Original Article

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Agreement between fragility assessment instruments for older adults registered in primary health care

Concordância entre instrumentos de avaliação da fragilidade em idosos na atenção primária à saúde

Acuerdo entre instrumentos de evaluación de fragilidad en mayores registrados en atención primaria de salud

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ABSTRACT

Objective: To assess the level of agreement between the Subjective Frailty Assessment (SFA) and Clinical Functional Vulnerability Index (CFVI-20) for the diagnosis of frailty in older adults.

Methods: A descriptive, comparative, cross-sectional study was conducted in 2018/2019 with 492 older adults at nine Family Health Strategy units in the city of Três Lagoas, state of Mato Grosso do Sul, Brazil. Frailty was assessed using the SFA and CFVI-20 in addition to a structured interview. The Wilcoxon test and Pearson's chi-squared test were used for the comparisons.

Results: Agreement was 35.4%, with a Kappa coefficient of 0.11. After dichotomizing the sample into frail and non-frail individuals, agreement was 70.1%, with a Kappa coefficient of 0.41 and Cronbach's alpha coefficients of 0.61 and 0.74 for IVCF-20 and SFA, respectively. The prevalence of frailty was lower using the IVCF-20 (17.1%) compared to 59.8% using the SFA.

Conclusion: Agreement regarding the classification of frailty between the two instruments ranged from low to moderate. This finding underscores the need for a standardized instrument for measuring frailty in community-dwelling older adults.

Keywords: Frail elderly. Reproducibility of results. Primary health care. Health vulnerability.

RESUMO

Objetivo: Avaliar o nível de concordância entre a Avaliação Subjetiva da Fragilidade (SFA) e o Índice de Vulnerabilidade Clínico-Funcional (IVCF-20) para rastreio da fragilidade em idosos.

Métodos: Estudo descritivo, comparativo e transversal realizado em 2018/2019 com 492 idosos, em 09 Estratégias Saúde da Família no município de Três Lagoas-MS. A Fragilidade foi avaliada utilizando a SFA e IVCF-20 e entrevista estruturada. Para comparações, utilizou testes de Wilcoxon e qui-quadrado de Pearson.

Resultados: Concordância foi de 35,4%, com coeficiente Kappa de 0,11. Dicotomizando em idosos frágeis e não-frágeis, a concordância foi de 70,1%, com coeficiente Kappa foi 0,41 e o alfa de Cronbach para IVCF-20 foi 0.61 e SFA 0.74. A prevalência da fragilidade foi menor do IVCF – 20 (17,1%) e maior na SFA (59,8%).

Conclusão: A concordância entre os dois instrumentos variou de baixa a moderada, destacando a necessidade de padronizar o instrumento para aferir a fragilidade em idosos comunitários.

Palavras-chave: Idoso fragilizado. Reprodutibilidade dos testes. Atenção primária à saúde. Vulnerabilidade em saúde.

RESUMEN

Objetivo: Evaluar el nivel de concordancia entre la Evaluación Subjetiva de la Fragilidad (SFA) y el Índice de Vulnerabilidad Clínico-Funcional (IVCF-20) para el rastreo de la fragilidad en los individuos.

Métodos: Estudio descriptivo, comparativo y transversal realizado en 2018/2019 con 492 ancianos, en 09 Estrategias de Salud Familiar en el municipio de Três Lagoas-MS. La fragilidad se evaluó mediante el SFA y el IVCF-20 y una entrevista estructurada. Para las comparaciones, se utilizaron las pruebas de chi-cuadrado de Wilcoxon y Pearson.

Resultados: La concordancia fue 35,4%, con un coeficiente Kappa 0,11. Al dicotomizar en frágiles y no frágiles, la concordancia fue 70,1%, con un coeficiente Kappa 0,41, un alfa de Cronbach para el IVCF-20 de 0,61 y SFA de 0,74. La prevalencia de la fragilidad fue menor en el IVCF – 20 (17,1%) y mayor en el SFA (59,8%).

