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Long-term back pain recall in Generation XXI adolescents: the role of sensitivity and pain history

Nare Navasardyan[a,b], Ana Henriques[a,b,c], Sónia Bernardes[d], Elsa Mateus[e], Makram Talih[a,b], Raquel Lucas[a,b,*]

Abstract

Introduction: Adolescence is a period of profound cognitive and affective development, making it a critical period for studying pain memory and its role in chronic pain.

Objective: As this issue is underexplored in adolescents, we aimed to quantify the long-term back pain recall and assess its association with other pain-related factors and experiences.

Methods: We analyzed data of 1,089 participants from the Generation XXI birth cohort (Portugal), comparing back pain reported at age 13 (Lübeck Pain-Screening Questionnaire) to recalled back pain at 18 (explicit pain memory), investigating instances of forgetting/under-recalling, over-recalling, concordantly recalling presence/absence of back pain. We combined concordant recalls into a single category and under-recalling and over-recalling of any back pain as instances of discordant recall. Parameters such as current pain, family members with recurrent pain, health-related quality of life, environmental sensitivity, and self-perceived pain sensitivity were analyzed.

Results: At age 18, a small percentage of participants recalled experiencing back pain at age 13, while 12% under-recalled it. Concordant recall was significantly higher in boys (OR: 1.62; 95% confidence interval [CI]: 1.20–2.19) and individuals with higher environmental sensitivity (OR: 1.74; CI: 1.07–2.85). Those experiencing current pain were less likely to under-recall compared with those without current pain (OR: 0.21; CI: 0.05–0.91). A good health-related quality of life increased the likelihood of under-recall (OR: 2.91; CI: 1.11–7.67) but did not significantly affect over-recall.

Conclusion: Our results suggest that pain history and sensitivity significantly influence recall, which could contribute to pain experiences later in life.

Keywords: Memory, Long-term, Adolescence, Back pain, Cohort study

1. Introduction

Adolescence is a critical phase for both brain development and the formation of lifelong health trajectories, including chronic pain.[51] Pain experiences during this period may differ from other life stages due to ongoing development and social influences. If pain-related memories are reinforced during this stage, it can hinder the unlearning of maladaptive behaviors, increasing the risk of developing chronic pain.[15] From a developmental perspective, forgetting past pain is both natural and adaptive, helping to protect against the reinforcement of harmful pain memories.[37] Research has demonstrated that individuals with higher sensitivity are more adversely impacted by negative experiences, making them more likely to form lasting negative memories of their pain, which can then shape their future pain experiences.[7,53,55]

Physicians commonly rely on patients' recall of previous pain experiences when making diagnoses and choosing pain

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[a] EPIUnit, Instituto de Saúde Pública, Universidade do Porto, Porto, Portugal, [b] Laboratório para a Investigação Integrativa e Translacional em Saúde Populacional (ITR), Porto, Portugal, [c] Departamento de Ciências da Saúde Pública e Forenses, e Educação Médica, Faculdade de Medicina, Universidade do Porto, Porto, Portugal, [d] Department of Social and Organizational Psychology, Iscte - Lisbon University Institute/Centro de Investigação e Intervenção Social (CIS), [e] Liga Portuguesa Contra as Doenças Reumáticas, Lisboa, Portugal

**Corresponding author. Address: ISPUP-EPIUnit, Universidade do Porto, Rua das Taipas 135, 4050-600 Porto, Portugal. Tel.: +351 222 061 820. E-mail address: raquel.lucas@ispup.up.pt (R. Lucas).*

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management strategies.[18] Notably, between 12% and 20% of children and adolescents with low back pain seek medical evaluation. The likelihood of consulting a physician due to back pain rises significantly from age 13, with a sustained escalation from 15 years onwards.[10,20,24,25,28,34,50]

The consistency of pain reports depends on complex memory processes that shape how individuals perceive and recall pain over time.[47] In adult studies, various factors have been suggested to influence pain recall, such as sex, age, specific personality traits (eg, neuroticism, extraversion), and the methods employed for assessment.[26,41] Current and past pain experiences can significantly impact the recall of prior pain experiences.[57] Research conducted among patients aged 16 to 45 years experiencing chronic masticatory muscle myalgia revealed that discordant pain recall increased over time throughout the weeks.[22] A study examining recall, specifically the presence of prior musculoskeletal pain in manufacturing workers, found that recalling musculoskeletal pain or discomfort experienced 6 years prior often differed from original reports, with under-recalling being very common.[35]

Although pain recall has been studied, cohort research specifically on back pain is scarce, with the majority focusing on the adult population. Most studies addressing the topic have had relatively short recall periods (eg, 3 months or a year), were clinical or experimental, and focused mainly on the intensity of pain among patients with chronic pain.[4,8,33,43] A recent systematic review and meta-analysis by Cuenca-Martínez et al. identified sex and age as reliable predictors of memory distortion, focusing mostly on acute and experimental pain, highlighting a need for future research.[17] As chronic pain has pediatric roots, examining long-term pain recall in adolescents could provide valuable insights into how explicit pain memory, long-term memories that can be consciously accessed, plays a role in the development and persistence of chronic pain trajectories.[3] In this study, we aimed to quantify the long-term recall of back pain (presence and absence) and assess its association with other pain-related factors and experiences.

