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Long-term adolescent multi-site musculoskeletal pain is associated with psychological distress and anxiety

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ABSTRACT

Objective: Although several studies have shown that adolescent musculoskeletal pain is associated with psychological problems in a cross-sectional setting, the associations of long-term musculoskeletal pain with psychological distress and anxiety are not known.
Methods: The study included 1773 adolescents belonging to the Northern Finland Birth Cohort 1986. They received a postal questionnaire at the age of 16 years and a follow-up questionnaire two years later. The first inquiry contained questions about the sites of musculoskeletal pain; the second had the same pain questions, along with measures of distress and anxiety. Risk ratios (RR) were assessed by log-linear regression analysis.
Results: Multi-site musculoskeletal pain (in ≥2 body locations) at both 16 and 18 years was common, reported by 53% of girls and 30% of boys. Multi-site pain at both ages, compared to those with multi-site pain neither at 16 nor 18 years, was associated with psychological distress at the age of 18 among both girls (RR 1.8 95% CI 1.2–2.7) and boys (RR 3.5 95% CI 2.1–5.9). For anxiety, the corresponding relative risks were 1.5 (95% CI 1.0–2.2) and 1.8 (95% CI 1.4–2.3), respectively. For short-term multi-site pain (prevalent only at the age of 16 or 18), these relative risks were between 0.8 and 2.3.
Conclusions: Adolescents with long-term multi-site pain have higher levels of distress and anxiety than those without or with only short-term multi-site pain. Associations were found in both genders, but the relationship between pain and distress was more pronounced among boys. The associations had modest effect strength.

List of abbreviations

GHQ-12	The 12-item General Health Questionnaire
STAI	State-Trait Anxiety Inventory
NFBC1986	Northern Finland Birth Cohort 1986
OBS	Oulu Back Study
SD	standard deviation
RR	relative risk

1. Introduction

Adolescence is a period of rapid and extensive psychological and physical change. This period is vulnerable to external disturbance due to its multifaceted tasks in forming a whole, sufficiently harmonious personality [1,2]. Distress-related and anxiety symptoms are among the most frequent mental problems in youth [3]. Some problems later in life may also at least partly originate from childhood or adolescence [4].

Musculoskeletal pain (MP), or pain that is attributed to the musculoskeletal system, is common already in adolescence [5], and starts as early as childhood [6]. Prevalence increases with age [7–9]. MP may be caused by an injury among children and adolescents [10], but long-term multi-site pain in youth is less likely due to injury. Several other factors including physical activity, obesity, sedentary activity and smoking habits have been associated with long-term pain [11]. Psychosocial factors such as emotional and behavioural disorders have also

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been reported to be associated with MP [12–17]. Evidence on the importance of anxiety in relation to MP is conflicting, however. One systematic review found no prognostic value of anxiety in low back pain [18], while another systematic review identified eleven factors related to poor prognosis of MP in primary care, among these anxiety and/or depression, and higher somatic perceptions and/or distress [19]. Most of the previous studies have been conducted on adults, but psychological distress and somatic complaints in have been previously reported to associate with multi-site musculoskeletal pain [20] and mental problems [21] in adulthood. The problem is considered to be a complex entity where a wide array of factors may have an effect on individual's pain experience. There are numerous theories attempting to explain the high comorbidity of pain and psychological disorders, such as hypothalamic-pituitary-adrenal axis dysfunction [22] and diathesis-stress model [23]. However, there is a lack of a more detailed analysis of the associations between multi-site MP and specific somatic symptoms and anxiety as a psychological trait during sensitive development phases of adolescence.

In this study, we aimed to narrow this gap. We hypothesized that long-term adolescent multi-site musculoskeletal pain is associated with psychological distress and anxiety, and tested this hypothesis in the Northern Finland Birth Cohort 1986 (NFBC1986).

2. Methods

2.1. Study population and setting

The study is a two-year follow-up survey among adolescents. The participants belong to the NFBC1986, which consists of individuals with an expected date of birth between July 1st, 1985 and June 30th, 1986 (N = 9479) in the two northernmost provinces of Finland, Oulu and Lapland. Follow-up data of NFBC1986 was collected in when the participants were 15 to 16 years old (hereafter named the "16-year follow-up"). The follow-up included a postal questionnaire, which was sent between May 2001 and April 2002 to all the cohort members who were alive whose addresses were also known (n = 9215). The questionnaire contained questions regarding musculoskeletal pain. Another follow-up questionnaire was sent between September 2003 and January 2004, when the participants were 17 to 18 years old (hereafter named the "18-year follow-up"). The second follow-up forms were sent only to a sub-group of NFBC86 as a part of another extensive data collection (Oulu Back Study, OBS). Including the whole NFBC86 was not possible because the OBS included resource-consuming clinical examinations and travel to Oulu. This also limited the participant pool of the current study to birth cohort members living within 100 km of the city of Oulu (n = 2969). The second questionnaire contained the same items as the first, but also included mental health outcomes. The current study's participation rate was good, as 80% of the initial NFBC 1986 took part in the 16-year follow-up, and 68% of the OBS target population responded to the 18-year follow-up. A total of 1773 adolescents responded to both the 16- and 18-year questionnaires.