Conclusión: La concordancia entre los dos instrumentos fue de baja a moderada, lo que pone de manifiesto la necesidad de estandarizar el instrumento para evaluar la fragilidad en los ancianos que viven en la comunidad.

Palabras clave: Anciano frágil. Reproducibilidad de los resultados. Atención primaria de salud. Vulnerabilidad en salud.

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INTRODUCTION

The aging of the population has led to greater recognition and a better understanding of the phenomenon of frailty. This syndrome is not yet fully defined, but its characteristics include an increased physical or psychological vulnerability to dependence when exposed to stressors[1,2]. Recent studies show that frailty syndrome has a significant impact on the lives of older adults, their families and healthcare services[3]. In Latin American and Caribbean countries, where the prevalence of chronic non-communicable diseases is high, one out of every five older people is considered frail[4].

Although aging and frailty are somewhat linked, chronological age *per se* seems not to be an adequate predictor of this condition. Aging is a heterogeneous process and the health of individuals is closely related to the capacity for biopsychosocial satisfaction independently of age or the presence of disease[5]. Nonetheless, recent studies foresee an increase in the prevalence of frailty in upcoming years[6]. Thus, identifying frail older adults and those at risk of becoming frail is of fundamental importance, constituting a public health priority on all levels of health care. This assessment can guide interventions aimed at tackling the severity of the syndrome and minimizing adverse outcomes[6–8].

Frailty is an evolving concept with no consensus on the definition of its components, which hinders the establishment of diagnostic criteria for use in clinical practice and epidemiological research[3,5]. However, the considerable challenge that frailty poses to healthcare systems points to the need to develop pragmatic screening programs as the first step in managing this condition. Once diagnosed, frail individuals should be referred to appropriate care facilities based on individual need[9,10].

The literature offers numerous frailty assessment instruments, but none is an internationally recognized standard measure of the condition. Moreover, the reliability and validity of most of these instruments have not been evaluated, underscoring the need for cross-cultural validation studies[6,9,11–14]. Recently, two frailty assessment instruments have gained prominence due to their practical application: the Subjective Frailty Assessment (SFA)[15] and the Clinical-Functional Vulnerability Index-20 (CFVI-20)[5]. Both assessment instruments have satisfactory reliability and sensitivity and are easy to administer even by healthcare providers not specialized in geriatrics and gerontology.

Although some studies have used these frailty assessment instruments in the same target population, none have investigated their interscale agreement[6,11,14]. This evaluation is relevant, as the lack of agreement between frailty assessment instruments and inconsistency in measuring frailty may be a significant source of bias when reporting frailty endpoints. Therefore, the aim of the present study was to evaluate the level of agreement between the SFA and the CFVI-20 for diagnosing frailty in older adults. We hypothesized that the instruments would have high interscale agreement, as both were developed based on the same constructs of comprehensive geriatric assessments.

METHODS

Study design, participants and setting

A cross-sectional study was conducted to assess the level of agreement between two frailty scales in a representative sample of the population living in the city of Três Lagoas, state of Mato Grosso do Sul, Brazil. Data collection occurred between November 2018 and November 2019. At that time, city had an estimated population of 119,465 residents, nine Family Health Strategy (primary care modality) units and 14 Family Health teams (41.1% coverage in the municipality).

The inclusion criteria were age 60 years or older and being registered at a primary care unit with a Family Health Strategy in the city. The exclusion criteria were mental illness/disorder or untreated systemic disease, uncorrected hearing or visual impairment and absence from the residence after two contact attempts at different times of the day. To obtain a representative sample of each area, Family Health teams provided lists of individuals in the area of coverage that met the inclusion criteria. Invitation to participate in the study occurred during a home visit or while the individuals awaited care at the health unit.

The study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving research study participants were approved by the UFMS institutional review board (certificate number: 85481518.4.0000.0021). All participants provided written informed consent.

