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Dancing as non-pharmacological treatment for healthy aging in the COVID-19 era; a gerontological perspective

PATRYCJA RĄGLEWSKA[1], VIDA DEMARIN[2]

Abstract

Findings reveal a strong correlation between physical activity and cardiorespiratory fitness, the nervous system, psycho-motor skills, vascular aging, mood, cognition, and the overall quality of life as a result of a regular non-pharmacological treatment. Among many types and modes of physical activities dancing seems superior thanks to the widest spectrum of its impact on the body, including not only physical (fitness endurance, muscle strengthening, flexibility), but also psychological (cognition) and even social needs (satisfying the need of closeness, reducing the sense of loneliness). In view of the above, we summarize current knowledge on the connection between healthy ageing and dancing, which should be especially recommended for older people (>60 y).

KEYWORDS: COVID-19, dancing, physical activity in gerontology.

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Corresponding author: raglewska@awf.poznan.pl

[1] *Poznan University of Physical Education, Department of Physical Therapy and Sports Recovery, Poznan, Poland*
[2] *Croatian Academy of Sciences and Arts, International Institute for Brain Health, Zagreb, Croatia*

Introduction

There is conclusive evidence that classical medicine including surgery and pharmacological treatment in certain cases may be indispensable during the aging process; however, any non-pharmacological treatment that does not disrupt normal bodily function is of interest, provided it can be effective in the prevention or management of disease. This is especially valuable when positive effects are observed in terms of cardiorespiratory fitness [16], the nervous system [21], psycho-motor skills [8], vascular aging [18], mood, cognition and the overall quality of life [11] as a result of regular non-pharmacological treatment. One spectacular example is dancing, which is especially recommended for older people (>60 y) [7] proving to be superior to fitness exercise [17] thanks to the widest spectrum of its impact on the body, including not only physical (fitness endurance, muscle strengthening, flexibility), but also psychological (cognition) and even social needs (satisfying the need of closeness, reducing the sense of loneliness).

Biological aging

Processes that influence biological aging might be divided into two classes as innate functions that decline/change over time and those affected by damage-related factors. These adaptations are accompanied by vascular and neurological changes that compromise muscle function [5]. A challenge in the study of aging is to determine whether the deterioration of muscle and nervous system functions is attributed to aging *per se* or rather whether is a consequence of disease and lifestyle. Unfortunately, among numerous factors aging itself is the essential risk factor for neurodegenerative diseases, including Parkinson's disease (PD), Alzheimer's disease (AD), dementia and increased sensitivity to sudden pathophysiological episodes, such as stroke. However, focusing on AD as the main cause of dementia, about

33% of all AD cases worldwide could be attributed to seven risk factors, including smoking, diabetes, hypertension, obesity, low education, physical inactivity and depression, with the largest proportion of AD cases attributable to physical inactivity [13]. Thus, among other things physical activity is regarded as one of the most significant non-pharmacological treatments against rapid, pathological and unfavourable symptoms of neurological aging [20]. For instance, Voss et al. first demonstrated the existence of exercise-induced functional plasticity in large-scale brain systems in the aging brain [22].

Muscles and nervous tissues are functionally connected, and thus an exercising person who usually focuses on training muscles also needs to be aware that during exercise the nervous system is trained as well. Moreover, maintaining cognition in older age is more likely in physically active people than in those who are physically inactive. In 2003 Verghese et al. reported in the NEJM that leisure activities, reading, playing musical instruments, playing board games and dancing are associated with a reduced risk of dementia [21].

Muscle must be lifelong trained

Aging is associated with changes in muscles that contribute to the age-related decline in peak aerobic and anaerobic power. Additionally, age-related alterations in muscle metabolism, including mitochondrial capacity and insulin sensitivity, are apparent. That is important in the view of the fact that muscle health is a decisive factor against physical frailty and determines maintenance of metabolic health until the limit of chronological age. The role of exercise against aging is well documented; however, more details need to be discussed concerning the intensity, frequency, volume and type of physical activity (exercise) as most suitable for people above >60 y and which thus could be especially recommended. First of all, exercise can be classified into the three following subclasses: resistance, endurance and patterned movements, where only endurance and resistance exercise have a significant influence on the muscle phenotype, while patterned movement exercises concern essentially a motor program in the central nervous system, resulting in almost imperceptible biochemical changes in muscles.

