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The effect of a high-intensity training program on BCL2 and BAX proteins and on sprint performance in young 100-m sprinters

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ABSTRACT

The biochemical and physiological processes in the athlete's body play a significant role in preserving internal and environmental balance via functional adaptations of the internal organs when training. The objective of this research was to prepare a high-intensity training program in BCI2 and BAX proteins for young 100m sprinters and also to identify the effect of this training program on the BCI2 and BAX proteins and on sprint performance. The researchers used the experimental method with a pre- and post-test for its suitability to the nature of the problem. The study sample included 6 young sprinters from Wasit Governorate. For data analysis, the researcher used the Statistical Package for the Social Sciences (SPSS). The results of the study showed statistically significant differences between the pre- and post-tests results in the BCI2 and BAX proteins and sprint achievement in 100 m, in favor of the post-test ($p < 0.05$). In conclusion, the training program had an effect on the low level of protein BCL2 and on the high level of protein BAX, and the training program was also effective in developing the achievement test in young 100-m sprinters.

KEYWORDS

Training Program; BCL2 Protein; BAX Protein; Sprint Performance

1. INTRODUCTION

The tremendous advancement and development of science, technology, and laboratory equipment enable scholars to reach necessary results in their fields of expertise, particularly in the field of sports physiology. The field of sports training physiology plays an important role in modifying training loads for physiological responses and adaptations that occur in athletes, by understanding the details that occur for the purpose of development and control over everything

studied from a scientific point of view and careful specialization in changing training programs and balanced nutrition to maintain a homogeneous internal environment (Al-Masry, 2001).

To develop sports training, biokinetic skills, diversity of training loads, and age groups must be taken into account when increasing the training intensity during the workout season through a prepared plan aimed at stimulating the vital organs of the body. This will stimulate work mechanisms at their higher levels to make positive adjustments for the purpose of raising the required level during the planned period. The study of the biological and physiological processes in the athlete's body has an essential role in maintaining the internal and environmental balance through the functional adaptations of the internal organs when training (El-Din, 2000; Shukri & Abd-Rabbo, 2002).

Proteins are key factors for maintaining the internal environment that controls the programming of cell death during training, where protection is for tissue damage in the muscular system that leads to a decrease in the number of cells that affect the immune system through biological variables (Abdel-Fattah, 2003). To enhance the achievement, we decided to put targeted exercises in place to maintain the internal system, which in turn would improve achievement.

This study aims to prepare a high-intensity training program in BCI2 and BAX proteins for young 100m sprinters, and also to identify the effect of this training program on the BCI2 and BAX proteins and on sprint performance in young 100-m sprinters. The hypothesis of the study was that there would be significant differences between the pre and post-tests in the BCI2 and BAX proteins and achievement in favor of the post-test.

2. METHODS

2.1. Study Design and Participants

The researchers used the experimental method with a pre- and post-test for its suitability to the nature of the problem.

The research community was limited to the sprinters of Wasit governorate clubs for youth deliberately, and consisted of 6 sprinters clubs (Al-Kut, Al-Muwafiqia, Al-Zaeem, Al-Azza, Al-Zaytoun, Al-Nomaniya), with a sprinter for each club. So, the sample of the study included 6 young sprinters from Wasit Governorate.

2.2. Equipment and Tools

The equipment and tools used in this research were: Spectrophoto meter-cecil 7200 for measuring proteins, made in Germany; a centrifuge blood separator; a cooling box for transporting

blood samples to the laboratory; 6 Chinese-made electronic stopwatches; Lenovo calculator; Athletics track; medical injection size five cc; medical cotton; disinfecting alcohol; test tubes; EDTA anti-coagulant plastic tubes; kits for measuring proteins.

2.3. Research Procedures

2.3.1. The method of work and blood analysis to measure the BCL2 & BAX proteins

Just before exerting efforts, 5ml of blood sample was taken from the vein of each sprinter's participating in the study. The blood sample was placed in special test tubes containing EDTA anticoagulant. This substance is an anticoagulant with the purpose of keeping the blood not coagulated. They were kept in the cooling box and transported to the laboratory. This process was performed in the same manner prior to taking the measurements of the pre- and post-tests.

2.3.2. The achievement test 100m

An achievement test of 100m was conducted for the research sample via a legal straight used to measure the distance. The test method was carried out with a sitting position for all members of the sample, then they began preparing and launching to sprint the completion distance of 100m. When the sample members reached the finish line, all of them were held by an assistant staff for testing only. The time was calculated in seconds for each sprinter in the sample for the purpose of conducting statistics on the raw numbers. This method was carried out for the pre- and post-test with the same procedures.