Sample size

This study evaluated the level of agreement between two frailty instruments. As the exact prevalence of frailty in the target population was unknown, we assumed a proportion of 50%, which would give the largest sample size. We sought to detect at least 40% of interscale agreement, with a margin of error of 10% and a 5% significance level, which resulted in a minimum sample of 350 participants.

Variables and data collection procedures

Trained undergraduate and graduate students conducted face-to-face evaluations. The following data were collected:

sex, age, schooling, marital status, monthly individual income, monthly family income and the number of residents in the home. Health-related data included the chronic use of medications (yes or no), the number of daily-use medications, self-reported diagnosis of systemic arterial hypertension (yes or no) and diabetes mellitus (yes or no). We measured the blood pressure at the beginning and end of the evaluation and recorded the mean of the two measurements in mmHg. We also performed anthropometric measurements in triplicate for the determination of weight (kg), height (m), calf circumference (cm), hip circumference (cm) and abdominal circumference (cm). The body mass index (BMI) was calculated using the standard formula: weight (kg)/height $(m)^2$

Instruments

Frailty was measured using two instruments administered in the form of an interview. The Subjective Frailty Assessment[15] evaluates five frailty components with dichotomous responses (yes or no): self-reported fatigue, unintentional weight loss, reduction in strength, reduction in walking speed and low physical activity level in the previous year. A sum of three or more affirmative responses indicates frailty, one or two affirmative responses indicates pre-frailty and the absence of affirmative responses indicates non-frailty. This instrument was developed and validated to assess the frailty status of Brazilian older adults and has a good internal consistency: reduction in walking speed (0.77), grip strength (0.72), low physical activity (0.63), self-reported fatigue (0.37) and weight loss (0.31).

The CFVI-20[5] is a multidimensional instrument with twenty questions addressing age, self-perceived health, functional disability, cognition, mood, mobility, communication and comorbidities. The final score ranges from 0 to 40 points. A score of 0 to 6 indicates a low risk of clinical-functional vulnerability, 7 to 14 indicates moderate risk and scores above 15 indicate high risk. Studies have shown that a threshold of 6 points has good sensitivity (0.740) and specificity (0.861) for determining the occurrence of frailty in older adults. Therefore, this cutoff point was used in the present analysis.

Statistical analysis

Based on the results of the Shapiro-Wilk normality test, continuous data were expressed as median and interquartile range (IQR: 1st to 3rd quartile). Categorical variables were expressed as absolute and relative frequencies. Comparisons between groups were performed using the Wilcoxon-Mann-Whitney test for continuous variables and Pearson's chi-square test with Yates continuity correction for categorical variables. We used Cohen's kappa (K) coefficient to determine the level of agreement between the two frailty classification instruments. K values were classified as poor (< 0.40), moderate (0.40 to 0.75) or excellent (> 0.75). Cronbach's alpha (α)[16] was used to measure the internal consistency of each instrument. An α coefficient between 0.6-0.7 indicates an acceptable level of reliability, while coefficients of 0.8 or above indicate a very good level of reliability. A bilateral[17] p-value < 0.05 was considered indicative of statistical significance. All analyses were conducted using the R program, version 3.5.3 (The R Foundation for Statistical Computing, Vienna, Austria) in the R-Studio 1.1.463 (RStudio Inc., Boston, USA).

RESULTS

A total of 571 older adults were visited and 492 agreed to participate in the study. Figure 1 shows the flowchart of study participation. Reasons for exclusion were a change of address (n = 3), lack of contact after two attempts (n = 14) and refusal to participate in the study (n = 62). The final sample had a minimum of 25 individuals from each of the nine primary care units, covering all areas of the city.

According to table 1, most participants were women (60%) and median age was 70 years (interquartile range: 64 to 76 years). Half were married (50%) and median schooling was 3.5 years (interquartile range: 1 to 5 years). Median individual income was up to the Brazilian monthly minimum wage (interquartile range: R$998 to R$1400) and median family income was about two times the Brazilian monthly minimum wage (interquartile range: R$998 to R$2500). Significant differences between the sexes were found for virtually all variables analyzed.