While in the case of resistance exercise the primary acute response is connected with an increase of protein synthesis, in the case of endurance exercise the primary acute response leads to increased levels of slow contractile and regulatory proteins, decreased levels of glycolytic enzymes, increased levels of oxidative enzymes, increased mitochondrial mass and a decrease in the fast-fiber area. Those processes become especially important in view of the fact that in healthy people aged 60-71 yr the maximal oxygen uptake (VO_2max) adapts to aerobic exercise to the same relative extent as in young people and this adaptation is independent of age, gender and the level of fitness at the beginning of training [9].

Most ballroom dances (formal social dancing in couples) such as Standard dances: slow waltz, tango, foxtrot, and Latin dances: rumba and cha-cha, are characterized by their impact on the aerobic metabolic system, which makes them especially suitable for people over 60 years old. During slow to moderate endurance exercise, two essential intracellular signals triggering muscle adaptation may be distinguished: first, a progressive increase in the AMP : ATP ratio and second, an increase of free Ca^{2+} in myocytes [6]. Since most adaptations can be compounded by training-induced ischaemia, this additionally draws attention to a crucial AMPK role in stimulating both vasculogenesis and angiogenesis in exercised muscles [14]. However, aerobic processes do not decline as strongly during aging as muscle strength does; thus, resistance exercises need to be focused on as an essential part of the exercise regimen for older >60 y.

Why is resistance exercise important during aging?

Resistance exercise is any form of exercise that causes muscular contraction at external resistance. Several subtypes can be distinguished: eccentric, concentric, dynamic, static exercises and others. During dancing all subtypes can be observed. However, the phenotypes of prognosed hypertrophy and increased bone density can be expected only as a result of systematic and progressive activity of adequate intensity, weekly frequency, duration of each programmed bout, causing adaptation of the body according to the overload principle. Even a single bout of resistance exercise brings a 50% increase of protein synthesis at 4 h and 115% at 24 h. However, these data refers to young men [10]. In older >60 y persons we do not observe true hypertrophy, but rather slower sarcopenia and muscle decline.

In the enhanced protein synthesis observed after a resistance exercise, mTOR plays a pivotal role. The mTOR pathway is a specific response of skeletal muscles to resistance exercise, nutritional or environmental stimuli; however, the decisive variable is activation through the regular and adequate intensity of exercise. Thus, regular resistance exercise and an adequate choice of intensity are essential for all physically active people, but especially for adults >60 y, as a crucial factor stimulating intracellular muscle protein synthesis and

maintaining adaptation to exercise bouts as changing environmental conditions.

Which style of dance is most suitable for older people?

Among the many dance styles and techniques contemporary dance can be especially dedicated and recommended for adults >60 y, as it represents a combination of aerobic and resistance exercise, but is still characterized by its impact on the aerobic metabolic system [19]. However, for the elderly there may be some bodily movement restrictions associated with age-associated changes in the labyrinth, skeletal muscle and joint functioning limitations in the context of the necessary floor practice including rolling, shifting, sliding, travelling, transferring weight, etc.

Dancing is most commonly accompanied by music. Regardless of age and musical expertise, people relatively easily synchronize their body movements to rhythmic music [15]. It should be emphasized that the necessity of coordinating bodily movements to the music rhythm is a positive challenge for people >60 y, especially for their nervous system. Effectiveness of rhythmic music-based interventions on cognitive functioning and motricity especially in neurological populations are being evaluated and adjusted to improve health and well-being [12].

Dance therapy

In the process of prevention and treatment of various illnesses common in elderly people, art therapy plays a significant role. The concept of art therapy (Latin *ars* – art and Greek *therapeia* – care, treatment) involves treatment through art. Although this form of therapy is only reimbursed as a health service in psychiatry, it is increasingly often chosen by therapists and coaches as one of the more effective actions delaying ageing. Therefore, it is a method suitable not only for diseased individuals, but also for healthy people aiming to improve their physical and mental health.

