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THE MECHANISM FOR ANALYZING THE ATHLETE'S PROFILE (GENETIC - MORPHOLOGICAL - PSYCHOPHYSIOLOGICAL - PSYCHOLOGICAL - MENTAL) AND INVESTING IN IT BY ACTIVATING ENVIRONMENTAL FACTORS AS A MODERN SCIENTIFIC APPROACH

BEN AZIZ HANANE[1*], AIT OUAZZOU MOHAND OUAMER[2], ATBA ABDELLAH[3], RAFA AHMED[4], HAMANI IBRAHIM[5]

[1]University of algiers3 , Algeria, Laboratory of College and School Sports and Futures Betting.
[2] Laboratory of Science, Expertise, and Technology of Sports and Physical Activities, University of Algiers3, Department of Sciences and Techniques of Sports and Physical Activities, Faculty of Human andSocial Sciences, University of Jijel (Algeria) .
[3]Laboratory of Education and Mental Health, University of Algiers 2.
[4] University of Bouira, Algeria, Laboratory of Modern Sciences in Physical and Sports Activities, 10000.
[5] University of Bouira, Algeria, Laboratory of Modern Sciences in Physical and Sports Activities, 10000.

benaziz.hanane@univ-alger3.dz[1]
mohandouamer.aitouazzou @ univ-jijel.dz[2]
Abdellah.atba@univ-alger2.dz[3]
a.rafa@univ-bouira.dz[4]
i.hamani@univ-bouira.dz[5]

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ABSTRACT:
Many contemporary educational **and** biological theories emphasize the importance of the interaction between genetic predispositions and the educational environment in shaping the personality of the athlete and directing his abilities. In 1963, educational philosopher John Dewey emphasized that the formation of an individual's personality and cognitive development depend on the mutual interaction between the individual's innate (inherited) predispositions and the surrounding environmental factors. According to Dewey, education cannot be fruitful simply by providing an educational environment unless the learner has intrinsic predispositions and capabilities to respond to that environment.

Keywords: analyzing the athlete's profile, investing, activating environmental factors.

Introduction:

Many contemporary educational and biological theories emphasize the importance of the interaction between genetic predispositions and the educational environment in shaping the personality of the athlete and directing his abilities. In 1963, educational philosopher John Dewey emphasized that the formation of an individual's personality and cognitive development depend on the mutual interaction between the individual's innate (inherited) predispositions and the surrounding environmental factors. According to Dewey, education cannot be fruitful simply by providing an educational environment unless the learner has intrinsic predispositions and capabilities to respond to that environment. (Dewey, 1963, p. 403). In the same context, Jean-Jacques Rousseau asserts in his book (Émile, ou De l'éducation, 1762) that the child is born equipped with latent innate natural dispositions that education should develop rather than suppress or shape according to the desires of adults. That is, education, for Rousseau, is a means of preparing the appropriate environment for the development of the child's latent abilities and extracting those innate dispositions latent in the child according to the laws of nature with which he was created (Al-Abrashi, 1967, p. 62). Thus, innate genetic dispositions represent, in the current research topic, raw human resources upon which acquired capabilities are built. While we have emphasized the importance of these dispositions in shaping the personality of the athlete, environmental factors are no less important, especially since these dispositions only express themselves through acquired capabilities, meaning in the educational capabilities displayed by the athlete in sporting situations.