Table 2 shows the main differences between frail and non-frail individuals using each instrument. In the comparison of the two instruments, significant differences were found between frail and non-frail individuals with regards to sex, marital status and income (individual and family) when the CFVI-20 was used, but not when the SFA was used.

A total of 59.8% of the participants were classified as frail using the Subjective Frailty Assessment, whereas 17.1% were classified as being at high risk for clinical-functional vulnerability when using the CFVI-20 (Table 3). The proportion of individuals classified as frail using the CFVI-20 increased to 55.9% when employing the cutoff point of 6 points for the diagnosis of frailty. Cronbach's alfa was 0.612 for the CVIF-20 and 0.749 for the Subjective Frailty Assessment. Considering

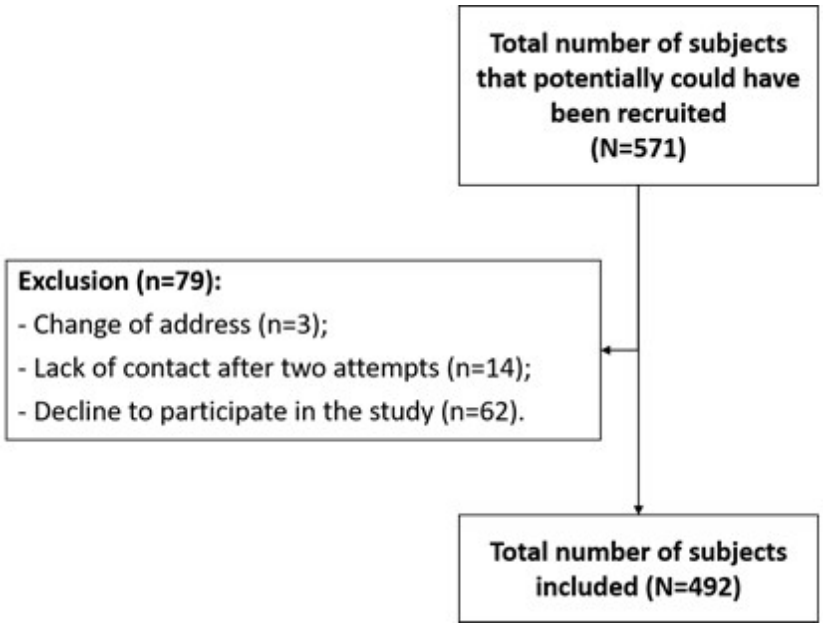

Figure 1 – Flowchart of study participation and reasons for exclusion.
Source: Research data, 2021.

three categories for each instrument, interscale diagnostic agreement occurred with 174 individuals (35.4%), with a Kappa coefficient of 0.11 (95% confidence interval [CI]: 0.06 to 0.17; $p < 0.001$).

To explore interscale agreement further, we analyzed the relationship between the mean CFVI-20 scores and respective variations according to the Subjective Frailty Assessment categories. Figure 2 shows the results of this analysis. Mean CFVI-20 scores were progressively higher as higher levels of frailty were found in the individuals according to the SFA. Moreover, the slope of the curve was significantly higher when going from a pre-frail to frail status based on the SFA.

Considering the importance of diagnosing frailty, we also analyzed interscale agreement for this outcome. For such, we dichotomized the different profiles as non-frail (CFVI-20 ≤ 6; Subjective Frailty Assessment < 3) and frail (CFVI-20 > 6; Subjective Frailty Assessment > 3). Interscale agreement for diagnosing frailty occurred for 349 individuals (70.1%), with a Kappa coefficient value of 0.41 (95% CI: 0.32 to 0.48; $p < 0.001$), indicating a moderate level of agreement.

