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FRAGILIDADE FÍSICA E MULTIDIMENSIONAL EM IDOSOS ATIVOS DE UMA FUNDAÇÃO SOCIAL NO SUL DO CHILE

PHYSICAL AND MULTIDIMENSIONAL FRAILTY IN ACTIVE OLDER ADULTS FROM A SOCIAL FOUNDATION IN SOUTHERN CHILE

FRAGILIDAD FÍSICA Y MULTIDIMENSIONAL EN PERSONAS MAYORES ACTIVAS DE UNA FUNDACIÓN SOCIAL DEL SUR DE CHILE

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RESUMO

Introdução: A fragilidade é uma síndrome geriátrica caracterizada pela redução da reserva fisiológica e aumento da vulnerabilidade a estressores. Pode ser abordada por meio de um modelo físico (Fried) ou por uma perspectiva multidimensional (TFI), que integra dimensões psicológicas e sociais. No Chile, a fragilidade representa um desafio crescente devido ao rápido envelhecimento populacional.
Objetivo: Determinar a prevalência de fragilidade física e multidimensional em pessoas idosas ativas de uma fundação social no sul do Chile e avaliar a associação entre ambas as classificações.
Métodos: Estudo quantitativo, descritivo e transversal, com amostragem probabilística aleatória simples. Participaram 124 idosos com 60 anos ou mais, autônomos e ativos em oficinas comunitárias. Utilizaram-se um questionário sociodemográfico, o fenótipo de fragilidade de Fried e o Tilburg Frailty Indicator (TFI). A análise incluiu estatística descritiva, intervalos de confiança de 95%, teste do qui-quadrado (χ^2) para avaliar a associação entre as classificações de ambos os instrumentos e V de Cramer para estimar a magnitude dessa associação.
Resultados: Observou-se que 52,4% apresentaram pré-fragilidade e 11,3% fragilidade física. A fragilidade multidimensional atingiu 36,3%. A fraqueza muscular foi o critério físico mais prevalente. Verificaram-se sintomas psicológicos moderados e altos níveis de apoio social. O teste do qui-quadrado evidenciou uma associação estatisticamente significativa e de magnitude moderada entre as classificações de fragilidade segundo Fried e TFI ($\chi^2 = 19,97$; $gl = 2$; $p < 0,001$; V de Cramer = 0,40).
Conclusão: A fragilidade é frequente mesmo em idosos ativos. A elevada proporção de pré-fragilidade evidencia a necessidade de intervenções preventivas integrais focadas em exercício físico, apoio emocional e fortalecimento das redes sociais.

Palavras-chave: fragilidade; pessoas idosas; Tilburg Frailty Indicator; fenótipo de fragilidade; envelhecimento saudável

ABSTRACT

Introduction: Frailty is a geriatric syndrome characterized by reduced physiological reserve and increased vulnerability to stressors. It can be conceptualized through a physical model (Fried) or a multidimensional approach (TFI), incorporating psychological and social domains. In Chile, frailty is a growing public health challenge due to the rapid aging of the population.
Objective: To determine the prevalence of physical and multidimensional frailty among active older adults from a social foundation in southern Chile and to assess the association between both classifications.
Methods: A quantitative, descriptive and cross-sectional study was conducted using probabilistic simple random sampling. The sample included 124 adults aged 60 and over, functionally independent and active in community workshops. A sociodemographic questionnaire, the Fried frailty phenotype, and the Tilburg Frailty Indicator (TFI) were applied. Analyses included descriptive statistics, 95% confidence intervals, the chi-square (χ^2) test to assess the association between both frailty classifications, and Cramer's V to estimate the magnitude of this association.
Results: A total of 52.4% presented prefrailty and 11.3% were frail according to Fried. Multidimensional frailty reached 36.3%. Muscle weakness was the most prevalent physical criterion. Moderate psychological symptoms and adequate social support levels were observed. The chi-square test showed a statistically significant association of moderate magnitude between Fried and TFI frailty classifications ($\chi^2 = 19.97$; $df = 2$; $p < 0.001$; Cramer's V = 0.40).
Conclusion: Frailty is prevalent even among active older adults. The high proportion of prefrailty underscores the need for comprehensive preventive strategies focused on physical exercise, emotional support, and social network strengthening.

