Pain catastrophizing in the elderly

An experimental pain study

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Published in:
Scandinavian Journal of Pain

DOI (link to publication from Publisher):
10.1515/sjpain-2023-0035

Publication date:
2024

Document Version
Publisher's PDF, also known as Version of record

Original Experimental

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https://doi.org/10.1515/sjpain-2023-0035
received March 16, 2023; accepted November 29, 2023

Abstract

Objectives: – Pain catastrophizing in the aging population has not been studied in great detail. Existing investigations have reported conflicting results on the effects of age on pain catastrophizing in relation to pain responses. This study investigated the relationship between pain catastrophizing, and its individual components (rumination, magnification, and helplessness), and the responses to standardized experimental pain stimuli in old and young, healthy adults.

Methods: – Sixty-six volunteers (32 old: 65–87, 18 females; 34 young: 20–35, 17 females) participated in the study. Pain catastrophizing including the components of rumination, magnification, and helplessness was assessed with the pain catastrophizing scale (PCS). Experimental pain was induced by applying predefined pressure stimulations to the trapezius muscle. Pain intensity and unpleasantness were assessed using numerical rating scales. Pain catastrophizing levels and pain responses were statistically compared between the two age groups.

Results: – Elderly individuals reported significantly (p = 0.028) lower scores of pain catastrophizing (Med = 5; interquartile range [IQR] = 14) than younger individuals; this difference was driven by the significantly lower components of rumination (Med = 2; IQR = 4; p = 0.017) and helplessness (Med = 2; IQR = 7; p = 0.049). A larger proportion of young (57.8%) rated pain catastrophizing at high levels, with scores above the 75th percentile (Med = 20). Additionally, elderly reported the lowest pain intensity (Med = 5; p = 0.034) and pain unpleasantness (Med = 4.5; p = 0.011) responses to the experimental pressure stimuli. In the elderly group, pain unpleasantness was positively and significantly associated with pain catastrophizing (r_s = 0.416, p = 0.021), rumination (r_s = 0.42, p = 0.019), and helplessness (r_s = 0.434, p = 0.015), respectively. No associations were found in the young group.

Conclusions: – Elderly reported lower PCSs than young adults. Rumination and helplessness were reduced in the elderly group. The elderly population showed positive correlations between catastrophizing levels and pain unpleasantness to standardized pressure pain stimuli. Results supported the view that elderly possess resilience over specific domains of pain catastrophizing that could counteract pain perception due to physiological decline.

Keywords: pain catastrophizing, experimental pain, elderly, age, pain responses, cognitive functioning

1 Introduction

The effect of aging on pain perception remains controversial. Some clinical and experimental studies have reported higher pain sensitivity in elderly [1,2], whereas others have shown reduced pain sensitivity, pain complaints, and emotional reactivity in elderly individuals when compared with younger ones [3–6]. Although elderly individuals are more vulnerable to adverse health outcomes such as declining in physiological functioning and developing painful chronic conditions, the aging process per se does not necessarily lead to chronic pain [7]. Differences in prevalence of chronic pain could be attributed to several social, psychological, and biological variables and the copresence of co-morbid factors, which, in turn, can impact pain perception and modulation. Cognitive decline among the aging population poses a specific problem when pain conditions are assessed.

The study was also presented in the form of poster presentation at the IASP 2022 World Congress of Pain in Toronto, Canada.

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Aging is a complex dynamic process due to various physical and psychological changes [8]. Studies have found that elderly are more psychologically resilient than younger individuals. In fact, there is a slight decrease in self-reported negative affect, lower rates of anxiety, and major depression as compared with younger and middle-aged adults [9,10].

Among psychological factors, pain catastrophizing has been identified as a significant risk marker for adverse pain and health outcomes [11–13]. High pain catastrophizing is associated with enhanced pain sensitivity, increased pain severity, emotional distress and suffering, increased disability, and worse outcomes after surgery [14–18]. Additionally, catastrophizing has been suggested to be a predictor for developing chronic pain or chronification of acute pain in pain-free individuals [19].

