1. Purpose of the Study

| a. Describe the purpose of the study in your own words. | To evaluate for associations between pain catastrophizing and pain characteristics and level of mobility including risk for falls in community-dwelling elderly population. |
| b. What was the gap in knowledge that researchers wanted to address with this study? | Study wanted to assess if pain catastrophizing is related to mobility problems in elderly patients with chronic pain. |

2. Study Design

| a. What is the overall study design (RCT, case-control, observational, prospective cohort study, etc.)? | Cross-sectional, population based study |

3. Sample description

| a. What is the sample size? | 354 older adults (> 70-year-old) |
| b. What are the samples’ characteristics (demographics)? | Age group 70-90 accounted for 88.4% of subjects, oldest group 91-101 accounted for 11.6% of the cohort. |
| | Male 34%, Female 65.9% |
| | White 80.4%, Non-white 19.6% |
| | Married 40.9%, not married 59.1% |
| | High school 25.6 %, High school/College grad 74.4%<br>Regular BMI 39.1%, overweight 39.6%, obese 21.3%<br>Heart disease 44%, lung disease 15.4%, RA 3.5%, peripheral neuropathy 21.1%, DM 13.3%, Spinal stenosis 21.4%, PAD 11.6%<br>No OA 68.5%, +OA 24.7%<br>No depression 94.3%, +Depression 5.7%<br>No Anxiety 95.7%, +Anxiety 4.3%<br>No analgesics 69.5%, >1 daily analgesic 23.3%<br>Self-efficacy for managing pain: Low 46.6%, High 53.4% (excluded 90 participants who did not report chronic pain)<br>Short physical performance 6-9.99 (reference) 27.8%, 10-12 75.2%<br>Gait speed: Slow (reference) 37.3%, Fast 62.7%<br>

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c. What were the eligibility and/or exclusion criteria? | Eligibility criteria: age ≥ 70 years old, able to walk 20 feet without assistance and communicate in English, and planned to live in the Boston area for at least two years.

Exclusion criteria: diagnosis of a terminal disease, severe hearing and vision deficits, or presence of moderate to severe cognitive impairment determined by a Mini-Mental State Exam (MMSE) score of less than 18.

d. What was the attrition rate? What was the majority of attrition attributed to? | N/A

4. Methods & Outcomes | Pain catastrophizing was measured using the 13-item Pain Catastrophizing Scale (PCS), with scores ranging from 13–65.
Prevalence of depression, measured using PHQ-9)

Pain severity and pain interference were assessed by subscales of the Brief Pain Inventory.

Pain distribution was classified as none, single site, and multisite.

Mobility performance was assessed using the Short Physical Performance Battery (SPPB).

Falls were assessed using monthly fall calendar postcards. A fall was defined as “unintentionally coming to rest on the ground or other lower level not as a result of a major intrinsic event (e.g. myocardial infarction or stroke) or an overwhelming external hazard (Kellogg International Work Group, 1987; Leveille et al., 2008).”

“C. How did the researchers analyze the data? What tests did they use?

We used ANOVA and t-tests to evaluate differences in mean PCS scores between groups. In the cross-sectional analyses, multivariable linear regression was used to examine PCS score in relation to the continuous dependent variables: pain severity, pain distribution, short physical performance, and gait speed. In the longitudinal analysis of falls data, negative binomial regression models were performed to determine the adjusted incidence rate ratios for PCS score predicting rate of falls. We did not include depression and anxiety in the multivariable models because pain catastrophizing is closely associated with anxiety and depression (Keefe et al., 1989; Sullivan et al., 1995), and thus would be an over-adjustment to include in these models.

All analyses were performed using SAS version 9.4 (SAS Institute, 2000).”

5. Results

a. What were the results for the main outcomes?

Investigators found that one in four participants (24%) had high levels of pain catastrophizing (PCS scores >30).

Pain catastrophizing was independently associated with more severe levels of pain (p-value=0.01) and pain interference (p-value=0.004);
participants with multisite pain were more likely to report higher pain catastrophizing score (p-value=0.006).

Surprisingly, there was no association between higher PCS and worsened mobility or increased risk for falls.

Pain catastrophizing was LESS likely in the oldest group of participants (age 91-101), and in the participants that did not report comorbid depression or anxiety.

In contrast, pain catastrophizing was MORE likely in younger participants (age 71-90), and was significantly associated with OA (p-value<0.05).