Keywords: frailty; older adults; Tilburg Frailty Indicator; frailty phenotype; healthy aging

RESUMEN

Introducción: La fragilidad es un síndrome geriátrico caracterizado por la disminución de la reserva fisiológica y el aumento de la vulnerabilidad frente a estresores. Su expresión puede abordarse desde un modelo físico (Fried) o desde un enfoque multidimensional (TFI), integrando dimensiones psicológicas y sociales. En Chile, la fragilidad constituye un desafío creciente debido al envejecimiento acelerado de la población.
Objetivo: Determinar la prevalencia de fragilidad física y multidimensional en personas mayores activas de una fundación social del sur de Chile y evaluar la asociación entre ambas clasificaciones.
Métodos: Estudio cuantitativo, descriptivo y transversal, con muestreo probabilístico aleatorio simple. Participaron 124 personas mayores de 60 años, autovalentes y activas en talleres comunitarios. Se aplicaron un cuestionario sociodemográfico, el fenotipo de fragilidad de Fried y el Tilburg Frailty Indicator (TFI). El análisis incluyó estadística descriptiva, intervalos de confianza al 95%, prueba chi-cuadrado (χ^2) para evaluar la asociación entre las clasificaciones de ambos instrumentos y V de Cramer para estimar la magnitud de dicha asociación.
Resultados: El 52,4% presentó pre-fragilidad y el 11,3% fragilidad física. La fragilidad multidimensional alcanzó un 36,3%. La debilidad muscular fue el criterio físico más prevalente. Existieron síntomas psicológicos moderados y adecuados niveles de apoyo social. La prueba chi-cuadrado evidenció una asociación estadísticamente significativa y de magnitud moderada entre las clasificaciones de fragilidad según Fried y TFI ($\chi^2 = 19,97$; $gl = 2$; $p < 0,001$; V de Cramer = 0,40).
Conclusión: La fragilidad es frecuente incluso en personas mayores activas. La alta proporción de pre-fragilidad evidencia la necesidad de intervenciones preventivas integrales, centradas en ejercicio físico, apoyo emocional y fortalecimiento de redes sociales.

Palabras clave: fragilidad; personas mayores; Tilburg Frailty Indicator; fenotipo de fragilidad; envejecimiento saludable

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INTRODUCTION

Population ageing constitutes one of the most relevant demographic phenomena worldwide and poses growing challenges for health systems, public policies, and communities. The World Health Organization warns that the proportion of people aged 60 years and over will continue to increase steadily in the coming decades, with implications for the demand for care, the prevention of disability, and the sustainability of health services (World Health Organization, 2024). In Latin America and the Caribbean—and particularly in Chile—this process is occurring at an accelerated pace, shaping a scenario that requires strategies aimed at healthy ageing and the early detection of conditions associated with vulnerability (Economic Commission for Latin America and the Caribbean, 2021; National Statistics Institute of Chile, 2019).

Ageing is not a homogeneous or linear process, but rather manifests itself in diverse ways according to life trajectories, social determinants, accumulated health conditions, and the context in which people age. From a biological perspective, ageing is associated with a progressive decline in physiological reserve and in the capacity to respond to stressors, which increases the risk of adverse events such as disability, hospitalization, and mortality (Clegg et al., 2013). However, these changes interact in complex ways with psychological and social factors, shaping different levels of vulnerability in old age.

In this context, the concept of frailty emerges, understood as a geriatric syndrome characterized by greater vulnerability to internal and external stressors, resulting from the decline of multiple physiological systems. One of the most widely used models for its assessment is the frailty phenotype proposed by Fried and colleagues, which defines frailty based on five physical criteria: unintentional weight loss, exhaustion, muscle weakness, slow gait speed, and low level of physical activity (Fried et al., 2001). This model has demonstrated a high capacity to predict adverse outcomes and has been widely validated in different population contexts (Dent et al., 2019).

Nevertheless, the accumulated evidence has shown that frailty cannot be explained solely from a physical dimension. In response to this limitation, multidimensional models have been developed that incorporate psychological and social components, recognizing that these factors significantly influence the vulnerability of older adults. The model proposed by Gobbens conceptualizes frailty as a dynamic state that emerges from the interaction between physical, psychological, and social domains, and is operationalized through the Tilburg Frailty Indicator (TFI) (Gobbens et al., 2010). This approach has shown greater sensitivity for identifying frailty in older adults who maintain an apparently adequate functional level (Gobbens, 2021).

Several studies have shown that psychological symptoms such as low mood, anxiety, and perceived low self-efficacy are associated with a higher risk of frailty, even in physically active people (Nicholson et al., 2022). Likewise, social factors such as isolation, unwanted loneliness, and lack of social support have been consistently related to functional decline and poorer quality of life in old age (Gale et al., 2018). In contrast, social and community participation has been identified as a protective factor, favouring the maintenance of autonomy and well-being in older adults (Berkman et al., 2014).