In 1993, psychologist Richard Lazarus theorized that an individual's behavior and development are the result of a continuous interaction between their innate biological characteristics and the surrounding environmental factors. Lazarus criticized theories that attribute behavior to environmental influences alone and view the individual as a blank slate, emphasizing that individuals are not born blank, but rather endowed with fixed genetic predispositions that influence how they respond to life situations. In contrast, social and cultural conditions influence the course of their biological and psychological development, such that biological factors (personality and innate) interact with environmental factors (the external environment) on a continuous basis to shape the path of development and behavior (Richard, 1993, p. 243). In the same context, Dr. Kamal Mohamed El-Dessouki asserted in 1989 that environmental factors do not create traits in a child that they are not born genetically predisposed to; rather, the role of the environment is limited to providing the appropriate conditions for the growth of these inherited predispositions. (Al-Dasouki, 1989, p. 50). Thus, we can assert that the differences between athletes are due to differences in genetic predispositions that develop under the influence of environmental factors, not because the environment imparts new traits to them. Rather, environmental factors (the sports training process) cannot bestow upon an athlete a trait for which he was not born with a genetic predisposition. Rather, they merely prepare for the development of inherited predispositions, which expands the scope of individual differences among athletes. Without a doubt, environmental factors determine the development of genetic predispositions, including the training method, educational pedagogy, diet, all adapted pedagogical methods, the economic level, the cultural and social level, the geographical environment, and even the political orientations and educational and economic levels of the country. Regarding the importance of discovering the athletic champion at an early age, we seek what the German educator Friedrich Wilhelm Fröbel (1782-1852) theorized that early childhood possesses tremendous innate predispositions and latent biological and cognitive abilities that grow at a rapid pace. However, adults often do not realize the value of these abilities until after this fertile period has passed. Developmental theorists have indicated the validity of this scientific perspective, as neuroscience shows that the brain is at its most ready to learn during the first five years of life. Fröbel emphasized the need for early educational intervention to invest the energy of innate predispositions to activate the child’s potential before it is too late. He believed that educators should guide children in various aspects of their development, while preparing appropriate educational means and environments that help unleash their latent abilities. (Ohwovoriole, 2023) The Italian physician Maria Tecla Artemisia Montessori emphasized that we make an educational mistake when we assume that children can be shaped according to our desires, because a child learns only within the limits permitted by their level of organic and neurological maturity. Montessori also demonstrated that environmental factors greatly influence a child's growth, education, and training, as children need a suitable environment. Despite her early emphasis on the role of the environment, Montessori later highlighted the importance of the integrated interaction between innate genetic predispositions and acquired environmental factors in shaping a child's growth and development. This balance between nature (heredity) and nurture (environment) became a distinctive feature of her educational philosophy in its later stages. (El-Sayed Mohamed, 2024)

This scientific analysis presents us with the nature vs. nurture debate in sports. An athlete may be born with a certain talent or genetic predisposition (such as strength, speed, or height), but the extent of an athlete's success depends on harnessing that innate talent through appropriate sports training and a suitable environment. Innate talent alone is not sufficient; it must be coupled with skills acquired through adapting the sports training process. Professor Sergienko's 1999 research also indicates that an athlete's morphological characteristics are determined by genetic factors, while their physiological functions depend on the interaction of both genetic and environmental factors. Therefore, a system for identifying talented athletes should be adopted based on genetic

studies of the athlete's family, in addition to analyzing their genes, with the aim of predicting their morphological characteristics and physiological functions. (Sergienko, 1999, p. 120). A study conducted by Martinek.V in 2000 confirmed that athletes with certain genetic characteristics have a greater ability to reach the highest desired athletic levels. (Martinek.V, 2000, p. 35).

This scientific theory is attributed to the researcher (Baker) in 2001 (in an article entitled "Genes and Training for Athletic Performance Revisited"). He indicates that about 50% of the variance in athletic performance between individuals is attributed to genetic factors, compared to 50% to environmental factors (such as training, nutrition, and equipment). Baker also explained that this percentage is not fixed, but can change depending on the athlete's level of experience. This means that the contribution of genetic versus environmental factors differs between novice and experienced athletes. The more experience an athlete has and the more training hours they accumulate, the greater the influence of environmental factors compared to genetic factors. (Baker, 2001, pp. 2-5).

This explanation is also consistent with the proposal of Dr. Will G. Hopkins (2001) presented limited evidence that differences in genetics and training contribute in similar proportions to the difference in athletic talent. In other words, Hopkins and Baker (2001) agree on the presence of a genetic influence (about half) on athletic performance, with Baker emphasizing that the relative role of genetics and environment changes according to the athlete's experience (Hopkins, 2001, p. 1).

Joseph Baker and Hopkins Will G. (2001) add in their research that genetics are responsible for 50% of the differences between athletes in physical performance, and 50% for the influence of environmental factors. In addition, there is a role for genetics in explaining individual differences in performance between athletes, as well as in discovering athletic football talent (Hopkins, 2001, p. 10). Giuseppe Lippi, Umile Giuseppe Longo, and Nicola Maffulli (2009) explain that physical fitness A strong genetic component of up to 50% is shown by data from the world ranking of athletes (Lippi, Longo, & Maffulli, 2009, p. 40).

Studies by Perusse and Pankinen in 2002 demonstrated that the use of the human genome map in athletic performance has become used in some advanced sports academies to select athletic talents, which has been reflected in improving international competitiveness indicators (Perusse et al., 2003, pp. 1248–1264).

