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PRISMA-7 as a Frailty Screening Tool in Primary Care: Evidence from Community-Dwelling Older Adults in South Tyrol with a Focus on Gender Bias

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PRISMA-7 as a Frailty Screening Tool in Primary Care: Evidence from Community-Dwelling Older Adults in South Tyrol with a Focus on Gender Bias

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Abstract: Background/Objectives: Frailty screening is essential for identifying older adults at risk for adverse health outcomes. The Program of Research to Integrate Services for the Maintenance of Autonomy 7 (PRISMA-7) is a widely utilised self-reported frailty tool; however, concerns persist regarding its potential gender bias due to item 2, which assigns a frailty point for the male sex. This study aimed to assess the suitability of PRISMA-7 for population-level frailty screening in South Tyrol, Italy, evaluate the impact of item 2 on frailty classification, and investigate the feasibility of PRISMA-6 (excluding item 2) as an alternative tool. **Methods**: A cross-sectional survey was conducted among 1,695 community-dwelling older adults aged ≥ 75 years in South Tyrol. Frailty was assessed using the PRISMA-7 and PRISMA-6. Sociodemographic, health, and lifestyle data were collected to explore associations with frailty classifications. Logistic regression models were used to identify the frailty predictors for each scoring system. The agreement between the PRISMA-7 and PRISMA-6 was analysed, and internal consistency was evaluated. **Results**: The prevalence of frailty was 33.9% using PRISMA-7 and 27.0% using PRISMA-6. Under PRISMA-7, men had a higher prevalence of frailty (34.7%) than women (33.0%), whereas PRISMA-6 reversed this pattern (men, 21.4%; women, 33.0%). Removing item 2 improved internal consistency (Cronbach's alpha for PRISMA-7 = 0.64 vs. PRISMA-6 = 0.75) and aligned frailty classifications with known predictors including age, health status, and physical activity. Logistic regression models highlighted significant sex differences under PRISMA-7 but not under PRISMA-6. **Conclusions**: PRISMA-7 introduces a gender bias by overestimating frailty in men, whereas PRISMA-6 offers a more equitable alternative. Validation of the PRISMA-6 against established frailty tools is recommended to ensure robust and unbiased frailty screening for primary care integration in South Tyrol and beyond.

Keywords: frailty screening; PRISMA-7; sex bias; South Tyrol; population-level screening; primary care; PRISMA-6: older adults

1. Introduction

Frailty is a clinical syndrome characterised by a decline in physiological reserves, leading to increased vulnerability to adverse health outcomes, such as falls, hospitalisation, disability, and mortality [1]. As the population ages, identifying frailty in older adults becomes crucial for implementing preventive and management strategies to maintain autonomy and improve the quality of life [2].

The concept of frailty encompasses multiple domains including physical, psychological, and social factors [3]. Early detection through screening in primary care settings enables timely intervention that may delay or reverse frailty progression [4]. Various screening tools have been developed, among which, the Program of Research to Integrate Services for the Maintenance of Autonomy 7 (PRISMA-7) is notable for its brevity and ease of administration [5].

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The PRISMA-7 is a seven-item questionnaire designed to identify frailty in older adults [6]. Each item is answered with 'yes' or 'no', with a score of ≥3 indicating frailty. These questions addressed age, health status, physical capability, and social support. Owing to its simplicity, the PRISMA-7 is recommended for use in various healthcare settings, including primary care [7,8].

Italy's healthcare system is undergoing significant reforms to enhance primary care and community health services. Ministerial Decree No. 77, issued on 23 May 2022 delineates novel organisational models and standards for territorial healthcare assistance [9]. A salient aspect of this decree is the emphasis on the early detection and management of frailty within the community, promoting integrated care pathways, and reinforcing the role of primary care providers [10].

Although PRISMA-7 is widely utilised, concerns have been raised regarding its sensitivity and specificity across diverse populations and settings. Notably, item 2, which assigns a point for the male sex, has been scrutinised for potential gender bias, potentially leading to over-identification of frailty in men and under-identification in women. In a Brazilian validation study of PRISMA-7, item 2 exhibited a weak correlation with other items and did not significantly contribute to identifying functional loss or frailty, suggesting potential redundancy [11]. Similarly, the Chinese validation indicated that excluding item 2 increased the tool's internal consistency, implying that its inclusion might introduce gender bias by disproportionately identifying males as frail [12]. The Turkish study also noted that item 2 loaded onto a separate factor, behaving distinctly from other items, which could lead to over-identification of frailty in men and under-identification in women [13]. These findings collectively raise concerns about the appropriateness of including item 2 in diverse populations, as it may not align well with the core purpose of the PRISMA-7 tool in detecting frailty or functional loss.

Furthermore, there is limited research on the applicability of the tool in specific regions, such as South Tyrol, considering the unique demographic and cultural factors. Sociocultural factors significantly influence frailty prevalence, with studies indicating variability in gender-related outcomes across different regions [14,15]. This heterogeneity underscores the importance of considering cultural and societal contexts when assessing frailty and interpreting gender differences in prevalence.

