

# Relationship Between the Type and Amount of Physical Activity and Low Back Pain in Koreans Aged 50 Years and Older

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**Objectives:** To examine the association between the type and amount of physical activity (PA) and low back pain (LBP) in people aged  $\geq 50$  years.

**Design:** Cross-sectional study.

**Setting:** A nationwide survey.

**Participants:** Data were obtained from the Fifth Korea National Health and Nutrition Examination Survey, which was conducted in 2010 and 2011. Overall, 1796 men and 2198 women aged  $\geq 50$  years were included.

**Methods:** PA was categorized as vigorous, moderate, walking, strength exercises, or flexibility exercises. The total amount of PA was presented as quartiles of the total metabolic equivalent (MET)-minutes/week based on the PA questionnaire. Multivariate logistic regression analysis was performed to examine associations between LBP and the type and amount of PA.

**Main Outcome Measurements:** Odds ratio for LBP according to the type of PA and the quartiles of the total MET-minutes/week.

**Results:** After adjusting for age and body mass index, vigorous and moderate PA were associated with an increased risk of LBP in both men and women, whereas strength exercises were associated with a reduced risk of LBP. These associations were maintained after adjusting for all potential confounders. Subgroup analysis according to age revealed that these trends were most significantly demonstrated in women aged  $\geq 65$  years. The PA quartiles for total MET-minutes/week for men showed a U-shaped association with LBP, whereas only the fourth PA quartile for women showed an increased risk of LBP compared with the second quartile.

**Conclusions:** These results suggest that both the type and amount of PA affect the development of LBP in people aged  $\geq 50$  years and thus activity modification might be helpful for prevention and management of LBP.

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## INTRODUCTION

Low back pain (LBP) is very common and is a major burden on public health [1,2]. Studies suggest a lifetime prevalence as high as 84% [3]. In many cases, LBP becomes chronic, leading to significant disability [4]. The prevalence of chronic low back pain is about 23%, with 11%–12% of the population experiencing disabling pain [5]. Therefore identifying relevant risk factors is important for prevention and effective management.

Physical activity (PA), including occupational or leisure activities, is thought to be a risk factor for LBP [6,7] because of increased mechanical loading of the spine [8]. Authors of many studies report a positive relationship between PA and LBP [9–11], whereas other authors report no relationship [12]. Moreover, some forms of PA may actually help manage and prevent LBP by strengthening the back and core muscles [13–15]. Thus the association between PA and LBP is unclear [6].

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As previously mentioned, different types and amounts of PA may have different effects on LBP; therefore, it would be helpful to investigate the effects of these different factors together. However, most studies have only focused on the specific type of PA, such as occupational activity or specific exercises [6,16]. In addition, these studies were performed in the working population [7,11,17] rather than in the elderly population, even though LBP is common in elderly persons. Therefore the aim of the present study was to examine the relationships between PA and LBP, considering the type and amount of PA, in Koreans aged  $\geq 50$  years, through a nationwide study.

## METHODS

### Data Sources and Study Population

The data used in this study were obtained from the Fifth Korea National Health and Nutrition Examination Surveys (KNHANES V-1 and V-2), which were conducted in 2010 and 2011 by the Korea Centers for Disease Control and Prevention. KNHANE V-1 and KNHANE V-2 were nationwide, representative surveys of 8958 people in 3840 households and 8518 people in 3840 households, respectively. Participants were selected with use of the multistage clustered and stratified random sampling method, considering residence area, gender, and age group based on National Census Data. From this pool of subjects, those aged  $\geq 50$  years who had completed surveys on height, body weight, bone mineral density (BMD), presence of LBP, level of PA, smoking, alcohol consumption, and educational status were selected. Overall, data from 3994 subjects (1796 men and 2198 women), all of whom provided informed consent, were examined. This study was approved by the institutional review board (IRB) of our hospital (IRB No. 2013-1107).

### Assessment of LBP

The presence or absence of LBP was assessed by questionnaire. Subjects with LBP were defined as those who replied "yes" to the question, "Have you experienced low back pain for more than 1 month out of the past 3 months?" Subjects who replied "no" were defined as not experiencing LBP.

### Physical and BMD Measurements

In the original survey, height, body weight, and waist circumference were measured with use of standard protocols. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared ( $\text{kg}/\text{m}^2$ ). Total hip BMD was measured by dual-energy x-ray absorptiometry (DEXA; DISCOVERY-W fan-beam densitometer, Hologic, Inc, Bedford, MA) with use of standard procedures. BMD was measured in the left hip (except in subjects who had received a left hip implant). Osteoporosis was defined as

a T-score  $< -2.5$ . Osteopenia was defined as a T-score between  $-2.5$  and  $-1.0$ .

### Assessment of PA

PA was assessed by the self-administered questionnaire, which asked the subjects how often they engaged in each activity listed in the Korean version of the International Physical Activity Questionnaire—Short Form (IPAQ-SF). The IPAQ includes questions about the frequency, duration, and intensity of PA during the previous week [18]. Vigorous PA was defined as at least 20 minutes of vigorous activity on 3 or more days of the week. Moderate PA was defined as at least 30 minutes of moderate-intensity activity on 5 or more days of the week. Walking was defined as at least 30 minutes of walking on 5 or more days of the week. In addition to use of the IPAQ, strength and flexibility exercises were also assessed by questionnaire. Strength or flexibility exercises were defined as the performance of strength exercises or flexibility exercises on 2 or more days of the week.

Total PA metabolic equivalent (MET)-minutes/week was derived from the IPAQ data. An average MET score was calculated for each type of activity [19]. The following values were used to analyze the IPAQ data: walking = 3.3 METs, moderate PA = 4.0 METs, and vigorous PA = 8.0 METs. These values were used to define 4 continuous scores:

- Walking MET-minutes/week =  $3.3 \times \text{walking minutes} \times \text{walking days}$
- Moderate PA MET-minutes/week =  $4.0 \times \text{moderate-intensity activity minutes} \times \text{moderate-intensity activity days}$
- Vigorous PA MET-minutes/week =  $8.0 \times \text{vigorous-intensity activity minutes} \times \text{vigorous-intensity activity days}$
- Total PA MET-minutes/week = sum of walking + moderate PA + vigorous PA MET-minutes/week scores

Based on the total PA, subjects were divided into PA quartiles according to gender.

### Assessment of Environmental Factors

Patients were categorized as "nonsmokers" or "current smokers." Alcohol consumption was dichotomized as less than twice per week or more than twice per week. Education status was categorized as elementary school graduate or below, middle school graduate, or high school graduate or above. Residential area was categorized as urban or rural.

### Statistical Analysis

All analyses were performed separately for each gender. According to the presence or absence of LBP, clinical characteristics were compared using the student *t*-test for continuous variables and the  $\chi^2$  test for categorical variables. Multiple logistic regression analysis was used to assess the association between LBP and each type of PA: vigorous PA,

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