Sugiura and Sugiura, Clin Dermatol Res J 2020, 6:1
DOI: 10.37532/cdrj.2020.6(1).144

Clinical Dermatology Research Journal

Review Article

A SCITECHNOL JOURNAL

Outdoor Sports under UV Sunlight Exposure is not all Demerits - Considering its Advantages

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Abstract

Many physicians have warned of the risks of UV exposure during outdoor exercise. Outdoor exercise under sunlight, however, has not only adverse effects, but also many physical advantages. These include improved mental health, reduced mental stress, bone remodelling and increased muscle strength by increasing Vitamin D (25(OH) D3) levels, improved metabolism of glucose and lipids, growing up muscle mass and better skin by increased cortisol. Cortisol is also effective for antiaging by increasing anti-inflammatory factors, up-regulation of antioxidant enzymes, and improved skin blood flow by heating. Outdoor exercise with UV exposure has some good effects on the skin and physical body; females with regularly exercise outdoors are often perceived to be younger than their age and to possess good skin brightness and tone.

Keywords: Sports; Skin; Outdoor; UV; Athlete

Introduction

Many physicians have warned of the adverse effects of exposure to outdoor Ultraviolet (UV) sunlight on the skin and eyes. We have met many females regularly engage in outdoor sports such as triathlon or marathons, however, have better skin brightness and tone than others their age. There are physical and psychological changes involved in enjoying outdoor exercise. These include mental hygiene, decreased stress, improved blood circulation and lip metabolism, increased muscular strength, bone remodelling (synthesizing vitamin D) and prevention of age-related neurodegenerative processes [1, 2]. These changes are affected by the quality and quantity of activity, environment and physical condition. One main factor of the environment is sunlight, UV. The skin of many female triathlon or marathon athletes showed good condition and tone not by skin care alone. They often appear cheerful and younger than their ages, and doing sports regularly with exposure to sunlight is not all about disadvantages. In this time, we focus on the merits of outdoor exercise in the sun.

Environment and Exercise

Outdoor exercise involves a variety of environment factors such as weather, air, sunlight, landscape, people, insects, animals, birds, bicycles and cars. These stimulate the brain or body via vision, respiration and skin, and such stimulation can cause physical changes. In particular, UV sunlight, only available outdoors, affects the human body differently than indoor sports.

Exercises are divided as follows: aerobic, resistance training, strength training and calisthenics. There are various reports about exercise types: aerobic exercise has therapeutic effects against mental illness [3, 4]; resistance training is effective for improving health [5, 6]; and physical exercise is the best way to prevent or delay aging [7]. The outdoor environment affects endurance sports such as triathlons and marathons because these sports are time consuming. Endurance sports should produce more multiplier physical and physic effects.

Skin and Mental Hygiene

There have been many reports about the relation between physical exercise and mental health [8-11]. From the clinical evidence, exercise improves mental conditions (depression, Alzheimer's and Parkinson's disease) and the Quality of Life (QOL) [12-14]. It is well known that physic stresses often negatively affect skin conditions such as urticarial, acne, atopic dermatitis, prurigo and itching. On the other hand, improvement of mental hygiene can in some cases improve these skin conditions. Outdoor exercise reduces mental stress or confusion and promotes psychological benefits (happiness, satisfaction and improved QOL) [15-31]. Outdoor exercise involves one type of physical stress, the secretion of cortisol. UV sun exposure increases the active cortisol level in the skin by 11beta-hydroxysteroid dehydrogenase type 1 (11β-HSD1) [32, 33]. Cortisol is often used as a tablet or external medicine for treatment of dermatoses. Exercise under UV exposure should decrease mental stress and increase cortisol level, resulting in good skin tone and brightness. Moreover, dermatoses might be improved. Actually, UV is often used in treatment of skin diseases, and outdoor sports in sunlight could be a treatment for dermatoses.

Skin, Bone and Muscle

Outdoor exercise with UV exposure is practical and effective for remodelling bone and increasing muscle. Remodelling bone is closely related to vitamin D (25(OH) D3) levels. There have been reports on 25(OH) D3 levels in athletes [34, 35], and 25(OH) D3 levels may depend on diet or exposure to sunlight. Vitamin D3 (25(OH) D3) from the diet has low-level absorption; therefore, most vitamin D3 (25(OH) D3) is synthesized by exposure to sunlight. Ultraviolet B (UVB) in the skin is crucial. Using SPF 15 sunblock decreases synthesis of vitamin D in the skin, and this reduction causes a phenomenon in the skin similar to that of melanin in African Americans and Africans [36, 37]. Protection from sunlight is effective for preventing skin cancer, but it is not favourable for the synthesis of vitamin D and bone remodelling. Sunlight is particularly essential to vitamin D synthesis for elder females, because they are likely to eat less and shelter from the sun using sunblock. Their bones are more fragile due to menopause. Recently, some females have taken extreme measures to shelter from sunlight using sunblock, long sleeves, or facemasks whenever they go out, and often exercise indoors to protect against sunburn. Because vitamin D absorption from the diet is low, these females often develop osteoporosis. Outdoor exercise is effective for menopausal-related

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Received: November 11, 2020 **Accepted:** December 15, 2020 **Published:** December 23, 2020

doi: 10.37532/cdrj.2020.6(1).144

and aging-related bone changes. It increases bone mass and strength, mitigates bone loss and prevents the death of bone cells. Exercise with UV exposure will be important for aging females.

