





BMJ Open Association between chronic pain and physical activity in a Swiss population-based cohort: a cross-sectional study

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ABSTRACT

Objective To assess the bidirectional association between chronic pain and both subjectively and objectively measured physical activity (PA).

Design Cross-sectional study.

Setting Population-based sample in Lausanne, Switzerland, May 2014 to April 2017.

Participants Non-stratified, representative sample of the population of Lausanne (Switzerland) aged 35–75 years. Participants were excluded if they had missing data for the pain or the PA questionnaires, for accelerometry (defined as >20% of non-wear time or duration <7 days) or for covariates.

Primary outcomes Primary outcomes were association between chronic pain and previous, subjectively assessed PA (questionnaire), and subsequent, objectively assessed PA (accelerometry). Daily pain, pain duration, number of painful sites and pain intensity were assessed by questionnaire. PA was assessed by questionnaire 2 weeks prior and by accelerometry 2 weeks after completion of the pain questionnaire. PA was further categorised as sedentary (SED), light and moderate-to-vigorous PA.

Results 2598 participants (52.9% women, mean age 60.5 years) had subjectively assessed PA. Multivariable analysis showed time spent in SED to be negatively associated with the number of painful sites: adjusted mean±SE 528±5, 522±7 and 502±7 min/day for 0, 1–2 and 3+ painful sites, respectively, p for trend <0.005. No other association was found between chronic pain and subjectively assessed PA categories. 2205 participants (52.8% women, mean age 61.7 years) had accelerometry-derived PA. No significant association between chronic pain and subsequent objectively assessed PA was found after multivariable analyses.

Conclusion In this Swiss population-based cohort, no consistent association was found between chronic pain and PA. Hence, in the general population, chronic pain does not significantly impact time spent in PA.

INTRODUCTION

The relationship between chronic pain and physical activity (PA) in the general population is of public health interest. Severe chronic pain and widespread pain increase all-cause¹ and cardiovascular² mortality, respectively, while PA reduces mortality³ and cardiovascular disease.⁴

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ We analysed a large sample size with detailed information regarding chronic pain and physical activity (PA) to assess the association between chronic pain and previous and subsequent PA.
- ⇒ We assessed the association between chronic pain and both subjectively and objectively measured PA.
- ⇒ Previous PA was assessed by questionnaire, and recall or information bias cannot be excluded.
- ⇒ We had to exclude a sizeable fraction of participants due to missing data.
- ⇒ Our sample was mostly composed of Caucasian people aged 45–85 years living in the city of Lausanne, Switzerland. Hence, its generalisability to populations differing in age, ethnicity and/or culture remains to be assessed.

Chronic pain is a major barrier for PA,^{5 6} mainly due to fear of pain exacerbation.^{7 8} Therefore, chronic pain is often presumed to decrease PA, despite contradictory findings in the literature. A systematic review reported a lack of evidence regarding decreased PA in adults with chronic low back pain.⁹ Conversely, another systematic review reported decreased PA in older adults with chronic musculoskeletal pain.¹⁰ Importantly, most studies assessed PA using self-reported questionnaires,^{9–11} which are prone to reporting bias.

Objective measurement of PA with accelerometry is nowadays the preferred approach to assess PA. Previous studies using objective assessment of PA mainly focused on specific chronic pain diseases such as fibromyalgia,^{12–14} chronic back pain^{13 15} or osteoarthritis.¹³ In these specific groups, chronic pain was generally associated with decreased PA. On the contrary, little is known about the association between chronic pain and PA in the general population. A recent population-based study in the UK¹⁶ found a negative association between the number of painful sites and objectively measured PA, whereas

no association was found between chronic pain intensity and PA. Similar findings were reported in Japanese older adults by Murata *et al.*¹⁷ The directionality of the association between chronic pain and PA is also unclear, that is, whether increased chronic pain decreases PA or if increased PA increases (or decreases) chronic pain.

Hence, we assessed the association between chronic pain and PA measured both subjectively and objectively in a population-based cohort. Our hypothesis was that chronic pain intensity and the number of painful sites would be negatively associated with PA.

POPULATION AND METHODS

Study population

The detailed description of recruitment and follow-up procedures of the CoLausPsyCoLaus study have been described previously.¹⁸ Briefly, the CoLausPsyCoLaus study is a population-based cohort exploring the biological, genetic and environmental determinants of cardiovascular disease and their association with mental disorders. A non-stratified, representative sample of the population of Lausanne, Switzerland, aged 35–75 years was recruited between June 2003 and May 2006. Lausanne is a Swiss city of approximately 145 000 inhabitants as of 2021, with an extensive network of public transport.