Psatha and others confirmed that athletic performance depends on genetic factors by about 50%, while the contribution of endurance characteristics ranges between 44–68%, and strength characteristics between 48–56%.

The remaining determinants of athletic performance are attributed to non-genetic factors, which include pedagogical training methods (Psatha, Mitropoulou, & Patrinos, 2025, pp. 1–3).

Research conducted by Hopkins Will G. in 2001 concluded that genetic predisposition plays a fundamental role in directing athletes towards practicing athletic activity based on their genetic nature, as each athlete possesses an inherited profile. Genes impose limits on the athlete's morphological makeup, and genetics determine the extent to which an athlete can respond to training loads. Furthermore, the dynamics of increasing athletic performance develop with athletes who possess genetic predispositions, while they do not develop significantly with athletes who do not possess appropriate genetic predispositions. (Hopkins, 2001, pp. 1-5).

In the same context, Lippi & et al.'s 2009 research confirmed that early identification of novice athletes' innate predispositions constitutes a pivotal step in directing them toward sports activities that are compatible with their genetic and physiological abilities. This guidance provides a basis for optimal investment in emerging talents, while reducing the possibility of their inclusion in sports activities that may not be compatible with their natural build.

The same study also confirms that genetic testing and assessment of physiological determinants (such as high endurance or muscular strength) help determine the physical and functional profile of an athlete. Genetic analyses also help predict the level of response to sports training, which

contributes to the design of more individualized training programs. However, the same study confirms that genetic factors alone are not sufficient to achieve athletic excellence, as the actual translation of these genetic predispositions depends on the interaction with environmental, psychological, and social factors. Therefore, an athlete's success is not attributed solely to the genetic code. (Lippi, Longo, & Maffulli, 2009, pp. 37-40).

Konopka et al. (2023) also provided a critical picture of the field of athletic performance genetics through a "systematic SWOT analysis of narrative reviews." The researchers scanned Medline and Embase databases, which showed that the heritability of performance is approximately 50% (44–68% for endurance traits, and 48–56% for strength traits), while the remaining half is attributed to environmental factors (training and nutrition) and the environment. The team identified five strengths (Konopka, Sperlich, Rietjens, & Zeegers, 2023, pp. 1-14).

Semenova et al. (2023) confirmed that athletic performance, including endurance and strength abilities, is a complex trait formed by subtle interactions between genetic and environmental factors. Their analyses showed that Approximately two-thirds of individual variance in athletes' performance (≈ 66%) is attributable to genetic determinants, while the remaining third is explained by non-genetic variables such as training quality, diet, medical and social support, and psychological factors. Genetic testing remains limited in its ability to accurately predict elite performance unless combined with a comprehensive assessment of the training environment and context that activates latent genetic potential. (Semenova, Hsll, & Ahmetov, 2023, pp. 1-31)

‹While Andersen & al. (2000) highlights that the genetic distribution of heavy myosin protein types within skeletal muscle fibers is a key factor in the differentiation of elite athletes, as this distribution determines the proportion of slow (Type I) fibers with high endurance capacity versus fast (Type IIa/IIx) fibers with strength and rapid contraction, the data show that individuals are born with a wide variation in the proportions of these fibers within muscles, which imposes genetic pre-determined limits on their ability to excel in endurance or speed sports. Although intensive training can induce functional modifications in fibers, such as switching between IIx and IIa or increasing the size of fast fibers through hypertrophy, the transition from slow to fast fibers remains limited and slow, and there is no conclusive evidence that the reverse can occur permanently. (Andersen, Schjerling, & Saltin, 2000, pp. 48-55).

Bouchard & al. (1997) also confirm that understanding the human genome has become a necessity in the field of competitive sports, given the essential role genetic factors play in determining the level of physical fitness of athletes. Researchers indicate that athletic performance is not only determined by environmental factors, but is also affected by the genetic fingerprint of each athlete, as genetic differences between individuals contribute to the diversity of their response to athletic training. A study also indicates the necessity of employing the genetic map in designing athletic training programs, which is a strategic step to develop athletic performance according to precise scientific standards. (Bouchard, Malina, & Perusse, 1997, p. 15). Singer & Janelle (1999) also believe that providing an appropriate training environment would enable an athlete with genetic talent to reach the highest levels. A number of researchers have expressed this by saying that elite athletes are "made" through hard training, but only if they were "born" with high innate talents. (Singer & Janelle, 1999) Regarding the current state of Algerian football academies, most talents were discovered by chance and spontaneously, without any scientific criteria. Therefore, we add that the phenomenon being studied in this research topic cannot be addressed to find alternative solutions except through a diagnostic process of the importance of the repercussions produced by the basic determinants in their raw form. We specifically mention those multidimensional predispositions in the athlete's personality, which are closely related to what is genetic. This requires us to make the process of examinations and diagnosis of genetic predispositions the proper starting point for the process. Discovering and preparing talented athletes at an early age.