2. Methods

2.1. Study design

We analyzed data from participants from the Generation XXI (G21) Portuguese population-based birth cohort, described in detail elsewhere.[2,30] In brief, G21 recruitment took place between April 2005 and August 2006 at 5 public maternity units in the metropolitan area of Porto, Portugal. Mothers of live-born babies with a gestational age of over 23 weeks were invited to participate up to 72 hours after delivery. At birth, 91.4% of the invited mothers accepted to participate, and overall, 8647 children were included in the cohort. The entire cohort was invited to participate in subsequent waves at ages 4 (86% participation) between 2009 and 2011, 7 (80%) between 2012 and 2014, 10 (74%) between 2015 and 2017, 13 (54%) between 2018 and 2020, and 18 (ongoing).

Each wave included physical examinations of the children and youth, alongside face-to-face structured interviews with both the children/youth and their caregivers conducted by trained interviewers. These examinations and interviews collected clinical, social, and behavioral characteristics such as common diseases and symptoms, school-related issues, adverse experiences, anthropometric measurements, and blood samples for standard analytical parameters.

2.2. Ethical considerations

The G21 birth-cohort study complies with the Helsinki Declaration for medical research and with current national legislation and was approved by the Ethics Committee of Hospital São João/University of Porto Medical School. This study was approved by the ethics committees of the Institute de Saúde Pública da Universidade do Porto (ISPUP) (Ref CE21199) and Hospital Garcia de Orta (Ref 12/2022). Informed consent was obtained from both the adolescents and their caregivers, when applicable.

2.3. Study sample and data collection

Data collection for pain-related information at age 18 started through a mobile app called "SEPIA." It was developed for Android and iOS in collaboration with the Institute of Systems and Computer Engineering, Technology and Science (INESC TEC) to collect data about prior pain experiences from each adolescent and 1 caregiver (92% mothers, by design). The research team emailed 5756 families who had provided their email addresses. Afterward, each adolescent and/or caregiver who agreed to participate was sent a set of credentials to access the app and a link to Google Play or the App Store that allowed the app to be downloaded (https://ispup.up.pt/sepia/). This collection was complemented with data from the currently ongoing wave, including adolescents who finished the pain-related assessment by September 30, 2023.

In our final sample, we included adolescents who had completed the Lübeck Pain-Screening Questionnaire (LPQ) at age 13 and the pain memory questionnaire at 18. In total, 1089 participants were included (**Fig. 1**). Among others, significant differences in baseline characteristics were noted between remote and face-to-face modality: sex (girls: remote—vs face to face [54.2% vs 46.2%]; $P = 0.005$), current pain status (having pain: remote—vs face to face [68.7% vs 42.3%]; $P < 0.001$) (**Table 1**).

2.4. Study variables

The LPQ is a specific questionnaire developed for epidemiological investigations of pain characteristics among children and adolescents.[42] It has been administered to the cohort since age 7 to evaluate the prevalence of pain in children and adolescents over the preceding 3 months, the consequences of pain, and self-perceived triggers of pain and its impact on daily living. The first question of the LPQ was used, covering having pain within the past 3 months, with a negative response bypassing further questions about pain. If the response was affirmative, the participants were requested to describe their experience, specifically identifying the pain location within the last 3 months. Additional information gathered by the questionnaire, which has not been used in this article, is described in detail elsewhere.[31]

The pain memory questionnaire was based on the LPQ and was introduced to participants at the age of 18 years (through app and face to face). The first question was "When you were 13 year old (between the seventh and ninth grades of school), did you have any pain that was always present or that was repeated many times?." If the response was negative, no further questions were asked. However, if the answer was affirmative, participants were requested to provide details on the anatomical site of the recalled pain.

