Effectiveness of the Osaka “Ten-Year Rejuvenation” Project

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ABSTRACT

Introduction: The “Ten-year rejuvenation project” is an initiative of the Osaka Prefectural Government to reduce the physical and mental age of residents in the prefecture by ten years and enable them to live in good health and vitality in preparation for the Expo 2025 Osaka, Kansai, Japan. Our team tested a “Ten-year rejuvenation dance” for elderly people with the goal of enhancing participants’ muscle strength and physical fitness and improving their cognitive function through memorizing the dance choreography.

Method: Groups of around 30 participants each were recruited at 12 locations in Osaka prefecture and the Ten-year rejuvenation dance was practiced once per week over two months. Physical and mental tests carried out before and after participation were compared. Videos were also distributed so participants could dance at home in their free time. The dance program combines elements from physical therapy to improve joint flexibility, balance, muscle strength, and agility.

Results: Physical fitness and cognitive scores were both significantly increased and physical tests showed that physical age was reduced by five to ten years. These results confirmed the meaningfulness of continuing this activity.

Conclusion: Continued dancing demonstrated positive effects on mind and body, so we plan to increase video distribution to elderly people who cannot leave the house, expand the implementation area, and continue verification in the future.

Keywords: Cognition, elderly people, post-pandemic, Ten-year rejuvenation.

1. INTRODUCTION

While many social issues such as the globally declining birthrate and aging population or increasing severity of natural disasters have been intensifying in recent years, the theme of the Expo 2025 Osaka, Kansai, Japan, which will be held in Japan in 2025, is a positive development outlook. In 2021, the Osaka Prefectural Government initiated a “Ten-year rejuvenation project” [1] in preparation for the Expo, an initiative to reduce the physical and mental age of residents in the prefecture by ten years and enable them to live in good health and vitality.

However, during the project’s planning stage in 2020, the COVID-19 coronavirus was discovered, leading to the postponement of the Tokyo Olympics. Soon after, a state of emergency was declared and residents were asked to self-isolate. In 2021, the COVID-19 pandemic aggravated the vulnerability of the elderly and caused restrictions in medical treatment, contributing to an increased death rate for the first time in ten years since the Great East Japan earthquake. Mutant strains further expanded the pandemic in 2022 [2] and in order to maintain social distance, infection prevention measures such as video distribution were prioritized for this project [3]. The request for self-isolation was finally lifted in early 2023 and post-pandemic revitalization projects aimed at prefectural residents were launched [4].

Our Ten-year rejuvenation dance was one of these projects, and we recruited around 30 elderly participants at 12 locations in Osaka prefecture, practiced the Ten-year rejuvenation dance once per week over two months, and compared physical and mental tests carried out before
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and after. We also distributed videos so participants could dance at home in their free time [5]. The dance program combines elements from physical therapy to improve joint flexibility, balance, muscle strength, and agility. The duration of each session is 90 minutes: 60 minutes of dancing, including several breaks, followed by a cool-down and a short 30-minute lecture. The goal of the activity is to restore physical and cognitive functions that have declined during the three-year pandemic and to improve mental vitality.

Dancing enhances muscle strength, endurance, and mobility; improves gait status [6]; and mentally improves depression, anxiety, cognition, and psychomotor skills [7]. Fast walking and dancing are recommended by the Physical Activity Guidelines for Americans-second edition, and physical activity has been shown to provide immediate health benefits and reduce the risk of eight types of cancer as well as heart diseases and stroke [8]. In addition, the enjoyment of dancing increases motivation and continuation rates [9]. Causative factors of these effects are said to be neuroplasticity induced by learning and performing complex movements, focusing on the instruction being given, combining visual and rhythmic movements, and using social cognition skills in social interactions [10].

Based on this knowledge, the purpose of this study is to validate the physical and cognitive effects of this dance program by comparing scores before and after participation and to examine the factors contributing to “Ten-year rejuvenation.”

2. Method

2.1. Subjects

We recruited 50 elderly people in each of Osaka prefecture’s 12 districts by public advertisement. People who were not physically able to perform light exercise and people with a blood pressure of 180/110 mmHg or higher or a heart rate of 110 beats/min or higher were excluded.

