

SHORT COMMUNICATION

Vigorexia

Vigorexia

Luciano Caero¹ , Juliana Libertelli¹

¹Universidad de Flores, Facultad de Psicología y Ciencias Sociales. Ciudad Autónoma de Buenos Aires, Argentina.

Citar como: Caero L, Libertelli J. Vigorexia. AG Salud. 2023;1:19. <https://doi.org/10.62486/agsalud202319>

Enviado: 14-06-2023

Revisado: 11-09-2023

Aceptado: 28-10-2023

Publicado: 29-10-2023

Editor: Porf. Dr. Javier Gonzalez-Argote 

ABSTRACT

The article discusses the concept of Vigorexia, also known as the Adonis Complex or Muscle Dysmorphia, which is a mental illness characterized by an obsession with body image, particularly muscularity. It was first named by psychiatrist Harrison G. Pope in the 1990s when studying weightlifters in a Boston gym. Vigorexia leads individuals to perceive themselves as small and weak despite having a muscular appearance. Some experts view Vigorexia as a behavioral addiction, marked by an obsession with exercise and the consumption of substances like anabolic steroids to increase muscle mass. It is often associated with distorted body image and dissatisfaction with one's appearance. The article highlights that Vigorexia has not always been recognized as a distinct disorder and was not initially included in diagnostic manuals. Anabolic steroids, testosterone, and growth hormones are commonly abused substances among individuals with Vigorexia, contributing to physical and mental health problems. Long-term use of these substances can lead to severe health issues, including psychosis. The article also touches on the impact of the COVID-19 pandemic on recreational bodybuilding practitioners, as lockdowns and social distancing measures disrupted their routines, potentially exacerbating anxiety and sadness. Additionally, it distinguishes between general physical activity and bodybuilding, with the latter emphasizing muscle development, strength, and aesthetics. The practice of bodybuilding often involves weightlifting and specialized machinery in gyms. In summary, Vigorexia is a mental disorder characterized by an obsession with muscularity, distorted body image, and the abuse of substances like anabolic steroids. It has physical and mental health consequences and has become more prevalent in recent years, affecting both athletes and non-athletes.

Keywords: Vigorexia; Adonis Complex; Muscle Dysmorphia; Body Image; Anabolic Steroids.

RESUMEN

El artículo analiza el concepto de Vigorexia, también conocido como Complejo de Adonis o Dismorfia Muscular, que es una enfermedad mental caracterizada por una obsesión con la imagen corporal, en particular la musculatura. Fue nombrada por primera vez por el psiquiatra Harrison G. Pope en la década de 1990 al estudiar a los levantadores de pesas de un gimnasio de Boston. La vigorexia lleva a los individuos a percibirse a sí mismos como pequeños y débiles a pesar de tener una apariencia musculosa. Algunos expertos consideran la vigorexia una adicción conductual, marcada por la obsesión por el ejercicio y el consumo de sustancias como los esteroides anabolizantes para aumentar la masa muscular. Suele asociarse a una imagen corporal distorsionada y a la insatisfacción con el propio aspecto. El artículo destaca que la vigorexia no siempre se ha reconocido como un trastorno diferenciado y no se incluyó inicialmente en los manuales de diagnóstico. Los esteroides anabolizantes, la testosterona y las hormonas del crecimiento son sustancias de las que suelen abusar las personas con vigorexia, lo que contribuye a problemas de salud física y mental. El consumo prolongado de estas sustancias puede provocar problemas de salud graves, incluida la psicosis. El artículo también aborda el impacto de la pandemia de COVID-19 en los practicantes de culturismo recreativo, ya que los encierros y las medidas de distanciamiento social alteraron sus rutinas, exacerbando potencialmente la ansiedad y la tristeza. Además, distingue entre la actividad física general y el culturismo, haciendo hincapié

este último en el desarrollo muscular, la fuerza y la estética. La práctica del culturismo suele implicar levantamiento de pesas y maquinaria especializada en gimnasios. En resumen, la vigorexia es un trastorno mental caracterizado por una obsesión por la musculatura, una imagen corporal distorsionada y el abuso de sustancias como los esteroides anabolizantes. Tiene consecuencias para la salud física y mental y se ha hecho más prevalente en los últimos años, afectando tanto a deportistas como a no deportistas.