This study aimed to evaluate the suitability of the PRISMA-7 as a self-reported frailty screening tool for community-dwelling individuals aged 75 years and above in South Tyrol's primary care settings. Specifically, it seeks to assess the impact of item 2 on frailty classification and explore potential gender biases, providing evidence-based recommendations for its implementation considering Ministerial Decree 77/2022.

2. Materials and Methods

2.1. Study Design

This study was designed as a cross-sectional, population-based survey conducted in the Autonomous Province of Bolzano/South Tyrol, Italy, over a three-month period between March 1 and May 30, 2023. The survey adhered to STROBE guidelines for observational studies, ensuring methodological transparency and rigor [16].

2.2. Study Setting and Population

The investigation was conducted in South Tyrol, a multilingual and multicultural region in Northern Italy, where approximately 70% of the population is German-speaking, 25% Italian-speaking, and 5% Ladin-speaking [17]. The target population comprised community-dwelling individuals aged 75 years and older, representing approximately 51,000 older adults in South Tyrol. A stratified probabilistic sampling approach was employed to ensure that the results were representative of the regional population. Sampling accounted for key demographic factors, including age group (75–84 years and ≥85 years), sex (male and female), and residency status (urban and rural communities). The Provincial Institute of Statistics (ASTAT) conducted the randomly selected 3,600 individuals from the official resident register.

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2.3. Inclusion and Exclusion Criteria

Eligible participants were community-dwelling older adults aged ≥ 75 years. Individuals residing in long-term care facilities were excluded from the study, as were those who were unable to complete the questionnaire independently or with the assistance of a family member because of severe health or cognitive impairments.

2.4. Data Collection

Data were collected using a standardised questionnaire made available in the three primary languages spoken in the region: German, Italian, and Ladin. Participants were offered three modes of survey completion to accommodate the varying levels of digital and physical accessibility. These comprised self-completion of an online survey hosted on LimeSurvey, paper-based completion with return by post, or telephone interviews administered by trained ASTAT personnel. Non-respondents were followed up with a second invitation one month later to maximise participation.

2.5. Measures

Frailty was assessed using the PRISMA-7 questionnaire, a seven-item instrument wherein responses are coded as binary (yes/no) and a score of three or greater indicates frailty [6] in its German [18] and Italian [19] versions, respectively. To investigate potential sex bias, a modified version of the questionnaire, referred to as PRISMA-6, was also analysed. PRISMA-6 excluded Item 2, which attributes a frailty point to the male sex.

Additional sociodemographic data were collected, including age, sex, native language (German, Italian, Ladin, or others), citizenship, education level (below high school or high school and higher), financial resources (excellent, good, adequate, or insufficient), and living situation (alone or with a partner/family). Self-reported health and lifestyle factors were also included, such as perceived health status (poor, moderate, good, or very good) and level of physical activity (≥2 hours per week, <2 hours per week, or none). Care utilisation data were collected to assess informal and formal care support, including the use of family assistance, community nursing, private care providers, meals-on-wheels, and frequency of general practitioner (GP) visits.

2.6. Statistical Analysis

Given the absence of a gold standard for frailty classification, an indirect assessment strategy was employed to evaluate the performance of the PRISMA-7 and PRISMA-6. Descriptive statistics, including means, medians, and frequencies, were used to summarise the characteristics of the study sample and frailty prevalence based on both instruments. The prevalence of frailty was further stratified by key variables including sex, age group, education level, and urban or rural residency.

Comparative analyses between PRISMA-7 and PRISMA-6 were conducted to investigate the influence of Item 2. Differences in frailty classification were analysed using the chi-square test for categorical variables and Wilcoxon rank-sum test for continuous variables. Agreement between PRISMA-7 and PRISMA-6 was evaluated using proportional overlap, and misclassification rates were determined by identifying individuals classified as frail by one instrument but not the other.

Logistic regression models were employed to identify predictors of frailty, while adjusting for sociodemographic and health-related covariates. Sex-stratified analyses were performed to examine whether the predictors of frailty differed between men and women. Internal consistency for the PRISMA-7 and PRISMA-6 was assessed using Cronbach's alpha to determine the reliability of the instruments and evaluate the impact of excluding Item 2 on overall coherence.

Finally, proxy indicators of frailty, such as age, physical activity levels, perceived health status, and care dependency, were analysed to indirectly validate the performance of PRISMA-7 and PRISMA-6.

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3. Results

3.1. Sample Characteristics and Frailty Prevalence

The study included 1,695 community-dwelling older adults aged 75 years and older. Frailty prevalence varied depending on the scoring tool used. Employing PRISMA-7, which included Item 2 (male sex), 33.9% (n = 574) of the participants were classified as frail (Table 1). Conversely, PRISMA-6, which excluded item 2, identified 27.0% (n = 457) as frail (Table 2).

