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Association between pain locus of control and fall risk in older adults with chronic pain: community-based cross-sectional study

Associação entre o lócus de controle da dor e o risco de quedas em idosos com dor crônica: estudo transversal de base comunitária

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ABSTRACT

BACKGROUND AND OBJECTIVES: Chronic pain and falls are common in older adults and may be influenced by locus of control. The objective of this was study examined the association between pain locus of control and fall risk in community-dwelling older adults.

METHODS: This cross-sectional observational study included 84 aged (≥60 years) reporting chronic pain. Participants completed the Pain Locus of Control Scale and the Downton Fall Risk Index. Associations between fall risk and pain locus of control types (internal, chance, other powerful, other people) were analyzed using linear regression adjusted for age and gender.

RESULTS: Higher Downton Fall Risk Index scores were independently associated with lower internal locus of control (β=−0.646; 95% CI −1.106 to −0.187; p=0.006; R^2 = 0.10) and higher other people locus of control scores (β = 0.396; 95% CI 0.051 to 0.742; p=0.025; R^2 = 0.09). No significant associations were observed for the chance or other powerful domains.

CONCLUSION: Among community-dwelling older adults with chronic pain, fall risk was independently associated with locus of control, particularly lower internal control and greater attribution to others. Although significant, the models explained a modest proportion of variance, and causality cannot be inferred due to the cross-sectional design. These findings suggest that psychological beliefs about control may be relevant in the multidimensional assessment of fall risk.

KEYWORDS: Accidental falls, Aging, Chronic pain, Locus of control, Psychology.

RESUMO

JUSTIFICATIVA E OBJETIVOS: Dor crônica e quedas são comuns em idosos e podem ser influenciadas pelo lócus de controle. O objetivo deste estudo foi investigar a associação entre lócus de controle da dor e risco de quedas em idosos residentes na comunidade.

MÉTODOS: Este estudo observacional transversal incluiu 84 idosos (≥60 anos) que relataram dor crônica. Os participantes responderam à Escala de Lócus de Controle da Dor e ao Índice de Risco de Quedas de Downton. As associações entre risco de queda e tipos de lócus de controle (interno, ao acaso, outros poderosos, outras pessoas) foram analisadas por regressão linear ajustada por idade e sexo.

RESULTADOS: Escores mais altos no Índice de Risco de Quedas de Downton foram associados independentemente a um menor lócus de controle interno (β=−0,646; IC 95% −1,106 a −0,187; p=0,006; R^2 = 0,10) e a escores mais altos no lócus de controle outras pessoas (β = 0,396; IC 95% 0,051 a 0,742; p=0,025; R^2=0,09). Nenhuma associação significativa foi observada para os domínios ao acaso ou outros poderosos.

CONCLUSÃO: Entre idosos residentes na comunidade com dor crônica, o risco de quedas foi associado de forma independente ao lócus de controle, particularmente menor controle interno e maior atribuição a outros. Embora significativos, os modelos explicaram uma proporção modesta da variância, e a causalidade não pode ser inferida devido ao delineamento transversal do estudo. Esses achados sugerem que as crenças psicológicas sobre o controle podem ser relevantes na avaliação multidimensional do risco de quedas.

DESCRITORES: Dor crônica, Envelhecimento, Lócus de controle, Psicologia, Quedas acidentais.

HIGHLIGHTS

- Pain locus of control is independently associated with fall risk in community-dwelling older adults
- Internal control beliefs are linked to lower fall risk, while external reliance increases susceptibility
- Psychological factors should be considered in multidimensional fall prevention strategies

INTRODUCTION

Population ageing is a widespread and historically unique process that affects almost every nation, irrespective of their level of development. Worldwide, declining fertility combined with marked gains in life expectancy has led to a steady increase in the proportion of older adults[1,2]. With the growing pace of population aging, clarifying the causal links between demographic shifts and population health outcomes is becoming ever more crucial[3].

Aging triggers a cascade of physiological, inflammatory, and neurological changes that increase susceptibility to chronic pain and falls. Musculoskeletal decline-including sarcopenia, osteoarthritis, and intervertebral disc dehydration-contributes significantly to persistent pain, particularly in the spine and large joints[4]. Inflammaging, characterized by chronic, low-grade inflammation, increases cytokines such as IL-6, TNF, and IL-1β, which sensitize nociceptive pathways and intensify pain perception. Concurrently, reduced neuroplasticity and enhanced central sensitization with aging promote pain chronification[5]. Psychosocial factors such as depression, social isolation, and poor sleep further amplify pain and reduce tolerance[6].