Therefore, through this scientific research, we seek to shed light, in a relatively scientific manner, on the reality of Algerian football academies in terms of the importance of the process of early examination and diagnosis of the athlete's profile, which we can consider an important starting point towards the process of investing in acquired environmental factors as the dependent variable that helps highlight genetic predispositions. This will only be achieved through the process of adapting the educational pedagogical method, as well as the process of adapting pedagogical facilities and means according to the dimensions shaping the personality of the novice athlete. We specifically mention the morphological, physiological, and psychophysiological dimensions, in addition to the cognitive-mental dimension, as well as the psychological-emotional, psycho-social, or socio-cultural aspect. This means that the organic and nervous maturity of the novice athlete represents the primary source of the environmental conditions and capabilities required to be provided, meaning that the causal relationship between what is possible as readiness and ambition as ability is achieved. Study Hypotheses: General Hypothesis: There is a statistically significant relationship between officials in charge of managing Algerian football academies and the importance of investing in acquired environmental factors, financial capabilities, and technology to prepare future elite athletes. However, the club's strategic planning to standardize the scouting process for novice athletes remains far from satisfactory in terms of the extent of attention paid to all forms of examinations, diagnoses, and genetic predisposition tests that control the outcomes of environmental factors.

2- Substantial Hypotheses:

-There is a statistically significant relationship between officials in charge of managing Algerian football academies and the importance of early biological examinations and diagnoses of genetic predispositions. This reflects a growing awareness of the role of genetic analysis as a tool for predicting athletic performance levels and early detection of football talent. In other words, it is expected that these officials will pay great attention to the use of genetic testing as a modern scientific method for early detection of athletic champions and the development of their performance.

- There is a statistically significant relationship between the officials in charge of managing Algerian football academies regarding the importance of psychological and mental tests and diagnoses. However, there is a lack of awareness of the importance of using a battery of subconscious psychoanalysis tests among novice athletes. This reflects a lack of awareness of its importance among sports club staff members due to a prevailing belief in the primacy of physical skills.

- There is a statistically significant relationship between the officials in charge of managing Algerian football academies regarding the importance of tests and diagnoses of morphological and physiological readiness among novice athletes. This reflects an awareness of their importance among sports club staff members.

- There is a statistically significant relationship between the officials in charge of managing Algerian academies regarding the importance of strategic planning in terms of adapting pedagogical methods, adapting sports activities, and developing a training program tailored to age groups and following international benchmarks. This reflects an awareness of their importance among sports club staff members.

3-The importance of the study and its objectives:

It is clear to us that the process of discovering raw genetic predispositions depends on the importance of the battery of tests, tests, and measures that highlight the genetic pattern that distinguishes the novice athlete. Hence, the importance of investing in the predispositions of the novice athlete emerges, in terms of resorting to the process of examining and diagnosing the genetic and innate genotype, with the aim of investing in the athlete through the process of adapting sports training. In addition, it also adapts all environmental and health factors, such as nutrition, recovery,

and incentives, whether material or moral, and adapts various sports facilities and equipment to improve elite athletic performance, especially technological and modern scientific methods.
-Highlighting the dialectical relationship between the demands of growth and its laws with the organic and nervous maturity of the novice athlete with the nature of the adapted sports activity, in addition to the appropriate pedagogical method according to the characteristics of physical morphological and psychological mental growth that is carried out through the process of adjusting and controlling the various factors and variables that have a negative or positive impact on the sports performance, and the most important of all of this lies in what can be expected in the medium or short term, and we specifically mention the process of directing the sports activity that is most responsive to his genetic predispositions.

