DUNEDIN STUDY CONCEPT PAPER FORM

Provisional Paper Title: Childhood maltreatment predicts musculoskeletal pain experience in middle age.

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Background: Musculoskeletal (MSK) pain is a significant burden on individuals, healthcare, and society (1). Among the 291 musculoskeletal conditions studied in the Global Burden of Disease study (2010), low back pain (1st), neck pain (4th), and hip and knee osteoarthritis (11th) were the top-ranking conditions in terms of years lived with disability (2-6). The NZ Health Survey (2016-2017) reports that one in five New Zealanders (20%) living with chronic pain, the rate rising steeply with an ageing population (7, 8).

The musculoskeletal pain experience is influenced by biological, psychological, social, lifestyle and demographic factors (9). These factors interact to determine individuals' pain experience, prognoses, and treatment outcomes. Identifying early-life biopsychosocial risk factors that predict musculoskeletal pain experience later in adulthood is vital to inform prevention efforts or target the early risk factors to reduce the overall pain burden.

Exposure to maltreatment in childhood (CM) is a childhood psychosocial adversity linked to chronic pain in adulthood (10-16). The British birth-cohort study (14) identified the increased risk of developing chronic widespread pain (CWP) in adults (at 45 years) with childhood exposure (at seven years of age) to the following adverse events: hospitalisation due to a road traffic accident; in institutional care; experienced maternal death and familial financial hardships. Few studies based on population-based health survey data identified that early stressful experiences (based on retrospective reports) increased the risk of developing chronic physical pain in adults (11, 15, 17). Overall, the literature investigated the links between CM and the development of widespread pain, but it did not explain the contributions of CM to musculoskeletal pain experience itself. Moreover, these studies (11, 15) (14) attempted to control for a few well-known confounders (sex, social class and adulthood psychological distress) when establishing the relationship between CM and the development of chronic pain.

However, the models did not control for early-life stress exposures (18, 19) and those co-occurring to the exposures (e.g. childhood behaviours) (20-23), known to increase the likelihood of reporting CWP at the age of 45 years (14, 21-23). Thus, we do not know the independent contributions of CM on musculoskeletal pain experiences (pain severity interference and coping).

Why it matters: Prevention/early intervention is the best way to reduce the burden of pain in adulthood. Childhood maltreatment can be one of the targets for prevention and early intervention for reducing the pain burden in adulthood.

Study objectives:

- To investigate whether childhood maltreatment is associated with musculoskeletal pain experiences 30 years later.
- To investigate whether other co-occurring childhood risk factors influence any observed associations.

Childhood Maltreatment: The measure of childhood maltreatment is a cumulative index of five maltreatment indicators [Atypical maternal behaviour, Harsh discipline, Disruptive caregiver changes, Physical abuse and Sexual abuse] during childhood (from ages 3 to 11 years).

Musculoskeletal pain experiences [on the assessment day & in the past year] were characterised by the painful body sites, pain severity, pain interference in life, pain type, pain coping strategies at age 45.

Data analysis methods: All analyses will be conducted in SPSS version 27 (IBM Corp, 2021). Multiple linear/logistic regression analyses will be conducted to assess the relationship between childhood maltreatment (CM) and pain measures in adulthood. We propose two primary analyses:

1. **Primary analysis 1** would report musculoskeletal pain experience descriptively at Phase 45 by sex and the total sample.

2. **Primary analysis 2** would investigate the associations between childhood maltreatment (Phases 3-11) and pain experience (phase 45). The models will be controlled for potential covariates to explore the unique contribution of CM to the musculoskeletal pain experience, and any observed association might be attributable to risk factors ancestral and co-occurring to the primary exposure of interest.

Variables needed at which ages:

Primary predictor variable (Phases 3-11): Childhood maltreatment (categories: no, definite, probable).

Primary outcome variables (Phase-45): Pain severity and pain interference (on the assessment day and in the past 12 months), number of pain areas, widespread pain and coping statements.

Covariates (phases 0-11): Sex, childhood socioeconomic status, childhood IQ, and childhood behaviours.

Demographics (phase 45): pain regions, pain type, pain medications intake/any pain meds in the last year, history of serious injuries, migraine/headaches, and arthritis.

Significance of the Study (for theory, research methods or clinical practice):

Developing robust evidence: Musculoskeletal pain is a global health priority; therefore, it is vital to determine early risk factors associated with its experience. Adverse childhood exposures (ACE) can shape the musculoskeletal pain experience in adulthood through multiple biopsychosocial behavioural mechanisms. The Dunedin Study has prospectively collected ACEs, including childhood maltreatment, other childhood exposures, and potential mechanistic factors that may explain pain experience in adulthood. This robust data can help test the evidence for independent contributions of CM on adulthood pain experiences by taking into account co-exposures, ancestral exposures, and other potential confounders. Moreover, this proposed prospective investigation would also reveal other childhood exposures' unique contributions to the adult musculoskeletal pain experience.

Clinical practice: Recognizing the contributions of CM to MSK pain experiences will highlight the importance of screening CM as part of clinical pain management.

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