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The purpose of the present study was to examine the prevalence of strength training among Japanese adults, and to identify the characteristics of individuals who engage in strength training regularly. The current data was collected from 3000 randomly selected Japanese adults in the SSF National Sports-Life Survey 2006 (Sasakawa Sports Foundation, 2006). The response rate was 62.2%. As a result, the prevalence of regular strength training (more than 2 times per week) was 3.9%. In particular, the rates of regular strength training were low in older individuals (60-69 years were 2.5%, over 70 years were 0.6%). Logistic regression analysis revealed that age, gender, smoking habit, and self-rated physical fitness were significantly correlated with regular strength training. These findings indicate that the majority of Japanese do not participate strength training, especially among the elderly, women, smokers, and those with a lower degree of physical fitness.

Keywords: strength training, prevalence, correlates, elderly, SSF National Sports-Life Survey

1. Introduction

Strength training is a type of exercise intended to increase muscular strength and endurance. Its effects on health promotion have been demonstrated. Previous research has found that strength training is effective in modifying risk factors for chronic diseases such as ischemic heart disease (Hurley, et al., 1988), osteoporosis (Nelson, et al., 1994), and diabetes mellitus (Fluckey, et al., 1994). Based on such findings, one of the goals of Healthy People 2010, a nationwide health promotion plan in the USA, is to promote strength training to the extent that 30% of the American population will engage in this activity twice or more per week by the year 2010 (US Department of Health and Human Services, 2000).

In Japan, the effects of strength training on fat distribution, blood lipid (Tsuzuku, et al., 2007), and other factors have been also reported. In the Exercise and Physical Activity Reference for Health Promotion 2006 (EPAR2006), established by the Ministry of Health, Labor, and Welfare in 2006, cardiovascular endurance and muscular strength are considered as the two most significant elements of physical fitness related to health promotion. As the exercises for improving these health-related components of physical fitness, the EPAR2006 recommends brisk walking and jogging for cardiovascular endurance and strength training for muscular strength (Preparatory Committee for Recommended Exercise Allowance and Exercise Guidelines 2006). Thus, strength training to increase muscular strength and endurance as well as aerobic exercises to enhance cardiovascular fitness such as

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brisk walking and jogging is attracting attention as exercise for the health promotion in Japan.

Even though the national statement has encouraged individuals to engage in strength training due to its positive effects on physical and mental health, this may not necessarily lead to the nationwide dissemination of strength training in Japan. In order to promote a strategically practical approach to create a suitable environment for strength training and to increase the proportion of Japanese population engaging in strength training, it is necessary to investigate not only its effects but also its current prevalence and factors associated with engaging in strength training. Such investigations would be effective in specifying target groups and in gaining practical clues for effective behavioral change of strength training. In Japan, however, few studies from the viewpoint of the promotion of strength training for Japanese population have been conducted.

With the aim of increasing the proportion of Japanese population performing strength training, therefore, the current prevalence of strength training and the characteristics of individuals who engage in strength training were investigated in the present study. A survey on the strength training was conducted for the 2006 SSF National Sport-Life Survey (Sasakawa Sports Foundation, 2006). Because this survey covered sports in general, however, the data on strength training presented in the report was general, with cross tabulations but no further details.

With permission from the Sasakawa Sports Foundation, a secondary analysis of the Sports Life Data 2006 (Sasakawa Sports Foundation, 2006) was conducted in this study in order to examine the prevalence and correlates of strength training among Japanese adults.

2. Methods

2.1. Data collection and participants

The present study was a secondary analysis of the 2006 SSF National Sport-Life Survey conducted by the Sasakawa Sports Foundation in June-July, 2006. Survey participants were selected by the stratified random two-stage sampling method with a set sample size of 3,000 individuals. For stratification, all municipalities in Japan were classified into 11 prefecture-based areas, in each of which component municipalities were classified based on urban scales. In this way, 3,000 samples were prorated based on size of population aged 20 years or older in respective areas and city size. For the selection of participants, the same sampling method as was utilized in the national population census for 2005 was used; that is, geographical surveillance points (towns, communities, streets and etc.) were determined and participants were selected by the random systematic sampling based on resident registration within the range of these respective surveillance points. Questionnaire were administered and collected by data takers with the placement method. Through these procedures, 1,867 valid responders were obtained. All specific survey procedures were referred to Sasakawa Sports Foundation (2006). Approval of the use of analyzed data was obtained from Sasakawa Sports Foundation before a secondary analysis of the data was conducted.

