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The effect of exercise on the quality of the skin

Niki Tertipi^{1,*} , Eleni Sfyri¹ , Vasiliki Kefala¹ , Foteini Biskanaki¹ , Eleni Andreou¹ , Dimitrios Chaniotis¹ , Efstathios Rallis¹ 

¹Department of Biomedical Sciences, School of Health and Care Sciences, University of West Attica, GR-12243 Athens, Greece.

*Corresponding author

Niki Tertipi, University of West Attica, GR-15231, Attica, Greece.

E-mail: ntertipi@uniwa.gr

Abstract

The skin is the body's largest organ, serving as the primary barrier against infections and diseases. It is the part of the body that comes into direct contact with the environment. The proper functioning of the skin is influenced by the supply of blood, oxygen, and water. Exercise has numerous health benefits. It aims to strengthen and promote the health and well-being of our body, offering various advantages. It enhances cardiovascular health, reduces the risk of diseases, boosts the immune system, helps us manage stress, and enhances our psychological well-being. It improves overall body function and influences the quality of the skin.

KEYWORDS

exercise, skin aging, skin elasticity, sarcopenia, collagen, stress, skin hydration

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1. INTRODUCTION

Exercise improves the health of the skin, making it more youthful and resilient, regardless of age [1]. It enhances blood flow, aids in better cell nutrition, and more effectively removes toxins from the body. It prevents certain changes in skin cells that lead to signs of aging, including the loss of elasticity [2].

Sarcopenia refers to the phenomenon of decreased muscle mass and skin elasticity. Lack of exercise is the primary risk factor for sarcopenia [3,4,5,6].

Stress has a negative impact on the skin, especially for those suffering from chronic skin conditions such as acne, eczema, rosacea, and psoriasis. Moderate exercise has been proven to have antioxidant effects, contributing to the reduction of oxidative stress in the body [7].

Research has shown that individuals with higher levels of physical activity have better hydration in the stratum corneum. When we exer-

cise, sweat production has been proven to have anti-aging effects. Regular exercise has multisystem anti-aging effects and influences the primary characteristics of skin aging [8].

The present article provides an overview of the available information linking exercise to skin quality. Exercise can play an essential role in improving skin quality.

2. DISCUSSION

Using the PubMed database, we searched for articles citing exercise-related skin effects. We sorted the articles that specifically study the effects of exercise on skin aging.

Studies have shown that regular exercise improves skin health, making it more youthful and resilient, regardless of age [1]. Exercise may be able to reverse some of the skin cell changes that lead to signs of aging, including the loss of elasticity [1].

Cell metabolism improves and they work better, in the same way that exercise boosts your body's metabolic rate to burn calories [2].

2.1. Skin Aging

Through exercise, the function of the cardiac muscles is strengthened. Increased blood flow enables better circulation of oxygen throughout our body, and the skin receives the necessary nutrients to appear and feel more hydrated and healthier. Skin cells absorb the needed nutrients more quickly, enhancing their vitality [1].

Anything in our organism that exceeds the necessary levels is considered a toxin. Improved blood flow, through exercise, more effectively removes toxins from the body, and skin cells are less affected by the harmful consequences. Regular exercise has multifaceted anti-aging effects. Exercise influences the key characteristics of aging, and studies demonstrate the attenuation of dermal aging. During menopause, estrogen levels decrease, leading to skin thinning. Regular exercise, specifically 4 hours of aerobic training, reduces the thinning of the keratin layer compared to no exercise [9,10].

2.2. Exercise and skin elasticity

Elasticity is a natural property of the skin known to decrease with aging. Exercise prevents some of the cellular changes in the skin that lead to signs of aging, including the loss of elasticity. This occurs because the metabolism of the skin cells improves in the same way that exercise

enhances the body's metabolic rate. A study examining the anti-aging effects of exercise found that endurance exercise (cycling in this case) yielded rejuvenating results for the skin [2].

A study demonstrated that skin elasticity and superior skin structure improved both in aerobic exercise and resistance training. In the aerobic exercise group, the elasticity of the superior skin structure improved, leading to an enhancement of the extracellular matrix (ECM), associated with the skin's elastic properties. In the resistance training group, the thickness of the skin increased, which typically decreases with aging, and the elasticity of the superior skin structure improved, resulting in an improvement of the extracellular matrix (ECM) [1].