Pain catastrophizing did not have any significant association with gender, race, BMI, marital status, education level or chronic conditions (other than OA), daily analgesic use, gait speed or physical performance.

6. Limitations & Interpretation

a. What were the authors’ major conclusions? Please use quotation marks and page number if using exact wording.

Results align with other studies finding an association between pain catastrophizing and more severe pain, as well as multisite pain.

Multiple studies looking at MRI of brain found that increased pain catastrophizing modulated the perception of pain and made it more severe by hypervigilance, increased emotional distress, and increased attention to pain. Other studies showed a similar pathway, however it progressed in a retrograde fashion (Buchgreitz, Egsgaard, Jensen, Arendt-Nielsen, & Bendtsen, 2008): increased frequency of pain lead to sensitization of nociceptive receptors and ultimately activation of supraspinal areas in the brain like the thalamus →this was related to an increased emotional response to pain, including increased attention to pain and distress as well as increased levels of pain catastrophizing. (Cathcart, Winefield, Lushington, & Rolan, 2010).

The unanticipated finding of this study was that pain catastrophizing did not seem to be associated with poorer levels of physical performance or increased risk for falls. In the population studied, the “younger” elderly group (which accounted for approx. 88% of subjects) was more likely to catastrophize pain. The eldest subset of participants (approx. 11%) were less likely to
catastrophize pain. Mobility of the first group was compared to that of their older counterparts. Results may be skewed by the fact that the first group (younger) was more likely to have better mobility/physical fitness compared to the second group (older) just because of their age.

On review of previous research there were a few possible explanations for why the eldest among us were less likely to catastrophize pain: 1. surviving a long time with chronic pain may give opportunity to develop more successful coping mechanisms; 2. Older adults are more likely to use a wider range of coping strategies including pacing themselves and asking for help and using outside support - as such they seem to be less impacted from an emotional standpoint; 3. Elderly people have “greater general coping skills” compared to their younger counterparts.

**b. Do the authors’ conclusions make sense to you? If no, why not?**

Findings related to correlation between worse PCS and higher pain severity, pain interference and multisite pain are corelating with prior research.

The lack of correlation between worse PCS and mobility is not very clearly evaluated. The investigators mention they compared the mobility of the 70-90 year-olds to the mobility of the 90-100 year-olds. It would probably be beneficial to look at a greater variety of age groups and comparing them to the mobility of a pain-free person in their own age range; then we could better understand which factor is associated with worsened mobility: increasing age/loss of muscle mass or pain or maybe both.

The investigators felt they were not able to generalize the findings of the study to all subgroups of elderly patients and were considering that additional research may be needed and perhaps including younger patients may be reasonable.

This is a cross-sectional study and its data can be used to assess prevalence of pain catastrophizing but it cannot be used to determine causality between pain catastrophizing and pain outcomes.

A larger sample size may be needed to find more modest associations.
### 7. Analysis

<table>
<thead>
<tr>
<th>a. What do you think are the article/study’s strengths?</th>
<th>Presents great review of existing data including some very interesting research in the physiology of chronic pain. Discusses in depth the correlation between pain and its association with psychological maladaptive response as well as the importance of considering CBT and teaching healthy coping mechanisms for a more successful approach for chronic pain management.</th>
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<td>b. What do you think are the article/study’s weaknesses?</td>
<td>Demographically the subsets of the population studied (including sex, race, mobility and gait speed) are not balanced.</td>
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<td>c. What do you think are the most meaningful takeaways for clinical practice or research?</td>
<td>Clinical: Understanding that there is a strong correlation between severity of pain and psychological implications (like pain catastrophizing) that can impact significantly the quality of life of an elderly person with chronic pain. Clinical: Developing successful coping mechanisms may improve a patient’s subjective feeling of pain and overall well-being. CBT may be an additional therapy to be considered for treatment of chronic pain. Research: it may be difficult to answer a specific question using data collected for a cross-sectional study because it is difficult to ascertain if a measured parameter is either cause or effect. Personal lesson: Learn from your elders - take your time, ask for help when you need it, and maintain a positive outlook on life.</td>
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<td>d. What are the contributions of the article as described by the authors?</td>
<td>None explicitly stated.</td>
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The population studied was largely English speaking, living in a large urban area in the NE, results may not be generalizable to other cultures, races, different geographical distribution.