4-Previous and Similar Studies:

- The study by Cantelmo & al. entitled "Gene Doping: Present and Future" (2020): The study by Cantelmo & al. Entitled "Gene doping: present and future," the study provides a systematic analytical review of the scientific literature on the phenomenon of gene doping, in order to assess its historical development and envision its future in the field of sports. The researchers relied on an analysis of 62 scientific references published between 1983 and 2018, and included a comprehensive review of emerging molecular technologies such as CRISPR-Cas9 and gene transfer using viral vectors used either for therapeutic purposes or for the potential to enhance athletic performance illegally. The study adopted a systematic bibliographic review methodology, without conducting laboratory or field experiments, and focused on analyzing the development of gene doping technologies on the one hand, and the responses of international bodies such as the World Anti-Doping Agency (WADA) on the other. The results showed that gene doping represents the most complex and sophisticated stage in the chain of sports cheating methods, as no international body had adopted a standard detection method for this practice until 2018, despite ongoing attempts through PCR analysis, gene sequencing, and proteomics. The study concluded with several pivotal findings, most notably that the complete elimination of gene doping appears almost impossible in light of the rapid acceleration of gene-editing technologies. The study also showed that the future use of gene therapy in sports may pose profound ethical and legal challenges, including the potential creation of a new competitive category comprising "gene-modified" athletes, to protect the principle of sports fairness. At the regulatory level, the study revealed significant legislative gaps between the speed of scientific development and the slow response of legal and regulatory frameworks. Regarding the preparation of elite athletes, the study offers a crucial forward-looking perspective, highlighting that future preparation programs may not be limited to training and nutritional aspects, but must include an understanding of modern genetic sciences, given the potential emergence of the "gene-modified athlete" as a real competitor on the international stage. The study also called for raising awareness among coaches and athletes about the health and ethical risks associated with the use of these technologies, and avoiding viewing them as an easy means to accelerate access to the top. Thus, the study contributes to shedding light on the growing overlap between biotechnology and athletic excellence, and warns of the disconnect between ethical standards and scientific progress in the absence of regulation. Strict proactive. (Cantelmo, Pereira da Silva, Mendes-Junior, & Dorta, 2020, pp. 1093-1101)

5- Methodology, Population, and Study Sample:

In the current study, we relied on the descriptive analytical approach. The primary study sample included 97 individuals, including sports coaches, sports educators, and sports advisors in football at the Algerian football academy level.

6- Exploratory Study:

We conducted an exploratory study on a limited number of coaches, educators, and sports advisors. The study consisted of 30 individuals to verify the psychometric properties (validity + reliability) of

the data collection tools, distributed according to the variables of job title, number of years of experience, and number of years of sports practice.

7- Field Study Tools:

We relied on a questionnaire to collect data, which included (35) statements. It was carefully designed according to the concepts underlying the topic in light of previous studies. We used a five-point Likert scale, and we also relied on a semi-structured interview.

8- Statistical Methods Used in the Study:

We relied on the Statistical Package for the Social Sciences (SPSS) program to conduct statistical data analysis. We adopted a significance level of 0.05, corresponding to a confidence level of 0.95, to interpret the results of the hypothesis test.

We also relied on the following statistical tests:

. Internal consistency using the Spearman correlation coefficient.
. Structural validity using the Spearman correlation coefficient.
. Reliability using the Cronbach's Alpha Coefficient.
. Normal distribution using the Kolmogorov-Smirnov test.
. Descriptive analysis of personal data using the Descriptive statistic.
- Descriptive analysis of independent and dependent variables using descriptive statistics.
- One-sample statistical tests to verify hypotheses.
- One-way ANOVA tests to verify hypotheses.

9-Results and Discussion :

- Presentation, discussion, analysis, and interpretation of the results:

- Presentation, discussion, analysis, and interpretation of the results of the first partial hypothesis, which states the following:

- There is a statistically significant relationship between the officials responsible for managing Algerian football academies and the importance of early biological tests and diagnostics of genetic predispositions. This reflects a growing awareness of the role of genetic analysis as a tool for predicting athletic performance levels and early detection of football talent. In other words, it is expected that these officials will pay great attention to the use of genetic testing as a modern scientific method for early detection of athletic champions and improving their performance.

Table No. (01): Descriptive analysis of the importance of biological tests and diagnostics of genetic predispositions.

Degree Correspondence	Rank	Standard Deviation	Arithmetic Mean	Expressions	mber
High		,9410	4,10	Genetic screening and diagnosis of genetic predispositions is important in discovering and developing athletic champions.	
High		1,063	4,07	The sports academy must have medical laboratories equipped with modern technological devices for genetic screening and diagnosis of athletes.	