Pain catastrophizing may decrease with age. However, the relationship between pain catastrophizing and pain perception in elderly individuals is unclear and may depend on individual factors and the type of pain experienced. Additionally, this relationship has been mainly reported by observational studies [20,21]. Some studies have reported that age moderates the relationship between pain catastrophizing and pain severity, indicating that young individuals with recurrent acute pain catastrophize more than elderly individuals with persistent and disabling chronic pain [22]. On the contrary, pain catastrophizing is found to be more strongly associated with pain intensity among older people, whereas pain intensity among younger people is more related to emotional responses to pain [23]. A longitudinal study showed that the effects of pain catastrophizing in worsening pain perception disappear when controlling for age, suggesting that elderly individuals might use different coping strategies [24].

Pain catastrophizing is a multifaceted construct constituted by several interrelated psychological dimensions [11,13]. Most commonly, it has been accepted to incorporate the tendency to repetitive negative thoughts about pain (rumination), the exaggeration on the perceived pain-related threat (magnification), and the sense of inability to effectively cope with pain (helplessness) [25]. Although existing research on the differential effect of these dimensions of pain catastrophizing on pain is scarce, the few studies revealed key contributions of the single domains of catastrophizing over pain-related outcomes [26,27]. Helplessness has shown to predict pain levels, perceived interference in life, affective distress, and depression; magnification has been associated with physical health and functioning [26,28,29], whereas rumination has been associated with lower pain tolerance [27]. So far, no studies on age-related differences investigating separate domains of pain catastrophizing are available. However, psychological literature, which examined these constructs separately and directly compared young and old adults, found that older individuals reported less ruminative thinking than young ones [30,31], and that reduced helplessness can predict resilience in both young and elderly individuals [32].

Pain catastrophizing has often been investigated as single construct; however, examining the construct as whole limits the analysis of its dimensions and their impact on pain-related outcomes [11,26]. Instead, an identification of how specific components of pain catastrophizing contribute to age difference in pain can be used to identify risk or resilience factors that can be informative regarding treatment approaches for proper psychological pain-related management.

The aim of the present experimental study was to investigate the relationship between pain catastrophizing together with its subdimensions (rumination, magnification, and helplessness) and pain responses to standardized experimental pressure stimuli in elderly and young individuals. Based on previous findings, we hypothesized that the elderly would have the lowest pain catastrophizing scores (PCSs) and the lowest pain sensitivity. Additionally, we hypothesized that each single dimension of catastrophizing will have different relationships with age and pain sensitivity.

2 Methods

2.1 Subjects

Sixty-six healthy young and elderly volunteers participated in the study, 34 young: 20–35 (24 ± 3.2 years, 17 F) and 32 elderly: 65–87 (74 ± 6.2 years, 18 F). Sample size was determined using an a priori calculation estimating type 1 error at 5% (alpha = 0.05) and type 2 error at 15% (85% power), with a conservative effect size moderate-to-large (d = 0.5–0.8).

Participants were recruited via posted advertisements and signed informed consent. They were screened with an interview prior to participation to exclude conditions that could affect their ability to follow instructions, answer the questionnaire, and report pain perception. In the interview, the participants were also assessed with the Mini Mental State Examination (MMSE) to ensure that their cognitive capabilities were intact. Individuals that scored >28 on MMSE were included in the study. Additionally, the following exclusion criteria were determined: if the participant reported the presence of severe ongoing pain, diabetes, signs of rheumatic or arthritic disease, especially on the neck and shoulders, and mental conditions such as

anxiety and depression. All participants were pain-free, and none had taken any analgesic or sedative for at least 48 h prior to the experiment.

The study protocol was approved by the local ethical committee (N-20130071; N-20210065), and it was in accordance with all relevant national regulations, institutional policies, and followed the Helsinki Declaration and IASP's guidelines for pain research in humans. The study was part of a larger study on assessing pain in dementia as a part of the EU-COST action TD1005. The subjects in this study were recruited as healthy controls in the primary study.