A significant disparity emerged in the frailty prevalence according to sex. PRISMA-7 indicated a higher frailty prevalence in men (34.7%) than in women (33.0%), whereas PRISMA-6 reversed this trend, demonstrating a higher frailty prevalence in women (33.0%) than in men (21.4%; $p < 0.001$).

Age was a robust predictor of frailty, with individuals aged ≥85 years exhibiting significantly higher frailty prevalence than those aged 75–84 years. Using PRISMA-7, 63.2% of those aged ≥85 years were frail compared to 13.7% in the younger cohort ($p < 0.001$). Similar trends were observed for PRISMA-6, where frailty prevalence among those aged ≥85 years was 51.4% compared with 10.1% in the 75–84 age group.

Table 1. Sample characteristics and prevalence of PRISMA-7 frailty.

Characteristics	Total (n = 1695)	Non-frail (n = 1121)	Frail (n = 574)	p-Value[1]
Gender, % (n)				0.50
Female	48.1 (815)	67.0 (546)	33.0 (269)	
Male	51.9 (880)	65.3 (575)	34.7 (305)	
Age (years), % (n)				
75-84 years	59.3 (1005)	86.3 (867)	13.7 (138)	< .001
≥ 85 years	40.7 (690)	36.8 (254)	63.2 (436)	
Native tongue, % (n)				0.12
German	53.2 (902)	64.4 (581)	35.6 (321)	
Italian	42.1 (713)	68.7 (490)	31.3 (223)	
Ladin	4.0 (67)	65.7 (44)	34.3 (23)	
Other	0.8 (13)	46.2 (6)	53.8 (7)	
Citizenship ,% (n)				0.17
Italian	98.7 (1673)	66.3 (1110)	33.7 (563)	
Other	1.3 (22)	50.0 (11)	50.0 (11)	
Community, % (n)				0.05
Urban	45.6 (773)	68.2 (629)	31.8 (293)	
Rural	54.4 (992)	63.6 (492)	36.4 (281)	
Living situation, % (n)				0.23
Living alone	30.4 (516)	77.1 (791)	32.9 (388)	
Living with partner/family	69.6 (1179)	64.0 (330)	36.0 (186)	

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Children, % (n)				0.05
Yes	79.3 (1344)	65.0 (873)	35.0 (471)	
No	20.7 (351)	70.7 (248)	29.3 (103)	
Educational level, % (n)				<.001
Below Highschool	77.8 (1319)	63.3 (835)	36.7 (484)	
Highschool or higher	22.2 (376)	76.1 (286)	23.9 (90)	
Financial resources, % (n)				< .001
Excellent or good	28.5 (483)	73.1 (353)	26.9 (130)	
Adequate	49.4 (837)	67.7 (567)	32.3 (270)	
Insufficient or low	22.1 (375)	53.6 (201)	46.4 (174)	
Overall optimism, % (n)				< .001
Yes	84.5 (1433)	69.9 (119)	30.1 (143)	
No	16.5 (262)	45.4 (1002)	54.6 (431)	
Health status, % (n)				< .001
Poor or moderate	59.7 (1012)	50.7 (513)	49.3 (499)	
Good or very good	40.3 (683)	89.0 (608)	11.0 (75)	
Physical activity				< .001
2 hours or more a week	43.2 (733)	84.4 (619)	15.6 (114)	
Less than 2 hours a week	40.1 (679)	59.6 (405)	40.4 (274)	
Never	16.7 (283)	34.3 (97)	65.7 (186)	

[1] *p*-value, chi-squared test.

Table 2. Sample characteristics and prevalence of PRISMA-6 frailty.

Characteristics	**Total sample (*n* = 1695)**	**Non-Frail (*n* = 1238)**	**Frail (*n* = 457)**	***p*-Value[1]**
Gender - % (n)				< .0001
Female	48.1 (815)	67.0 (692)	33.0 (188)	
Male	51.9 (880)	78.6 (546)	21.4 (269)	
Age (years) - % (n)				< 0.001
75-84 years	59.3 (1005)	89.9 (903)	10.1 (102)	
≥ 85 years	40.7 (690)	48.6 (335)	51.4 (355)	
Native tongue - % (n)				0.06
German	53.2 (902)	71.7 (647)	28.3 (255)	
Italian	42.1 (713)	75.3 (537)	24.7 (176)	