In Chile, the prevalence of physical frailty has been estimated between 10% and 12% in people aged 60 years and over, while pre-frailty exceeds 50%, evidencing a broad group at potential risk of progression towards more advanced states of vulnerability (Troncoso-Pantoja et al., 2020). Likewise, studies that have incorporated multidimensional instruments report higher prevalences, suggesting that the psychological and social dimensions of frailty could be underdiagnosed when exclusively physical criteria are used (Santiago et al., 2020). These differences highlight the importance of using comprehensive approaches for its assessment, especially in community contexts.

Older adults who actively participate in social foundations and community spaces are usually considered functionally healthy; however, this participation does not exclude the presence of underlying physical, psychological, or social vulnerabilities. In this sense, the early identification of frailty, particularly in states of pre-frailty, constitutes a key opportunity to implement preventive interventions aimed at delaying or reversing its progression (Puts et al., 2017). However, studies comparing Fried's physical phenotype and the multidimensional approach of the TFI in active older adults who participate in community contexts remain scarce, particularly in territories of southern Chile.

Within this framework, the present study aimed to determine the prevalence of physical and multidimensional frailty in active older adults from a social foundation in southern Chile and to assess the association between both classifications.

1. THEORETICAL FRAMEWORK

Ageing is a universal, complex, and multifactorial process that involves progressive transformations across biological, psychological, and social domains. Far from being a linear phenomenon, it is shaped by life-course trajectories marked by accumulated experiences, social determinants, health-related behaviours, and environmental conditions that influence how people reach old age. From this perspective, the World Health Organization highlights the importance of understanding ageing as a heterogeneous process, in which individual and contextual resources determine the possibility of maintaining functionality, autonomy, and well-being (World Health Organization, 2024).

In this context, frailty emerges as a central concept for understanding vulnerability among older adults. It is a syndrome characterized by a decline in physiological reserve and in the capacity to respond to stressors, increasing the risk of adverse events

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such as falls, hospitalization, disability, or mortality. Traditionally, frailty has been studied from a physical approach, particularly based on the phenotypic model proposed by Fried. This model defines frailty according to five criteria: unintentional weight loss, exhaustion, muscle weakness, slow gait speed, and low level of physical activity (Fried et al., 2001). The presence of three or more criteria indicates frailty, whereas one or two criteria correspond to pre-frailty, an intermediate stage relevant for prevention. This model has proven useful for predicting negative clinical outcomes and continues to be a fundamental reference in geriatric research (Dent et al., 2019).

However, limiting frailty exclusively to physical deterioration is insufficient, since older adults experience vulnerabilities that transcend the biological domain. In response to this need, Gobbens et al. (2010) developed a multidimensional model that integrates physical, psychological, and social components, operationalized through the Tilburg Frailty Indicator (TFI). This instrument incorporates elements such as emotional problems, cognitive difficulties, anxiety levels, quality of interpersonal relationships, availability of social support, and community participation, recognizing that frailty is a dynamic phenomenon that arises from the interaction between multiple dimensions of human functioning. Recent research supports this approach and demonstrates that non-physical components significantly influence the risks associated with frailty, reinforcing its understanding as a complex, dynamic, and multidimensional condition (Gobbens, 2021; Kim & Rockwood, 2024).

In line with this perspective, several studies have shown that mental health plays a relevant role in the transition from pre-frailty to frailty. Symptoms such as low mood, anxiety, or low self-efficacy increase vulnerability even in physically active people (Nicholson et al., 2022). Similarly, the social dimension has acquired increasing relevance: social isolation, unwanted loneliness, and lack of support networks have been consistently associated with a greater risk of functional decline and frailty (Gale et al., 2018). In contrast, participation in community activities, meaningful bonds, and family support can act as protective factors, favouring healthy ageing (Berkman & Syme, 2010).

Physical factors continue to be determinants, especially multimorbidity and muscle weakness. Chronic diseases such as hypertension, diabetes, osteoarthritis, or dyslipidaemia may contribute to reduced physiological reserve and increase the risk of frailty (Dent et al., 2019). Grip strength, in particular, is one of the most robust predictors of mortality and functional decline in older adults (Fried et al., 2001). However, it is the interaction between physical, psychological, and social factors that allows for a more precise understanding of different levels of vulnerability in old age.