Given the interplay of physical and psychological factors, it is not surprising that chronic pain has been associated with increased risk of falls in older populations. Falls in later life are multifactorial events, often linked to a decline in functional capacity and the cumulative effect of comorbidities. Even in the absence of injury, a previous fall can lead to a heightened fear of falling, which itself is a strong predictor of subsequent falls[7].

In this context, individual beliefs and perceptions regarding pain may play a critical role. The Pain Locus of Control Scale (PLOC) assesses how individuals attribute control over their pain experiences – whether to internal factors (self-agency), chance (external-random), other powerful (external, such as doctors and health professionals), or other people (external, such as family members and caregivers)[8,9]. These beliefs are known to influence health behaviors, treatment adherence, and risk perception[10-13].

Psychological constructs influence how individuals interpret symptoms, adhere to treatment recommendations, and engage in protective or risky behaviors[11,12,14]. In older adults with chronic pain, beliefs regarding who or what controls pain outcomes may shape coping strategies and functional engagement. An external locus of control, particularly when attributed to other people such as family members and caregivers, may reinforce passive coping patterns, reduced participation in rehabilitation exercises, and greater functional dependence[12,15]. Reduced engagement in active pain management and mobility-related activities may progressively impair physical function, balance confidence, and autonomy, thereby increasing vulnerability to falls[16,17]. Conversely, an internal locus of control may promote self-management behaviors, proactive coping, and sustained participation in therapeutic strategies[12,16].

Although constructs such as fear of falling and self-efficacy are well-established predictors of fall risk and functional decline[17], locus of control represents a broader cognitive belief system concerning perceived agency over health outcomes[16]. While fear of falling reflects an emotional response to perceived threat and self-efficacy refers to confidence in performing specific tasks, locus of control captures generalized expectations regarding whether health outcomes are determined by one's own actions or by external factors. In the context of chronic pain, these generalized beliefs may influence long-term engagement in rehabilitation, adherence to exercise, healthcare utilization patterns, and autonomy[12,14].

From a clinical perspective, identifying psychological factors associated with fall risk may expand traditional prevention strategies beyond physical rehabilitation alone. Interventions targeting maladaptive health beliefs, including cognitive-behavioral and educational approaches, have demonstrated potential in modifying control beliefs, improving adherence, and enhancing functional outcomes in older adults with chronic conditions[6,18]. Therefore, understanding whether pain-related locus of control is associated with fall vulnerability may inform adjunct psychological strategies within fall prevention programs.

Despite evidence linking locus of control to health behaviors, healthcare utilization, and functional independence in older adults, its association with fall risk, particularly in the context of chronic pain, remains underexplored. Investigating this relationship may clarify whether pain-related control beliefs constitute a relevant psychological correlate of fall vulnerability. Therefore, this study aimed to examine whether different types of pain locus of control are associated with fall risk in community-dwelling older adults.

METHODS

Study design

This cross-sectional observational study employed a quantitative approach using structured questionnaires as the primary data collection tool (Figure 1). This study adhered to ethical guidelines for research involving human subjects and was reviewed and approved by the Research Ethics Committee.

All participants were provided with detailed information about the study's objectives, risks, and benefits, and were informed of their right to withdraw from participation at any point without penalty. All participants signed the Free and Informed Consent Term (FICT). They were fully informed about the confidentiality of the data, the study procedures, and their voluntary participation. They were given the opportunity to ask questions, ensuring that their participation was made with full understanding.

Aiming at a more accurate and complete presentation, the description of the following topics was based on the items of the Strengthening Reporting of Observational Studies in Epidemiology (STROBE) checklist[19].

Sample size

Sample size was calculated using the G*Power software, assuming a medium effect size (0.4), 5% significance level, and 80% power, yielding a minimum required sample of 46 participants. A final sample of 84 individuals was obtained, corresponding to a weak-to-moderate correlation effect size (0.3). Although the final sample size exceeded the minimum calculated requirement,