The study conformed to the principles of the Declaration of Helsinki. The participants took part voluntarily and signed their informed consent with their parents during both follow-up data collections. The data was only handled on a group level and personal information was replaced by artificial identification codes. The research protocol was approved by the Ethics Committee of the University Hospital of Oulu.

2.2. Psychological distress and anxiety

Psychological distress was measured at the age of 18 by the 12-item version of Goldberg's General Health Questionnaire (GHQ-12), which was developed to screen for non-specific psychiatric morbidity in populations [24]. The four alternatives in each question were dichotomized as 1–2 = 0, 3–4 = 1, and the overall sum of the twelve items was dichotomized as 1) 0–3 points meaning "no distress" and 2) four or more points indicating psychological distress, as in studies that validate the GHQ-12 in contrast to standardized psychiatric interviews [25,26].

In addition, an anxiety score was derived from a six-item anxiety inventory, which is a modified version of the 20-item State-Trait Anxiety Inventory [27,28] about how the person generally feels ("I feel calm," "I feel tense," "I feel upset," "I am relaxed," "I feel satisfied," "I am worried"). All items were rated on a four-point scale: "Not at all" = 1, "A little" = 2, "To some degree" = 3, and "Very much so" = 4. Boys and girls were then (separately) divided into quartiles according to the anxiety point summary score (reverse scaling was used for "I feel calm," "I am relaxed," and "I feel satisfied"). The upper quartile was used as an indicator of anxiety [29,30].

2.3. Musculoskeletal pains

The questionnaire included items about self-reported, six-month prevalence of musculoskeletal pains, and asked [31]: "Have you had any aches or pains during the last six months in the following areas of your body?" 1) Neck or occipital area, 2) shoulders, 3) lower back, 4) elbow, 5) wrist, 6) knee and 7) the ankle-foot area. These anatomical areas were also illustrated by a drawing. The response alternatives were a) no; b) yes, but I have not consulted a physician, physiotherapist, nurse or other health professional because of the pain; c) yes, and I have consulted a physician, physiotherapist, nurse or other health professional because of the pain. For further analyses, the pain variable was dichotomized as a) no pain and b) pain (with or without consultation). In this study, we classified the participants into the following groups, according to the number of pain locations and the presence of multiple pain at specific time points: 1) a maximum of one pain site at 16 and 18 years ('No-No' group); 2) two or more locations at 16 years but a maximum of one pain site at 18 years ('Yes-No' group); 3) two or more locations at 18 years but a maximum of one pain location at 16 years ('No-Yes' group); and 4) two or more locations at both 16 and 18 years ('Yes-Yes' group).

2.4. Other measurements

The level of physical activity, obesity, sedentary time and smoking habits have been previously characterized as being associated with musculoskeletal pains [11]. These risk factors were elicited at the age of 18 years and were considered potentially confounding factors in the statistical analyses. Physical activity was elicited by asking "How much do you participate in a) brisk and b) light physical activity outside school hours?" The term "brisk" was defined as activity causing at least some sweating and shortness of breath. The term "light" was defined as physical activity causing no sweating or shortness of breath. The daily amount of physically active commuting was also elicited by asking "How many minutes in total do you walk, cycle or otherwise physically move to school and back home daily?" These values were changed to hours per week and divided into five groups: 1) Very active (over 6 h of brisk physical activity per week), 2) Active (4–6 h of brisk physical activity per week); 3) Moderately active (2–3 h of brisk physical activity per week); 4) Lightly active (1 h of brisk physical activity or less than half an hour of brisk physical activity together with over 2 h of light or commuting physical activity per week); and 5) inactive (less than half an hour of brisk physical activity and less than 2 h of light or commuting physical activity per week). Body weight and height were both self-reported. BMI was calculated as weight / height^2 (kg / m^2). Overweight was defined as a BMI of 85%–95% (24.2–27.3 for girls and 25.4–28.4 for boys) and obesity as a BMI above 95% (>27.3 for girls and >28.4 for boys). Smoking status was categorized as: not smoking at all, smoking four days per week or less often and smoking five to seven days per week. Participants were asked: "Have you ever smoked in your life?" and "Do you currently smoke?". The amount of sitting was estimated by asking how many hours a day the participant spent doing the following activities after school hours: watching TV, reading