2.3. Sarcopenia and skin elasticity

Sarcopenia is associated with the elasticity of the skin and the reduction of muscle mass. Lack of exercise is the primary risk factor for sarcopenia. A gradual decrease in the number of muscle fibers begins around the age of 50. The decline in muscle fibers and strength is more pronounced in individuals leading a sedentary lifestyle compared to those who are more physically active. Exercise provides better support for the skin and yields significant health benefits, such as improved metabolism and BMI, and the limitation of sarcopenia [11,12]. It enhances insulin sensitivity, promoting protein synthesis in the muscles, thus preventing sarcopenia [6].

2.4. Exercise and Collagen

Collagen is a protein found in the skin responsible for elasticity, firmness, moisture, and cell renewal. Regarding the skin, aerobic exercise stimulates mitochondrial biogenesis in dermal fibroblasts, increasing the content of dermal collagen. The interleukin-15 (IL-15) protein, originating from these muscles, has been identified as the mediator of these effects. Resistance exercise releases growth hormone from the pituitary gland, which stimulates fibroblast cells, resulting in collagen production [2]. During exercise, skin cells receive essential nutrients like oxygen and vitamins, nourishing the fibroblast cells in the skin and promoting collagen production. Exercise supports the fibroblastic cells responsible for collagen synthesis in the skin [2]. Exercise provides essential nutrients, such as vitamins and oxygen, to the skin cells, aiding in their renewal. These nutrients nourish the fibroblast cells in the skin, which produce specific types of collagen. Even a single exercise session can induce changes and im-

provements over time in the physiological properties of the extracellular matrix (ECM), primarily composed of water and collagen [13].

2.5. Exercise - Stress - Skin

Our emotions affect the skin. The nerve endings release neuropeptides during prolonged periods of stress. Stress hormones release inflammatory substances that may lead to: Dehydration of the skin, aggravation of skin issues, increased sensitivity, premature formation of wrinkles and fine lines [14]. Anxiety has a negative impact on the skin, especially for those suffering from chronic skin conditions such as acne, eczema, rosacea, and psoriasis. It triggers numerous physiological reactions within the body that can lead to flare-ups, inflammation, and allergic skin reactions. The skin is not only a target of neuroendocrine factors but also a source of hormones and neurotransmitters in response to stress. Moderate exercise has been proven to have antioxidant effects, contributing to the reduction of oxidative stress in the body [14].

Exercise reduces the heightened hormonal and immune responses of the body during periods of stress, minimizing the risk of chronic skin conditions and flare-ups. It maintains a healthy immune system, making it more capable of responding to stress control. Exercise yields positive results on psychological levels. Thirty minutes of daily exercise, five times a week, are sufficient to reduce stress with remarkable outcomes. Exercise enhances the secretion of endorphins, the hormones of well-being. It increases the brain's sensitivity to serotonin and norepinephrine, hormones that aid in the production of positive emotions [14].

2.6. Exercise and Skin Hydration

A study revealed that individuals with higher levels of physical activity exhibit increased hydration in the stratum corneum (SC hydration of stratum corneum), preventing the occurrence of skin problems such as dryness. Exercise improved the skin's ability to retain moisture, and skin hydration levels were consistent between both genders [15].

2.7. Exercise and skin perspiration

Sweat is the body's fluid produced by sweat glands and primarily consists of water, inorganic salts, and fatty acids. It possesses thermoregulatory capabilities and maintains skin homeostasis. The quantity of produced sweat depends on the

number of glands and can be influenced by various factors, such as physical activity, resulting in skin hydration, cooling, and functioning as a natural exfoliant [16].

The production of sweat due to exercise has been proven to have anti-aging effects. It helps remove harmful bacteria from the skin surface that can cause blockage of sweat gland pores, facial and body rashes, which worsen with the presence of makeup [16].

2.8. Exercise and Skin Health

Every cell in our body requires water to function properly. Our body consists of over 70% water, and water intake is considered the best way to combat dehydration. Proper hydration is essential for maintaining the elasticity of the skin and overall health.

When the skin is exposed to the sun, sweating during exercise further increases the photosensitivity of the skin, exacerbating the harmful effects of exposure to ultraviolet radiation. The use of sunscreen when exercising outdoors is considered essential [17].

When exercising, it is essential to cover rashes and eruptions. Clothing that wicks moisture away should be used to avoid skin irritations. Hygiene rules should be observed in changing rooms, and the sharing of personal care items should be avoided. Makeup should not be applied because, in combination with sweating, it can be detrimental to the skin. Regular examinations by a dermatologist are considered necessary [17].

