

2020 Doctoral dissertation (Abstract)

Safety of early morning exercises and  
its effect on physical, mental, and social aspects  
in community-dwelling older adults

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## **I . Purpose**

This study aimed to investigate the safety of early morning exercises including radio calisthenics and clarify their effects on physical, mental, and social aspects in community-dwelling older adults.

## **II . Study 1 - (1)**

### **Safety of early morning exercises in terms of circulatory dynamics**

This study aimed to assess the presence or absence of hypertension and seasonal variation in the circulatory dynamics of community dwelling elders before and after performing early morning exercises.

We included 76 community-dwelling older adults who performed exercises early in the morning. Data on sex, age, height, weight, current medical history, history, diagnosis of hypertension, high blood pressure treatment (medicine), presence or absence of pain, and blood pressure measurements before and after exercises were collected from the patients.

Participants who answered that they were diagnosed with hypertension were categorized in the hypertension group, while those who answered that were not diagnosed with hypertension were categorized in the no hypertension group. Using repeat measurements of general linear models, we analyzed systolic blood pressure (SBP), diastolic blood pressure (DBP), pulse, and double product (DP) values as dependent variables. Measurements exercise before and after exercises and seasonal factors (summer and winter) were considered independent variables. The baseline values of each item were considered adjustment variables for the hypertension and no hypertension groups.

As a result of the general linear model (repeated measurement), the main effects and interactions of SBP, DBP, Pulse, and DP were not observed before and after exercises and the measurement season as independent variables in both groups. In winter, 4 (11.4%) and 4 (10.0%) patients in the hypertension and no hypertension groups, respectively, had a pre-exercise SBP of  $\geq 160$  mmHg. In summer, 0 (0%) and 4 (9.0%) patients in the hypertension and no hypertension groups, respectively, had a pre-exercise SBP of  $\geq 160$  mmHg.

The results suggest that even in the early morning when the risk of morning surges increase, relatively low-intensity exercise can be performed relatively safely, regardless of the season and the presence of hypertension.

## **III . Study 1 - (2)**

### **Safety of early morning exercises in terms of the locomotor disorder**

This study aimed to investigate the occurrence of injury and pain caused by early morning radio calisthenics and to assess the safety of early morning exercises in terms of the locomotor disorder.

We included 116 community-dwelling older adults with an early morning exercises routine. Data on sex, age, current and past medical history, history of injury and pain caused by radio calisthenics, presence or absence of current pain, site of pain, appearance and increase in numbness after the start of exercises, amount of exercises performed without overdoing, and amount of exercises not performed were collected from the patients.

The chi-square ( $\chi^2$ ) test was used for self-adjustment of exercises between patients with and without pain. In addition, we performed a simple aggregation of specific exercise items that are self-adjusting in the type of action of radio calisthenics.

Twenty-one (18.3%) patients were diagnosed with motor disease, 39 (33.6%) patients had pain, and 77 (66.4%) patients had no pain. Only 1 (0.9%) patient reported an injury and pain caused by exercises, and five (4.4%) patients complained of numbness after radio calisthenics. The  $\chi^2$  test indicated no significant difference between patients with and without pain or the percentage of those who were self-adjusting exercise ( $p = 0.628$ ).

These results suggest that radio calisthenics can be performed relatively safely, even in the early morning. The safety has been assessed in terms of occurrence of injury and pain. In the case of radio calisthenics, self-adjustment is possible.

#### **IV. Study 2**

##### **Effects of early morning exercises on physical, mental, and social aspects**

This study aimed to clarify the effects of early morning exercises, including radio calisthenics, on the physical, mental, and social aspects of community-dwelling older adults.

We included 84 community-dwelling older people who performed early morning exercises (exercises group) and participated in both baseline and tracking surveys. The control group consisted of 84 age-, sex-, and 5 meter(m) comfortable walking time-matched community-dwelling older people by propensity score matching who participated in both baseline and tracking preventive long-term care checkups in the same city.

Data on age, sex, height, and weight were collected from the patients. To measure the physical aspects, exercise frequency, duration of exercise, and exercise event, 5 m maximum and comfortable walking time, grip strength, knee extension muscle strength, and timed up and go test (TUG) were used. For mental aspects, the WHO-5 mental health scale (WHO5) was used. The shortened version of the Lubben Social Network Scale (LSNS6) was used for social aspects.

Using repeated measurements of general linear models, we analyzed the 5 m maximum and comfortable walking time, TUG, grip strength, knee extension muscle strength, WHO5 score, and LSNS6 score as dependent variables. Measurement time (baseline and tracking) and groups (early morning exercises group, control group) were analyzed as

independent variables, and age, sex, and measurement values of each item at baseline were analyzed as adjustment variables.

The interaction between the measurement time and group was confirmed in the 5 m comfortable walking time ( $p = 0.011$ ), maximum walking time of 5 m ( $p < 0.01$ ), TUG ( $p < 0.01$ ), and LSNS6 score of related items about friends ( $p = 0.01$ ).

The study results showed that early morning exercises had a good effect on the ability to move and social support for friendships. We considered two reasons that could influence social support and friendship—the characteristics of the target group of this study, which carried out the movement including the radio exercises that the participant was not limited and the participation in the subgroup that was derived from a group of radio calisthenics.

## **V. Conclusion**

Through the first and second studies, we confirmed that early morning exercises, including radio calisthenics, were exercises with less risk of circulatory response and locomotor disorder for older people. In addition, it was confirmed that radio calisthenics has a good influence not only on the ability to move but also on social support networks in friends.