Palabras clave: Vigorexia; Complejo de Adonis; Dismorfia Muscular; Imagen Corporal; Esteroides Anabolizantes.

INTRODUCTION

Vigorexia, also known as muscle dysmorphia or Adonis complex, is a psychological disorder characterized by a compulsive obsession with muscle development and physical appearance. This condition, which predominantly affects young men, manifests itself in a relentless pursuit of achieving a muscular and athletic body, accompanied by a distorted perception of one's own body image.^(1,2)

Over the last few decades, vigorexia has gained attention in the scientific community and in society in general, due to its increasing prevalence and the serious implications it has for the physical and mental health of those who suffer from it. This disorder is closely linked to the consumption of substances such as anabolic steroids, growth hormones and other physical performance-enhancing products, which further aggravates its detrimental effects.^(3,4)

The present study aims to explore the relationship between vigorexia and substance use by examining the factors that contribute to its development, its clinical manifestations, and the health consequences for those who experience it. In addition, the differences between general physical activity and recreational bodybuilding will be analyzed in order to better understand the motivations and behaviors associated with this disorder.^(5,6,7,8)

Through a comprehensive review of the existing literature and consultation with experts in the field, we seek to provide a deeper understanding of vigorexia and its implications, as well as identify possible prevention and treatment strategies to address this emerging public health problem.

METHODS

In order to carry out this study on vigorexia and its relationship with substance use, an exhaustive bibliographic review of the existing literature on the subject was used. Various academic and scientific sources were used, including articles from specialized journals, books, doctoral theses and official documents issued by health agencies and health authorities.⁽⁹⁾

The literature search was performed in electronic databases such as PubMed, Google Scholar and Scopus, using search terms related to vigorexia, eating disorders, substance use, anabolic steroids, steroids, and other terms relevant to the study. The search was limited to articles published in English and Spanish, with a publication date up to January 2022.

We selected those studies that provided relevant and updated information on vigorexia, its relationship with substance use, its clinical manifestations, risk factors, physical and mental health consequences, as well as possible interventions and treatments.

In addition to the literature review, experts in the field of clinical psychology and psychiatry were consulted in order to obtain additional opinions and perspectives on the topic.

Once the relevant information had been compiled, the data were analyzed and synthesized to produce the present article, which seeks to provide a comprehensive view of vigorexia and its relationship with substance use, as well as to point out possible areas for future research in this field.

RESULTS AND DISCUSSION

Vigorexia is also known as Adonis Complex. Adonis, the Syrian god, taken and popularized by Greek mythology, represents the young and attractive man and the bearer of tremendous immature vanity.⁽⁶⁾

From there arises the concept known today as the Adonis complex; on the other hand, Vigorexia is also called obsession with the body.

However, it was the psychiatrist Harrison G. Pope (1993),⁽¹⁰⁾ at the beginning of the '90s, in the laboratory of Biological Psychiatry of the McLean Hospital in the United States, who named Vigorexia as a new mental illness, a concept that arises when studying people who practiced weightlifting in a gym in Boston.⁽¹⁰⁾

In the study, it was possible to observe the side effects of abusing anabolic steroids. Some of the individuals were found to exhibit psychotic-like behaviors.⁽¹¹⁾

However, there were already in the 1970s some references in the observations that Baekeland (1970)⁽¹²⁾ made in his work about the dependence of some people on physical exercise.⁽¹²⁾

Sometime later, Pope and his team realized that some of the subjects examined had a somatic disorder

related to body image, which they designated as muscular dysmorphia or bigorexia.