2.2 Apparatus

2.2.1 Pressure stimuli

An electronic hand-held pressure algometer (Somedic AB, Stockholm, Sweden) was used to produce noxious mechanical pressure. A force gauge fitted with a rubber disk with a surface of 1 cm^2 was used in this study.

2.2.2 Experimental pain testing

Pressure stimuli of varying intensities were used and applied by using the electronic hand-held pressure algometer. Three different pressure intensities were used (50, 200, and 400 kPa) that have been shown to elicit "no pain," "slight pain," and "moderate pain," respectively. Each pressure stimulus was applied on the upper border of the trapezius muscle in ascending order. Stimuli were applied to the right and left trapezius muscle resulting in six pressure stimuli at the two location sites (left and right) at three different intensities. The pressure was increased steadily for 2 s until the desired intensity was reached and kept constant for 5 s. A similar protocol was used in previous studies [33,34].

2.2.3 Numerical rating scale (NRS)

Participants' pain intensity and unpleasantness ratings were assessed immediately after each pressure stimulus using an NRS posted in front of the participants. The intensity rating scale ranged from 0 (no pain) to 10 (the worst pain imaginable). The unpleasantness rating scale ranged from 0 (no unpleasant) to 10 (unbearable unpleasant). Before the experiment started, the experimenter introduced the two rating scales to the subject and explained the conceptual distinction between the intensity and unpleasantness dimensions of pain. Instructions were like the ones used by previous authors [35,36].

2.2.4 PCS

The PCS is composed of 13 items answered on a 5-point Likert-type scale. Total score lies between 0 and 52, and a higher score reflects higher levels of pain catastrophizing. Scores above 30 indicate a cut-off point for clinical significance. The scale comprises three subscales: rumination, magnification, and helplessness. These subscales are composed of four items (score range: 0–16) for rumination, three items (score range: 0–12) for magnification, and six items (score range: 0–24) for helplessness [25]. Reliability data report adequate to excellent internal validity scores (coefficient alpha for total PCS = 0.87–0.93, rumination = 0.87–0.91, magnification = 0.66–0.75, and helplessness = 0.78–0.87, respectively) [37].

The PCS was administered before the pain measures and was used as an index of individual characteristics. The participants were instructed to answer the questions by reflecting on their thoughts and feelings about past pain experiences.

2.3 Procedure

The experiment took place in a quiet and climate-controlled room, where the subjects were seated in a comfortable chair. The subjects filled in the PCS and were familiarized with the experimental procedure. Before the test started, subjects were trained until they understood the procedure and could follow the instructions.

Six pressures were applied on the trapezius muscle starting from the lowest intensity on the dominant and non-dominant side of the body in an alternated order: 50 kPa (dominant) – 50 kPa (non-dominant) – 200 kPa (dominant) – 200 kPa (non-dominant) – 400 kPa (dominant) – 400 kPa (non-dominant). Randomization for starting with the dominant/non-dominant side of the body was applied across subjects and individually assessed.

After each stimulation, subjects were instructed to rate the pain intensity and unpleasantness of the pressure stimulation.

2.4 Data analysis

Data were checked for normality using Shapiro–Wilk tests and calculating data frequency in histograms and Q–Q plots. Data were non-normally distributed;

consequently, non-parametric tests were used in the following analyses.

Mann–Whitney U-tests were used to compare pain catastrophizing and subscales of rumination, magnification, helplessness, and NRS pain intensity and unpleasantness between young and elderly. Effect size estimations were calculated using the following formula: $r = \frac{z}{\sqrt{N}}$, with values of 0.1 small, 0.3 medium, and 0.5 large effect size [38].