Vitamin D and calcium are not absorbed sufficiently from the diet for bone remodelling; this requires exposure to sunlight (UV). Willis [38] reported that low levels of vitamin D in athletes could lead to reduced muscle strength and significantly increase the risk of bone injuries [38, 39]. Low levels of vitamin D can affect the exercise capacity of professional athletes [40, 41]. Outdoor sports with exposure to sunlight is necessary for remodelling bone and building muscle, and these physical changes result in better skin condition and health.

The synthesis of vitamin D in the skin during outdoor activities in sunlight (UVB) affects the circulating levels of 25(OH) D, which is related to glucose metabolism [42-44]. A 25(OH) D deficiency is a nascent symptom of metabolic disease [45]. In obesity, there can be hypovitaminosis D3, high BMI, and low physical performance [46]. Outdoor exercise is effective not only for slimming, but also to improve metabolism of glucose and lipids.

Cortisol and skin

Human skin can produce and release cortisol in various environments; exposure to solar radiation [47-49], dryness [50], skin cancer [51], and trauma [52]. Exposure to UV increases active cortisol in the skin by 11beta-hydroxysteroid dehydrogenase type 1 (11β-HSD1) [32, 33]. This increasing cortisol might be caused by Interleukin-1be-ta (IL-1β) [50]. Outdoor sport is one kind of physical stress, and causes secretion of cortisol. Cortisol plays roles in increasing muscle mass and strength [53]. Most outdoor sports with a high degree of exposure to sunlight could be in a dry environment. Stress such as solar radiation, dry skin and physical exercise could produce cortisol secretion in the skin by IL-1β, causing increased muscle mass and strength, and better brightness and skin tone. The degree of improvement could depend on the quality and quantity of sports in sunlight.

Exercise, Oxidative Stress and Aging

Dillard [54] first reported muscular exercise increases oxidant damage (stress), and Sies & Cadenas [55] defined oxidative stress as a disturbance between the pro-oxidant and antioxidant balance. Physical activity can cause oxidative stress, while it also involves preventive action of increasing antioxidants by multiple pathways [56-59]. Previous reports clarified that oxidative stress is an imbalance between the formation of oxidants (free radicals, reactive oxygen and nitrogen) and the body's antioxidant defence capacity [60, 61]. The low concentration of reactive oxygen species induces the antioxidant enzymes and other anti-inflammatory agents [62]. Exercise has the potential to increase anti-inflammatory factors, up-regulation of antioxidant enzyme gene promoter, and reduce adipose tissue [63].

Exercise-induced oxidative stress is subject to the age, gender, duration and intensity of exercise, training status, nutrition and oxidative stress levels at rest [64-69]. Long-duration high-intensity exercise can cause oxidative damage to skeletal muscle [70-72]. Chronic oxidative stress by overtraining is associated with chronic fatigue [73], illness [74], muscle atrophy [75] and long-term performance decrement [5]. Nutrition, especially vitamins C [76-78] and E [79-82], has a role in inhibiting exercise-induced oxidative stress and muscle injury. In athletes, reducing oxidative stress is crucial for recovery and maintenance of performance. Dietary vitamins C and E after exercise are effective not only in athletes but also in people that exercise regularly (particularly endurance training or aerobic exercise) to reduce oxidative stress.

Previous reports showed regular swimming or running on a treadmill reduced oxidative damage in rats [83-85]. Mild oxidative stress induced by swimming or running may reduce oxidative damage to cells and tissues by operation of the antioxidant system. Mild oxidative stress plays a role in reducing risk of diseases associated with aging. The antiaging effects of physical exercise include increased muscle mass and bone density, enhanced metabolic function, improved respiratory function, increased neurogenesis, improved circulation and vascular systems, among others [86, 87]. People enjoying regular aerobic exercise such as swimming or running could reduce oxidative damage related to aging. Generally, skin blood flow is attenuated in aged skin, while in young skin, skin blood flow increases during whole body heating [88]. Aged skin in heating stress relies on NO-mediated vasodilation [89]. Endurance exercise causes functional vascular adaptations; elevation of skin blood flow [90] and endothelium-dependent vasodilatation [91-96]. This adaptation plays a role in maintenance of higher skin blood flow [97]. Moderate or endurance physical exercise and regular sports are effective for anti-aging and improve skin blood flow, resulting in younger appearance. In the result, female triathletes appear younger than their age.

Conclusion

Endurance sports such as triathlons, marathons, long-distance bike rides, and open water swimming could reduce oxidative stress, produce antiaging effects, and increase skin blood flow. These effects could result in a younger appearance and improved skin tone and brightness. Outdoor exercise, especially endurance sports, under UV exposure is not all about demerits.

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