2.2. Intervention Method

Participants memorized the dance choreography as shown in Fig. 1 and then performed the dance together with the other participants. Cognitive and physical tests were conducted before start and after done and dusted of the intervention, and the physical age before and after participation was compared. This research was conducted from April 2023 to January 2024.

2.3. Evaluation Method

2.3.1. Cognitive Test

2.3.1.1. Group-Style Matsui 10-Word Memory Test (Immediate Replay)

Ten words are read out and memorized, and participants then write down the words they remember within one minute. The maximum score is 40 points.

2.3.1.2. Yamaguchi Kanji Symbol Substitution Test (YKSST)

Participants substitute letters representing colors with corresponding symbols. The maximum score is 75 points.

2.3.1.3. Word Generation Task

Participants write down as many animal names as possible within one minute; one point is given for each word. The maximum score is 50 points.

2.3.1.4. Group-Style Matsui 10-Word Memory Test (Delayed Replay)

Participants write down the words they remember among the ten words memorized in part (1). Maximum score is 10 points.

2.3.2. Physical Test

2.3.2.1. Functional Reach Test (FRT)

Participants in their natural standing position raise their arms up to shoulder height and then move their raised arms in front of their body. The distance traveled by the fingertips is measured. Body balance ability is measured.

2.3.2.2. The 30-Second Chair-Stand Test (CS-30 Test)

The number of times that participants can stand up from a chair within 30 seconds is evaluated.

2.3.2.3. Timed Up & Go Test (TUG)

The time needed to stand up from sitting leaning against the chair’s backrest, walk three meters, turn around and walk back, and sit back down is measured.

Fig. 1. Memorize the choreography and match it with others.
2.4. Analysis Method

A paired t-test was used to compare measurements before and after participation, and a comparison using age-specific reference criteria [11]–[13] was performed to evaluate rejuvenation. A correlation coefficient and coefficient of determination by regression equation were used for the evaluation of the correlation between cognitive and physical fitness.

2.5. Ethical Considerations

The outline of the research, voluntary nature of participation, anonymity, and agreement regarding the publication of the document were explained to prospective participants both in writing and verbally, and their consent was subsequently obtained.

The study protocol was approved by the ethical review board of Nara Medical University, and Nagoya Gakuin University.

2.6. Clinical Trial Registration

This study has been registered in the clinical trial registration database: University Hospital Medical Information Network (UMIN); registration number: UMIN000052209.

3. Results

There were 153 subjects, 15 males, and 138 females, with an average age of 73.3 ± 6.37.

Significant improvements (p < 0.01) were seen in both cognitive scores (Table I) and physical fitness tests (Table II), and physical age was shown to have been reduced by 5–10 years (Table III).

No correlation was found between scores in the FRT and CS-30 tests and cognitive scores. Only the TUG test correlated with all cognitive scores, and the Pearson product-moment correlation coefficient between TUG test and each cognitive test were −0.4 for immediate replay and delayed replay, −0.3 for word generation task, and the strongest correlation was seen with −0.6 for YKSST. As shown in Fig. 2, however, the coefficient of determination by regression equation was 0.3, so the contribution rate of this model to the data was not high.

Participants’ Narratives: Narratives from participants after project completion included reports such as having become able to put on socks while standing on one leg, not needing a cane anymore, having more confidence in their movements, feeling younger, and having become more active.

4. Discussion

As a result of this initiative to reduce the physical and mental age of participants by ten years, age was reduced by an average of 16 years in the FR test, an average of 11 years in the CS-30 test, and an average of 2 years in the TUG test. Cognitive functions were also improved and there was a correlation between cognitive scores and TUG scores. Since the TUG test measures walking speed, there was a correlation of −0.4 between walking speed and delayed as well as immediate recall and a correlation of −0.6 between walking speed and YKSST; executive function (EF), and capacity of attention. While the determination coefficient was not high with 0.3, the results suggest that a program to improve agility and increase walking speed has positive effects on cognitive function.

In this study, the strongest correlation was found between walking speed and EF and capacity of attention, but a problem is that EF tends to decline easily, especially in elderly people [14]. Since EF is a daily behavioral ability, [15], a decline in this function can lead to difficulties in daily life. At the same time, the capacity for attention also

\[ y = -0.0488x + 8.9517 \]

\[ R^2 = 0.3034 \]
decreases with higher age [16], and elderly people become unable to pay attention to or concentrate on routine tasks. If not counteracted, this kind of functional decline continues to worsen, and functional decline due to the inability to be active because of the restrictions during the pandemic has been reported [17]. Reduced physical activity and a sedentary lifestyle during the pandemic have led to a slower walking speed [18].