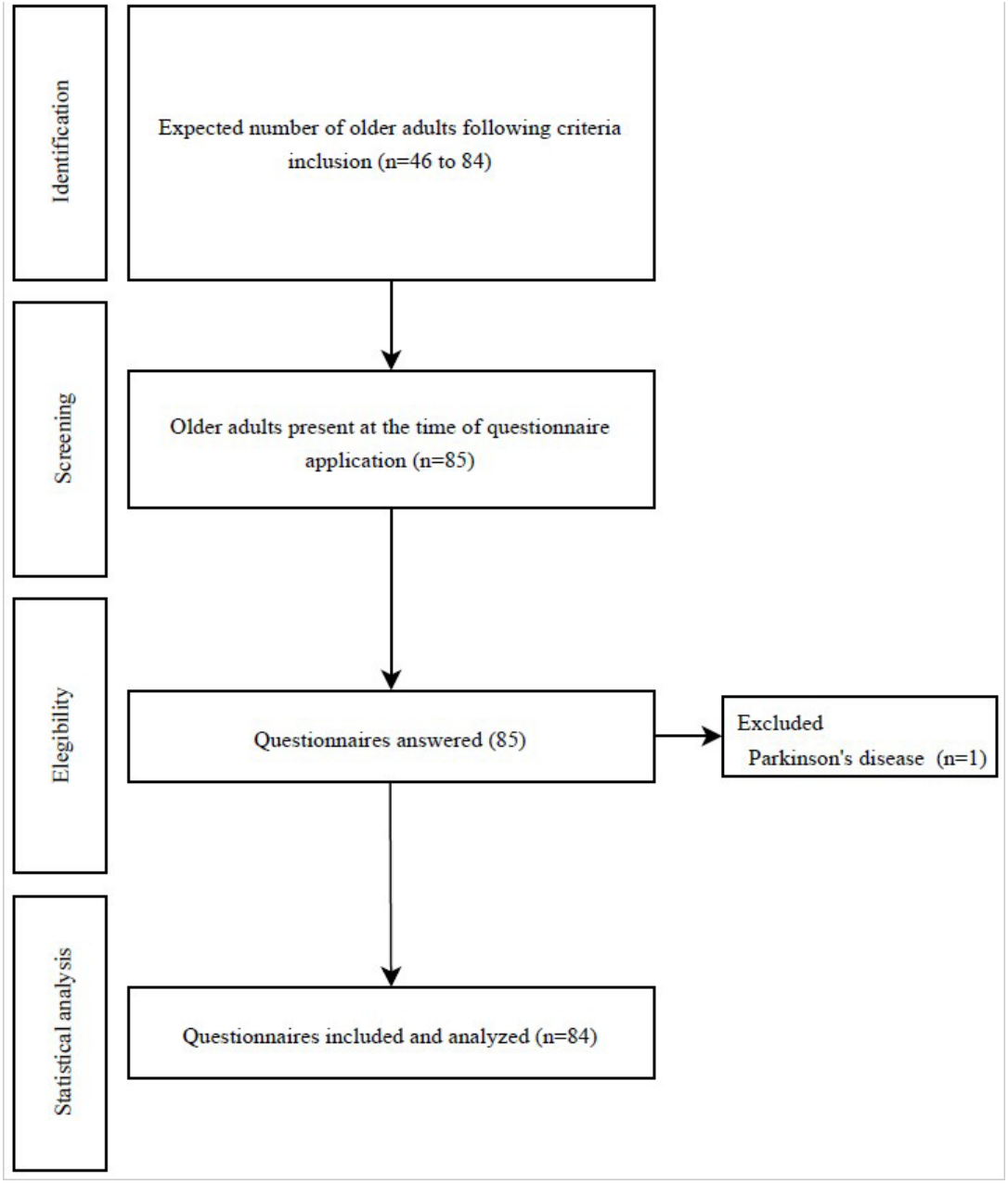

Figure 1. Study flowchart.

the inclusion of multiple predictors in the regression models may limit estimate stability and increase the risk of overfitting. Therefore, findings should be interpreted cautiously.

A total of 84 community-dwelling older adults aged 60 years or older who reported experiencing pain was included in the study. Inclusion criteria were: age ≥60 years, literacy, experiencing chronic pain (for more than 3 months). Exclusion criteria included: incomplete questionnaires, inability to complete the interview due to unforeseen circumstances, previously diagnosed neurological disorders affecting mobility (e.g., Parkinson's disease, stroke sequelae), severe uncorrected visual impairment, self-reported severe cognitive impairment, and inability to walk independently. Participants were recruited through convenience sampling in public community spaces.

Data were collected through structured, easy-to-understand questionnaires covering pain locus of control and fall risk. Data collection was conducted in public squares and parks, characterizing a sample of community-dwelling older adults. The interviews lasted an average of 15 minutes.

The primary instrument was the PLOC questionnaire, validated and adapted for older adults to ensure comprehension and usability[8]. The PLOC comprises 18 items with four response options from "strongly disagree" (1 point) to "strongly agree" (4 points), assessing the extent to which individuals attribute control over their pain to internal factors, chance, other powerful (doctors and health professionals), or other people (family and caregivers).