2.2. Contents of survey

2.2.1. Practice of strength training

Questions 1 and 2 of the questionnaire were utilized for the engagement of strength training. Question 1 asked respondents to choose all sports and exercises they had engaged in during a previous year from 60 events of sports and exercises on the list. The 60 events of sport and exercise on the list were presented in Japanese alphabetic order. Respondents were instructed to circle all which applied. In the current study, those who responded that they had performed strength training were regarded as strength training practitioners.

Question 2 asked respondents to choose 5 from the activities they had selected in Question 1 and to indicate the frequency of their engagement in each activity. For Question 2, respondents were guided to choose one from among 3 alternatives, per year, month, or week, in order to provide the number of strength training session they engaged in. Engagement in strength training on s more than 104 days per year, more than 10 days per month, or more than 2 days per week were all regarded as "more than 2 days per week" for the purposes of the present study.
2.2.2. Correlates

Referring to the review of the correlates of physical activity and exercise (Trost, et al., 2002), possible related factors to the prevalence of strength training were selected from the responses to Question 12 and face sheets of the Survey. Question 12 was a set of questions regarding lifestyle habits and health. Focused factors in the present study were self-rated health, self-rated physical fitness, and smoking habit.

For the question regarding self-rated health, "What do you think of your health?", survey respondents were guided to select one from among the following alternatives: 1) excellent, 2) good, 3) somewhat poor, and 4) poor. In the present study, Responders were classified into 2 groups: responders indicating 1) or 2), and those indicating 3) or 4).

For the question concerning self-rated physical fitness, "What do you think of your physical fitness?", responders were guided to select one from among the following 3 alternatives: 1) highly physically fit, 2) moderately physically fit, and 3) not physically fit. In the present, the responders were divided into 2 groups: those indicating 1), and those indicating 2) or 3).

For the question regarding smoking habit, respondents were guided to select one from among the following alternatives: 1) current smoker, 2) former smoker, and 3) never smoker. In the present study, those who indicated option 1) were regarded as "smokers," and those who indicated option 2) or 3) were considered "non-smokers."

Age, gender, height, weight, and marital status were utilized within the face sheets for data analysis. Height and weight were converted into BMI \( \text{BMI} = \frac{\text{weight (kg)}}{\text{height}^2 \text{(m)}} \). Based on the criteria for overweight and underweight, the participants were classified into 3 groups: 1) lower than 18.5, 2) 18.5 or higher and lower than 25, and 3) 25 or higher.

2.3. Analyses

First, the prevalence of engaging in regular strength training among general Japanese adults was examined. Secondly, after statistical adjustment for the influences of each variable, a logistic regression analysis was conducted with regular strength training as a dependent variable and with age, gender, BMI, marital status, self-rated health and self-rated physical fitness as independent variables in order to examine correlates of engaging in regular strength training. Based on the criteria used for Healthy People 2010, "Engagement in regular strength training" was defined as a 2-day or more per week participation in strength training. For all data analysis, SPSSver.14.0 for Windows (SPSS JAPAN Inc.) was used.
3. Results

3.1. Characteristics of the participants

The participant characteristics were shown in Table 1. Of the participants, approximately 30% had a smoking habit, approximately 70% were married, and approximately 80% were 25 or less kg/m² on BMI. Approximately 70% of the participants reported that their health was either excellent or good, and approximately 10% indicated that they were physically fit.

3.2. Prevalence of strength training

The prevalence of strength training by adults were shown in Figure 1. Age group-based proportions of the participants with regular participation in strength training were as follows: 9.9% in 20-29 years, 5.0% in 30-39 years, 4.9% in 40-49 years, 2.2% in 50-59 years, 2.5% in 60-69 years, and 0.6% in over 70 years (3.9% in average).

3.3. Correlates of regular participation in strength training

In order to examine correlates, a logistic regression analysis was conducted with regular participation (more than twice per week) in strength training as a dependent variable. Significant relationships were revealed between regular participation in strength training and age, gender, marital status, smoking habit, and self-rated physical fitness (Table 2); participants who were aged over 50, females, smokers, and those not physically fit were less likely to engage in strength training regularly. Even with adjustment for other influential variables, a negative associations between engagement of regular strength training and age were found, indicating that the older the participant, the less frequently strength training was engaged in.