2.5. Recall variable

For this study, we focused on adolescents' reports of any back pain. We consolidated the reported pain sites from the LPQ, grouping the lower/mid back, neck, and shoulders as a single site

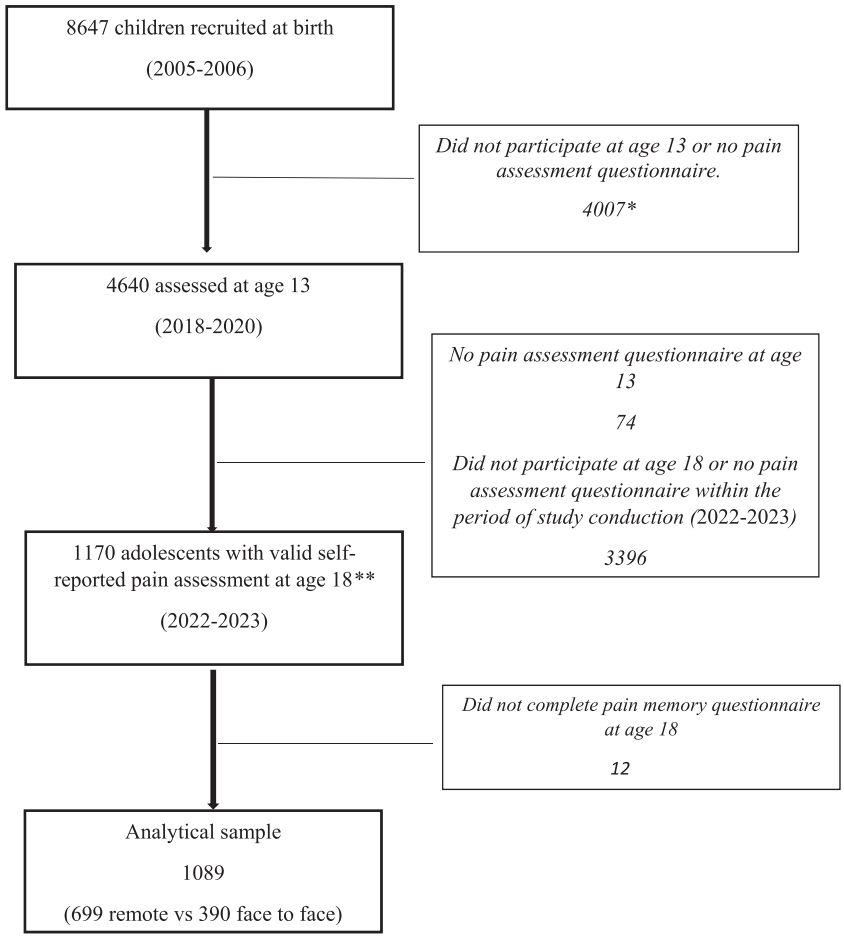

Figure 1. Participants' flowchart. *Of those, 69 participated at age 18. **Responded to the Lübeck Pain Questionnaire.

for back pain. Those who answered positively to any of these pain sites were considered to have back pain. The same approach was applied to identify recalled back pain from the pain memory questionnaire.

Back pain reported at the age of 13 was compared with the recalled back pain at age 18. Consequently, 4 groups were formed: forgetting or under-recalling (pain documented at age 13 but not remembered at age 18), over-recalling (no pain reported at age 13 but remembered at age 18), concordantly recalling presence (pain reported at ages 13 and 18), and concordantly recalling absence (pain not reported at age 13 nor at age 18).

We further merged both concordant recalls into a single group and under-recalling and over-recalling of any back pain as discordant recall instances.

2.6. Pain-related variables

Pain at age 18 was assessed using LPQ, and the presence of any pain and any back pain were utilized as predictor variables. In addition, at age 18, participants were asked whether a family member (parents, siblings, others—grandparents, etc.) had experienced recurrent or prolonged pain, with responses categorized as Yes or No.

To measure self-perceived sensitivity about pain, we utilized a question asking participants about their agreement level with the statement: "Generally, pain doesn't bother me as much as it bothers others." We employed a Visual Analog Scale (VAS) to assess responses, ranging from 0 (indicating complete disagreement) to 100 (representing complete agreement). Responses equal to or less than 50 were categorized into the negative perception group, whereas scores above 50 were categorized into the positive perception group.

Environmental sensitivity was assessed using the Highly Sensitive Child (HSC) Scale, an instrument that measures individual differences in responsiveness to environmental stimuli.[40] This scale evaluates various dimensions of sensitivity, such as ease of excitation, aesthetic sensitivity, and low sensory threshold, providing a comprehensive understanding of adolescents' reactions to their surroundings. To create the environmental sensitivity variable, we totaled the responses to all 12 questions from the Highly Sensitive Child Scale. Every question provided a scale, utilizing the Likert scale format from 1 to 7 for respondents to provide their answers. Responses equal to or less than 3.64 were classified as the low category, between 3.64 and 4.65 as medium, and above 4.65 as the high group.[40] The internal consistency of this score in our sample, as measured by Cronbach alpha, is 0.7382. Our final analysis combined the low and medium categories into a single low-medium group.

