The role of obesity and physical activity in non-specific and radiating low back pain: The Young Finns study

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Objective: To study the effects of obesity, physical activity, and change in physical activity on the incidence of low back pain and explore whether obesity modifies the effects of physical activity.
Methods: As part of the ongoing Young Finns Study, 1224 subjects aged 24–39 years free from low back pain during the preceding 12 months at baseline in 2001 were included. Obesity was defined based on the body mass index (BMI) and waist circumference, and physical activity was assessed by the metabolic equivalent of task (MET) index in 2001 and 2007.
Results: Abdominal obesity, defined by an increased waist circumference, was associated with an increased incidence of radiating low back pain (adjusted odds ratio (OR) = 1.7 and 95% confidence interval (CI) 1.1–2.7), while it had no effect on non-specific low back pain. BMI was associated neither with the incidence of radiating low back pain nor with non-specific low back pain. Compared with subjects who stayed active during follow-up, those with a low level of physical activity (adjusted OR = 2.0 and 95% CI 1.1–3.5) and active subjects who further increased their physical activity during follow-up (OR = 3.1 and 95% CI 1.5–6.7) had a higher incidence of radiating low back pain. Low level of physical activity was associated with an increased incidence of radiating low back pain in obese (OR = 3.3 and 95% 1.1–10.4), but not in non-overweight subjects (OR = 1.1 and 95% CI 0.6–1.9). Physical activity was not associated with non-specific low back pain.
Conclusions: Our findings indicate that both obesity and low level of physical activity are independent risk factors of radiating low back pain. The current findings propose a U-shaped relation between physical activity and radiating low back pain. Moderate level of physical activity is recommended for the prevention of low back pain, especially in obese individuals. In all, our findings imply that obese individuals should stay physically active, even if they may not lose weight.
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Low back pain is a common health problem, often leading to sickness absence and early exit from the labor market, placing a huge burden both on individuals and the society [1,2]. According to the WHO, 60% of work disability in Europe is due to musculoskeletal disorders [3]. It is also well known that obesity and sedentary lifestyle heavily contribute to chronic non-communicable diseases such as cardiovascular diseases and diabetes [4–6]. Recently, systematic reviews and a meta-analysis have shown an association between obesity and low back pain [7,8] —an

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association needing further characterization and exploration of possibilities for prevention.

The annual prevalence of low back pain varies between 25% and 60% [9–11], and that of sciatic pain or sciatica between 2% and 34% [12]. The prevalence, however, depends on the definition of low back pain and recall period [13]. Non-specific low back pain is highly prevalent already in young populations, but its incidence decreases with age [14]. Radiating low back pain, on the other hand, is less common, but it is more persistent and the incidence increases with age [14].

Although studied extensively, the association between leisure time physical activity and low back pain remains controversial [15–19]. Some studies have suggested physical inactivity as a risk factor for low back pain [15,17,20–22]. On the other hand, other studies have found an increased risk of low back pain in physically active subjects [18,23]. Furthermore, a systematic review found suggestive evidence for harmfulness of high level of physical activity on sciatic pain [8].

A vicious circle has been observed between physical inactivity and obesity [24]. Physical inactivity increases the risk of obesity, especially abdominal obesity [24,25], and obese subjects tend to be less active and physically less fit than non-overweight subjects [26]. While the interrelation between obesity and physical inactivity is rather well known, how they may modify each other's effects on low back pain is largely unexplored.

Of previous studies on the association between obesity or physical activity and low back pain, many have had a cross sectional design. Cohort studies have typically assessed the effect of baseline obesity or physical activity on a low back outcome at follow-up and only a minority has taken into consideration the variation in time of those risk factors [27–29]. Moreover, interrelated effects of obesity and physical activity on low back pain have most often been assessed by mutual adjustment. To our knowledge, none of the previous studies have evaluated whether obesity modifies the effect of physical activity on low back pain. Although there is some indication that the effects of obesity or physical activity may be different on non-specific and radiating low back pain [30,31], the types of low back pain have rarely been differentiated in the studies.

In this population-based longitudinal study of young to middle-aged adults, we investigated the associations of obesity, physical activity, and change in physical activity with the incidence of non-specific and radiating low back pain. In addition, we explored how obesity modifies the effects of physical activity on low back pain.

MATERIALS AND METHODS

Population

This study is a part of an ongoing follow-up study, the Young Finns Study. In 1980, children and adolescents aged 3, 6, 9, 12, 15, or 18 years ($N = 4320$) were invited to participate in the study. Of them, 3596 (83%) participated (Fig. 1) [32]. The study was carried out in five Finnish university cities. The follow-up studies were carried out in 1983, 1986, 2001, and 2007, the two latest follow-ups included questions on low back pain. A total of 2620 (73% of those who participated at baseline) participated in 2001, and 2231 (62%) in 2007 [14,33]. The study protocol was approved by the local ethics committees and all subjects gave a written informed consent.

This study is based on the 2001–2007 follow-up with information on low back pain. The subjects' ages ranged from 24 to 39 at baseline in 2001. A total of 1991 subjects responded to both 2001 and 2007 surveys (Fig. 1). Subjects with missing information on the severity of low back pain in 2001 or 2007 ($N = 58$) were excluded, leaving 1933 qualified individuals. Subjects with low back pain for more than seven days during the preceding 12 months ($N = 709$) in 2001 were excluded, and those free from low back pain (seven days or less; $N = 1224$) were included in the study.

Outcome

The information on low back pain was based on three questions. The first question on the presence or absence of low back pain was "Have you had low back trouble (pain, ache, or unpleasant sensations) during the preceding 12 months?" A manikin was used to denote the anatomic area, and the alternative responses were "no" and "yes." If the answer was "yes," the following second and third questions addressed radiating and non-specific low back pain using a modified version of the Nordic questionnaire [34]: "What is the total length of time you have had low back trouble radiating below the knee during the preceding 12 months?" and "What is the total length of time you have had low back trouble other than radiating pain during the preceding 12 months?" The alternative responses for each question were: (1) no, (2) 1–7 days, (3) 8–30 days, (4) over 30 days, but not daily, and (5) daily. In this study on the incidence of non-specific and radiating low back pain, we combined the latter three groups to form low back pain for >7 days. We defined radiating low back pain as low back pain radiating below the knee level, and non-specific low back pain as low back pain without such radiation.

Weight-related factors

As part of the health examination, body weight and height, as well as waist and hip circumferences were measured in 2001 and 2007. Weight was measured in light clothes without shoes with a digital scale, with an accuracy of 0.1 kg, and height with a wall-mounted stadiometer with 0.5 cm accuracy. Body mass index (BMI) was calculated for all subjects, and overweight was defined as a BMI value between 25 and 29.9 kg/m^2, and obesity as a value greater than or equal to 30 kg/m^2 [35]. There were 21 subjects with BMI below 18.5 kg/m^2.