The first follow-up was performed between April 2009 and September 2012 and the second one between May 2014 and April 2017. In the second follow-up, participants were asked to fill a questionnaire including items on chronic pain and PA; participants were also invited to have their PA assessed by accelerometry. Hence, for this study, only data of the second follow-up were used. Two sets of analyses were performed for this study. The first one assessed the association between chronic pain and concomitant PA as assessed by the PAFQ. The second one assessed the effect of chronic pain on subsequent PA as assessed by accelerometry.

Chronic pain assessment

Pain was assessed with a self-administered retrospective questionnaire. This questionnaire has been previously applied in a French population-based study¹⁹ and evaluates the presence of daily pain, its duration, intensity, self-reported number of painful sites and neuropathic characteristics (online supplemental annex 1). The neuropathic characteristics of pain were assessed by the pain descriptors of the DN4 score.¹⁹ The DN4 questionnaire showed a high inter-rater reliability, with Kappa values between 0.70 and 0.96. Identification of the cut-off value to identify patients with neuropathic pain was performed using the Youden index. More details can be obtained from Bouhassira.²⁰ No a posteriori corrections of the responses were made, that is, if a participant reported he/she had pain but indicated no painful site, the information was analysed as such. The number of painful sites was categorised as none, 1–2 or 3+.

Chronic pain was defined as pain lasting for at least 3 months. Pain intensity was evaluated on a validated Numeric Rating Scale (NRS) ranging from 0=no pain to 10=worst imaginable pain. Participants reported if the pain varied during the last week and indicated the intensity of average pain during the last week. Several studies divided intensity of pain into three categories.^{21 22} For this study, pain was categorised into none to mild (NRS 0–4), moderate (NRS 5–6) and severe (NRS \geq 7) as proposed by a systematic review.²¹

Overall, the following pain types/characteristics were collected: presence of pain (no, yes); chronic pain (no, yes); number of painful sites (0, 1–2, 3+); pain intensity (mild (0–4), moderate (5–6) and severe (7+)) and neuropathic pain (no, yes).

PA assessment

Subjective assessment of PA was performed using the Physical Activity Frequency Questionnaire (PAFQ) (online supplemental annex 2). The PAFQ was validated in the population of Geneva, Switzerland, by comparing the energy expenditure assessed by PAFQ and a heart rate monitor. The heart rate monitor and the PAFQ were highly correlated ($r=0.76$).²³ The PAFQ is a self-reported questionnaire that assesses the type and duration of 70 different (non-)professional activities and sports during the last 7 days. Participants reported the number of days (0 to 7) and the duration they performed each activity (0–10 hours, with 15 min precision). For each activity/sport the type of PA (ie, sedentary (SED), light, moderate or vigorous) was assessed according to the compendium of physical activities,^{24 25} and the time corresponding to each type of PA was computed. SED activity was defined as <2 metabolic equivalent of tasks (MET), light PA (LPA) was defined as 2 to <3 METs, and moderate-to-vigorous PA (MVPA) as ≥ 3 METs.²⁶ One MET is defined as the energy expended per minute while sitting quietly, equivalent to 3.5 mL of oxygen consumed per kg of body weight per minute for an adult weighing 70 kg.

Objective assessment of PA was performed using a wrist-worn triaxial accelerometer (*GENEAActiv*, Activinsights Ltd, UK, www.activinsights.com). This validated device²⁷ has been previously used in a large cohort population study.²⁸ The accelerometers were pre-programmed with a 50 Hz sampling frequency and subsequently attached to the participants' right wrist. A previous study showed that left or right wrist accelerometer location did not impact PA assessment.²⁷ After a short training period, participants were requested to wear the device continuously, day and night, for 14 days in their free-living conditions. The data was then analysed using the R-package GGIR V.1.5–9 (<http://cran.r-project.org>).²⁹ Non-wear time was defined by the software based on built-in specific criteria.^{30 31} The R-code used to assess PA is provided in online supplemental annex 3. LPA was defined as an acceleration between 40 to 100 mG; moderate PA (MPA) as an acceleration between 100 and 400 mG, and vigorous PA (VPA) as an acceleration above 400 mG. As the time dedicated to

VPA was small, MPA and VPA were grouped into MVPA as performed in previous studies.³² As the amount of MVPA depends on the thresholds applied, we ran a sensitivity analysis using the values proposed by White.²⁹ LPA was defined as an acceleration between 85 and 180 mG; MPA as an acceleration between 181 and 437 mG, and VPA as an acceleration above 437 mG.