We used a question about whether participants had ever been diagnosed with any disease, with "Yes" and "No" options, without specifying the type of disease. To form a health-related quality-of-life variable (HRQOL), we compiled responses from all the questions in the Kiddo-KINDL questionnaire, a generic instrument for assessing health-related quality of life in adolescents. It is tailored specifically to capture the physical, emotional, social, and school-related well-being of individuals in this age group. Scores

Figure 2. Distribution of recall categories across tested factors.

ranged from zero (lowest) to 100 (highest). Before computing the final score, we reversed several questions that measured negative aspects. Responses equal to or less than 50 indicated a poor HRQOL, while scores above 50 were categorized as signifying a good HRQOL.[9,48] The internal consistency of this score in our sample, as measured by Cronbach alpha, is 0.7971.

From the data collected at the 13-year-old wave, we utilized the following variables that might be directly related to back pain experiences at age 13: whether there was an accident resulting in injury that necessitated a visit to a doctor or nurse within the past 12 months, emergency room visits within the last 12 months, history of bone fractures, and consultation with a health professional within the past 12 months, all with binary Yes or No responses.

2.7. Sociodemographic variables

Baseline sociodemographic characteristics included sex at birth, maternal education, and monthly household income. Maternal

Table 1

The sociodemographic and pain characteristics of participants.

	Remote (N = 699)	Face to face (N = 390)	*P*
Sex			
Male	320 (45.8)	210 (53.8)	**0.005**
Female	379 (54.2)	180 (46.2)	
Monthly household income (EUR)			
>2000	146 (23.5)	59 (19.4)	**0.007**
1000–2000	318 (51.3)	139 (45.7)	
<1000	156 (25.2)	106 (34.9)	
Maternal education			
>12	296 (42.8)	124 (32.8)	**<0.001**
10–12	239 (34.6)	123 (32.5)	
<10	156 (22.6)	131 (34.7)	
Current pain			
Yes	480 (68.7)	165 (42.3)	**<0.001**
No	219 (31.3)	225 (57.7)	
Current back pain			
Yes	359 (51.4)	114 (29.2)	**<0.001**
No	340 (48.6)	276 (70.8)	
A family member having recurrent or prolonged pain			
Yes	345 (49.4)	152 (39.0)	**<0.001**
No	354 (50.6)	238 (61.0)	

Bolded values indicate statistical significance at $P < 0.05$.

education was categorized into 3 groups based on years of schooling: higher education (>12 years), secondary education (10–12 years), and basic education (<10 years). Monthly household income was classified into 3 categories relative to Portugal's minimum wage: >2000 euros, 1000 to 2000 euros, and <1000 euros.

2.8. Statistical analysis

Descriptive statistics using the Pearson χ^2 test were performed to see the association between tested parameters and the concordance of recall. Frequencies and percentages described the corresponding categorical variables. Logistic regression analysis identified the contribution of independent variables to the concordant recall of any back pain, producing odds ratios (ORs) with respective 95% confidence intervals (CIs). We further analyzed the factors associated with under and over-recalling in comparison with the ones concordantly recalling the presence of back pain. Separate regression models were constructed for each profile, considering statistical significance and theoretical plausibility.

3. Results

3.1. Description of back pain recall characteristics

At age 18, 3% concordantly recalled experiencing back pain at 13, whereas over three-quarters concordantly recalled its absence. About one-fifth of the participants had difficulty recalling their back pain from 5 years prior, with 12% under-recalling and 8% over-recalling their past back pain. We summarized the distribution of recall categories across tested variables in **Figure 2**. Within our sample, 1.5% of all boys (12.3% of those with back pain reported at age 13) and 4.8% of all girls (18.5% of those with back pain reported at age 13) concordantly recalled experiencing prior back pain. **Table 2** summarizes factors associated with long-term pain recall, highlighting that girls, those with current pain, and individuals with a family history of pain (particularly maternal pain) are more likely to over-recall their pain experiences. High sensitivity and poor quality of life also trend towards over-recall, though not always statistically significant. Sociodemographic characteristics, along with prior pain-related factors like emergency visits and bone fracture history, show no significant impact on pain recall.

When examining the factors associated with concordant and discordant back pain recall, significant factors include sex ($P = 0.002$), current pain ($P < 0.001$), current back pain ($P < 0.001$), and having a family member with prolonged pain ($P = 0.002$). Discordant recall is more common in girls, adolescents with current pain, and those with family members who experience recurrent or prolonged pain (see Table 1, supplemental digital content, http://links.lww.com/PR9/A303).

3.2. Profiles of adolescents with concordant back pain recall

Table 3 summarizes the results of simple and multivariable logistic regressions. In the unadjusted model, those with current back pain had 66% lower odds of concordant recall compared with those without current back pain (OR: 0.34; 95% CI: 0.25–0.46). Having a family member with recurrent or prolonged pain was associated with 37% lower odds of concordant recall (OR: 0.63; 95% CI: 0.47–0.85), while having any disease was borderline associated with lower odds of discordant recall (OR: 0.71; 95% CI: 0.50–1.01). Boys had 1.62 significantly higher odds of concordant recall of prior back pain than girls (OR: 1.62; 95% CI: 1.20–2.19).