Spearman's r correlations were used to evaluate the relationship between NRS pain intensities, unpleasantness responses, and pain catastrophizing measures in the elderly and young groups. The significance of these correlations was assessed using the bias-corrected and accelerated method, which is effective in controlling type 1 errors associated with multiple comparisons. The 95% confidence interval (CI) using bootstrap resampling (1,000 sample, bias-corrected confidence limits) was computed for each correlation. Significant coefficients with an associated CI that did not include zero were considered statistically significant.

Box plots were used for descriptive statistics, where results were presented as the median, range, and interquartile range (IQR).

Data were statistically analyzed using SPSS version 28.0. A significant level of 0.05 was used. One elderly subject was excluded from the analyses since the PCS was incomplete.

3 Results

3.1 Distribution of pain catastrophizing between young and elderly

The distribution of pain catastrophizing total score and subscale scores resulted in the following for (1) the young group: PCS tot (Med = 10; IQR = 8.8; 95% CI = 8.8–13.7), rumination (Med = 4; IQR = 6; 95% CI = 3.5–5.6), magnification (Med = 2; IQR = 3; 95% CI = 1.2–2.6), helplessness (Med = 4; IQR = 5.3; 95% CI = 3.8–6.0), and (2) the elderly group: PCS tot (Med = 5; IQR = 14; 95% CI = 4.8–11.0), rumination (Med = 2; IQR = 4; 95% CI = 1.5–5.6), magnification (Med = 2; IQR = 2; 95% CI = 0.9–2.0), and helplessness (Med = 2; IQR = 7; 95% CI = 2.1–5.3).

In addition, 19 subjects (24% of the sample) reported PCSs above the 75th percentile, corresponding to PCSs of ≥15 (Med = 20). A larger percentage of these individuals was young, 57.8%, whereas a smaller percentage, 42%, was elderly, with a larger percentage of men, 68.3%, as compared with women, 31.5%. Notably, in the elderly group, men were significantly older than women (EM, Med = 76.5; EW, Med = 71; $U = 190$; $N = 31$; $P < 0.005$).

Mann–Whitney U-tests showed that elderly individuals reported significantly lower pain catastrophizing total scores than young individuals ($U = 360.5$, $N1 = 34$, $N2 = 31$, $Z = -2.193$, $r = -0.27$, $p = 0.028$, two-tailed asymptotic). Additionally, comparisons within the subscale scores showed that elderly individuals had significantly lower ruminations ($U = 347.5$, $N1 = 34$, $N2 = 31$, $Z = 2.390$, $r = -0.29$, $p = 0.017$, two-tailed asymptotic) and helplessness scores ($U = 378.0$, $N1 = 34$, $N2 = 31$, $Z = -1.970$, $r = -0.24$, $p = 0.049$, two-tailed asymptotic) than young individuals. No significant difference was observed in the magnification dimension ($U = 469.5$, $N1 = 34$, $N2 = 31$, $Z = -0.784$, $r = -0.09$, $p = 0.433$) (Figure 1).

3.2 Pressure stimuli 50, 200, and 400 kPa: NRS intensities and unpleasantness

The different pressure stimulations resulted in the following: 400 kPa moderately pain intensity (dominant Med = 6; IQR = 4.13; no-dominant Med = 6; IQR = 7.5) and unpleasant pain (dominant Med = 5; IQR = 4.13; no-dominant Med = 5; IQR = 2.5) perceptions; 200 kPa slightly pain intensity (dominant Med = 4; IQR = 5; no-dominant Med = 5; IQR = 3.7) and unpleasant pain (dominant Med = 3; IQR = 4.5; no-dominant Med = 4; IQR = 4.5) perceptions; and 50 kPa no-pain intensity (dominant Med = 0.5; IQR = 1; no-dominant Med = 0.5; IQR = 1) and unpleasant pain (dominant Med = 0.0; IQR = 0.5; no-dominant Med = 0.0; IQR = 0.5) perceptions. No statistical difference was observed between the dominant and non-dominant sites. Since pressures of 400 kPa could elicit moderate pain stimulations, these were further analyzed.