4. Discussion

The present study was aimed to examine prevalence of strength training by adults and to identify correlates of regular participation in strength training in Japan. In the present study, those who engaged in strength training regularly (more than twice per week) accounted for 3.9% of survey participants. In the Healthy People 2010, the corresponding goal is set as 30%, while the actual proportion of regular participation in strength training reported 19.6%, according to a survey conducted in the US in 2004 (Kruger, et al., 2006). Although the US survey results could not be easily compared with this study results due to the difference in survey items, the result clearly indicates that most Japanese adults do not engage in strength training regularly.

After a statistical adjustment of variable influences,
correlates of regular participation in strength training were examined. The results indicated that age, gender, smoking habit, and self-rated physical fitness were significantly related to regular participation in strength training. In the review of the correlates of physical activity and exercise these factors were also identified as correlates (Trost, et al., 2002). Therefore, those who did not engaged in regular strength training in the current study may have little interest in physical activity or exercise in itself although the results of the review by Trost, et al., (2002) cannot necessarily be applied to the situation in Japan. While marital status, BMI, and self-rated health were not identify as correlates in this study, they were found as correlates of physical activity and exercise in the previous study (Trost, et al., 2002). It has not yet been clarified how marital status was observed as a correlate. Regarding BMI and self-rated health, 80% of participants had BMI which were higher than 18.5 and less than 25; and 70% of participants responded that their self-rated health was either excellent or good. Therefore, there is a possibility that many participants felt that they did not need to, rather than that they would not, engage in strength training.

Of the correlates that were found in this study, particular attention should be paid to age. Even for frail elderly people with reduced physical capacities, the improvement effect of strength training on physical functions has been observed (Fiatarone, et al., 1994). In The Long Term Care Insurance System, 2005 revision, therefore, motor function improvement service is included with a particular emphasis on the importance of strength training in order to prevent elderly people from requiring care support or to reduce the degree of care support needed (Improvement of Motor Function Research Group, 2005). The results of the present study indicate that most people would be not yet fully aware of the importance of strength training in spite of the increasing need for strength training for elderly people. The odds ratio of individuals aged 70 year or older was as small as 0.06, suggesting that though care prevention is needed especially in the old-old individuals, few of them engage in strength training regularly.

The present study is the first detailed to examine the prevalence of strength training and its correlates in Japan. Despite the limitation that the participants had to be chosen only from those who were able to give written responses to a survey, the present study is meaningful because of the quality of the data which was obtained through a highly accurate sampling method with the use of stratified random two-stage sampling conducted nationwide. The results indicate that the regular rate of participation in strength training becomes lower as age increases even with adjustment for other variable influences. Age, gender, smoking habit, and self-rated physical fitness were observed as correlates of prevalence of strength training. Based on the findings of a previous study (Trost, et al., 2002), it is implied that those who do not participate strength training tend to avoid any type of exercise. As well as other types of exercise such as brisk walking and jogging, it is necessary to establish specific strategies for the promotion of interest and participation in strength training among the elderly, females, smokers, and people with poor physical fitness.

Because the SSF National Sport-Life Survey, which was designed to clarify the overall tendencies of various activities, provided no definition of strength training, it was impossible to specify types of strength training that the participants had performed. There is a variety of strength training, such as machine training, own body weight training, and dumbbell training, with a variety of load intensities. It would be necessary in future studies to define strength training clearly and to identify the type of strength training.

While the SSF National Sport-Life Survey is a large-scaled social survey that has been conducted once every 2 years since 1994 and is based on well-designed research, it did not examine health status or medical history. It is assumed that medical history may affect participation in strength training. The effect of the presence of disease should be examined in future studies for the further evaluation of the prevalence of strength training.

It is also suggested that additional factors which prevent or promote regular participation in strength training should be identified through research on the factors other than those focused on in the current study. A study in the US has demonstrated that perceived pros and cons of strength training behavior and social support from others affected the strength training behavior of older people (Bopp, et al., 2004). Few studies on strength training in Japan have been conducted from such a perspective. It is hoped that factors influencing the prevalence of
strength training will be investigated in future studies in view of environmental factors such as training place, equipment, and instructors based on research conducted by Bopp, et al., (2004).

It is strongly suggested that supportive strategies for the promotion of strength training behavior should be adequately formulated based on future findings from various studies on strength training as mentioned above.

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References