After adjusting for confounders (maternal education, sex, having a disease, HRQOL, environmental sensitivity, pain perception), the association between current back pain and reduced concordant recall remained significant, where adolescents with current back pain have had 60% lower odds of recalling their past back pain status concordantly than others (OR: 040; 95% CI: 0.26–0.63). After adjusting for maternal education, a significant association between concordant recall and having a disease was also maintained, with 30% lower odds of concordant recall associated with having been diagnosed with a disease (OR: 0.70; 95% CI: 0.49–0.99). The association between environmental sensitivity and recall became significant after adjusting for confounders (maternal education, sex,

Table 2

Descriptive table of factors associated with the long-term recall.

	Remembering		Under-recalling	Over-recalling	*P*
	Having back pain	Not having back pain			
Total (%)	35 (3.2)	833 (76.5)	134 (12.3)	87 (8.0)	
Baseline characteristics					
Sex					
Male (527)	8 (1.5)	433 (82.2)	57 (10.8)	29 (5.5)	**<0.001**
Female (562)	27 (4.8)	400 (71.2)	77 (13.7)	58 (10.3)	
Missing					
Household income					
>2000€ (205)	8 (3.9)	151 (73.7)	31 (15.1)	15 (7.3)	0.347
1000–2000€ (457)	11 (2.4)	355 (77.7)	59 (12.9)	32 (7.0)	
<1000€ (262)	6 (2.3)	203 (77.5)	26 (9.9)	27 (10.3)	
Missing 165					
Maternal education					
>12 (419)	15 (3.6)	316 (75.4)	57 (13.6)	31 (7.4)	0.781
10–12 (362)	12 (3.3)	272 (75.1)	43 (11.9)	35 (9.7)	
<10 (288)	8 (2.8)	227 (78.8)	32 (11.1)	21 (7.3)	
Missing 20					
Follow-up characteristics (13 yo)					
Accident (hurt/injury) that led to a doctor or nurse room in the past 12 mo					
Yes (254)	8 (3.2%)	185 (72.8%)	40 (15.7%)	21 (8.3%)	0.287
No (834)	27 (3.2%)	647 (77.6%)	94 (11.3%)	66 (7.9%)	
Missing 1					
Emergency room visit in the last 12 mo					
Yes (413)	14 (3.4)	311 (75.3)	51 (12.4)	37 (8.9)	0.826
No (672)	21 (3.1)	518 (77.1)	83 (12.4)	50 (7.4)	
Missing 3					
Ever had a bone fracture					
Yes (188)	5 (2.7)	139 (73.9)	30 (16.0)	14 (7.4)	0.381
No (898)	30 (3.3)	692 (77.1)	103 (11.5)	73 (8.1)	
Missing 3					
Consultation with a health professional in the past 12 mo					
Yes (879)	30 (3.4)	670 (76.2)	104 (11.8)	75 (8.5)	0.422
No (208)	5 (2.4)	162 (77.9)	29 (13.9)	12 (5.8)	
Missing 2					
Follow-up characteristics (18 yo)					
Current pain					
Yes (645)	33 (5.2)	439 (68.1)	104 (16.1)	69 (10.6)	**<0.001**
No (444)	2 (0.5)	394 (88.7)	30 (6.8)	18 (4.0)	
Missing					
Current back pain					
Yes (472)	32 (6.8)	298 (63.1)	82 (17.4)	60 (12.7)	
No (617)	3 (0.5)	535 (86.7)	52 (8.4)	27 (4.4)	**<0.001**
Missing					
Ever being diagnosed with a disease					
Yes (319)	14 (4.4)	219 (68.7)	51 (16.0)	35 (10.9)	0.267
No (372)	15 (4.0)	280 (75.3)	46 (12.4)	31 (8.3)	
Missing 398					
Environmental sensitivity					
High (457)	21 (4.6)	341 (74.6)	58 (12.7)	37 (8.1)	
Low-medium (250)	3 (1.2)	194 (77.6)	36 (14.4)	17 (6.8)	0.094
Missing 382					
Quality of life					
Good (466)	16 (3.4)	340 (73.0)	70 (15.0)	40 (8.6)	**0.004**
Poor (107)	10 (9.3)	65 (60.8)	15 (14.0)	17 (15.9)	
Missing 516					
Pain perception					
Positive (474)	13 (2.7)	369 (77.9)	53 (11.2)	39 (8.2)	0.315
Negative (455)	19 (4.2)	339 (74.5)	64 (14.1)	33 (7.2)	
Missing 160					
Family member having recurrent or prolonged pain					
Yes (496)	22 (4.4)	353 (71.2)	69 (13.9)	52 (10.5)	**0.001**
No (593)	13 (2.2)	480 (80.9)	65 (11.0)	35 (5.9)	
Missing					
Mother with pain					
Yes (336)	15 (4.5)	239 (71.1)	46 (13.7)	36 (10.7)	**0.024**
No (753)	20 (2.7)	594 (78.9)	88 (11.7)	51 (6.7)	

(*continued on next page*)

Table 2 (*continued*)

Descriptive table of factors associated with the long-term recall.