In the Chilean context, these issues acquire special relevance, since frailty and pre-frailty express not only physical deterioration, but also accumulated conditions throughout the life course, related to chronic diseases, support networks, social participation, and timely access to health services (Troncoso-Pantoja et al., 2020; Gobbens, 2021). Therefore, the assessment of frailty requires consideration of the territorial and community particularities in which older adults age, especially in areas of southern Chile, where physical, psychological, and social vulnerabilities may be expressed in differentiated ways (Gobbens et al., 2010).

The adoption of a multidimensional approach is fundamental for understanding frailty in active older adults who participate in community spaces. Although these environments may act as protective factors by promoting social interaction and participation, they do not necessarily eliminate vulnerabilities in other domains of human functioning. Therefore, the use of comprehensive instruments makes it possible to identify risk profiles that might not be detected through approaches focused only on the physical phenotype, favouring a broader understanding of frailty in this type of population (Gobbens et al., 2010; Araya et al., 2018).

Finally, evidence indicates that frailty is, to a large extent, preventable and partially reversible when timely interventions are implemented. Multicomponent physical exercise programmes, muscle strengthening, cognitive stimulation, emotional support, and the strengthening of social networks have shown usefulness in preventing or delaying progression towards frailty (Puts et al., 2017). Understanding frailty from a holistic approach not only favours the design of preventive strategies, but also guides public policies and community actions that promote healthier and more sustainable ageing.

2. METHODS

2.1 Study design

A quantitative, descriptive, cross-sectional study was conducted, aimed at determining the prevalence of physical and multidimensional frailty in active older adults belonging to a social foundation in southern Chile, as well as assessing the association between both classifications. Data collection was carried out in person through individual interviews previously coordinated at the facilities of the participating institution.

2.2 Population, sample, and selection procedure

The eligible population consisted of 183 people aged 60 years and over enrolled in community activities offered by a social foundation in southern Chile. The sample was selected through simple random sampling from the foundation's institutional list.

For this purpose, each person on the list was assigned a consecutive number, and a draw was subsequently carried out using a digital random number generation tool. The selected individuals were contacted and invited to participate in the study, with the assessment being rescheduled in cases where they did not attend the initial appointment. No refusals were recorded, as they

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were individuals actively linked to the foundation and participants in its community activities. The final sample consisted of 124 older adults.

2.3 Inclusion and exclusion criteria

The inclusion criteria were: being 60 years of age or older, being enrolled in and actively participating in the foundation's activities, being functionally independent, and signing the informed consent form.

For the purposes of this study, a functionally independent person was considered to be someone who could attend community workshops independently, answer the interview, and perform the physical tests required by the instruments applied.

The exclusion criteria were: the presence of evident cognitive impairment that hindered understanding of the questions, severe communication difficulties, prolonged inactivity in the institution for a period longer than six months, or the presence of an acute illness at the time of assessment.

2.4 Data collection procedure

Data collection was carried out in person at the facilities of the participating foundation, following prior coordination with the selected older adults. The sociodemographic and health questionnaire, Fried's phenotype criteria, and the Tilburg Frailty Indicator were administered by the researchers through individual interviews, recording responses according to the guidelines established for each instrument. The physical tests corresponding to Fried's phenotype, specifically handgrip dynamometry for the assessment of grip strength and the gait test for the assessment of walking speed, were also performed by the researchers following standardized protocols.

Each assessment was conducted in a space that safeguarded participants' privacy, ensuring appropriate conditions for the interview and for the safe performance of the physical tests. Before the application of the instruments, the objective of the study was explained, questions were answered, and participants were asked to sign the informed consent form.

2.5 Data collection instruments

Sociodemographic questionnaire

A sociodemographic and health questionnaire developed for the study was administered, including age, sex, marital status, educational level, employment status, presence of self-reported chronic diseases, and regular attendance at health check-ups.

Fried's frailty phenotype

Physical frailty was assessed using Fried's phenotype criteria, which consider five components: unintentional weight loss, exhaustion, muscle weakness, slow gait speed, and low level of physical activity. Weight loss, exhaustion, and level of physical activity were assessed through individual interviews, while muscle weakness and slow gait speed were measured directly by the researchers using handgrip dynamometry and a gait test, respectively.

Muscle weakness was assessed through handgrip strength, using cut-off points adjusted by sex and body mass index. Slow gait speed was assessed through a physical performance test over a standardized distance, considering cut-off points adjusted by sex and height. Each positive criterion received one point, obtaining a total score between 0 and 5. According to the total score, individuals were classified as non-frail or robust when they presented 0 criteria, pre-frail when they presented 1 or 2 criteria, and frail when they presented 3 or more criteria (Fried et al., 2001).