Mann–Whitney U-tests showed that elderly individuals (Med = 5) reported significantly lower NRS intensity pain scores ($U = 366$, $N1 = 34$, $N2 = 31$, $Z = -2.122$, $r = -0.26$, $p = 0.034$, two-tailed asymptotic), and lower NRS unpleasantness pain scores (Med = 4.5) ($U = 334$, $N1 = 34$, $N2 = 31$, $Z = -2.546$, $r = -0.31$, $p = 0.011$, two-tailed asymptotic), than young individuals (Med = 6.3, NRS intensity; Med = 5.5, NRS unpleasantness), respectively (Figure 2).

3.3 Correlations between NRS pain responses and pain catastrophizing levels

Correlations were evaluated between NRS pain intensities and unpleasantness responses and total score of pain

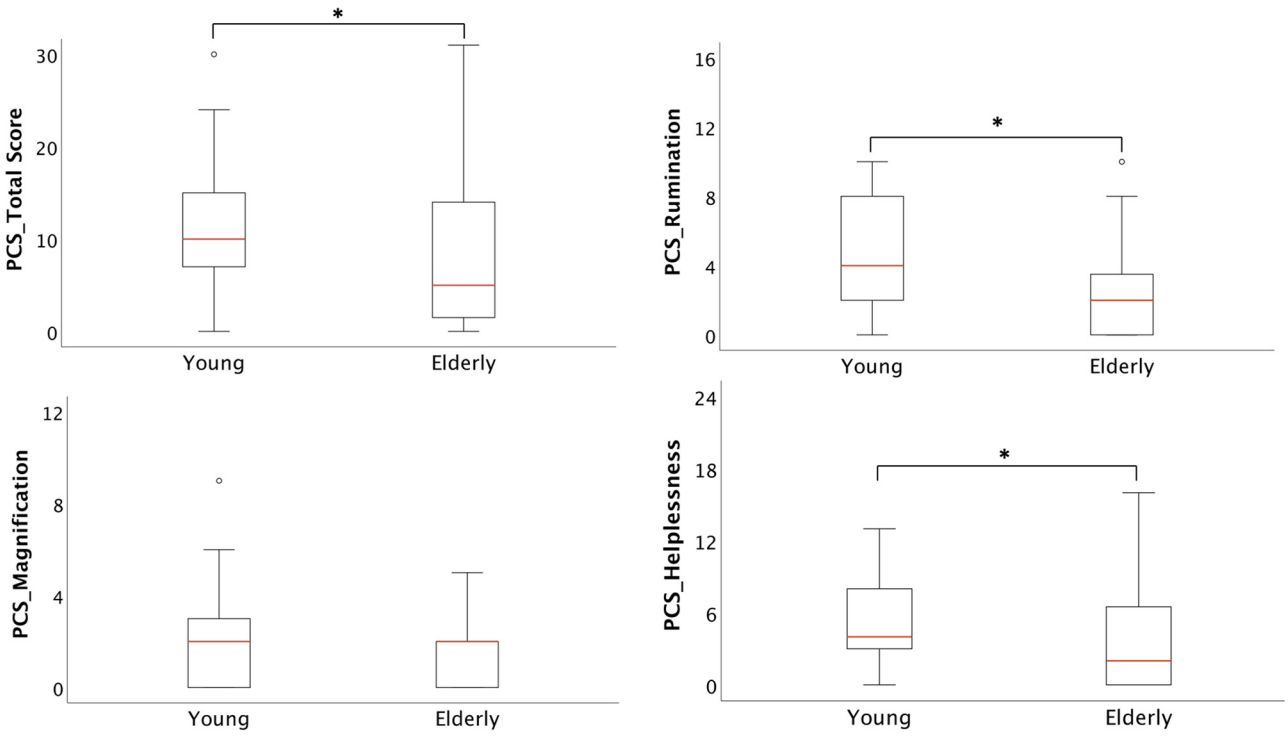

Figure 1: Significant lower pain catastrophizing total scores (p = 0.028*), rumination (p = 0.017*), and helplessness (p = 0.049*) scores were observed in elderly individuals when compared with young ones. Outliers are presented as ° in the figure.