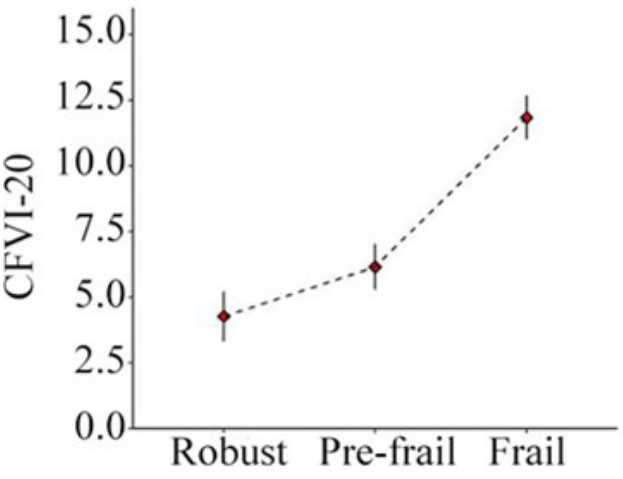

Figure 2 – Mean and variation in CFVI-20 scores according to each category of Subjective Frailty Assessment scale for older adults (n = 492) registered at primary care units.
Source: Research data, 2021.

Table 1 – Sociodemographic and health characteristics of older adults (n = 492) registered at primary care units.

Feature	Total (N=492)	Men (n= 196)	Women (n=296)	p-value
Sex				0,001
Men	39,84	39,84	-	0,001
Women	60,16	-	60,16	
Age (years)	70,00[64,00 – 76,00]	70,00[65,00 – 76,25]	69,00[64,00 – 75,00]	0,3
Marital status				<0,001
Not married	39(7,9)	17(8,7)	22(7,4)	<0,001
Married	246(50,0)	123(62,8)	123(41,6)	
Separated	74(15,0)	35(17,9)	39(13,2)	
Widowed	133(27,0)	21(10,7)	112(37,8)	
Schooling	4[1,5]	4[1,6]	3,0[1,5]	0,3
Individual income (R$)	998,00[998,00 – 1400,00]	998,00[998,00 – 1996,00]	998,00[954,00 – 998,00]	<0,001
Family income (R$)	1856,00[998,00 – 2500,00]	1996,00[998,00 – 3000,00]	1700,00[998,00 – 2000,00]	0,03
Number of residents in home	2,00[2,00 – 3,00]	2,00[2,00 – 3,00]	2,00[2,00 – 3.00]	0,7
Chronic use of medications				<0,001
No	53(10,8)	34(17,3)	19(6,4)	<0,001
Yes	439(89,2)	162(82,7)	277(93,6)	
Number of medications	3,00[2,00 – 5,00]	3,00[1,00 – 5,00]	3,00[2,00 – 5,00]	0,005

Table 1 – Cont.

Feature	Total (N=492)	Men (n= 196)	Women (n=296)	p-value
Systolic blood pressure, mmHg	120,00[120,00 – 140,00]	125,00[120,00 – 140,00]	120,00 [120,00 – 140,00]	0,4
Diastolic blood pressure, mmHg	80,00[70,00 – 80,00]	80,00[80,00 – 90,00]	80,00[70,00 – 80,00]	0,003
Systemic Arterial Hypertension				0,01
No	123(25,0)	61(31,1)	62(20,9)	0,01
Yes	369(75,0)	135(68,9)	234(79,1)	
Diabetes Mellitus				0,05
No	336(68,3)	144(73,5)	192(64,9)	0,05
Yes	156(31,7)	52(26,5)	104(35,1)	
Weight	70,30[60,85 – 82,00]	75,00[66,00 – 85,65]	66,80[58,00 – 78,85]	<0,001
Height	1,60[1,53 – 1,68]	1,68[1,63 – 1,72]	1,56[1,50 – 1,62]	<0,001
BMI	27,05[23,96 – 30,93]	26,43[23,93 – 30,01]	27,72[24,02 – 31,29]	0,05
Calf circumference	34,00[31,00 – 36,30]	34,00[32,00 – 37,02]	33,15[30,30 – 36,00]	0,04
Hip circumference	99,00[91,00 – 107,70]	98,00[90,45 – 105,50]	99,00[91,00 – 109,05]	0,06
Abdominal circumference	96,00[87,00 – 104,00]	98,00[90,00 – 105,50]	95,00[84,07 – 103,08]	0,003

Continuous data expressed as median [interquartile range]. Categorical data expressed as absolute frequency (relative frequency).
Source: Research data, 2021.