Tilburg Frailty Indicator (TFI)

Multidimensional frailty was assessed using the Tilburg Frailty Indicator (TFI), an instrument originally developed by Gobbens et al. (2010), composed of 15 items distributed across three domains: physical, psychological, and social. For this study, a Spanish version of the instrument was used, which had previously been employed in studies with Chilean older adults in community and day-centre contexts (Araya et al., 2018).

The physical domain includes aspects such as perceived physical health, weight loss, difficulty walking, balance, hearing, vision, hand strength, and physical tiredness. The psychological domain considers memory, mood, anxiety, and the ability to cope with problems. The social domain addresses living alone, perceived companionship, and support received from other people.

Each item was coded according to the instrument's scoring guidelines, obtaining a total score between 0 and 15 points. The presence of multidimensional frailty was considered when the total score was equal to or greater than 5 points.

2.6 Statistical analysis

Data were entered into Microsoft Excel and subsequently analysed using IBM SPSS Statistics version 26. Descriptive statistics were applied using absolute frequencies, percentages, and measures of central tendency. For the main prevalence estimates, 95% confidence intervals were calculated. The internal consistency of the Tilburg Frailty Indicator was assessed using Cronbach's alpha. To analyse the association between the classifications of physical frailty according to Fried and multidimensional frailty according

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to the TFI, the chi-square test (χ^2) was used, considering a significance level of $p < 0.05$. In addition, Cramer's V was calculated as a measure of the magnitude of association.

2.7 Ethical considerations

The study was approved by the Scientific Ethics Committee of the Reloncaví Health Service. All participants received verbal and written information about the objectives and procedures, signed an informed consent form, and participated voluntarily. The ethical principles of the Declaration of Helsinki were followed (World Medical Association, 2013), as well as the guidelines of the Council for International Organizations of Medical Sciences for research involving human beings (Council for International Organizations of Medical Sciences, 2016), and the seven ethical requirements proposed by Emanuel et al. (2000): social value, scientific validity, fair subject selection, favourable risk-benefit ratio, independent review, informed consent, and respect for participants.

Confidentiality was guaranteed through data coding and secure safeguarding of the information.

3. RESULTADOS

The sample consisted of 124 active older adults belonging to a social foundation in southern Chile, with a clear predominance of the age group between 60 and 69 years. The population was mostly female and had a medium to high educational level, with a relevant proportion of participants having completed higher education. Regarding health status, the most frequent chronic diseases were arterial hypertension, dyslipidaemia, type 2 diabetes mellitus, and osteoarthritis, with high adherence to regular health check-ups also being observed.

Table 1 - Sociodemographic and health characteristics of the sample (n = 124)

Variable	Category	n	%
Age (years)	60–69	79	64.0
	70–79	35	28.2
	≥ 80	10	8.1
Sex	Female	120	96.8
	Male	4	3.2
Marital status	Single	12	9.7
	Married	58	46.8
	Divorced	29	23.4
	Widowed	25	20.2
Educational level	No formal education	4	3.2
	Incomplete primary education	11	8.9
	Complete primary education	20	16.1
	Incomplete secondary education	34	27.4
	Complete secondary education	12	9.7
	Higher education	43	34.7
Employment status	Retired	50	40.3
	Pensioner	36	29.0
	Active	38	30.7
Chronic diseases*	Arterial hypertension	62	50.0
	Type 2 diabetes mellitus	35	28.2
	Dyslipidaemia	36	29.0
	Osteoarthritis	31	25.0
Health check-ups	Attends regularly	102	82.3
	Does not attend regularly	22	17.7

Note - Participants could report more than one chronic disease. Table prepared by the authors.

When physical frailty was assessed using Fried's phenotype, most older adults did not present unintentional weight loss or slow gait speed. However, almost half of the sample showed muscle weakness, making it the most frequently altered criterion. Likewise, approximately one quarter of the participants reported a feeling of exhaustion, while most reported engaging in regular physical activity. The distribution of the components of the frailty phenotype is presented in Table 2.

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Table 2 - Components of the frailty phenotype according to Fried's criteria (n = 124)

Component	Category	n	%
Unintentional weight loss	Yes	6	4.8
	No	118	95.2
Exhaustion	Yes	34	27.4
	No	90	72.6
Muscle weakness	Yes	60	48.4
	No	64	51.6
Slow gait speed	Yes	11	8.9
	No	113	91.1
Low level of physical activity	Yes	33	26.6
	No	91	73.4

Note: Percentages calculated based on n = 124. Table prepared by the authors.