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Ladin	4.0 (67)	71.6 (48)	28.4 (19)	
Other	0.8 (13)	46.2 (6)	53.8 (7)	
Citizenship - % (n)				0.08
Italian	98.7 (1673)	73.3 (1226)	26.7 (447)	
Other	1.3 (22)	54.5 (12)	45.5 (10)	
Community - % (n)				0.03
Urban	45.6 (773)	75.3)694)	24.7 (228)	
Rural	54.4 (992)	70.4 (544)	29.6 (229)	
Living situation - % (n)				0.02
Living alone	30.4 (516)	74.7 (881)	25.3 (298)	
Living with partner/family	69.6 (1179)	69.2 (357)	30.8 (159)	
Children - % (n)				0.06
Yes	79.3 (1344)	71.9 (967)	28.1 (377)	
No	20.7 (351)	77.2 (271)	22.8 (80)	
Educational level - % (n)				< 0.001
Below Highschool	77.8 (1319)	80.0 (923	30.0 (396)	
Highschool or higher	22.2 (376)	83.8 (315)	16.2 (61)	
Financial resources - % (n)				< 0.001
Excellent or good	28.5 (483)	81.4 (393)	18.6 (90)	
Adequate	49.4 (837)	75.0 (628)	25.0 (209)	
Insufficient or low	22.1 (375)	57.9 (217)	42.1 (158)	
Overall optimism - % (n)				< 0.001
Yes	84.5 (1433)	53.8 (141)	46.2 (121)	
No	16.5 (262)	76.6 (1097)	23.4 (336)	
Health status - % (n)				< 0.001
Poor or moderate	59.7 (1012)	58.9 (596)	41.1 (416)	
Good or very good	40.3 (683)	94.0 (642)	6.0 (41)	
Physical activity				< .0001
2 hours or more a week	43.2 (733)	90.6 (664)	9.4 (69)	
Less than 2 hours a week	40.1 (679)	68.2 (463)	31.8 (216)	
Never	16.7 (283)	39.2 (111)	60.8 (172)	

[1] *p*-value, chi-squared test.

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3.2. Sociodemographic Factors and Frailty

Several sociodemographic variables were associated with frailty (Tables 1 and 2). The native tongue exhibited a trend towards statistical significance, with German speakers presenting a higher frailty prevalence than Italian speakers, although this disparity diminished when utilising PRISMA-6. Financial resources emerged as a significant predictor, with individuals reporting insufficient or low financial resources exhibiting a markedly higher prevalence of frailty (PRISMA-7,46.4%; PRISMA-6,42.1%; $p < 0.001$).

Living situation did not demonstrate a significant association with frailty in the PRISMA-7 or PRISMA-6 classifications. However, participants with lower educational attainment (below high school) exhibited a significantly higher prevalence of frailty, particularly when assessed using PRISMA-6. For instance, under PRISMA-6, 30.0% of individuals with low education levels were classified as frail, compared to 16.2% among those with higher education levels ($p < 0.001$).

3.3. Health, Physical Activity, and Frailty

Health status and physical activity demonstrated a strong association with frailty irrespective of the scoring tool used (Tables 1 and 2). Participants who reported poor or moderate health exhibited substantially higher frailty rates (PRISMA-7: 49.3%; PRISMA-6: 41.1%; $p < 0.001$) than those who reported good or very good health. Similarly, physical inactivity was also a significant predictor. Among participants who did not engage in physical activity, the frailty prevalence was 65.7% in PRISMA-7 and 60.8% in PRISMA-6, whereas those who exercised ≥2 h weekly exhibited markedly lower frailty rates (PRISMA-7:15.6%; PRISMA-6:9.4%; $p < 0.001$).

3.4. Gender Differences in Frailty under PRISMA-6

A more comprehensive analysis of the PRISMA-6 results (excluding item 2) revealed significant gender disparities. Frail women demonstrated lower financial resources, with 40.1% of frail women reporting insufficient income compared with 26.6% of frail men ($p = 0.01$). Furthermore, women were more likely to reside alone (54.6%) than frail men (19.7%; $p < 0.001$) and have lower educational attainment. Conversely, frail men exhibited higher levels of physical inactivity, with 32.4% reporting no physical activity than 41.3% of frail women. Table 3 presents the results.

Table 3. Sex differences in PRISMA-6 frailty prevalence.

Characteristics	Frail (n = 457)	Male (n = 188)	Female (n = 269)	p-Value[1]
Age (years), % (n)				0.09
75-84 years	10.1 (102)	18.1 (34)	25.3 (68)	
≥ 85 years	51.4 (355)	81.9 (154)	74.7 (201)	
Native tongue, % (n)				0.04
German	28.3 (255)	50.5 (95)	59.5 (160)	
Italian	24.7 (176)	45.7 (86)	33.5 (90)	
Ladin	28.4 (19)	2.7 (5)	5.2 (14)	
Other	53.8 (7)	1.1 (2)	1.9 (5)	
Citizenship, % (n)				1.00