catastrophizing, rumination, magnification, and helplessness scores in elderly and young groups. No significant correlations were observed in the young group. In the elderly group, significant, positive correlations were observed between NRS pain unpleasantness scores and total PCSs (r_s = 0.416, p = 0.020, two-tailed), rumination (r_s = 0.420, p = 0.019, two-tailed), and helplessness (r_s = 0.434, p = 0.015, two-tailed). No significant correlations were observed with magnification and between all sub-scales of PCSs and NRS pain intensities.

4 Discussion

This study showed significantly lower scores of pain catastrophizing in elderly individuals compared to young ones. This difference was driven by rumination and helplessness, which were significantly lower in the elderly. Additionally, a larger percentage of young individuals rated pain catastrophizing at high levels, with scores above the 75th percentile. Elderly individuals also reported the lowest pain intensity

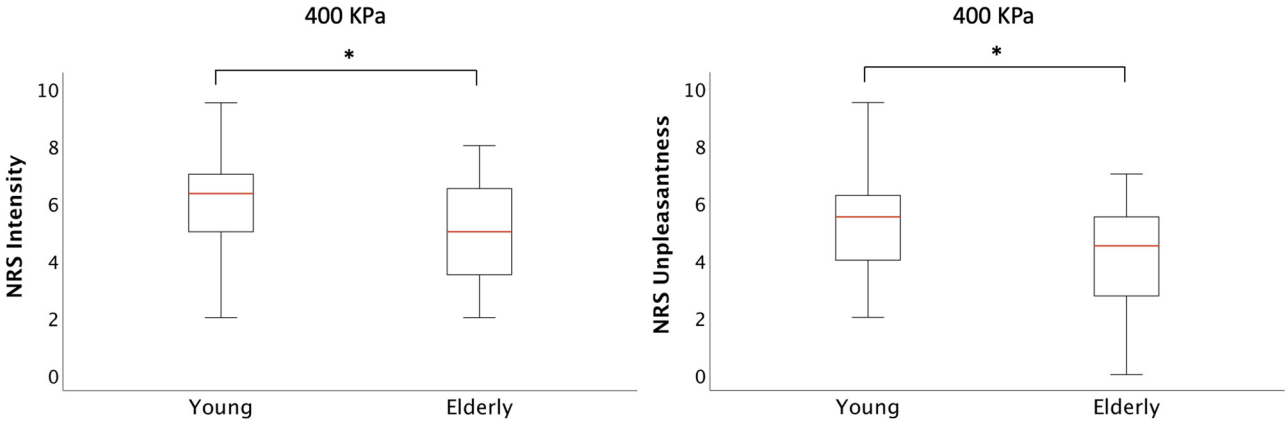

Figure 2: Significant lower pain intensity (p = 0.034*) and unpleasantness (p = 0.011*) NRS scores were observed in elderly individuals when compared with young ones.

and pain unpleasantness to experimental pressure stimuli. In the elderly group, pain catastrophizing, rumination, and helplessness were positively associated with pain unpleasantness scores.

4.1 Different emotional regulatory strategies in elderly individuals

The study supported the view that older adults are less bothered or emotionally affected by pain and might use pain-related coping strategies associated with psychosocial well-being more effectively. The results were also in line with empirical evidence from large-scale studies showing that elderly, non-demented, individuals are in a better mood than their younger counterparts [10,39] and have fewer negative emotional experiences and greater emotional control [40,41]. Different types of explanations exist, for example, an improved resilience due to more experience with life-related stressors, enhanced use of coping strategies, or simply the acceptance of pain as part of the aging process [3,42,43]. Greater pain acceptance or reluctance to express pain has been often related to stoic attitudes toward pain and have been reported in older adults [44]. However, a recent study that compared stoic attitudes between young and elderly during an acute experimental pain induction have not found any significant difference among the groups [45].