3. CONCLUSION

The skin-related benefits of exercise are less well-known than the overall health benefits. Exercise can contribute to improving skin quality and have anti-aging effects. Additional studies are needed to further clarify the impact of exercise on skin quality and its potential role in skin diseases.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

REFERENCES

1. Matrices Shu Nishikori, Jun Yasuda, Kao Murata et al: Resistance training rejuvenates aging skin by reducing circulating inflammatory factors and enhancing dermal extracellular. *Scientific reports*. 23;13(1):10214 (2023). <http://dx.doi.org/10.21203/rs.3.rs-2930012/v1>
2. Crane J, MacNeil L, Lally J, Ford R, Bujak A: Exercise-stimulated interleukin-15 is controlled by

- AMPK and regulates skin metabolism and aging. *Aging Cell* (2015). <http://dx.doi.org/10.1111/accel.12341>
3. Robinde Dhillon et al: Pathogenesis and Management of Sarcopenia. *Clin Geriatr Med*. 33(1): 17–26 (2017).
4. Abate M et.al. Frailty in the elderly: the physical dimension. *Europa medicophysica*. 43(3):407–15 (2007).
5. Faulkner JA et.al: Age-related changes in the structure and function of skeletal muscles. *Clinical and experimental pharmacology & physiology*. 34(11):1091–6 (2007).
<http://dx.doi.org/10.1111/j.1440-1681.2007.04752.x>
6. Caterina Tezzee et.al: Anabolic Resistance in the Pathogenesis of Sarcopenia in the Elderly: Role of Nutrition and Exercise in Young and Old People. *Nutrients* 15(18): 4073 (2023).
<http://dx.doi.org/10.3390/nu15184073>
7. Birgitta Langhammer et al: The Importance of Physical Activity Exercise among Older People. *BioMed Research International* 7856823 (2018).
<http://dx.doi.org/10.1155/2018/7856823>
8. Oizum Ryosuke et.al: The association between activity levels and skin moisturising function in adults. *Dermatol Reports*. 17;13(1):8811 (2021).
<http://dx.doi.org/10.4081/dr.2021.8811>
9. Christopher Yeh, Elizabeth Flatley, Omar Elkattawy, Lauren Berger, Babar Rao: Exercise in dermatology: Exercise's influence on skin aging, skin cancer, psoriasis, venous ulcers, and androgenetic alopecia. *J Am Acad Dermatol*. 87(1): 183-184 (2022).
<http://dx.doi.org/10.1016/j.jaad.2021.07.023>
10. Camboim, FEF, Nóbrega, MO, Davim, RMB et al: Benefits of physical activity in the third age for the quality of life. *Journal of Nursing*,11(6), 2415-2422 (2017).
11. Biskanaki F., Andreou E., Sfiri E., Tertipi N., Rallis E., Kefala V. Modern non-invasive methods for the treatment of skin aging. *Epitheorese Klin. Farmakol. Farmakokinet*. 38(1):31-36 (2020).
12. Sfiri E., Andreou E., Biskanaki F., Tertipi N., Kefala V., Rallis E. Research reviews on the role of exercise in the treatment of obesity. *Epitheorese Klin. Farmakol. Farmakokinet*. 38(1):59-64 (2020).
13. Georgios Mavropalias, Marni Boppart, Kayley Usher: Exercise builds the scaffold of life: muscle extracellular matrix biomarker responses to physical activity, inactivity, and aging. *Biol Rev Camb Philos Soc*. 98(2):481-519 (2023).
<http://dx.doi.org/10.1111/brv.12916>
14. Felipe B Schuch et.al: Exercise as a treatment for depression: A meta-analysis adjusting for publication bias. *J of psychiatric research*: 77:42-51 (2016).
<http://dx.doi.org/10.1016/j.jpsychires.2016.02.023>
15. Oizumi Ryosuke et.al.: The association between activity levels and skin moisturising function in adults. *Dermatol Reports* 17;13(1):8811 (2021).
<http://dx.doi.org/10.4081/dr.2021.8811>
16. Mathieu Saubade, Sarah Norrenberg, Cyril Besson, et al: Sweet as an indicator of health. *Rev Med Suisse* 14;17(745):1289-1294 (2021).
<http://dx.doi.org/10.53738/revmed.2021.17.745.1289>
17. Katarzyna Kliniec, Maciej Tota, Aleksandra Zalesińska, Magdalena Łyko, Alina Jankowska-Konsur: Skin Cancer Risk, Sun-Protection Knowledge and Behavior in Athletes- A Narrative Review. *Cancers* 22;15(13):3281 (2023).
<http://dx.doi.org/10.3390/cancers15133281>