High		**1,050**	**4,04**	**The sports academy must have a medical team to oversee the genetic screening and diagnosis of athletes.**	
High		**1,075**	**3,99**	**The sports academy must have a battery of tests and measurements that are important for genetic screening and diagnosis.**	
Very high		**,6780**	**4,65**	**General medical examinations must be conducted periodically for athletes.**	
High		**1,005**	**4,01**	**DNA analysis of high-level athletes is important for diagnosing athletes' genetic predispositions to predict their performance. International reference standards must be compared with local standards available at sports academies.**	
Very high		**,9120**	**4,21**	**The importance of biological screening and diagnosis of genetic predispositions**	
High		**,7380**	**4,15**	**After the importance of biological examinations and diagnoses of genetic predispositions**	

Source: Prepared by the researcher based on the outputs of the SPSS program.

-By analyzing the statistical data shown in Table No. (1), it becomes clear that the sample members' attitudes toward the importance of biological tests and diagnoses for genetic predispositions reached very high and high approval levels. The mean value of biological tests and diagnoses for genetic predispositions reached (4.15), which is confined to the range (from 3.4 to less than 4.2), indicating a high level of importance of biological tests and diagnoses for genetic predispositions according to the sample members in sports training schools in Algerian football. The standard deviation of the importance of these tests reached a value ranging to (0.7380), indicating that the orientations of specialists in sports training are not dispersed towards the importance of these tests. To determine the level of importance of biological tests and diagnoses for genetic predispositions among the sample members, the study relied on testing the hypothesis of statistical differences for a single sample (One-Sample Statistics), based on the arithmetic mean with a test value equal to (3), as shown in the following table: Table No.

Source:

Prepared by the researcher based on the outputs of the SPSS program.

- From Table (2), it is clear that the arithmetic mean for the dimension of importance of biological tests and diagnostics for genetic predispositions reached a value of (4.15), greater than the assumed value (3). The calculated (T) also reached a value of (15.382), which is greater than the tabular (T) value (1.984) at a degree of freedom of (96) and a significance level of (0.05). This means that the average significance level among the sample members exceeded the assumed arithmetic mean, which necessitates accepting the hypothesis that states: There is a high level of statistical significance at a significance level of ($0.05 \geq \alpha$) regarding the importance of these tests for preparing future competitive elite football teams to achieve high-level athletic performance, among sports coaches, sports educators, and sports advisors in sports training schools for beginners in Algerian football.

Semi-structured Interview Transcript for Sports Coaches and Sports Consultants Content analysis of the semi-structured interviews with sports coaches revealed that 7 out of 10 believed that developing a sports champion in football is a combination of innate talent and training, while 3 out of 10 coaches believed that a champion is created solely through training. This reflects a prevailing view among the majority regarding the complementary role of genetics and the environment in preparing a player. Regarding the appropriate age group, 6 out of 10 coaches indicated that the primary and preparatory years are the most appropriate, while 4 out of 10 coaches preferred to screen players during the preschool stage. This indicates an implicit agreement that the earlier the discovery, the better for honing football talent. All coaches (10/10) also agreed that early detection of talent enhances professionalism and prolongs the player's athletic career. Regarding how to identify talent, only 2 out of 10 coaches indicated adopting a structured methodology, such as using a comprehensive battery of tests (physical and morphological). 8 out of 10 coaches reported that the sports coach is primarily responsible for the selection process, while only two participants believed that a multidisciplinary team (including the coach, sports advisor, psychologist, and medical staff) should undertake this task. This indicates that talent discovery is generally viewed as an individual task for the coach in the field. Opinions varied regarding the role of football clubs and schools in the process of discovering football talent. 4 out of 10 participants confirmed that they play an effective role and are a major reservoir of talent, while 3 out of 10 believed that talent discovery often occurs by chance. 3 out of 10 others indicated that many talents are neglected due to the absence of a clear and organized methodology for discovery. All coaches (10/10) agreed that there are many football talents that have not been discovered due to neglect and the lack of appropriate facilities. All coaches also emphasized the significant role of science. In the making of a sports champion, through various medical, psychological and mental aspects (such as periodic medical examinations and psychological assessments) that contribute to improving the player’s performance, as for the emergence of individual differences with a genetic basis among players, 6 out of 10 coaches saw that these differences clearly exist (such as differences in physical structure), while 4 out of 10 indicated that there were no individual genetic differences, perhaps because they believed that training and environment could narrow these gaps. Regarding the connection between football talent and genetic genes, 8 out of 10 coaches confirmed that talent has a genetic basis, while 2 out of 10 coaches confirmed that the genetic role appears only in some special cases, meaning that there are exceptional cases in which genes explain superior talent, but not every talented player necessarily inherits his talent. Consistently, 7 out of 10 coaches supported that genetic predispositions play a major role in building and developing an athlete (especially with regard to inherited structural traits that affect his athletic performance), while 3 out of 10 downplayed the The importance of this role was emphasized, emphasizing that intensive training and a supportive environment are the foundation for developing a player. Regarding available resources, all coaches (10/10) confirmed the current lack of specialized medical laboratories for conducting genetic testing for athletes, reflecting a gap between the theoretical belief in the importance of genetic testing and the reality of its unavailability. This disparity is consistent with what some recent studies have indicated, as no reliable individual genetic marker has yet been proven to predict future athletic success. Conversely, all participants agreed on the availability of a sports medical team that conducts periodic medical examinations of players to monitor their health and fitness. Regarding the importance of genetic testing and diagnosis, 8 out of 10 sports coaches confirmed that these tests play a significant role in guiding players toward a sound start in their athletic career and predicting their chances of future success by understanding their genetic abilities and scientifically leveraging them in their training. Meanwhile, 2 out of 10 coaches reported that they lacked sufficient information to assess the importance of these tests, indicating a lack of clarity among some regarding the usefulness of genetic applications in the field of athletic selection.