The suggestion that elderly make a more effective use of pain-related coping strategies has been corroborated by studies showing that older people appear to use active [46,47] and adaptive coping strategies regardless of the overall pain intensity [42] and diverse use of emotion regulation strategies [48]. Today, it is acknowledged that pain catastrophizing is a complex phenomenon resulting in several interrelated processes, and it can be accounted as an emotional regulatory process [11].

Studies focusing on emotional regulatory strategies have found that reappraisal strategies (reframing the way one thinks about pain to reduce its emotional impact) partially mediate the relationship between the affective dimensions of pain and catastrophizing. Older women used reappraisal strategies more than younger women, whereas older men reported a lower use of reappraisal [48] and a larger use of suppression strategies (intentionally avoiding thoughts and feelings related to pain) than women. This is consistent with the idea that men tend to avoid emotional reactivity [49]. Additionally, distress, anxiety, and negative lifestyles mediated the relationship between catastrophizing and pain-related outcomes in older adults [20].

The present study also examined the contribution of the individual dimensions of pain catastrophizing between young and elderly. Rumination and helplessness were both reduced in the elderly as compared with the young ones. Previous psychological studies have shown that helplessness leads to a deterioration in motivation, cognition, and affect [50,51], and in elderly, the symptoms of helplessness have been associated with the risk of developing addictive behaviors [52]. Research on patients with rheumatological diseases revealed that helplessness is associated with a number of negative outcomes, such as poorer quality of life, functional disability, more severe symptoms, pain, fatigue, and higher distress [29,53,54]. Additionally, helplessness influenced patient's attitudes toward illness and interfered negatively with treatment compliance [55,56]. Conversely, a reduced sense of helplessness enabled engagement in meaningful activities for copying with pain [57]. In elderly, the self-perception to control over health-related issues is fundamental for maintaining physical and psychological well-being [58]. Similarly, studies investigating the influence of rumination over health showed that individuals with high levels of rumination, and who continued to think about stressful events, had a slower recovery of heart rate and higher levels of cortisol [59]. Less rumination is observed in older individuals above the age of 63 when compared with other age groups [30], whereas excessive rumination and worrying are observed in young college students, influencing the relationship between pain and anxiety/depressive symptoms [60].

The results support the view that generally, healthy older adults are more resilient than younger ones [32]. Psychological resilience has shown to contrast the negative effects of illness [61], especially in older adults [62,63], and contribute to a successful healthy aging. Conversely, the elevated ruminative scores observed in the young adults point to the growing concern about the steadily increasing poor mental health in young people [64], as well as the early onset of mental disorders such as depression and anxiety [65]. More studies are reporting associations between mental disorders and pain symptoms and higher rates of chronic pain in young adulthood [66,67]. Consequently, the different degree of catastrophizing responses observed in the present sample, between young and elderly, could lead to risk or protective factors depending on the age group considered.

Finally, whether pain catastrophizing changes as function of gender is not completely determined [68]; although evidence points to higher levels of pain catastrophizing in women [13,69,70], a recent meta-analysis showed that men with chronic pain syndrome who had psychosocial symptoms had elevated pain catastrophizing [71]. Although the

present study did not address gender difference due to small sample size, it was observed that high levels of pain catastrophizing were scored by elderly men, which were significantly older (>70) than the women (<70). Although limited, the studies that considered oldest-old individuals showed an increasing demand of care and support for pain management in this population [72,73]. Consequently, pain catastrophizing and gender difference in oldest groups are warranted for investigations.

4.2 Differences in age-related changes in pain perception

Experimental studies have shown a greater variability in pain perception among healthy old and young individuals. This variability has been attributed to the type of noxious stimulus used and the modality of the pain induction. For example, decreased sensitivity has been observed when phasic, short duration stimuli were applied on the skin surface, whereas increased sensitivity has been observed when tonic, deep, and diffuse stimuli were used [4,74,75]. However, age-related changes in nociceptive pathways have also been implicated in these differences. Experimental studies have highlighted a reduced pain tolerance and a decrement in the endogenous pain modulatory system in healthy elderly when compared with the young ones [76–78].