They developed a type of disorder that made them perceive themselves as petite, skinny and weak when, on the contrary, their appearance was muscular and of enormous proportions.

Pope also found that to increase lean weight and lose fat while gaining muscle mass, they were subjected to strict diets, low in fat, very rich in protein and carbohydrates, and abusive consumption of anabolic agents.

Baile (2005),⁽¹³⁾ in turn, defines bigorexia as a health disorder represented by a pathological preoccupation of being weak and not having enough muscular development in the body, even though this is, in addition to the fact that it manifests itself in the inability to see the actual size of one's own body accurately. It also leads to obsessive and negative behaviors related to appearance.

On the other hand, for Martínez Medina (2009),⁽¹⁴⁾ bigorexia is a mental disorder, not essentially an eating disorder; however, it is united by the obsessive preoccupation with the image and distortion of it as with the eating disorder. It also behaves as a behavioral addiction, which pursues muscle mass gain without care through exaggerated physical exercise and other behaviors such as ingesting anabolic steroids or steroids.

Therefore, it can be considered an addiction; according to Rodríguez Molina (2007),⁽¹⁵⁾ bigorexia resides in addiction to exercise, considering it as relatively new, contrary to some authors who argue that we should not speak of it as an addiction and mention that the obsessive-compulsive disorder must be a component of bigorexia because it involves repeated thoughts about the need to exercise, becoming the physical activity the compulsion, asserts that it is a disorder of eating behavior, and body dysmorphic, specifically, muscular.

Sobrinho (2006)⁽¹⁶⁾ describe behavioral addictions as dependence disorders related to daily actions that do not include the use of substances, i.e., people perform activities that generate pleasure repeatedly and constantly that become habits. They become psychic and emotionally dependent, regardless of their irrationality and consequences. In other words, behavioral addictions show incorrect self-control in people's behavior, leading them to situations where their health is put at risk.

Likewise, Castro and Ferreira (2007)⁽¹⁷⁾ point out that when exercise fulfills the objective of achieving muscle mass growth, vigorous individuals do not experience it in this way. It is no longer enough since it is not enough to feel good about themselves and their body, and they persist in the irrational belief about their volume and weakness.

Consequently, the obsession with muscle development, distorted self-perception, figure dissatisfaction and acceptance combine to be the breeding ground for substance abuse. Growth hormones, anabolics and steroids are the scaffolds that support an already deficient structure.

Muñoz and Martínez (2007),⁽¹⁸⁾ state that steroids are pharmacological chemical products used to increase muscle mass and lose fat.

On the other hand, Portela Guarín (2002)⁽¹⁹⁾ argues that vigorexia, in addition to the compulsive practice of exercise and extreme diets, leads to the use of certain drugs that facilitate the increase of muscle mass, mainly being anabolic steroids, testosterone, growth hormone.

In turn, other variables are considered; Castro (2013)⁽¹¹⁾ indicates that perhaps it is within the order of eating disorders since the concern is framed in the body.

Similar to body dysmorphic disorder, vigorexia has an excessive and pathological preoccupation with an imagined defect of the body or appearance.⁽¹⁵⁾ Being the body, its perception and conception are a big part of the conflict.

This is one of the main characteristics of vigorexia since the subjects cannot perceive the actual size of their body, which is why it could be said that it is a BDD and, more precisely, MDD (muscular dysmorphic disorder).⁽¹¹⁾

Cabrera & Fanjul (2002)⁽²⁰⁾ state that vigorexia is a disorder based on a discomforted desire to develop muscle mass, predisposing one to have a distorted image of one's body.

However, one could appreciate the physical appearance and body image.

Body image represents the body that each person constructs in his or her mind⁽⁵⁾ and the experience he or she has of his or her own body.⁽²¹⁾ Thus, some people with a physical appearance far from the canons of beauty may feel good about their body image and self-perception, and, on the contrary, others, socially and culturally estimated as standards or weighted ideals, may not feel and perceive themselves as such.