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Italian	26.7 (447)	97.9 (184)	97.8 (263)	
Other	45.5 (10)	4 (2.1)	2.2 (6)	
Community, % (n)				0.28
Rural	29.6 (229)	46.8 (88)	52.4 (141)	
Urban	24.7 (228)	53.2 (100)	47.6 (128)	
Living situation, % (n)				< 0.001
Living alone	25.3 (298)	80.3 (151)	54.6 (147)	
Living with partner/family	30.8 (159)	19.7 (37)	45.4 (122)	
Children, % (n)				0.16
Yes	28.1 (377)	79.3 (149)	84.8 (228)	
No	22.8 (80)	20.7 (39)	15.2 (41)	
Educational level, % (n)				0.07
Below Highschool	30.0 (396)	83.0 (156)	89.2 (240)	
Highschool or higher	16.2 (61)	17.0 (32)	10.8 (29)	
Financial resources, % (n)				0.01
Excellent or good	18.6 (90)	22.9 (43)	47 (17.5)	
Adequate	25.0 (209)	50.5 (95)	42.4 (114)	
Insufficient or low	42.1 (158)	26.6 (50)	40.1 (108)	
Overall optimism, % (n)				0.36
Yes	46.2 (121)	23.9 (45)	28.3 (76)	
No	23.4 (336)	76.1 (143)	71.7 (193)	
Health status, % (n)				0.83
Poor or moderate	41.1 (416)	90.4 (170)	91.4 (246)	
Good or very good	6.0 (41)	9.6 (18)	8.6 (23)	
Physical activity				0.08
2 hours or more a week	9.4 (69)	18.6 (35)	12.6 (34)	
Less than 2 hours a week	31.8 (216)	48.9 (92)	46.1 (124)	
Never	60.8 (172)	32.4 (61)	41.3 (111)	

[1] *p*-value, chi-squared test.

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3.5. Regression Analysis

Logistic regression models identified predictors of frailty for both the PRISMA-7 and PRISMA-6. The results are presented in Table 4. Using PRISMA-7, male sex was a significant predictor of frailty (OR = 0.42, 95% CI: 0.31–0.57, $p < 0.001$), reflecting the influence of Item 2. However, when employing PRISMA-6, the effect of sex was no longer significant (OR = 1.34, 95% CI: 0.98–1.83, $p = 0.067$), and other variables assumed greater prominence.

For both instruments, age ≥85 years (PRISMA-7: OR = 12.6; PRISMA-6: OR = 9.87; $p < 0.001$), poor financial resources (PRISMA-7: OR = 1.68; PRISMA-6: OR = 2.07; $p < 0.001$), and physical inactivity (PRISMA-7: OR = 6.67; PRISMA-6: OR = 7.58; $p < 0.001$) were strong predictors of frailty. Participants reporting good or very good health were significantly less likely to be classified as frail (PRISMA-7: OR = 0.12; PRISMA-6: OR = 0.11; $p < 0.001$).

Table 4. Factors explaining frailty in community-dwelling older adults ($n = 1695$).

	PRISMA-7			PRISMA-6		
	OR	**95% CI**	***p*-Value[1]**	**OR**	**95% CI**	***p*-Value[1]**
Age and Gender						
Females (reference group: males)	0.42	0.31;0.57	< 0.001	1.34	0.98;1.83	0.067
Age ≥ 85 years (reference group: 75-84 years)	12.6	9.45;17.0	< 0.001	9.87	7.30;13.5	< 0.001
Native tongue (reference group: German)						
Italian	0.62	0.43;0.88	0.008	0.77	0.53;1.12	0.2
Ladin & others	1.03	0.53;1.98	> 0.9	1.24	0.61;2.46	0.5
Rural community (reference group: urban)	0.87	0.61;1.23	0.4	1.01	0.70;1.45	> 0.9
Living alone (reference group: living with family)	1.02	0.75;1.40	0.9	0.97	0.70;1.33	0.8
Children (reference group: yes)	0.85	0.60;1.21	0.4	0.89	0.61;1.28	0.5
Educational level (reference group: below high school)	0.90	0.62;1.31	0.6	0.93	0.62;1.39	0.7
Financial resources (reference group: excellent or good)						
Adequate	1.21	0.86;1.71	0.3	1.28	0.88;1.87	0.2
Insufficient or low	1.68	1.12;2.52	0.012	2.07	1.36;3.16	< 0.001
Lifestyle and health-related factors						
Overall optimism (reference group: no)	0.47	0.33;0.67	< 0.001	0.54	0.38;0.78	< 0.001
Good or very good health status (reference group: poor or moderate)	0.12	0.09;0.17	< 0.001	0.11	0.07;0.16	< 0.001
Physical activity (reference group: ≥ 2 hours a week)						
Less than 2 hours a week	2.60	1.89;3.59	< 0.001	2.64	1.86;3.77	< 0.001
Never	6.67	4.46;10.1	< 0.001	7.58	5.01;11.6	< 0.001

[1] *P*-value, logistic regression analyses, Abbreviations: OR, odds ratio; CI, confidence interval.

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3.6. Impact of Male Sex on Frailty Classification

The exclusion of item 2 from PRISMA-7 (PRISMA-6) led to a reduction in the overall frailty prevalence from 33.9% to 27.0%. This shift disproportionately affected men, reducing their frailty prevalence from 34.7% to 21.4%, whereas the prevalence of frailty in women remained largely unchanged at 33.0%. Internal consistency upon the exclusion of item 2 improved (Cronbach's alpha for PRISMA-7 = 0.64 vs. PRISMA-6 = 0.75) suggesting its removal.