2.4. The Training Program

The training program presented in Table 1 is repeated for a second month with the same intensity, repetitions and rest periods (Table 1).

Table 1. Training program

Weeks	Days	Exercises	Rest between repetitions	Intensity	Rest between groups
First	Saturday	**30m ×3**	**1**min	90%	**5**min
		60m ×3	**1**min		**5**min
		80m × 3	**1**min		**5**min
	Tuesday	**80m × 3**	**2**min		**5**min
		120m × 3	**2**min		**5**min
	Thursday	**30m + 80m + 120m × 2**	**2**min		**5**min
Second	Saturday	**30m × 2**	**2**min		**5**min

		50m × 2	**2**min	95%	**5**min
		100m × 2	**2**min		**5**min
	Tuesday	**100m × 2**	**3**min		**5**min
		120m × 2	**3**min		**5**min
	Thursday	**50m × 2**	**3**min		**6**min
		100m × 2	**3**min		**6**min
	Saturday	**40m × 2**	**3**min		**5**min
		80m × 2	**3**min		**5**min
Third	Tuesday	**100m ×2**	**10**min	100 - 95%	
	Thursday	**30m × 2**	**3**min		**5**min
		60m × 2	**3**min		**5**min
	Saturday	**30m + 50m + 100m ×2**	**2**min		**5**min
Fourth	Tuesday	**80m + 100m + 120m × 2**	**3**min	95%	**5**min
	Thursday	**30m + 60m + 100m × 2**	**2**min		**5**min

2.5. Statistical Analysis

For data analysis, the researcher used the Statistical Package for the Social Sciences (SPSS). The t-test was used to determine the effect of the training program on the sample. A p-value of < 0.05 was considered statistically significant.

3. RESULTS

As Table 1 shows, there are statistically significant differences between the pre- and post-tests results in the BCI2 and BAX proteins and sprint achievement in 100 m in favor of the post-test ($p < 0.05$).

Table 1. The differences between pre- and post-test results in the BCI2 and BAX proteins and sprint achievement in 100 m.

Variables	**Pre-test**			**Post-test**			**Measuring unit**	***p***
	M	**SD**	**t**	**M**	**SD**	**t**		
Protein BCL2	6.665	0.499	7.361	4.985	0.333	6.881	Mg / ml	< 0.05
Protein BAX	4.891	0.102	6.055	6.102	0.499	7.666	Mg / ml	< 0.05
Sprint	11.99	0.735	1.234	11.70	0.640	1.001	sec	< 0.05

4. DISCUSSION

We had statistically significant differences between the pre- and post-tests results in the BCI2 and BAX proteins and sprint achievement 100 m in favor of the post-test ($p < 0.05$). Based on this fact, we see that the hypothesis of our study which states: "there are significant differences between the pre and post-tests in the BCI2 and BAX proteins and achievement, in favor of the post-test", is approved.

As a result of ongoing metabolic processes during the endeavor, energy was produced and ATP was released resulting in programmed cell death as a result of training adaptations. These adaptations also occur on the mitochondrial walls, which leads to a clear decrease in BCL2 protein. On the other hand, reversible changes occur to the proteins, which in turn activates the BAX protein as a result of the apoptosis of cells that are destroyed during the training and metabolism processes.

Mechanisms within the body are activated by programmed cell death, which activates other cells. The BCL2 protein undergoes activation. Simultaneously, during high-intensity exercise, proteins with pre-programmed mechanisms activate the BAX protein. Apoptosis, in turn, has a defensive role in cells. This occurs as a result of exercises that are in multiple distances and are linked in the special energy system in the 100m events. This stimulates the mitochondria to provide the muscles with energy production that causes apoptotic waste, as well as stimulates the role of proteins where some of them are activating and the other part inhibitory. It leads to adaptations within the muscle, as well as to the role of proteins in this programmed process, as well as programmed cellular healing, which has a role in the achievement (López et al, 2021, 2022).

5. CONCLUSIONS

The training program was effective on the low level of protein BCL2 and on the high level of protein BAX, and also in developing the achievement test in young 100-m sprinters. Based on the results of this study, we recommend to rely on protein measurements related to the efficiency of sprint. We also recommend to pay attention to the standardized training programs, which depend on a variety of distances according to the specificity of the event.

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AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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