It should be noted that the disorder was not initially included in the DSM-IV-TR American Psychiatric Association diagnostic manual.⁽²²⁾ This situation generated discussion regarding its classification, so some authors tried to place it within the different nosological entities.⁽²³⁾

Some equate it with addiction; others talk about it being an obsessive-compulsive disorder (OCD). It is also said to be an eating behavior disorder (ED) or a body dysmorphic disorder (BDD).⁽¹⁵⁾

Once Muñoz and Martínez (2007)⁽¹⁸⁾ state that it is not an eating disorder but a somatoform disorder, the term currently used begins to be used.

Therefore, they can be seen in the diagnostic criteria raised in the DSM-5 Manual,⁽²⁴⁾ are the following points:

- A. Preoccupation with one or more perceived defects or imperfections in physical appearance that are not observable or seem unimportant to others.

- B. At some point during the disorder, the subject has engaged in behaviors (e.g., looking in the mirror, excessive grooming, scratching the skin, wanting to make sure of things) or mental acts (e.g., comparing his or her appearance with others) that are repetitive in response to the Preoccupation with appearance.
- C. Preoccupation causes clinically significant distress or impairment in social, occupational, and other vital areas of functioning.
- D. Concern about appearance is not best explained by concern about adipose tissue or body weight in a subject whose symptoms meet diagnostic criteria for an eating disorder.

Specify whether:

With muscular dystrophy, the subject is concerned that his or her body frame is too small or under-muscled. This specifier is used even if the subject is concerned about other body areas, which is often the case.

Specify if:

Indicate the degree of introspection about body dysmorphic disorder beliefs (e.g., "I am ugly" or "I am deformed").

With excellent or acceptable introspection: The subject recognizes that the body dysmorphic disorder beliefs are clearly or probably not true or may or may not be accurate.

With little introspection, the subject thinks the body dysmorphic disorder beliefs are probably accurate.

With no introspection/delusional beliefs: The subject is convinced that the body dysmorphic disorder beliefs are true.

In turn, the DSM-IV mentions that it usually begins in adolescence and can be seen to begin gradually or suddenly and may go unnoticed because the subjects do not want to report their symptoms.

The intensity of the symptoms usually presents ups and downs, but there are few intervals in which they are absent.⁽²²⁾

It should be noted that the manual also does not provide more information about the disorder, the duration of symptoms is not mentioned, and there is no mention of how many criteria a patient must have to be diagnosed.⁽²⁵⁾

In ancient Rome and Egypt, both cultures attributed aphrodisiac and virilizing properties to sexual organs, and the ingestion of animal testicles was a frequent practice among monarchs and warriors at that time.

In 1889, the French physiologist Charles Brown-Sequard was the first to publish his own experience with the self-administration of liquid extracted from dog gonads, attributing rejuvenating properties to it. However, it was not until 1935 when Butenandt and Ruzicka succeeded in synthesizing testosterone, a milestone that revolutionized the field of endocrinology and earned them the Nobel Prize in Chemistry in 1939.

In the 40s, the first studies on human beings were initiated. In 1950, its use for sporting purposes was used for the first time with great followers in the next 25-30 years, and its massification and excessive abuse led the Olympic Committee to prohibit its use in 1976.

Anabolic androgenic steroids (AAS) correspond to synthetic derivatives of testosterone, which have specific medical indications. However, they are currently used for non-clinical purposes.

There is a relationship between vigorexia and the consumption of substances intended to increase performance, many of them under the legal format in the order of vitamin complexes.

On the other hand, illegal substances such as anabolic steroids outside of medical prescription.

Baile (2005)⁽¹³⁾ groups these substances under the following groups:

Minerals and electrolytes sometimes accompany vitamin complexes. Diuretics, insulin, caffeine.

Dietary supplements are composed mainly of proteins extracted from milk or egg whey (sometimes at 90 % concentration) in powdered form, bars, or shakes.

Substances exist in the body, such as carnitine or creatine, which favor increasing muscular volume and making the best use of muscular energy.