Covariates

Professional occupation, smoking status and medications were collected with a self-administered questionnaire. Professional occupation was categorised as professionally active (yes/no). Smoking status was categorised as never, former and current smoker. Medications prescribed or over the counter over the last 6 months were coded using the Anatomical Therapeutic Chemical (ATC) classification. The following painkillers were considered: paracetamol (ATC code: N02BE01), metamizole (N02BB02), anti-inflammatory and antirheumatic products (ATC codes beginning with M01A or M01B), opioids (ATC codes beginning with N02A) and codeine (R05DA04). Salicylates, antidepressors and antiepileptics were not included, as the reason of prescription (ie, pain management or other purpose) was not specified.

Depression was assessed using the CES-D questionnaire (Center for Epidemiologic Studies Depression Scale), and participants were considered as presenting with depression if their score was ≥ 30 .

Weight was measured to the nearest 100 g using a Seca scale (Hamburg, Germany) with participants in light indoor clothes and without shoes. Height was measured to the nearest 5 mm using a Seca height gauge (Hamburg, Germany). Body mass index (BMI) was calculated as $\text{weight}/\text{height}^2$ and categorised as underweight ($<18.5 \text{ kg}/\text{m}^2$), normal ($18.5 \leq \text{BMI} < 25 \text{ kg}/\text{m}^2$), overweight ($25 \leq \text{BMI} < 30 \text{ kg}/\text{m}^2$) and obese ($\geq 30 \text{ kg}/\text{m}^2$).

Exclusion criteria

Participants were excluded if they (1) didn't complete the pain or the PA questionnaires; (2) had missing accelerometry data (defined as $>20\%$ of non-wear time or duration <7 days) or (3) had missing covariates data.

Statistical analysis

Statistical analyses were conducted using Stata V.15.1 for windows (StataCorp).

Two sets of analyses were performed. The first analyses assessed the association between chronic pain and concomitant PA assessed by the PAFQ. All participants with PAFQ data, irrespective of the accelerometry data, were eligible. The second analyses assessed the effect of chronic pain on subsequent PA assessed by accelerometry. All participants with accelerometry data, irrespective of the PAFQ data, were eligible.

Descriptive results were expressed as number of participants (percentage) for categorical variables and average \pm SD or median (IQR) for continuous variables. Bivariate analyses were performed using chi-square for

categorical variables and Student's t-test, analysis of variance or Kruskal-Wallis test for continuous variables. Multivariable analysis was performed using analysis of variance for continuous variables, and results were expressed as multivariable-adjusted mean \pm SE. Statistical significance was assessed for a two-sided test with $p < 0.05$.

Patient and public involvement

Patients and the public were not involved in the design or planning of the study.

RESULTS

Association between chronic pain and concomitant, subjectively assessed PA

Of the initial 4881 participants, 2598 (53.2%) were included in the analysis between chronic pain and concomitant, subjectively assessed PA. Exclusion criteria are presented in online supplemental figure 1 and the characteristics of included and excluded participants are summarised in online supplemental table 1. Included participants were younger, more frequently non-smokers and had a lower BMI. Of the 2598 included participants, 2529 (97%) had data for depression. Included participants presented less frequently with depression, although a considerable number of excluded participants did not have data for depression (online supplemental table 1).

The characteristics of the participants according to the number of painful sites are summarised in online supplemental table 2. Participants with a higher number of painful sites were older, more frequently women, had a higher BMI, received a higher number of painkillers and presented more frequently with depression.

The bivariate and multivariate associations between chronic pain and concomitant, subjectively assessed PA are summarised in online supplemental table 3 and table 1, respectively. On bivariate analysis, a higher number of painful sites was negatively associated with SE and positively associated with LPA; higher pain intensity was negatively associated with MVPA (online supplemental table 3). On multivariable analysis, a higher number of painful sites was negatively associated with SED, while no association was found between pain intensity categories and PA levels (table 1). Similar findings were obtained after adjustment on depressive status (online supplemental table 4).