The smaller amount of exercise during the pandemic significantly reduced EF, and even people with previously healthy cognitive function may have experienced cognitive function decline due to reduced activity [19]. In a previous study that measured TUG scores before and after the pandemic, people with a walking speed of 1.0 m/s or lower before the pandemic had a significant reduction in TUG scores [20], suggesting that people with a slow walking speed are at high risk of functional decline. Restoration of walking function in elderly people is an important priority post-pandemic and the restoration of gait demonstrated in this study should be seen as an opportunity to further distribute and expand this initiative to restore functionality and maintain restored function.

Next, the participant narratives included reports confirming the positive psychological effects on participants, such as increased confidence in movements after participating in this activity or feeling more energized. The restoration of physical functions that had declined during the period of self-isolation, the numerary reduction in physical age, and the return of psychological vitality as first steps towards revitalization are a significant achievement. The psychological impact of the outbreak of the pandemic was seen in a 25% increase in the incidence of anxiety and depression worldwide [21]. Especially in the elderly, depression-related health status declined greatly during the pandemic [22] and the recovery from this is a global challenge. Mental health risks due to the pandemic have been reported to be higher in elderly people than in other age groups [23].

A correlation with walking speed has also been found in depression, and the rate of depression is high in people who walk more slowly and have larger variability in gait status [24]. Since elderly people walk more slowly and become less ambulatory with increasing age, preventive measures are essential. Dance is an activity that can be incorporated easily into the daily routine, especially for elderly people, and our country has the custom of “radio calisthenics” in which people perform a prescribed choreography according to the rhythm. This radio exercise was popularized throughout the entire country in 1928 at the initiative of the Ministry of Education and elderly people have been familiar with it since childhood [25]. There is also the well-established custom of wearing a yukata (traditional summer clothing) and dancing traditional local dances at summer festivals [26].

Local dances are present and passed down as tradition all throughout the world, such as the Waltz in Austria and the Tango in Argentina, and are familiar to all locals [27]. This study took advantage of this affinity to gathering and dancing together and created a choreography incorporating functional restorative movement exercises based on physical therapy set to familiar music and songs. The effect of nostalgia and a return to the old days of mood by old familiar music can be expected and is thought to influence subjective rejuvenation. Subjective rejuvenation has the effect of actual brain age youthfulness, improved health, and prolonged life expectancy [28]. Regarding this, the recollective effect of music called music-evoked autobiographical memories (MEAMS), has attracted attention because it can evoke vivid, emotional, and episodic autobiographical memories [29]. MEAMS conjure feelings of youthfulness, nostalgia, and other emotions [30], and let especially elderly people recall vivid memories from their youth [31].

In addition, dancing greatly lowers the risk of developing dementia, and regular dancing decreases the dementia risk by 76%, twice as much as reading [32]. Similarly, a comparison of aerobic exercise and dance showed that dancing was more effective for cognitive functions [33], [34]. These data support dancing as an excellent program to prevent dementia that is familiar to elderly people. This initiative will be expanded and verified nationwide in the future.

5. Conclusion

The results of our validation of a dance based on physical therapy elements with the goal of rejuvenating the mind and body by 10 years resulted in a significant improvement in cognitive function and a significant rejuvenation of physical function. Rejuvenating effects on emotional state and mood were also seen, suggesting that efficacy was enhanced through synergy with the benefits of music.

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Conflict of Interest

Authors declare that they do not have any conflict of interest.

References

Office of Disease Prevention and Health Promotion, Office of the WHO News Release. COV AX delivers its 1 billionth COVID-
Sawami et al. Effectiveness of the Osaka “Ten-Year Rejuvenation” Project
Osaka. “10 years younger rejuvenation project” channel. 2010. Available from: https://www.youtube.com/watch?v=xAGeywEDLQ&list=PLZVxf7nKqKhXrAxFnsh68YTAnOORBCh [Accessed 20th January 2024].
Osaka. 10 years younger rejuvenation project” channel. 2010. Available from: https://www.youtube.com/watch?v=xAGeywEDLQ&list=PLZVxf7nKqKhXrAxFnsh68YTAnOORBCh