Anabolic steroids. Pharmacological products are used to increase muscle mass and lose fat. Their trade and consumption outside of medical prescription is not allowed. As well as human growth hormones.

Also known as androgenic anabolics, anabolic steroids are products derived or synthesized from testosterone. The primary male hormone and androgen are naturally produced by the gonads.⁽²⁶⁾

It has several essential functions in adult male development. At once, anabolic function directly interacts with the regulation of fat metabolism and muscle development.⁽⁷⁾

The first testosterone derivatives for medicinal use were synthesized around 1930.⁽²⁷⁾ They were part of the treatments for developmental deficits, delayed pubertal development in males, breast cancer, anemia, etc.

It is from the 1950s that they began to be used by athletes as a method to build muscle and gain strength beyond the possibilities that training without chemicals provided.

In the 1956 Olympics, anabolic steroids were used by a considerable proportion of the participating athletes.

According to Wroblewka (1997),⁽²⁸⁾ however, it was not until the 1976 Summer Games that their use was banned by the International Olympic Committee.

At first, their consumption was limited to athletes seeking to improve their physical performance or bodybuilders who wanted to increase their musculature; today, the use of anabolic steroids has expanded to a sector of the population outside the sports practice.⁽³⁾

On the other hand, although they are not narcotic or psychotropic substances, they are used with a pattern of abuse in various sports activities, which is why the consumption of anabolic steroids for recreational, aesthetic, or competitive purposes is considered by many psychiatrists as an addiction.

It is known that in the long and short term, it produces physical and mental health problems of the psychosis type.^(1,29)

The number of consultations for erectile dysfunction, infertility, gynecomastia, and behavioral and hepatic alterations has been directly proportional to the reported increase in incidence. The increase in employment by non-experienced users for cosmetic purposes has caused a state of alertness in general.^(30,31,32)

On the other hand, this study aims to relate how the particular context of the situation generated by the COVID-19 pandemic affected recreational or cosmetic bodybuilding practitioners.

Within the dispositions established by the WHO and the measures taken by the Argentinean authorities, confinement, and social distancing have been implemented, causing a significant movement in people's daily activities and routines, impacting all dimensions of society, including physical activity, which was hindered.

This situation brought about a significant increase in anxiety and sadness, as reported by the Observatory of Applied Social Psychology, School of Psychology, University of Buenos Aires, which studied the relationship between psychological distress and social isolation.⁽³³⁾ Anxiety involves facing an uncertain threat, and sadness involves having experienced an irrevocable loss.⁽³⁴⁾

According to the WHO, physical activity is any bodily movement produced by skeletal muscles, with the consequent consumption of energy. It involves activities performed during play, work, travel, household chores, and recreational activities.⁽³⁵⁾

Therefore, general physical activity could be differentiated from exercise. This would be a subcategory of organized, structured, cycled, and repetitive physical activity that aims to improve or maintain one or more components of physical fitness.

What would be the practice of bodybuilding for recreational and aesthetic purposes?

In this order, it could also be called fitness, a type of training that, for marketing purposes, is called fitness. It arose around 1980 with the proliferation of gyms and sports clubs. Small weights, bars with weights, and specialized machinery characterize it.

It leads to the fact that it can be complemented with aerobic exercise to differentiate itself from the bodybuilding movement, where bodybuilding training is aimed more at hypertrophy strength and aesthetic issues such as loss of body fat, development, and definition of muscle mass. In other words, they share their origins.

All practices that used to be carried out in gyms have significantly increased in recent years. Moreover, on the other hand, its development in the open air has also become more popular.⁽³⁶⁾

CONCLUSION

In conclusion, this study has provided a comprehensive view on vigorexia and its relationship with substance use, highlighting its complex interactions and impacts on the physical and mental health of those who experience it. It has been evidenced that vigorexia involves not only an obsession with muscle development, but also a distortion of body image and compulsive behaviors related to physical appearance.