In the present study, the pain intensity and pain unpleasantness ratings to pain pressure stimuli were significantly reduced among elderly individuals. The results are in line with some of the aforementioned findings, and these decrements could be due to an actual reduction of pain sensitivity due to the noxious experimental modality utilized. Alternatively, it could also be speculated that the decrements in pain ratings could had been the product of supraspinal processing that top-down regulates the descending modulatory pain system. Less catastrophizing was driven by less rumination and less helplessness dimensions which are cognitive processes governed by prefrontal cortical structures [79]. Additionally, elderly individuals exhibit positive associations with catastrophizing and unpleasant ratings, indicating that these two variables were somehow related and influenced by each other, mainly in elderly but not in the young ones. It could be hypothesized that compensatory cognitive and emotional mechanisms take place in healthy elderly individuals when dealing with physiological pain-related changes. Future studies should investigate this hypothesis and underline the interactive mechanisms of resilience observed in elderly individuals.

4.3 Methodological considerations and limitations

The present study has some limitations. First, the sample utilized here was selected as control sample for a primary study on pain in dementia. Consequently, the generalizability of the findings would be difficult, especially for the elderly group who might not be representative of the population since they were selected to be very fit. Young and older individuals with persistent and chronic pain might struggle with low mood, poorer physical function, disability, and social isolation and are at risk of depression. Depressed mood is the strongest predictor of health decline in the elderly [80], and catastrophizing in individuals with mild cognitive impairment could be a limiting factor for proper cognitive management and preventive treatments for dementia for this group [81]. However, studies investigating catastrophizing in individual with cognitive impairment are lacking at the present. In the elderly, dementia is likewise a major hurdle for optimized pain management [82] and for using different pain scales/questionnaires [83,84].

A better stratification of aging groups: youngest-old (ages 65–74), middle-old (ages 75–84), and oldest-old (>85), could have been more informative about the development of pain catastrophizing over the lifespan, especially now that the global aging population tends to be larger and the old classification of above 65 is becoming too reductive.

Second, this study investigated pain catastrophizing with the sole use of the PCS. Pain catastrophizing is a complex phenomenon, and it could be a limitation to measure it with only one scale [85]. Additionally, although age-related difference has been suggested, pain catastrophizing could also depend by personality traits and individual pain experiences gathered during life. Future studies should attempt to replicate the present findings adding a larger range of psychological variables considering the multidimensionality of pain catastrophizing, personality variables, social context of the sample, as well as assessing the pain descending modulatory system.

5 Conclusions

The study showed that healthy elderly reported lower PCSs than healthy young adults. Additionally, the different dimensions of pain catastrophizing showed that rumination and helplessness were reduced in the elderly group, suggesting better coping and emotional regulatory mechanisms. For the elderly population, positive correlations between catastrophizing levels and pain unpleasantness to standardized pressure pain stimuli were found. Understanding age-related

psychophysical changes across lifespan can help in the development of intervention strategies that target different age periods accordingly.

Acknowledgments: Center for Neuroplasticity and Pain (CNAP) was supported by the Danish National Research Foundation (DNRF121).

Research ethics: The research complied with all relevant national regulations and institutional policies, and it was in accordance with the tenets of the Helsinki Declaration for conducting research on human volunteers. The local regional ethical committee (N-20130071; N-20210065) approved the project.

Informed consent: Informed consent was obtained from all individuals included in this study, or their legal guardians or wards.

Author contributions: The authors have accepted responsibility for the entire content of this manuscript and approved its submission.

Competing interests: Lars Arendt-Nielsen is a Honorary Editor and a Section Editor of the *Scandinavian Journal of Pain*. The authors report no conflicts of interest in this work.

Research funding: The authors state that no external funding is involved. Internal funds financed the study.

Data availability: The raw data can be obtained on request from the corresponding author.

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