	Remembering		Under-recalling	Over-recalling	*P*
	Having back pain	Not having back pain			
Father with pain					
Yes (165)	8 (4.9)	122 (73.9)	22 (13.3)	13 (7.9)	0.582
No (924)	27 (2.9)	711 (77.0)	112 (12.1)	74 (8.0)	
Siblings with pain					
Yes (29)	3 (10.3)	20 (69.0)	2 (6.9)	4 (13.8)	0.075
No (1060)	32 (3.0)	813 (76.7)	132 (12.5)	83 (7.8)	
Other family members with pain					
Yes (51)	3 (5.9)	38 (74.5)	5 (9.8)	5 (9.8)	0.636
No (1038)	32 (3.1)	795 (76.6)	129 (12.4)	82 (7.9)	

Bolded values indicate statistical significance at $P < 0.05$.

disease, HRQOL, current pain, pain perception, and family member with recurrent pain), higher environmental sensitivity was associated with 1.74 higher odds of concordant recall (OR: 1.74; 95% CI: 1.07–2.85).

3.3. Profiles of adolescents with under and over-recalling

Table 4 summarizes the results from a multinomial logistic regression model examining factors associated with under-recall and over-recall of back pain. The analysis included 3 outcomes: under-recall (n = 134), over-recall (n = 87), and concordant recall of experiencing back pain (n = 35), with the latter serving as the reference category. The concordant recall of no back pain experience category (n = 833) was excluded to focus on comparisons between under-recall, over-recall, and concordant recall among those with prior reported back pain, leaving a final sample of 256 adolescents.

Boys are significantly more likely to under-recall pain (OR: 2.49; 95% CI: 1.05–5.90), while girls are less prone to it (OR: 0.40; 95% CI: 0.17–0.95). Current pain (OR: 0.21; 95% CI: 0.05–0.91) and current back pain (OR: 0.15; 95% CI: 0.04–0.51) at age 18 significantly reduce the likelihood of both under-recall and over-recall. High environmental sensitivity is associated with lower odds of under-recall (OR: 0.23; 95% CI: 0.06–0.82), and good quality of life increases the likelihood of under-recall (OR: 2.91; 95% CI: 1.11–7.67) but does not significantly affect over-recall. Other factors do not significantly influence under and over-recalling.

4. Discussion

In our study, we aimed to quantify the long-term recall of back pain and explore its association with other pain-related experiences. We found that the majority of our participants could concordantly recall their prior back pain status (presence and

Table 3

Profiles of adolescents with concordant back pain recall.

Variables	Unadjusted model		Adjusted model*		Adjusted model†	
	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*
Male sex (female as reference)	1.62 (1.20–2.19)	**0.002**		—		—
Accident (hurt/injury) that led to a doctor or nurse's room in the past 12 mo (no as reference)	0.75 (0.54–1.05)	0.095	0.77 (0.55–1.09)	0.139	0.74 (0.53–1.04)	0.091
Emergency room visits in the last 12 mo (no as reference)	0.91 (0.67–1.23)	0.547	0.90 (0.66–1.22)	0.502	0.98 (0.67–1.43)	0.920‡
Bone fracture history (no as reference)	0.79 (0.58–1.16)	0.239	0.79 (0.54–1.15)	0.218	0.95 (0.59–1.55)	0.846‡
Consultation with a health professional in the past 12 mo (no as reference)	0.96 (0.65–1.40)	0.833	0.97 (0.66–1.41)	0.864	1.24 (0.78–1.97)	0.358‡
Current pain (no as reference)	0.33 (0.24–0.47)	**<0.001**	0.32 (0.23–0.46)	**<0.001**	0.29 (0.16–0.51)	**<0.001**§
Current back pain (no as reference)	0.34 (0.25–0.46)	**<0.001**	0.33 (0.24–0.45)	**<0.001**	0.40 (0.26–0.63)	**<0.001**§
Environmental sensitivity (low-medium as reference)	1.02 (0.70–1.50)	0.898	1.01 (0.69–1.49)	0.939	1.74 (1.07–2.85)	**0.027**‖
Quality of life at age 18 (poor as reference)	1.38 (0.87–2.20)	0.175	1.41 (0.88–2.49)	0.149	1.25 (0.73–2.15)	0.409¶
Pain perception at age 18 (negative as a reference)	1.12 (0.72–1.55)	0.470	1.36 (0.82–1.57)	0.78	1.08 (0.70–1.67)	0.720#
A family member having recurrent or prolonged pain (no as reference)	0.63 (0.47–0.85)	**0.002**		—		—
Ever been diagnosed with a disease (no as reference)	0.71 (0.50–1.01)	0.054	0.70 (0.49–0.99)	**0.049**		—

Bolded values indicate statistical significance at $P < 0.05$.