10-Discussion of the Results:

The results of the current study reveal a clear awareness among those responsible for managing Algerian football academies of the importance of early biological tests to diagnose genetic predispositions. Table (1) showed that the average approval rates for statements related to the role of genetic testing in discovering and preparing sports champions were high (e.g., the average for the entire dimension = 4.15, a high score). This indicates a growing awareness that genetic analysis is a promising tool for predicting early athletic achievement. This result intersects with what was stated in the semi-structured interview, as almost all those responsible for managing these academies confirmed that science plays a major role in shaping athletic champions from an early age. Eight out of ten indicated that athletic talent is largely linked to genetics, although most of them also believe that talent is born and created together through a combination of innate predisposition and appropriate training. This dual conception (innate talent + training environment) is consistent with the current scientific trend, which considers athletic performance to be the result of a complex interaction between genetic and environmental factors. Recent studies show that approximately 50–66% Some of the differences in athletes' performance can be explained by genetic factors, while the remaining half or third are attributable to environmental factors, training, nutrition, psychological and social support, and other factors. This was also confirmed by research by Semenova et al. (2023), which found that approximately two-thirds of the variance in athletic achievement is determined by genetics, while the remaining third is explained by training and environmental conditions. Academies officials demonstrate awareness, consistent with the scientific literature, of the relative importance of genetic factors in athletic performance. On the other hand, sample members emphasized the need for specialized laboratories and medical staff to conduct these genetic tests in academies (mean for statement 2 = 4.07, statement 3 = 4.04, etc., all within the "high" range). However, the interviews revealed a lack of current laboratories that conduct genetic tests for athletes (10 out of 10 respondents agreed that they are not available). This paradox between perception and practical performance may be due to the novelty of the local application of genetic technologies or their high cost. Previous studies have highlighted similar obstacles, including the high cost of these tests, the poor generalizability of their results, and the small sample sizes in sports genetics research. For example, Konopka et al. (2023) explained in their critical analysis that one of the most prominent weaknesses is the limited sample size, high cost, and weak standardization criteria, which makes the application of genetic testing results in early sports selection a matter that requires extreme caution. However, the same researchers see future opportunities in adopting a precision training approach based on genetic prediction and integrating “multi-omics” technologies in athlete development, provided that methodological and ethical controls are improved. This trend towards personalized training that takes into account individual differences seems to be present in the minds of officials of the academies under study; While they expressed strong agreement on the need to compare international benchmarks with local player standards (mean score 7 = 4.21, very high), this can be explained by their desire to adopt global best scientific practices, including genetic standards, to ensure the selection and preparation of talent based on objective foundations and precise criteria.

