

Exercise-induced bradycardia can be due to intrinsic adaptation of the sinus node ***(Calai et al., 2002)***. In addition, long-term adaptation responses include hypertrophy increases the muscle mass of the ventricles, allowing greater force to be exerted with each be larger due to their size. Also, the usable portion of the lung, which is the vital capacity, may be more extensive than usual (5.5-4.56 L) as the swimmers may have a critical ability equaling 75% of the total lung capacity.

So, the training effect can decrease normal breathing per minute, increasing vital capacity and transforming the lungs into a more efficient organ capable of processing more air and extracting essential oxygen. This was by the research data and following the opinion of ***Barrett et al. (2010).***

Table (3) Hormones Profile

VARIABLES	M	SD	Normal Values
Growth H ng/mL	6.36	0.8	0.5-8
Testosterone ng/mL	7.28	0.6	2.5-8.8

Table (3) revealed a higher growth hormone concentration of the swimmers than the average growth hormone level (0.5-8 ng/ mL). This higher level of growth hormone may help swimmers reach higher levels, which are following researchers in the success of swimmers, as indicated by ***Ganong (2000)***, who stated that growth hormone is the most abundant hormone produced by the pituitary gland. Its secretion reaches its peak in the body during adolescence. This secretion helps to stimulate muscle growth. Additional influences like exercise, stress, a low plasma glucose concentration, and sleep can also affect the secretion of growth hormones. He also added that growth hormones stimulate tissue uptake of amino acids, the synthesis of new proteins, and long bone growth. Growth hormone spares glucose by opposing the action of insulin, increasing the mobilization of fatty acids, therefore earning growth

This shows the positive effect of swimming training on hormones and functions.

This result agrees with the research concentration of the data of ***Williams (2012), Overgaard & Dzavik (2011), and MacCardle et al. (2000).***

Researchers agree that the testosterone hormones induce anabolic and metabolic action in almost all tissues of the body ***(Zhang & Lazar (2000); Dayan, (2001); Yen, (2001); Basser & Thorner, (2002); Burger, (2004)).***

hormone the reputation as the fountain of youth.

The effects of exercise on growth hormone and other metabolic hormones help stimulate these hormones to release. Hence the increased muscle growth and increased strength lead to positive nitrogen and may lead to a higher fitness standard and strength gain, which is important in swimmers selection and reaching a higher score ***(Heyward, 1991; Howley & Franks, (1992); Petterson & Bryant, (1995); Wilmore, 1982; Zatsiorsky, 1995).***

Table (3) indicated that the testosterone hormone reported in swimmers at rest was higher than the average concentration (25-8,8 ng/mL).

Table (4) ACE Concentration compared to normal values

VARIABLE	M	SD	Normal Values
ACE ng/mL	**189.6**	**±12**	**37.2-202**

Table (4) reveals that ACE concentration is a high value compared to the average

Indicate high ACE concentration compared to normal values short-distance players led to increased athlete speed and strength and can be a biological marker of the selection of short-distance athletes and players.

The discussion indicated that the ACE and hormonal profile as biological variables of short-distance swimmers might help the selection, meaning that the hypothesis has been realized.

Conclusion:

High ACE concentration is a marker of white muscle fibers. Also, the primary variables (pulse rate, lactate, respiratory rate, and vital capacity) and growth hormone testosterone might be good indicators for selecting short-distance swimmers in Egypt.

Recommendations:

It is recommended to use ACE and hormonal profile in conjunction with other selection methods such as anthropometric genetic, and psychological methods of selection of short distance swimmers.

values. The increased concentration of ACE indicated potent vasoconstriction of the blood vessels affecting muscle fibers characterized by fast white threads available of speed and strength and are suitable for selecting short-distance swimmers.

Roggers (2000) added that white muscle fibers are characterized by a lack of pigment, which makes the muscle white in color. Also, there is a lack of mitochondria and myoglobin with a large diameter and depend on glycogen and lactic acid in anaerobic metabolism. This kind is in abundance in the ACE DD genotype and is found in players of short distances and affects the speed and strength of the player.

Schneider (2001) and Tsianos et al. (2005) reported that a high concentration of ACE affects the size of muscle fibers by increasing white fibers. Hence, characterizing

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