4. Discussion

This study evaluated the suitability of PRISMA-7 as a self-reported frailty screening tool in community-dwelling older adults in South Tyrol, with a particular focus on the impact of Item 2 ("Are you male?") for frailty classification. The findings reveal that while PRISMA-7 is known to effectively identify frailty, it disproportionately classifies men as frail due to the inclusion of item 2, introducing a potential gender bias. When item 2 was excluded (PRISMA-6), frailty prevalence shifted significantly, with women demonstrating higher frailty rates, aligning with the broader literature on sex differences in frailty. These results challenge the validity of the PRISMA-7 in contexts where gender equity is paramount and suggest that the PRISMA-6 may provide a more accurate and equitable assessment of frailty.

Our findings corroborate prior evidence on sex differences in frailty and extend the discussion to the implications of excluding item 6 from the PRISMA-7 questionnaire, as highlighted in the Green study, where its irrelevance in the Greek context prompted its removal to improve cultural sensitivity and tool applicability [20]. Numerous studies have demonstrated that women exhibit a higher frailty prevalence due to longer life expectancy, greater multimorbidity, and higher rates of disability [21–25]. Furthermore, women experience more severe frailty trajectories and worse outcomes when frail, suggesting differences in frailty profiles rather than in prevalence [26].

PRISMA-7, with item 2, contradicts these established patterns by consistently identifying a higher prevalence of frailty in men. Validation studies in Brazil, China, and Turkey have similarly highlighted this anomaly, attributing it to item 2's disproportionate weighting rather than to clinically significant differences in frailty [11–13]. These findings, consistent with our results, indicate that the inclusion of item 2 biases frailty classification, particularly in male-dominated or gender-balanced cohorts.

The exclusion of item 2 in PRISMA-6 rectified this gender bias, revealing a frailty prevalence pattern more congruent with other clinical and epidemiological assessments. For instance, women demonstrated a higher frailty prevalence under PRISMA-6, consistent with age-related trends and self-reported health limitations (Table 3). This supports the hypothesis that item 2 artificially inflates frailty prevalence in men, thereby skewing the overall results.

The findings have significant implications for the implementation of frailty screening at the population level, particularly in primary care settings, as mandated by Italian Ministerial Decree 77/2022 [10] and performe in the Italian region of **Friuli Venezia Giulia [27]**. PRISMA-7's apparent gender bias poses a challenge for equitable care delivery. Systematic misclassification of frailty in men could lead to overutilisation of healthcare resources or misallocation of interventions, while underreporting frailty in women could result in missed opportunities for early intervention and prevention [28].

PRISMA-6, which excludes Item 2, has emerged as a more balanced alternative, providing a tool that is better aligned with an evidence-based understanding of frailty [21–25]. Its adoption would mitigate gender bias and allow for more accurate identification of at-risk individuals, particularly women, whose frailty profiles are often underappreciated in male-weighted scoring systems.

Despite the strengths of this study, including its representative population sample and comprehensive analysis, several limitations should be considered. First, the absence of a validated gold standard for frailty, such as the Clinical Frailty Scale or Fried's Frailty Phenotype, precludes direct sensitivity and specificity analyses of PRISMA-7 and PRISMA-6 [29]. Second, the study design

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limits the ability to assess the long-term predictive validity of PRISMA-7 and PRISMA-6 for adverse health outcomes, such as hospitalisation or mortality. Lastly, the findings are specific to South Tyrol's multilingual and multicultural population and may not be generalisable to other settings. Future research should address these limitations by validating the PRISMA-6 against a recognised gold standard in longitudinal studies. Cross-cultural adaptations and validation in diverse populations would also ensure the broader applicability of the findings.

These findings provide substantial evidence to support the formal validation of PRISMA-6 as an independent frailty screening instrument. This validation process should encompass an evaluation of PRISMA-6 and PRISMA-5 (excluding both item 2 and item 6, which refers to the possibility of having a person that may provide help in case of need, as proposed in the Greek validation study [20]) in comparison with established instruments such as the Clinical Frailty Scale [30]. The analysis should assess their capacity to predict adverse outcomes, including hospitalisation and functional decline, while examining internal consistency, reliability, and construct validity to determine if the exclusion of these items enhances the coherence of the instruments. Moreover, the validation process should ensure that PRISMA-6 and PRISMA-5 perform consistently across genders without compromising sensitivity or specificity, thereby addressing potential gender and cultural biases.

5. Conclusions

This investigation elucidates the limitations of PRISMA-7 as a frailty screening instrument attributable to the gender bias introduced by Item 2. PRISMA-6 is a promising alternative, demonstrating greater congruence with established frailty patterns and reduced gender bias. Given the increasing emphasis on population-level frailty screening, validating the PRISMA-6 could contribute significantly to equitable and effective healthcare planning and resource allocation. Subsequent research should prioritise this validation to ensure robust and unbiased frailty assessment in diverse clinical and community settings.