The literature review and data analysis reveal the need to address vigorexia as a public health problem, developing prevention and treatment strategies that address both the psychological and physiological aspects of this disorder. It is essential to promote greater awareness of the risks associated with the use of performance-enhancing substances, as well as to foster a culture of healthy physical exercise and acceptance of body diversity.

In addition, the importance of early detection and timely intervention to reduce the negative impact of vigorexia on the quality of life of affected individuals is highlighted. Further research is needed to better understand the underlying mechanisms of this disorder and to develop more effective and personalized treatment approaches.

Ultimately, addressing vigorexia and its implications requires a multidisciplinary approach involving mental health professionals, clinicians, educators, and society as a whole to promote a culture of holistic wellness and respect for body diversity.

BIBLIOGRAPHIC REFERENCES

1. Lorenzo Fernández P, Lorenzo-Velázquez B. Farmacología básica y clínica. 2018.

2. Olivardia R, Pope Jr HG, Hudson JI. Muscle dysmorphia in male weightlifters: a case-control study. *Am J Psychiatry* 2000;157:1291-6.
3. Baile JI, González Díaz A, Ramírez Ortiz C, Suárez Andujo P. Imagen corporal, hábitos alimentarios y hábitos de ejercicio físico en hombres usuarios de gimnasio y hombres universitarios no usuarios. *Rev Psicol Deporte* 2011;20:0353-66.
4. Mitchell L, Murray SB, Cobley S, Hackett D, Gifford J, Capling L, et al. Muscle dysmorphia symptomatology and associated psychological features in bodybuilders and non-bodybuilder resistance trainers: A systematic review and meta-analysis. *Sports Med* 2017;47:233-59.
5. Guimon J. Los lugares del cuerpo. Paidós; 1999.
6. Peyró CF, Oñate CG. La influencia de modelos somáticos publicitarios en la vigorexia masculina: Un estudio experimental en adolescentes. *ZER Rev Estud Comun* 2011;16:265-84. <https://doi.org/10.1387/zer.4845>.
7. Pinel JPJ, Miño E, Sánchez Hoyos MA. Biopsicología. Pearson Educación; 2001.
8. Pope H, Phillips KA, Olivardia R. The Adonis complex: The secret crisis of male body obsession. Simon & Schuster; 2002.
9. Hernández Sampieri R, Mendoza Torres C. Metodología de la Investigación. Las rutas cuantitativa, cualitativa y mixta. 1.a ed. España: McGraw Hill; 2020.
10. Pope HG, Katz DL, Hudson JI. Anorexia nervosa and “reverse anorexia” among 108 male bodybuilders. *Compr Psychiatry* 1993;34:406-9. [https://doi.org/10.1016/0010-440X\(93\)90066-D](https://doi.org/10.1016/0010-440X(93)90066-D).
11. Castro R. Diferencias de personalidad, autoconcepto, ansiedad y trastornos de alimentación en deportistas de musculación: Patrones psicológicos asociados a la vigorexia. PhD Thesis. Universidad de Jaén, 2013.
12. Baekeland F. Exercise Deprivation: Sleep and Psychological Reactions. *Arch Gen Psychiatry* 1970;22:365-9. <https://doi.org/10.1001/archpsyc.1970.01740280077014>.
13. Baile JI. Vigorexia: Cómo reconocerla y evitarla. Editorial Síntesis; 2005.
14. Martínez Medina F. Trastornos de conducta alimentaria intervención desde el ámbito educativo. vol. 16. 2009.
15. Rodríguez Molina JM. Vigorexia: Adicción, obsesión o dismorfia; un intento de aproximación. *Salud Drog* 2007;7:289-308.
16. Sobrino Cabra O, Cos Milas A, Gómez Macías V, García Blanco C, Sala Cassola R, Ballesteros García M. Adicciones comportamentales. Conductas socioculturales 2006.
17. Castro CFG, Ferreira R. Vigorexia: Estudio sobre la adicción al ejercicio. Un enfoque de la problemática actual. Universidad de Antioquia, 2007.
18. Muñoz Sánchez R, Martínez Moreno A. Ortorexia y vigorexia: ¿nuevos trastornos de la conducta alimentaria? *Trastor Conducta Aliment* 2007;5:457-82.
19. Portela Guarín H. Cómo problematizar la Educación Física desde la transición del concepto del cuerpo al de corporeidad. *EFDeportes* 2002;8:1-8.
20. Cabrera Y, Fanjul C. Influencia de los modelos publicitarios en la adolescencia: Anorexia y vigorexia. *Rev Sociol Educ-RASE* 2012;5:122-37. <https://doi.org/10.7203/RASE.5.2.8313>.
21. Raich RM. Imagen corporal. Piramide; 2000.
22. American Psychiatric Association. Diagnostic and statistical manual of mental disorders: DSM-IV-TR.