When comparing our results with previous studies, we find consistency in several aspects. First, there is consensus on the role of science and genetic analysis. All sports consultant experts, during the interviews, emphasized the role of science (including genetic testing) in developing athletic performance. This parallels what Cantelmo et al. (2020) argued regarding the need to raise awareness among coaches and athletes about modern genetic techniques in athletic preparation, including emphasizing the importance of genetics without neglecting training. Also, the majority of sports coaches (7 out of 10) emphasized that a player is born with talent, but it must be refined through training, which is confirmed by the literature. Even with the high contribution of genes to performance, training and environment remain essential factors for activating these latent abilities.

For example, twin studies indicate that genes determine the maximum physical potential of an athlete, but achieving this high level is conditional on appropriate training and nutritional conditions. Other research has shown that some players may have an innate morphological or muscular composition (such as the ratio of fast versus slow muscle fibers) that gives them an advantage in certain types of performance. Andersen and colleagues' (2000) study found that genetic variation in the distribution of type I versus type II muscle fibers sets upper limits on an athlete's ability to excel in endurance or speed. This is reflected in our coaches, who indicated the emergence of physical differences among players with a genetic basis. Six out of 10 confirmed the presence of genetic differences in physical abilities among players. As for those who denied observing clear differences (three out of 10), their opinion may be attributed to the effect of intensive training in narrowing the gap or covering genetic differences. This is addressed by the concepts of adaptation and environmental gene expression, as the training environment may modify gene expression, reducing apparent differences despite the presence of underlying genetic differences. Despite this general consensus, the comparison also reveals important differences between our results and some recent scientific proposals. While the academy officials in our study highly rated the importance of early genetic testing, some scientific reviews question the current usefulness of genetic testing in talent discovery. For example, prominent experts such as Webborn et al. (2015) cited in Konopka et al. (2023) concluded that current genetic testing has no reliable practical role in selecting athletic talent. This is due to the highly complex nature of athletic performance resulting from the interaction of hundreds of genetic variants with environmental and training factors that are difficult to isolate. This view appears to contradict what our sample confirmed.

In terms of the practical significance of our results, the near-unanimous agreement among sample members on the importance of periodic examinations (mean of statement 5 = 4.65, very high) and the presence of a follow-up medical team (interview question 13, 10/10 consensus on the presence of periodic medical examinations) sends a positive message that the basic infrastructure for nurturing talent is in place. This constitutes a solid foundation upon which to build on to incorporate more specialized analyses, such as genetic testing, whenever available. Taking into account what recent research suggests about the possibility of using genetic information in training allocation, its application in academies could lead to directing young players towards training methods or playing positions that suit their genetic profile. For example, a player with certain genetic variants associated with high endurance abilities might be directed to focus more on the aerobic physical aspect than others, while someone with a genetic predisposition for strength and muscle explosion could be given training programs that focus on speed and strength. Such scientific allocation is described in sports literature as the concept of precise or personalized training, an approach that avoids a uniform training measure for everyone and allows each player to train in a way that suits their genetic abilities and circumstances. Together, the environment, and thus our officials' awareness of this idea, albeit implicitly, through their emphasis on the presence of medical teams and comprehensive talent testing batteries, reflects administrative maturity that can be developed with further awareness and training in modern sports sciences. Conclusion: Our data showed that there is a local consensus on the value of early genetic testing, which is a positive indicator of the adoption of science and technology in the field of talent discovery. From a methodological perspective, developing a champion remains a multidimensional process that cannot be reduced to a single genetic or environmental dimension. Therefore, the contribution of the current study lies in its emphasis on the need to adopt an integrative perspective that combines genetic predisposition and adaptive training environment factors to achieve high-level sporting achievement. This perspective is supported by the latest findings in sports science and is consistent with the views of the majority of our current study sample, giving our results enhanced scientific and practical credibility. At the same time, the discussion highlights that any differences between our study and

previous studies can be attributed to rapid scientific progress and increased local awareness in recent years rather than fundamental contradictions. Overall, these results reflect coaches' awareness of the importance of combining genetic and environmental factors in shaping the future football champion project from the early stages. They also reveal shortcomings in current talent discovery mechanisms (both in terms of the scarcity of reliance on scientific testing and the lack of infrastructure for conducting genetic analysis), which A more comprehensive scientific approach is needed to bridge these gaps and improve the effectiveness of selection and nurturing programmes for emerging football talent.

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