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Abbreviations

The following abbreviations are used in this manuscript:

ASTAT	The Provincial Institute of Statistics of Alto Adige - South Tyrol
CI	Confidence interval
DOAJ	Directory of open access journals
EU GDPR	European Union General Data Protection Regulation
GP	General Practitioner
MDPI	Multidisciplinary Digital Publishing Institute
OR	Odds ratio
PRISMA	Program of Research to Integrate Services for the Maintenance of Autonomy

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STROBE **Strengthening the Reporting of Observational studies in Epidemiology**

References

1. Doody, P.; Lord, J.M.; Greig, C.A.; Whittaker, A.C. Frailty: Pathophysiology, Theoretical and Operational Definition(s), Impact, Prevalence, Management and Prevention, in an Increasingly Economically Developed and Ageing World. *Gerontology* **2023**, *69*, 927–945, doi:10.1159/000528561.
2. Guo, Y.; Miao, X.; Hu, J.; Chen, L.; Chen, Y.; Zhao, K.; Xu, T.; Jiang, X.; Zhu, H.; Xu, X.; et al. Summary of Best Evidence for Prevention and Management of Frailty. *Age Ageing* **2024**, *53*, afae011, doi:10.1093/ageing/afae011.
3. Ye, L.; van Grieken, A.; Alhambra-Borrás, T.; Zhou, S.; Clough, G.; Markaki, A.; Bilajac, L.; Raat, H. Interplay of Physical, Psychological, and Social Frailty among Community-Dwelling Older Adults in Five European Countries: A Longitudinal Study. *J Urban Health* **2024**, *101*, 730–739, doi:10.1007/s11524-024-00831-5.
4. Travers, J.; Romero-Ortuno, R.; Bailey, J.; Cooney, M.-T. Delaying and Reversing Frailty: A Systematic Review of Primary Care Interventions. *Br J Gen Pract* **2019**, *69*, e61–e69, doi:10.3399/bjgp18X700241.
5. Ma, L. Current Situation of Frailty Screening Tools for Older Adults. *J Nutr Health Aging* **2019**, *23*, 111–118, doi:10.1007/s12603-018-1123-4.
6. Raîche, M.; Hébert, R.; Dubois, M.-F. PRISMA-7: A Case-Finding Tool to Identify Older Adults with Moderate to Severe Disabilities. *Arch Gerontol Geriatr* **2008**, *47*, 9–18, doi:10.1016/j.archger.2007.06.004.
7. England, N.H.S. NHS England » Identifying Frailty Available online: https://www.england.nhs.uk/ourwork/clinical-policy/older-people/frailty/frailty-risk-identification/ (accessed on 18 December 2024).
8. National Institute for Health and Care Excellence Recommendations | Multimorbidity: Clinical Assessment and Management | Guidance | NICE Available online: https://www.nice.org.uk/guidance/ng56/chapter/Recommendations (accessed on 1 August 2021).
9. Vicentini, C.; Garzaro, G.; Cornio, A.R.; Bosio, D.; Bergamaschi, E.; Parravicini, G.P.; Zotti, C.M. The Italian Policy of Mandating SARS-CoV-2 Vaccination for Healthcare Workers: Analysis of the Policy Processes and Preliminary Outcomes. *Health Policy* **2023**, *128*, 49–54, doi:10.1016/j.healthpol.2022.11.006.
10. Mauro, M.; Giancotti, M. The 2022 Primary Care Reform in Italy: Improving Continuity and Reducing Regional Disparities? *Health Policy* **2023**, *135*, 104862, doi:10.1016/j.healthpol.2023.104862.
11. Saenger, A.L.F.; Caldas, C.P.; Raîche, M.; da Motta, L.B. Identifying the Loss of Functional Independence of Older People Residing in the Community: Validation of the PRISMA-7 Instrument in Brazil. *Arch Gerontol Geriatr* **2018**, *74*, 62–67, doi:10.1016/j.archger.2017.09.008.
12. Yeung, M.T.; Gan, Y.; Teo, S.Q.; Lim, K.Q.; Leow, H.X.; Jbabdi, M.; Raiche, M.; Yang, M. The Chinese Translation and Cross-Cultural Adaptation of PRISMA-7 Questionnaire: An Observational Study to Establish the Accuracy, Reliability and Validity. *BMC Geriatrics* **2024**, *24*, 204, doi:10.1186/s12877-024-04825-5.
13. Yaman, H.; Ünal, Z. The Validation of the PRISMA-7 Questionnaire in Community-Dwelling Elderly People Living in Antalya, Turkey. *Electron Physician* **2018**, *10*, 7266–7272, doi:10.19082/7266.
14. Ahrenfeldt, L.J.; Möller, S.; Thinggaard, M.; Christensen, K.; Lindahl-Jacobsen, R. Sex Differences in Comorbidity and Frailty in Europe. *Int J Public Health* **2019**, *64*, 1025–1036, doi:10.1007/s00038-019-01270-9.
15. Pitter, J.G.; Zemplényi, A.; Babarczy, B.; Németh, B.; Kaló, Z.; Vokó, Z. Frailty Prevalence in 42 European Countries by Age and Gender: Development of the SHARE Frailty Atlas for Europe. *GeroScience* **2024**, *46*, 1807–1824, doi:10.1007/s11357-023-00975-3.
16. von Elm, E.; Altman, D.G.; Egger, M.; Pocock, S.J.; Gøtzsche, P.C.; Vandenbroucke, J.P. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: Guidelines for Reporting Observational Studies. *Lancet* **2007**, *370*, 1453–1457, doi:10.1016/S0140-6736(07)61602-X.
17. Peterlini, O. The South-Tyrol Autonomy in Italy: Historical, Political and Legal Aspects. In *One Country, Two Systems, Three Legal Orders - Perspectives of Evolution: : Essays on Macau's Autonomy after the Resumption of Sovereignty by China. Oliveira, J. C., & Cardinal, P. (Eds.).*; Springer: Berlin Heidelberg, 2009 ISBN 978-3-540-68571-5.