Association between chronic pain and subsequent, objectively assessed PA

Of the initial 4881 participants, 2205 (45.2%) were included. Exclusion criteria are presented in online supplemental figure 2 and the characteristics of included and excluded participants are summarised in online supplemental table 5. Included participants were younger, more frequently non-smokers and taking painkillers. Of the 2205 included participants, 2102 (95%) had data for depression. No difference was found in the prevalence of depression between included and excluded participants,

Table 1 Multivariable-adjusted associations between chronic pain markers and concomitant, subjectively assessed physical activity, CoLaus|PsyCoLaus study, Lausanne, Switzerland, May 2014 to April 2017

	N	Sedentary		Light physical activity		Moderate-to-vigorous physical activity	
		Min/day	% time	Min/day	% time	Min/day	% time
Everyday pain							
No	1282	527±5	54.5±0.5	338±4	35.0±0.4	100±3	10.5±0.3
Yes	1258	515±5	53.7±0.5	338±4	35.2±0.4	107±3	11.1±0.3
P value		0.104	0.232	0.946	0.754	0.150	0.142
Chronic pain (≥3 months)							
No	153	523±14	54.3±1.4	348±11	36.2±1.1	92±9	9.5±0.9
Yes	1045	511±5	53.4±0.5	341±4	35.6±0.4	105±3	10.9±0.3
P value		0.428	0.568	0.555	0.644	0.167	0.143
No of painful sites							
0	1408	528±5	54.7±0.5	337±4	35.0±0.4	100±3	10.4±0.3
1–2	583	522±7	54.5±0.7	330±6	34.5±0.6	106±4	11.1±0.5
3+	549	502±7	52.3±0.8	347±6	36.1±0.6	112±5	11.6±0.5
P value for trend		0.004	0.009	0.197	0.118	0.034	0.039
Pain intensity							
Mild (0–4)	674	519±7	54.4±0.7	332±5	34.7±0.5	104±4	10.9±0.4
Moderate (5–6)	230	511±11	53.4±1.1	345±9	36.2±0.9	99±7	10.4±0.7
Severe (7–10)	73	479±20	50.3±2.1	363±16	37.6±1.7	118±13	12.1±1.3
P value for trend		0.064	0.057	0.064	0.095	0.316	0.395
Neuropathic pain							
No	505	521±8	54.3±0.8	335±6	35.0±0.6	102±5	10.7±0.5
Yes	71	520±20	54.6±2.0	342±16	35.7±1.6	94±12	9.8±1.3
P value		0.946	0.921	0.667	0.706	0.552	0.515

Results are expressed as multivariable-adjusted mean±SE. Between-group comparisons performed for each pain characteristic using analysis of variance, adjusting for age (continuous), gender (man, woman), smoking (never, former, current), body mass index categories (normal, overweight, obese), presence of pain killers (yes, no) and currently working (yes, no).

although a considerable number of excluded participants did not have data for depression (online supplemental table 5).

The characteristics of the participants according to the number of painful sites are summarised in online supplemental table 6. Participants with a higher number of painful sites were more frequently women, had a higher BMI, had a higher number of painkillers and presented more frequently with depression.

The bivariate and multivariate associations between chronic pain and subsequent, objectively assessed PA are summarised in online supplemental table 7 and table 2, respectively. On bivariate analysis, everyday pain and number of painful sites were negatively associated with MVPA (online supplemental table 7). After multivariable adjustment, the association between number of painful sites and MVPA was no longer significant, and no association between pain intensity categories and the different types of PA was found (table 2). Further adjusting for depression led to similar findings, although a higher

engagement in LPA among participants with neuropathic pain was found (online supplemental table 8).

A sensitivity analysis using higher thresholds to define MVPA led to considerable smaller amounts of MVPA performed, but no changes regarding the associations between pain and PA levels (online supplemental table 9).

DISCUSSION

A few studies have assessed the association between chronic pain and PA at the population level. Contrary to our initial hypothesis, our results suggest that chronic pain is associated neither with concomitant nor with prospective PA in a sample of community-dwelling people.