Art therapy does not only involve the use of visual art techniques, as it was the case at the beginning of its heyday. Apart from the visual art aspect, art therapy includes also music therapy and dance therapy. Art therapy is often a part of occupational therapy, which is defined as a continuous therapeutic activity using music, art or movement, carried out in order to rehabilitate a patient or maintain physical and mental fitness of participants. These activities can be performed individually or in groups and involve passive or active participation.

Art therapy in the form of music therapy and dance therapy allows the patient to focus on his or her relation with himself or herself and help build relations with others.

Apart from its relaxing effect, the therapeutic effect of music therapy on the nervous, motor, respiratory, circulatory, digestive and urogenital systems has been confirmed. Rhythm and tune used in music therapy activities positively affect body motor functions and imagination by improving thinking processes. Music therapy is based on listening to music, singing and – the patients' favourite – dancing.

In the case of elderly people the selection of music pieces plays a considerable role. The type of music used affects the emotions of dancers. Each type of dance therapy positively affects the mental and physical condition of the dancing person, stimulating the body and mind to reach the state of balance. When used in people with multiple chronic diseases of the nervous system "dance therapy has become not only an important area of specialised activity in the field of the Polish medicine, rehabilitation and education, but also an opportunity to treat dance art and music as prevention and a panacea for the threats of the modern world. In view of the popularity of art therapy we should bear in mind the ethical rule of *primum non nocere*, which should accompany every therapeutic activity".

Dance is a therapy which improves the mood through the effect of body movement, thus increasing the vitality and reducing the risk of depression, which is very common in elderly people.

However, some effects of dancing are vague and rather intuitive; even though contemporary medicine defines human beings in a biopsychosocial pattern after George Engel [3], since some ailments cannot be treated successfully by biological means, this activity by itself may be not enough. Frecska and Luna went even further and proposed a modified, extended paradigm: the biopsycho-socio-spiritual model [4]. According to WHO, "there is no health without mental health" [23]. Among the many inconveniences of aging loneliness is trully troublesome and there is strong evidence showing that it is a significant factor affecting well-being during aging [24]. For this reason, social behavior and activities such as dance take on an entirely new context for older people feeling lonely, since attending dance activities (classes, workshops, meetings) promotes the creation of social bonds and fosters microcommunities for those sharing the interest, which may counteracts the feeling of loneliness.

Moreover, it seems helpful to recognize that the state of art creation is a process that brings the human being closer to the inner element of the psyche. Delving into the moment of dancing provides the following impression.

When a dancer gives in to impulses and even pre-impulses (since Barba from Odin Theatret calls the Scandinavian term *Sats*), takes off the technique, style and all the learned roles from the foreground and immerses himself/herself in the place of vulnerability. This is when he/she takes off (disarms) one mask after another and faces himself/herself internally, not identified with anyone or anything, free from any judgment and view, aware of the inner needs, unrestricted by any rules, allowing the movement of consciousness in the structures of the imagination, realizing dreams, independent and distant. It may be assumed that at this moment the dancer is deeply immersing himself/herself in the inner element of their psyche. It makes dance, in some circumstances, a viable psychotherapeutic treatment and is defined by the American Dance Therapy Association (ADTA) as "the psychotherapeutic use of movement to promote emotional, social, cognitive, and physical integration of the individual, for the purpose of improving health and well-being" [1]. Results suggest that the Dance Movement Therapy (DMT) even decreases depression and anxiety and improves the overall quality of life and enhances interpersonal and cognitive skills [5]. Moreover, other more specific and non-specific psychotherapeutic mechanisms are connected to dance techniques including mirroring, non-verbal metaphors, movement analysis, imaginative techniques, meditative techniques, focusing and introspection, which all stimulate the nervous system in a non-pharmacological way [2].

Our limited knowledge concerning the relevance of dance as a commonly available and non-expensive non-pharmacological treatment may be broadened by a striking convergence between the effect of dancing and specific and non-specific health benefits and the interconnection between the body, the mind and the healing power of dance, thus supporting healthcare systems [8]. It makes dance a unique possibility of influencing the basically almost the entire human body architecture regardless of age and thus it needs to attract our attention also in the COVID-19 era.

Conflict of interests

The authors declare no conflict of interest.

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