To assess fall risk, the Downton Fall Risk Index was used, a validated tool for older populations that considers previous falls

(no, yes), drugs (none, sedative, hypotensors, antiparkinsonians, antidepressants, other), sensory deficit (none, visual, hearing, tactile), mental state (lucid, confuse, normal), and ambulation (normal, safe with help, not safe ow without help, not possible)[20,21]. The gait item was assessed through direct observation of the participant's walking pattern during the interview. Mental status was classified based on orientation and coherence of responses at the time of assessment, following the instrument's guidelines. The instrument contains 18 items, and scores >2 (3 or more) indicate a high risk of falls. The Downton Fall Risk Index is widely used in geriatric clinical practice as a multidimensional screening tool to identify older adults at high risk of falls, incorporating previous falls, drugs use, sensory deficits, mental status, and mobility components[20-22]. Its comprehensive structure allows clinically meaningful identification of fall vulnerability in community-dwelling older populations.

A pilot study was conducted in August 2023 to identify potential issues and refine the study protocol prior to full-scale implementation. These participants were excluded from the final sample. The main data collection occurred between September 2023 and January 2024. All data were collected in person by trained researchers. To reduce potential bias, all instruments were linguistically and contextually adapted to the target population, and interviewers received standardized training. Nonetheless, recall bias remains a possible limitation, particularly for self-reported fall history and drug use.

Participants were informed about the study's purpose and assured of confidentiality. At the end of the assessment, they received an educational pamphlet on fall prevention and consequences.

Statistical analysis

The total Downton Fall Risk Index score (sum of all items) was treated as a continuous outcome variable to explore linear associations with pain locus of control domains. Although the Downton Index is a discrete scale with a limited score range and a commonly used clinical cut-off (>2 points indicating high fall risk), the continuous score was retained for analytical purposes to preserve statistical power and avoid loss of information. Linear regression was selected due to its interpretability and relative robustness to moderate deviations from normality in samples of this size.

Separate linear regression models were constructed for each locus of control domain. Adjusted models included age and gender as potential confounding variables. Model assumptions were examined prior to interpretation. A significance level of $p<0.05$ was adopted, and results were presented with regression coefficients (β), 95% confidence intervals, and R^2 values. Statistical analyses were performed using the Jamovi software (version 2.3)[23].

RESULTS

A total of 85 community-dwelling older adults aged 60 years or older with self-reported pain were initially assessed. One participant was excluded due to a diagnosis of Parkinson's disease, resulting in a final sample of 84 individuals included in the analyses (Figure 1). The sample was predominantly male (54%), and 71% of participants were classified with high risk for falls, based on a Downton Fall Risk Index score >2. This classification was used for descriptive purposes only. Among the PLOC domains, the internal pain locus of control was the most frequently endorsed belief (Table 1).

Statistical analyses revealed a significant inverse association between Downton Fall Risk Index scores and the internal pain locus of control domain (p=0.006), indicating that participants with stronger internal control beliefs were associated with lower fall risk scores. This relationship remained significant after adjusting for age and sex (Table 2).

Interestingly, a positive association was identified between fall risk and the pain locus of control attributed to other people (family and caregivers) (p=0.025). Participants who reported greater reliance on other people to manage their pain demonstrated higher fall risk scores (Table 3).

In contrast, no significant associations were observed between fall risk and the chance pain locus of control domain, even after adjustment for potential confounders (p=0.382). Similarly, the pain

Table 1. Sample characterization (n=84).

Variables	Results
Age (mean, SD)	69 ± 64.75
Gender (%)	
Female	46
Male	54
Chronic pain (%)	
Yes	100
No	0
Downton Fall Risk Index (%)	
Low risk of falling (1-2)	29
High risk of falling (>2)	71
Pain Locus of Control Scale (%)	
Internal	88
Chance	7.1
External (other powerful/other people)	4.8

Table 2. Linear regression analysis examining the association between internal pain locus of control and Downton Fall Risk Index score (n=84).

Predictor	β	95% CI	Standard error	p-value
Internal locus of control	-0.646	-1.106 to -0.186	0.230	0.006*
Age	-0.053	-0.183 to 0.078	0.066	0.424
Gender	-0.080	-1.535 to 1.375	0.731	0.913

CI = confidence interval (95%). *p significant (<0.05). Dependent variable: Downton Fall Risk Index score.

Table 3. Linear regression analysis examining the association between other people pain locus of control and Downton Fall Risk Index score (n=84).