Table 2 – Sociodemographic and health characteristics of older adults (n = 492) registered at primary care units.

Feature	Overall (N=492)	CFVI-20			Subjective Frailty Assessment		
		Frail (>6)	Non frail (≤6)	p-value	Frail (≥3)	Non frail/ pre-frail (<3)	p-value
Sex				<0,001			0,558
Men	196(39,8)	90(32,7)	106(48,8)		114(38,8)	82(41,4)	
Women	296(60,2)	185(67,3)	111(51,2)		180(61,2)	116(58,6)	
Age (years)	70,0[64,0 – 76,0]	71,0[65,0 – 78,0]	68,0[64,0 – 73,0]	<0,000	71,0[65,0 – 77,0]	69,0[64,0 – 74,0]	0,001
Marital status				0,006			0,707
Not married	39(7,9)	19(6,9)	20(9,2)		21(7,1)	18(9,1)	
Married	246(50,0)	124(45,1)	122(56,2)		144(49,0)	102(51,5)	
Separated	74(15,0)	41(14,9)	33(15,2)		45(15,3)	29(14,6)	
Widowed	133(27,0)	91(33,1)	42(19,4)		84(28,6)	49(24,7)	
Schooling	3,5[1,0 – 5,0]	3,0[1,0–5,0]	4,0[1.0–8,0]	0,001	3,0[1,0 – 5,0]	4,0[2,0–8,0]	0,001
Individual income (R$)	998,00[998,0 – 1400,0]	998,0[998,0 – 1000,0]	998,0[998,0 – 1976,0]	0,004	998,0[998,0 – 1288,0]	998,0[998,0 – 1700,0]	0,176
Family income (R$)	1856,0[998,0 – 2500,0]	1500,0[998,0 – 2000,0]	1996,0[998,0 –3000,0]	0,006	1800,0[998,0 – 2400,0]	1908,0[998,0 -2994,0]	0,184
Chronic use of medications				0,001			<0,001
No	53(10,8)	18(6,5)	35(16,1)		18(6,1)	35(17,7)	
Yes	439(89,2)	257(93,5)	182(83,9)		276(93,9)	163(82,3)	

Continuous data expressed as median [interquartile range]. Categorical data expressed as absolute frequency (relative frequency).
Source: Research data, 2021.

Table 3 – Classification of frailty according to Subjective Frailty Assessment and CFVI-20 for older adults (n = 492) registered at primary care units.

Frailty Status	Subjective Frailty Assessment	CFVI-20
Robust/Low risk	80(16,3)	217(44,1)
Pre-frail/Moderate risk	118(24,0)	191(38,8)
Frail/High risk	294(59,8)	84(17,1)

Kappa agreement coefficient (95% confidence interval) = 0.11 (0.06 – 0.17); p < 0.001. Categorical data expressed as absolute frequency (relative frequency).
Source: Research data, 2021.

DISCUSSION

The present study evaluated the level of agreement between the SFA and CFVI-20 for the diagnosis of frailty in older adults. This issue is relevant, as a lack of agreement among assessment instruments and inconsistency in the diagnosis of frailty status can lead to significant bias when reporting frailty endpoints[5,15,18–20]. Although the initial hypothesis was that the two instruments would present high interscale agreement, the results revealed only a small to moderate level of agreement.

The prevalence of frailty among the community-dwelling older adults was lower using the CFVI-20 (17.1%) compared to the SFA (59.8%). Demographic, social, economic and morbidity-related factors as well as the use of health services influenced frailty in community-dwelling older adults, but the difference in the identification of these variables was greater when using the SFA.