According to the overall classification of Fried's phenotype, 36.3% of participants were classified as non-frail or robust (95% CI: 28.4–45.0), 52.4% as pre-frail (95% CI: 43.7–61.0), and 11.3% as frail (95% CI: 6.8–18.1). This finding highlights a high presence of intermediate states of physical vulnerability in a population that actively participates in community activities.

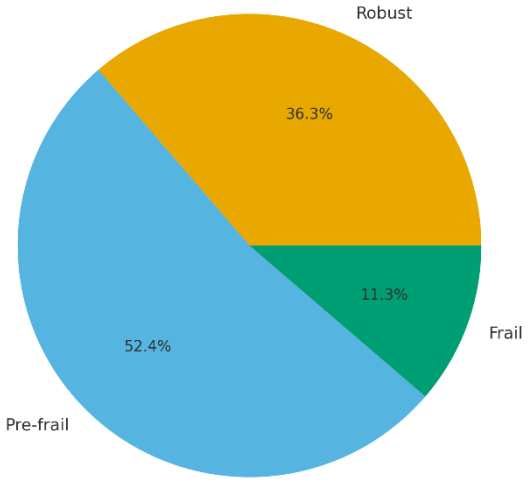

Figure 1 - Distribution of frailty according to Fried

Source: Prepared by the authors.

Prior to the analysis of the results of the Tilburg Frailty Indicator, its internal consistency was estimated for the present sample. The instrument presented a Cronbach's alpha of 0.63 for the total scale, an acceptable value for exploratory purposes, which should be interpreted considering the multidimensional nature of the instrument and the reduced number of items per domain. Regarding the components of the Tilburg Frailty Indicator, the physical domain showed that, despite a general self-perception of good health, difficulties related to gait, balance, hand strength, and the feeling of tiredness were identified. In the psychological domain, a non-negligible proportion of participants reported symptoms of low mood and anxiety, although most perceived themselves as capable of adequately coping with everyday problems. In the social domain, high levels of support received were observed, although a subgroup reported missing the presence of other people.

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Table 3 - Responses by items and domains of the Tilburg Frailty Indicator (TFI) (n = 124)

Domain	Item	Yes n (%)	No n (%)	Sometimes n (%)
Physical	Do you feel physically healthy?	103 (83.0)	21 (17.0)	—
	Have you lost weight without intending to?	6 (4.8)	118 (95.2)	—
	Do you have difficulty walking?	27 (21.8)	97 (78.2)	—
	Do you have difficulty maintaining your balance?	30 (24.2)	94 (75.8)	—
	Do you have poor hearing?	30 (24.2)	94 (75.8)	—
	Do you have poor vision?	110 (88.7)	14 (11.3)	—
	Do you feel a lack of strength in your hands?	33 (26.6)	91 (73.4)	—
	Do you feel physically tired?	41 (33.1)	83 (66.9)	—
	Do you have memory problems?	10 (8.1)	53 (42.7)	61 (49.2)
Psychological	Have you felt low in mood during the last month?	29 (23.4)	66 (53.2)	29 (23.4)
	Have you felt nervous or anxious during the last month?	32 (25.8)	62 (50.0)	30 (24.2)
	Have you felt able to cope with problems in a good way?	114 (91.9)	10 (8.1)	—
Social	Do you live alone?	19 (15.3)	105 (84.7)	—
	Do you miss having people around you?	33 (26.6)	70 (56.5)	21 (16.9)
	Do you receive support from other people?	121 (97.6)	3 (2.4)	—

Note: "—" indicates that the response option does not apply to that item. Percentages calculated based on n = 124. Table prepared by the authors.

The assessment of multidimensional frailty using the Tilburg Frailty Indicator showed that 36.3% of participants presented multidimensional frailty (95% CI: 28.4–45.0), while 63.7% were classified as non-frail (95% CI: 55.0–71.6). This result contrasts with the lower prevalence of physical frailty established according to Fried, highlighting the relevance of non-physical components in the comprehensive assessment of frailty.