Association between chronic pain and concomitant, subjectively assessed PA

Self-reported SED was negatively associated with the number of painful sites, meaning that people having

Table 2 Multivariable-adjusted associations between chronic pain markers and prospective, objectively assessed physical activity the following 2 weeks, CoLaus|PsyCoLaus study, Lausanne, Switzerland, May 2014 to April 2017

	N	Sedentary		Light physical activity		Moderate-to-vigorous physical activity	
		Min/day	% time	Min/day	% time	Min/day	% time
Everyday pain							
No	1038	594±2	68.4±0.3	179±2	20.4±0.2	98±2	11.2±0.2
Yes	1167	594±2	68.7±0.3	178±2	20.4±0.2	95±1	10.9±0.2
P value		0.944	0.476	0.744	0.999	0.208	0.166
Chronic pain (≥3 months)							
No	151	602±6	69.6±0.7	176±4	20.2±0.4	90±4	10.2±0.4
Yes	927	593±2	68.7±0.3	180±2	20.6±0.2	94±2	10.7±0.2
P value		0.219	0.255	0.457	0.371	0.332	0.283
No of painful sites							
0	1158	595±2	68.6±0.3	178±2	20.3±0.2	97±1	11.1±0.2
1–2	504	594±3	68.7±0.4	178±2	20.4±0.2	96±2	10.9±0.2
3+	543	590±3	68.4±0.4	180±2	20.6±0.2	96±2	11.0±0.2
P value for trend		0.185	0.690	0.598	0.283	0.630	0.614
Pain intensity							
Mild (0–4)	577	597±3	69.2±0.4	177±2	20.4±0.2	91±2	10.5±0.2
Moderate (5–6)	222	586±5	68.0±0.6	182±3	20.9±0.3	98±3	11.2±0.3
Severe (7–10)	83	593±8	68.4±1.0	185±5	21.2±0.6	92±5	10.4±0.6
P value for trend		0.635	0.479	0.169	0.179	0.951	0.938
Neuropathic pain							
No	432	597±3	69.4±0.4	176±2	20.3±0.2	90±2	10.4±0.2
Yes	61	586±9	67.5±1.1	188±6	21.4±0.7	98±6	11.0±0.6
P value		0.275	0.126	0.096	0.099	0.208	0.311

Results are expressed as multivariable-adjusted mean±SE. Between-group comparisons performed for each pain characteristic using analysis of variance, adjusting for age (continuous), gender (man, woman), smoking (never, former, current), body mass index categories (normal, overweight, obese), presence of pain killers (yes, no) and currently working (yes, no).

more painful sites were less sedentary. A possible explanation is that the location of the painful sites is more important than their total number; for instance, painful sites in the lower limbs might reduce PA more strongly than painful sites in the upper limbs. Overall, our results suggest that the number of painful sites has little impact on PA or that taken globally, PA is not a good marker for the impact of pain on daily-life and more refined activity-analysis should be performed.

No association was found between pain intensity and self-reported PA. Our findings are in agreement with a previous Dutch study, which found no association between pain intensity and self-reported PA in patients with chronic low back pain.³³ The investigated population was younger, aged 18–65 years old, compared with our study (mean age 60.5 years). Furthermore, pain intensity was evaluated with a momentary pain intensity assessment (‘Right now, I am in pain’) and a seven point Likert scale. Conversely, our results contradict a previous Swedish study conducted by Larsson, where average pain intensity the last 7 days was negatively associated with self-reported PA.³⁴ However, the Swedish

authors used a different pain intensity scale (six point Likert scale ranging from 0=no pain at all to 6=tremendous amount of pain), a different PA assessment (one question, answer with six levels) and the population investigated was older (mean age 74.4 vs 60.5 years in our study). Overall, our results suggest that the association between pain intensity and PA might not exist or might be dependent on the methodology used to assess pain and PA. Pain might influence the type of activity more than its intensity.

The NRS is a well-validated pain intensity scale and is recommended by the Initiative on Methods, Measurement and Pain Assessment in Clinical Trials (IMMPACT). To decrease variability between studies, the IMMPACT recommendations suggest using a specific format for the instructions regarding the description of the 11point scale. Furthermore, the IMMPACT recommendations suggest evaluating the absolute changes in pain intensity and the percentages of patients obtaining reductions in pain intensity of at least 30% from baseline.³⁵ Therefore, we suggest considering these methodology recommendations in future studies.



Association between chronic pain and subsequent, objectively assessed PA

No significant association between chronic pain and subsequent objectively assessed PA was found after multivariable analyses. This finding is in agreement with a Danish study conducted in 2019 in healthcare workers, where no association was found between objectively measured occupational PA and multisite pain (≥ 2 sites).³⁶ Similarly, a study conducted by Kratz *et al* reported persistence of PA despite a higher number of painful sites due to pain acceptance.³⁷ Conversely, a Japanese¹⁷ and a UK¹⁶ study found a negative association between the number of chronic musculoskeletal pain sites and MVPA. Possible explanations for these inconsistent findings could be the inclusion of older adults (75.3 vs 61.7 years in our study) or different pain perceptions related to ethnicity³⁸ in the Japanese study, and a higher prevalence of women (62% vs 53%) and of pain in ≥ 4 sites (69% vs 16%) in the UK study.¹⁶ Our sample was also not restricted to musculoskeletal pain. Finally, in the UK study, the decrease in MVPA was less than 5 minutes/day, which might not be clinically relevant. Overall, our results suggest that there is no association between the number of painful sites and PA.