American Psychiatric Association; 2011.

23. Lopez-Cuautle C, Vazquez-Arevalo R. Muscle Dysmorphia Diagnostic evaluation: A systematic review. *An Psicol* 2016;32:405.

24. American Psychiatric Association. Diagnostic and statistical manual of mental disorders: DSM-5. American Psychiatric Association; 2013.

25. Salaberría K, Más MB, Amor PJ, Echeburúa E. Tratamiento del trastorno dismórfico corporal: Una revisión crítica. *Rev Psicopatología Psicol Clínica* 2000;5:27-43. <https://doi.org/10.5944/rppc.vol.5.num.1.2000.3886>.

26. Tortora GJ, Derrickson B. Principios de anatomía y fisiología. Médica Panamericana; 2018.

27. Peters R, Copeland J, Dillon P. Anabolic-androgenic steroids: User characteristics, motivations, and deterrents. *Psychol Addict Behav* 1999;13:232-42. <https://doi.org/10.1037/0893-164X.13.3.232>.

28. Wroblewska A-M. Androgenic-anabolic steroids and body dysmorphia in young men. *J Psychosom Res* 1997;42:225-34. [https://doi.org/10.1016/S0022-3999\(96\)00302-9](https://doi.org/10.1016/S0022-3999(96)00302-9).

29. Armijo JA, Flórez J, Mediavilla A. Farmacología humana. Elsevier Masson; 2014.

30. Aguila F, Mercado A, Palma C. Esteroides androgénicos anabolizantes: Consecuencias en el hombre. *Rev Chil Urol* 2013;13-7.

31. Snyder PJ, Fricker P. Use of androgens and other hormones by athletes 2018.

32. Fischer MD, Michalakakis S, Wilhelm B, Zobor D, Muehlfriedel R, Kohl S, et al. Safety and Vision Outcomes of Subretinal Gene Therapy Targeting Cone Photoreceptors in Achromatopsia: A Nonrandomized Controlled Trial. *JAMA Ophthalmol* 2020;138:643-51. <https://doi.org/10.1001/jamaophthalmol.2020.1032>.

33. Ursino DJ, Villa J, Katz E, Silva M, Carbone L, Rodríguez Giuranna B, et al. La influencia de la cuarenta en el deporte y ejercicio físico. Observatorio de Psicología Social Aplicada, Facultad de Psicología, Universidad de Buenos Aires, 2020.

34. Lazarus RS. Emotion and adaptation. Oxford University Press; 1999.

35. World Health Organization. Actividad física 2020.

36. Dosil Díaz J, Caracuel JC. Psicología aplicada al deporte. Editorial Síntesis; 2003.

FINANCING

There is no funding for this work.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTION

Conceptualization: Luciano Caero, Juliana Libertelli.

Research: Luciano Caero, Juliana Libertelli.

Methodology: Luciano Caero, Juliana Libertelli.

Project management: Luciano Caero, Juliana Libertelli.

Original drafting: Luciano Caero, Juliana Libertelli.

Drafting-revision and editing: Luciano Caero, Juliana Libertelli.