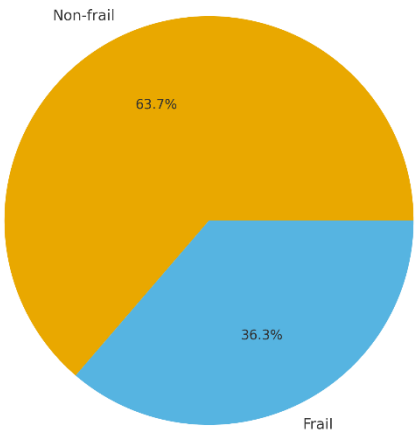

Figure 2 - Multidimensional frailty according to the TFI

Source: Prepared by the authors

Finally, when comparing the frailty classifications obtained using Fried's criteria and the Tilburg Frailty Indicator, a statistically significant association was observed between both instruments ($\chi^2 = 19.97$; df = 2; $p < 0.001$), with a moderate magnitude of association according to Cramer's V (V = 0.40). The proportion of multidimensional frailty increased progressively according to Fried's classification: 15.6% in non-frail/robust individuals, 41.5% in pre-frail individuals, and 78.6% in frail individuals. However, discrepancies were identified between both approaches, especially in the pre-frail group, suggesting that the instruments capture partially different dimensions of frailty. The association between both classifications is presented in Table 4.

Table 4 - Association between physical frailty (Fried) and multidimensional frailty (TFI) (n = 124)

Frailty according to Fried	TFI non-frail n (%)	TFI frail n (%)	Total n (%)
Robust	38 (30.6)	7 (5.6)	45 (36.3)
Pre-frail	38 (30.6)	27 (21.8)	65 (52.4)
Frail	3 (2.4)	11 (8.9)	14 (11.3)
Total	79 (63.7)	45 (36.3)	124 (100.0)

Note: Percentages were calculated based on the total sample. A statistically significant association was observed between the classification of physical frailty according to Fried and multidimensional frailty according to the TFI: $\chi^2 = 19.97$; df = 2; $p < 0.001$; Cramer's V = 0.40. Table prepared by the authors.

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4. DISCUSSION

The present study identified a high prevalence of pre-frailty and a relevant proportion of multidimensional frailty in active older adults participating in a social foundation in southern Chile. This finding is particularly relevant, as the study population is considered functionally active, reinforcing the notion that frailty may be present even in apparently protective community contexts.

Regarding physical frailty, more than half of the participants were classified as pre-frail according to Fried's criteria. This proportion is consistent with national and international evidence showing that pre-frailty greatly exceeds established frailty and constitutes a critical stage for preventive intervention (Troncoso-Pantoja et al., 2020; Dent et al., 2019). Nevertheless, the prevalence of physical frailty observed in this sample should be interpreted considering that the participants were active older adults linked to a social foundation, which may be associated with better levels of functionality, participation, and access to support networks. The high frequency of muscle weakness observed is consistent with that described by Fried et al. (2001), who identify this component as one of the relevant markers of functional decline in old age.

When frailty was assessed from a multidimensional approach using the TFI, a higher prevalence of frailty was observed compared with physical frailty, which is consistent with previous research indicating that exclusively physical models tend to underestimate the actual vulnerability of older adults (Gobbens et al., 2010; Gobbens, 2021). This result is also consistent with national studies that have used the TFI in Chilean older adults involved in community-based and day-centre settings, highlighting the usefulness of an integrated approach that incorporates physical, psychological, and social dimensions (Araya et al., 2018). In the present study, the presence of multidimensional frailty in more than one third of the sample suggests that, even among active older adults, vulnerabilities may coexist that are not fully captured by approaches focused exclusively on the physical component.

The results by TFI domains allow this interpretation to be explored in greater depth. In the psychological domain, symptoms of low mood and anxiety were identified in a non-negligible proportion of participants, although most perceived themselves as able to adequately cope with everyday problems, suggesting the coexistence of protective and risk factors in this population. From the social dimension, the findings show a broad availability of support networks, which could partially explain the low levels of social frailty observed. The literature highlights that social support and community participation act as protective factors against functional and psychological decline, favouring healthier ageing (Gale et al., 2018; Berkman & Syme, 2010). Nevertheless, the presence of feelings of loneliness in a subgroup of participants reinforces the need not to assume homogeneity in active populations.

The statistically significant association of moderate magnitude observed between the frailty classifications according to Fried and the TFI suggests partial convergence between both approaches, although not equivalence between instruments. This finding supports the complementary usefulness of both approaches for assessing frailty in active older adults. While Fried's phenotype mainly identifies physical vulnerability through criteria such as unintentional weight loss, exhaustion, muscle weakness, slow gait speed, and low level of physical activity (Fried et al., 2001), the Tilburg Frailty Indicator broadens the understanding of the phenomenon by incorporating physical, psychological, and social dimensions (Gobbens et al., 2010). Therefore, the differences observed in the classifications should not be interpreted as contradictions, but rather as an expression of the different conceptual and operational foundations of each instrument.