No association was found between chronic pain intensity and PA. This finding is in agreement with studies conducted in the Netherlands³³ and in Japan.¹⁷ A possible explanation is that participants with chronic pain remain physically active due to decreased pain sensitivity with regular PA.³⁹ Furthermore, healthcare professionals advocate to remain active despite pain. Interestingly, a study reported that high pain intensity does not impact quantitative PA metrics, but impacts the temporal organisation of PA patterns, combining type, intensity and duration of PA.⁴⁰ For instance, high pain intensity may increase the duration of rest periods and decrease the duration of PA periods,⁴¹ or increase PA in the mornings and decrease PA in the evenings.⁴²

Recommendations for future research

Future research assessing the relationships between pain and PA could rely on 'real-time' pain assessment using methods such as ecological momentary assessment.⁴³ The IMMPACT recommendations should be considered when designing future studies assessing chronic pain and PA.³⁵ The following outcome domains should be considered: pain, physical functioning, emotional functioning, participant ratings of improvement and satisfaction with treatment, symptoms and adverse events, participant disposition.³⁵

Strengths and limitations

Our study assessed the association between chronic pain and PA in a large, community-dwelling sample, while previous studies mainly evaluated this association in patients with a specific disease.^{12–15} Moreover, our study assessed the association between chronic pain and both subjectively and objectively measured PA, whereas previous studies mainly used subjectively assessed PA.^{9–11} Also, we could assess the associations between chronic

pain and PA both at the cross-sectional (subjective) and the prospective (objective) level. Finally, the sample size was relatively large, providing adequate power to detect clinically meaningful associations. In comparison, the two previous studies exploring this association in the general population included 267¹⁷ and 9856¹⁶ participants.

This study also has several limitations. First, our sample was composed of mostly Caucasian people aged 45–85 years living in the city of Lausanne, Switzerland. Hence, its generalisability to populations differing in age, ethnicity and/or culture remains to be assessed. Still, previous studies on the effects of ethnicity on pain are inconsistent; one study reported that ethnicity influences pain perception,³⁸ while another failed to find such an association.⁴⁴ Second, we had to exclude participants with missing pain, PA or covariates data. As excluded participants were older and had a higher BMI, this might have led to an underestimation of chronic pain. However, older age and higher BMI are also associated with decreased PA^{45 46}; therefore, the associations between chronic pain and PA would presumably remain the same. Third, the subjective assessment of the association between chronic pain and PA may be influenced by same source bias. Therefore, we included an objective assessment of the association between chronic pain and PA, using accelerometry. To note, no association was found between chronic pain and PA measured both subjectively and objectively. Finally, the quantification of stationary behaviour and light, MPA and VPA relies on specific thresholds, and the software package used. Despite several proposed thresholds in the literature based on calibration studies,^{27 29 47} there is no agreement regarding which thresholds to apply for each specific software. Still, using two different thresholds led to similar findings, suggesting that the absence of association between pain and PA does not depend on the threshold used to define MVPA.

CONCLUSION

In this Swiss population-based sample, no association was found between chronic pain and PA. Hence, in the general population, chronic pain does not preclude being physically active.

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Contributors OA, PM-V and PV designed the study. OA interpreted the results and wrote the manuscript. PM-V performed the statistical analyses, wrote the statistical analysis part, and revised the manuscript. PV and MRS reviewed the manuscript for important intellectual content. All authors approved the final version of the manuscript. PV had full access to the data and is the guarantor of the study.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by Ethics Commission of Canton Vaud approved the baseline CoLaus study (reference

16/03). The approval was renewed for the first (reference 33/09) and second follow-up (reference 26/14). Participants gave informed consent to participate in the study before taking part.

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Data availability statement Data are available on reasonable request. Due to the sensitivity of the data and the lack of consent for online posting, individual data cannot be made accessible. Only metadata will be made available in digital repositories. Metadata requests can also be performed via the study website www.colaus-psycolaus.ch.

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