* Adjusted for maternal education.

† Adjusted for maternal education and sex.

‡ Accident, disease.

§ Disease, HRQOL, environmental sensitivity, pain perception.

‖ Disease, HRQOL, current pain, pain perception, family member with recurrent pain.

¶ Disease, environmental sensitivity, current pain, pain perception, family member with recurrent pain.

Disease, environmental sensitivity, current pain, HRQOL, family member with recurrent pain.

Table 4

Profiles of adolescents with under- and over-recall (total subsample n = 256), reference category: concordant recall of experiencing back pain (n = 35).

Variables	Unadjusted model	
	Under-recalling (n = 134)	Over-recalling (n = 87)
	OR (95% CI)	OR (95% CI)
Male sex (female as reference)	**2.49 (1.05–5.90)**	1.69 (0.68–4.17)
Accident (hurt/injury) that led to a doctor or nurse's room in the past 12 mo (no as reference)	1.44 (0.60–3.43)	1.07 (0.42–2.72)
Emergency room visits in the last 12 mo (no as reference)	0.92 (0.43–1.97)	1.11 (0.50–2.47)
Bone fracture history (no as reference)	1.75 (0.62–4.89)	1.15 (0.38–3.48)
Consultation with a health professional in the past 12 mo (no as reference)	0.60 (0.21–1.68)	1.04 (0.34–3.21)
Current pain (no as reference)	**0.21 (0.05–0.91)**	0.23 (0.05–1.05)
Current back pain (no as reference)	**0.15 (0.04–0.51)**	**0.21 (0.06–0.74)**
Environmental sensitivity (low-medium as reference)	**0.23 (0.06–0.82)**	0.31 (0.08–1.18)
Quality of life at age 18 (poor as reference)	**2.91 (1.11–7.67)**	1.47 (0.56–3.89)
Pain perception at age 18 (negative as a reference)	1.21 (0.55–2.67)	1.72 (0.74–4.02)
A family member having recurrent or prolonged pain (no as reference)	0.63 (0.29–1.34)	0.88 (0.39–1.97)
Ever been diagnosed with a disease (no as reference)	1.19 (0.52–2.72)	1.21 (0.50–2.90)

Bolded values indicate statistical significance at $P < 0.05$.

absence). In addition, current back pain, having a disease, and a family member with recurrent pain were most likely to be associated with lower odds of concordant recall, whereas boys and adolescents with higher environmental sensitivity were linked to higher odds. Forgetting prior back pain was more likely to be associated with a better quality of life, while girls and individuals with higher environmental sensitivity were less likely to forget their pain.

While most adolescents had a concordant recall of their prior back pain status, only a small proportion showed concordance in recalling back pain experience at age 13. This contrasts sharply with the high proportion who concordantly recalled the absence of back pain during that period. This pattern aligns with previous research indicating that individuals reliably recalled the absence of symptoms more than its presence.[14,23,39,49] The inability to recall previous back pain may reflect changes over time, suggesting that pain memory is influenced by subjective factors and variations in pain perception and memory retention, leading to reporting inconsistencies.[12,26]

The observed association between current back pain and reduced likelihood of concordant recall aligns with previous research emphasizing the influence of ongoing pain on the recall of past pain experiences.[35] Ongoing pain may affect cognitive processes related to past pain, making it challenging to distinguish between current and previous pain sensations, which can impact long-term recall.[36,54] When focusing on adolescents with a history of back pain and excluding those with a concordant recall of no pain, we found that back pain at age 18 was less likely to show recall inconsistency, suggesting that those with past and present pain may have more consistent memories.