18. Braun, T.; Grüneberg, C.; Thiel, C. German Translation, Cross-Cultural Adaptation and Diagnostic Test Accuracy of Three Frailty Screening Tools. *Z Gerontol Geriat* **2018**, *51*, 282–292, doi:10.1007/s00391-017-1295-2.
19. Zaboli, A.; Brigo, F.; Brigiari, G.; Massar, M.; Ziller, M.; Sibilio, S.; Turcato, G. Comparative Analysis of Frailty Scales in Emergency Department: Highlighting the Strengths of the Triage Frailty and Comorbidity Tool. *J Emerg Nurs* **2024**, S0099-1767(24)00257-5, doi:10.1016/j.jen.2024.09.012.
20. Soulis, G.; Kyriakopoulou, E.; Leventouri, A.; Zigkiri, E.; Efthymiou, V.; Kentros, Z.; Koutsouri, A. Pilot Testing of Useful Tools' Validity for Frailty Assessment in Greece: Translated PRISMA-7 Tool, Modified Fried Criteria and Clinical Frailty Scale. *Healthcare* **2024**, *12*, 930, doi:10.3390/healthcare12090930.
21. Gordon, E.H.; Hubbard, R.E. Differences in Frailty in Older Men and Women. *Med J Aust* **2020**, *212*, 183–188, doi:10.5694/mja2.50466.
22. Gordon, E.H.; Hubbard, R.E. Do Sex Differences in Chronic Disease Underpin the Sex-Frailty Paradox? *Mech Ageing Dev* **2019**, *179*, 44–50, doi:10.1016/j.mad.2019.02.004.
23. Gordon, E.; Hubbard, R. Physiological Basis for Sex Differences in Frailty. *Curr Opin Physiol* **2018**, *6*, 10–15, doi:10.1016/j.cophys.2018.02.013.
24. Zeidan, R.S.; McElroy, T.; Rathor, L.; Martenson, M.S.; Lin, Y.; Mankowski, R.T. Sex Differences in Frailty among Older Adults. *Exp Gerontol* **2023**, *184*, 112333, doi:10.1016/j.exger.2023.112333.
25. Park, C.; Ko, F.C. The Science of Frailty: Sex Differences. *Clin Geriatr Med* **2021**, *37*, 625–638, doi:10.1016/j.cger.2021.05.008.
26. Whitesides, L.; Lynn, J. The Psychosocial Effects of Frailty on Women. *Clin Geriatr Med* **2021**, *37*, 543–552, doi:10.1016/j.cger.2021.05.003.
27. Regione Autonoma Friuli Venezia Giulia - Prisma-7 Available online: https://www.regione.fvg.it/rafvg/cms/RAFVG/salute-sociale/promozione-salute-prevenzione/FOGLIA38/?utm_source=chatgpt.com (accessed on 18 December 2024).
28. Boreskie, K.F.; Hay, J.L.; Boreskie, P.E.; Arora, R.C.; Duhamel, T.A. Frailty-Aware Care: Giving Value to Frailty Assessment across Different Healthcare Settings. *BMC Geriatrics* **2022**, *22*, 13, doi:10.1186/s12877-021-02722-9.
29. Bamps, J.; Capouillez, B.; Rinaldi, R.; Patris, S. Frailty Detection by Healthcare Professionals: A Systematic Review of the Available English and French Tools and Their Validation. *Eur Geriatr Med* **2023**, *14*, 773–787, doi:10.1007/s41999-023-00806-w.
30. Rockwood, K.; Song, X.; MacKnight, C.; Bergman, H.; Hogan, D.B.; McDowell, I.; Mitnitski, A. A Global Clinical Measure of Fitness and Frailty in Elderly People. *CMAJ* **2005**, *173*, 489–495, doi:10.1503/cmaj.050051.