In particular, the distribution of the pre-frail group according to Fried is relevant, given that these participants were distributed across the frail and non-frail categories according to the TFI. This heterogeneity may be explained by the intermediate nature of physical pre-frailty and by the capacity of the TFI to detect additional vulnerabilities in the psychological and social domains. Likewise, the presence of individuals classified as non-frail according to Fried but as frail according to the TFI reinforces the importance of assessing dimensions that are not exclusively physical, especially in community contexts where older adults may maintain active social participation while also presenting underlying vulnerabilities. This interpretation is consistent with the current understanding of frailty as a complex, dynamic, and multidimensional condition influenced by biological, psychological, and social factors (Clegg et al., 2013; Gobbens, 2021; Kim & Rockwood, 2024).

From a practical perspective, these findings reinforce the importance of implementing strategies for the early detection of frailty in community contexts, even among active older adults. The identification of states of pre-frailty and multidimensional frailty offers an opportunity to develop comprehensive interventions aimed at muscle strengthening, emotional support, and the strengthening of social networks, contributing to delaying progression towards more advanced states of vulnerability (Puts et al., 2017).

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STUDY LIMITATIONS

Among the limitations of the study, first, the small sample size should be acknowledged, which restricts the statistical power to perform stratified analyses or comparisons between subgroups. In particular, the marked female predominance of the sample limits the possibility of analysing differences according to sex and reduces the generalizability of the results to older men. Likewise, the inclusion of active older adults belonging to a single social foundation in southern Chile may introduce selection bias, given that these are participants linked to community activities and possibly with better support networks than other groups of older adults. Furthermore, the cross-sectional design allows prevalence and associations to be estimated, but does not allow causal relationships to be established or trajectories of frailty progression to be analysed. Finally, although the combined use of Fried's phenotype and the TFI allowed a complementary approach to the phenomenon, future studies should consider larger samples, greater male representation, and longitudinal designs that allow changes in physical and multidimensional frailty to be assessed over time.

Implications for future research

The findings of this study open new lines of research aimed at deepening the understanding of differentiated profiles of physical and multidimensional frailty in active older adults. Future research could explore in greater detail the interaction between muscle strength, psychological symptoms, perceived social support, loneliness, and community participation, in order to identify potentially modifiable protective and risk factors. Likewise, it would be relevant to study these relationships in different territorial and community contexts in southern Chile, considering urban, rural, institutional, and sociocultural differences that could influence the expression of frailty.

CONCLUSION

The present study showed a high proportion of physical pre-frailty and a relevant presence of multidimensional frailty in active older adults belonging to a social foundation in southern Chile. These findings show that community participation and the maintenance of an apparently preserved functional level do not exclude the existence of vulnerabilities associated with frailty.

The comparison between Fried's frailty phenotype and the Tilburg Frailty Indicator made it possible to identify a statistically significant relationship of moderate magnitude between both classifications. This result suggests partial convergence between the physical and multidimensional approaches, but also confirms that both instruments are not equivalent, but rather complementary for identifying different profiles of vulnerability.

From an applied perspective, the results reinforce the importance of considering comprehensive frailty assessments in community contexts, especially to detect states of pre-frailty and non-physical dimensions in a timely manner, which could go unnoticed in active older adults. This approach may contribute to the design of preventive strategies aimed at strengthening physical, emotional, and social capacities, tailored to the needs of this population.

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AUTHORS´ CONTRIBUTION

Conceptualization, K.O.V., L.V.M., Y.T.P., E.M.R. and P.B.V.; data curation, K.O.V., L.V.M., Y.T.P., E.M.R. and P.B.V.; formal analysis, K.O.V., L.V.M., Y.T.P., E.M.R. and P.B.V.; investigation, K.O.V., L.V.M., Y.T.P., E.M.R. and P.B.V.; methodology, K.O.V., L.V.M., Y.T.P., E.M.R. and P.B.V.; project administration, P.B.V.; software, K.O.V., L.V.M., Y.T.P., E.M.R. and P.B.V.; supervision, M.J.C.G. and P.B.V.; validation, M.J.C.G. and P.B.V.; visualization, M.J.C.G. and P.B.V.; writing – original draft, K.O.V., L.V.M., Y.T.P., E.M.R., M.J.C.G. and P.B.V.; writing – review & editing, M.J.C.G. and P.B.V.

CONFLICT OF INTERESTS

The authors declare no conflict of interests.

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