Exposure to chronic pain within the family may potentially influence how an individual perceives and remembers their pain episodes, potentially leading to discrepancies in recall.[11,45] Our analysis revealed a significant association between adolescents who have family members experiencing recurrent pain and the concordance of recall. Adolescents with family members suffering from ongoing pain exhibited lower odds of concordant recall. This suggests that familial experiences with pain may shape an individual's perception and memory of pain, possibly through shared genetic, environmental, or coping factors, highlighting the importance of considering familial context and the interplay between family dynamics and individual pain experiences.[6,13]

We found no discernible correlation between self-reported pain sensitivity and concordant recall. However, some research suggests that individuals with higher pain sensitivity may pay closer attention to their bodily sensations. As a result, they may have a clearer memory of past pain episodes compared with individuals who are less sensitive to pain.[27] The subjective nature of our study's self-perceived pain sensitivity measure might have introduced variability in participants' responses, which could have influenced the findings. Nevertheless, we have found an association between environmental sensitivity and pain recall, suggesting that adolescents with higher sensitivity to environmental stimuli have better recall, with forgetting being less common. The positive correlation could suggest that individual differences in sensitivity to environmental stimuli may influence the way pain experiences are perceived, processed, and remembered. Highly sensitive individuals often experience emotions more intensely.[7] Painful experiences can trigger strong emotional responses, enhancing memory formation and retention. Consequently, these individuals may recall past pain episodes more vividly. Heightened sensitivity to environmental stimuli may also enhance cognitive processing, including attention, perception, and memory, allowing more sensitive individuals to encode pain-related information more thoroughly, leading to more consistent recall over time.[1]

In addition, coping strategies and variations in attention and focus when prioritizing pain episodes differently can underscore the pattern of forgetting.[16,52]

In our study, sex was associated with pain recall, with greater concordance in boys, aligning with existing literature.[56] This disparity could be due to differences in sensitivity, coping strategies, and socialization norms regarding pain.[5] For example, men's pain might be taken more seriously due to expectations of stoicism, whereas women's pain might be downplayed or misunderstood, affecting their pain recall and the management of their conditions.[44] On the contrary, among adolescents with prior back pain, boys tend to forget pain experiences more than girls. This may be due to societal expectations and biases about how men should handle pain, influencing their memory and reporting.

We found a negative association between disease diagnosis and the concordant recall of back pain. Research supports the notion that significant life events can impact memory processes.[29] Managing the diagnosed condition's cognitive load might divert attention from past back pain experiences, potentially diminishing their prominence in memory. The psychological implications stemming from the disease diagnosis could overshadow or alter the retrieval of previous back pain incidents, potentially modifying their perceived intensity or significance[29,57]

While we did not identify a substantial link between the HRQOL and the concordant recall of back pain, our observations indicated that individuals who had no past pain and consistently remembered its absence, or those who under-recalled it after 5 years, demonstrated better HRQOL. Research shows that individuals with back pain generally have a lower HRQOL than those without.[19] This connection can impact the recall of past back pain status, highlighting the intricate nature of pain recall.[38]

The lack of association between household income and maternal education on pain recall differs from previous studies.[21,46] This inconsistency may stem from differences in study methodologies and sample variations. Age onset is likely a key factor, as the association appears more pronounced in older individuals, suggesting it affects adults more than adolescents.

Our study has limitations, notably the use of data from a population-based cohort with varying losses to follow-up, potentially leading to sociodemographic differences between participants and nonparticipants. However, a previous analysis within this cohort found no association between pain characteristics and sociodemographic factors, except for maternal education.[32] Our study focused on a more limited measure of pain recall. We did not differentiate between chronic and acute pain, which could lead to varied outcomes based on pain type. Chronic pain tends to have a more lasting impact on memory retention and perception of past pain experiences compared with acute pain. Moreover, pain memory and recall were not assessed based on the physical, psychological, or contextual intensity of past pain experiences but rather on whether pain was recalled as having occurred or not. As a result, our study does not fully capture the complexity of pain memory, nor was it designed to do so. Incorporating multidimensional tools in future studies would improve understanding and clinical relevance by capturing various aspects of pain, enhancing patient-reported outcomes, and treatment evaluations. Our categorization of over-recall, where pain is remembered at age 18 but not reported at age 13, may introduce a misclassification bias. The questionnaire covered pain in the past 3 months, so some participants may have recalled pain that began after the age 13 survey, leading to potential misclassification as discordant or over-recall. Over half of the age 18 participants were involved in mobile data collection, suggesting a bias toward adolescents with greater pain conditions being more likely to participate (**Table 1**).

Only a small percentage of adolescents remembered having back pain after 5 years, while almost 12% under-recalled it. Boys and adolescents with higher environmental sensitivity were more likely to demonstrate higher concordance in recalling prior back pain status. By contrast, concurrent pain, a diagnosis of any disease, and having a family member with recurrent pain were linked to discordant recall. Among adolescents with a history of back pain, forgetting pain experiences is more prevalent among boys, while this tendency is less common among those currently experiencing back pain and those with high environmental sensitivity. These findings highlight the importance of considering individual and familial factors in assessments of adolescent pain and underscore the need for tailored approaches in evaluating patient-reported pain histories. It is important to recognize that recalling past pain is not merely a cognitive task but a reassessment influenced by current experiences and perspectives.

Disclosures

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