Predictor	β	95% CI	Standard error	p-value
Other people locus of control	0.396	0.051 to 0.742	0.174	0.025*
Age	0.018	-0.080 to 0.116	0.049	0.712
Gender	-0.373	-1.466 to 0.721	0.550	0.500

CI = confidence interval (95%). *p significant (<0.05). Dependent variable: Downton Fall Risk Index score.

locus of control attributed to the other powerful domain (doctors and health professionals) showed no significant relationship with Downton scores (p=0.558).

DISCUSSION

This study found that older adults with a stronger internal locus of control regarding pain experienced a lower risk of falling, whereas those attributing pain management to others were more prone to falls. While direct literature on pain locus of control and fall risk is scarce, the present study's findings align with broader evidence linking internal locus of control to positive health outcomes and reduced vulnerability to adverse events.

The pain interference and multisite chronic pain significantly predict injurious falls in older adults ≥70 years)[24]. Moreover, an exploratory study found that moderate-to-severe pain influences fall circumstances, such as increased indoor falling and specific environmental triggers (e.g., dining room transfers), due to neuromuscular and functional vulnerabilities[25]. These findings help explain how pain and one's control over it may influence fall risk dynamics.

Older adults who perceive greater personal control - an internal locus of control - are less likely to suffer psychological distress under chronic strain, indicating enhanced resilience[26,27]. An internal locus of control fosters proactive health behaviors, resilience, and autonomy, all of which are protective against adverse outcomes in aging populations[16,28]. These abilities may translate into more proactive pain management and cautious behaviors, thus potentially contributing to lower fall risks.

Additionally, strong internal locus of control among older adults is associated with higher health-related quality of life, reinforcing the beneficial role of internal control beliefs[29]. This translates into better functional ability and confidence, both protective against falls.

The predominance of internal pain locus of control in the present study's sample may reflect the relatively active profile of community-dwelling older adults, who are often more engaged in self-care and decision-making regarding health. Autonomy and perceived self-efficacy are known to enhance functional independence, reduce fear of falling, and support healthy aging trajectories[17].

In contrast, dependence on others for pain management may reinforce physical and psychological dependency, diminishing confidence in one's own capacity to cope with pain and increasing fall susceptibility. Similar associations have been reported between an external locus of control, functional disability, and higher healthcare utilization[8,30,31].

Interestingly, in this study neither falls risk nor pain locus of control attributed to the other powerful (doctors and health professionals) or chance domains showed significant associations. One possible interpretation is that those with an external-professionals orientation may adhere to preventive guidance, partially mitigating fall risk. Meanwhile, those who view chance as the determinant may benefit from protective support networks or institutional interventions. Although speculative, this hypothesis invites further investigation.

Evidence indicates that locus of control is malleable and can be influenced by psychosocial and educational strategies[12]. Models such as the Health Belief Model or cognitive-behavioral interventions have shown promise in shifting maladaptive beliefs, enhancing adherence, and reducing fall-related risk behaviors[18].

Clinically, the malleability of health locus of control opens the door for targeted interventions. Physical function and social support in community-dwelling older adults are modifiable factors associated with levels of internal, external, and chance health locus of control, suggesting that interventions enhancing these domains may shift control beliefs toward the internal dimension[15]. Embedding these approaches into physiotherapy and interdisciplinary geriatric care could strengthen self-efficacy, promote internal pain locus of control, and ultimately reduce fall risk while supporting autonomy and quality of life in older adults.

Together, these findings underscore a plausible pathway: enhancing internal locus of control – especially in relation to pain – may foster better adaptive behaviors, functional independence, and resilience, which may represent a modifiable psychological target within fall prevention programs. Interventions focusing on improving physical function, social support, and pain self-management could thus hold promise for fall prevention strategies.

The present study contributes to literature by using validated tools and analyzing an often-overlooked psychological dimension in fall risk. Nevertheless, this study has limitations. Its cross-sectional design precludes causal inference. Data collection in public environments may have favored the inclusion of more active older adults, potentially limiting generalizability to frailer populations. The Downton Fall Risk Index is a screening instrument with a limited score range and was analyzed as a continuous variable, thus, findings should be interpreted as exploratory associations. Functional and clinical variables known to influence fall risk were not directly measured. Pain intensity and duration were not assessed, preventing evaluation of the influence of pain severity or chronicity on locus of control and fall risk.

CONCLUSION

Older adults with a stronger internal pain locus of control demonstrated lower fall risk scores, whereas reliance on others was associated with higher scores. These findings indicate that

pain-related control beliefs may represent psychological correlates of fall vulnerability, highlighting the need for longitudinal studies to clarify directionality and causality.

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