The prevalence of frailty in Brazilian community-dwelling older adults identified using the SFA in the present study differed from rates described in the Frailty in Brazilian Older Adults (FIBRA) study (9.1%)[21] and the Health, Wellbeing and Aging (SABE) study (8.5%)[3]. The fact that few population-based studies have used the CFVI-20 hinders the comparison of results[5,6]

The components of each instrument may explain the present findings. The CFVI-20 uses multidimensional aspects of aging, such as age, cognition, self-perception of health, mobility and communication[5,6,22], whereas the SFA adopts the physiological frailty model, with five well-defined criteria: self-reported fatigue, self-reported involuntary weight loss, reduction in strength, reduction in gait speed and low level of physical activity in the previous year[3,14,15,21,22]. The subjective aspect of the SFA is a relevant aspect to consider. For instance, the SFA uses the terms "unintentional weight loss, reduction in strength, reduction in gait speed and low level of physical activity in the past year" to assess neuroendocrine and muscle changes, malnutrition, inflammation, catabolic diseases and decreased mass muscle[3,13,15], whereas the CFVI-20 addresses these changes through the assessment of activities of daily living, mobility and communication. Self-reports increase the risk of bias, such as recall bias, which may explain the differences observed.

The SFA does not consider age, communication or multiple comorbidities in its assessment and uses less specific questions for the components that it has in common with the SCVI-20. Although both instruments recognize the relevance of the functional domain, the assessment of this domain differs substantially. The SFA assesses functioning based on daily activities, whereas the CFVI-20 considers basic activities, which require a lower level of functioning. Thus, the SFA is more sensitive to functional changes, while the CFVI-20 has greater specificity. The impact of subjectivity is more evident regarding the mobility component. For instance, the CFVI-20 assesses whether or not the time spent on the four-meter gait speed test is longer than five seconds. In contrast, the SFA[15] investigates the reduction in walking speed with the question: "Do you think you are walking slower today than you walked 12 months ago (a year ago)?". The CFVI-20[5] also differs from the SFA regarding other components, such as the ability to raise the arms above the shoulders, handle or hold small objects, the body mass index, calf circumference, difficulty walking that prevents the performance of activities of daily living, falls in the previous year and fecal incontinence. Thus, despite their broad practical applicability and availability, these instruments are not interchangeable[20–22]. This study advances knowledge on the subject by showing that the two instruments should be used as complementary tools for assessing frailty in older adults in the primary care setting.

The results of the present study should be considered in light of some limitations. The cross-sectional study design with a convenience sample makes it impossible to determine causality. Recall bias is another relevant limitation. Nonetheless, this study presents a pragmatic analysis comparing the SFA and CFVI-20 for the assessment of frailty in older adults and shows that the two instruments are not interchangeable.

CONCLUSIONS

The results of the present study indicate weak agreement in the classification of frailty between the Subjective Frailty Assessment and IVCF-20. However, moderate agreement was found when the outcome was dichotomized as "frail" and "not frail". The Subjective Frailty Assessment is a more specific tool for classifying frailty, as it considers the five components of Fried's phenotype, which is a more sensitive indicator. Therefore, despite evaluating similar concepts, the two instruments are complementary and one cannot be used to replace the other.

Frailty is a dynamic phenomenon that can transition between worsening and improving in community-dwelling older people. With the increase in life expectancy and the occurrence of syndromes linked to the aging process, primary care requires greater investments in health promotion and disease prevention strategies as well as screening for potentially harmful conditions, such as frailty.

The present findings underscore the need for a standardized instrument for measuring frailty in older people in the primary care setting. The assessment of frailty can assist healthcare providers in offering care to community-dwelling older people, including periodic multidimensional assessments by a multidisciplinary team. The present findings can also contribute to research, teaching and the establishment of public policies aimed at preventing clinical and functional vulnerability and reducing adverse outcomes, such as institutionalization, hospitalization as well as morbidity and mortality rates.

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