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Associations Between Social Isolation and Physical Frailty in Older Adults: A Systematic Review and Meta-Analysis

To the Editor:

The emergence of COVID-19 has drastically changed our daily lives.[1] Lockdowns were imposed across many countries for extended periods of time during the pandemic to reduce the risk of infection.[1] However, the side effects of lockdowns included loss of opportunities to socialize and interact with other people. Social isolation and its impacts on health have since been highlighted, especially among high-risk populations of older people.[1] Social isolation has been well documented as a significant risk factor of mortality, and has also been shown to be associated with poorer physical and mental health.[2]

Frailty is a geriatric syndrome characterized by cumulative age-related health deficits, decreased physiological reserve, and increased vulnerability to stressors.[3,4] Although social isolation and frailty are common in older adults, evidence is limited in the literature regarding the associations between social isolation and frailty.[5] The aim of this systematic review and meta-analysis was to investigate the associations between social isolation and frailty in community-dwelling older adults.

Methods

Search Strategy and Study Selection

The protocol was developed according to the PRISMA statements. PubMed was searched in March 2022 without language restriction for longitudinal and cross-sectional observational studies published in 2000 or later providing associations between social isolation and physical frailty. The populations included community-dwelling older adults with a mean age of 60 or older. The search strategy used the Medical Subject Heading (MeSH) and text terms: "social isolation (MeSH)" OR "social isolation" OR "socially isolated" OR "Berkman-syme" OR "Lubben" OR "disconnectedness" AND "frailty (MeSH)" OR "frailty" OR "frailties" OR "frail elderly (MeSH)" OR "frail elderly". Reference lists of relevant articles were also searched. It was attempted to contact study authors for necessary data. Risks of bias were examined using the 8-item Joanna Briggs Institute Critical Appraisal Checklist for Analytical Cross-Sectional Studies (https://jbi.global/sites/default/files/2019-05/JBI_Critical_Appraisal-Checklist_for_Analytical_Cross_Sectional_Studies2017_0.pdf) and were considered to be low if the score was ≥4 of 8. Odds ratios (ORs) of social isolation and frailty were combined using fixed-effects meta-analysis. Publication bias was examined by visually inspecting a funnel plot. Data analyses were performed using Review Manager 5 (The Cochrane Collaboration, Copenhagen, Denmark).

Results

Among 317 citations identified by the systematic review, 5 cross-sectional studies and 4 longitudinal studies were included in this review (Supplementary Table 1). A fix-effect meta-analysis combining ORs from 3 cross-sectional studies[6–8] showed significant association between social isolation and frailty (3 studies: pooled OR = 1.88; 95% confidence interval = 1.60–2.20; $P < .001$) (Figure 1). All 3 studies were considered to have low risk of bias (all studies scored 8 of 8). Heterogeneity was low ($I^2 = 21\%$; $P = .28$). It was difficult to assess the funnel plot because of the limited number of the included studies. Longitudinal studies examining associations between social isolation used different statistical methodologies; therefore, they could not be combined by meta-analysis. These studies showed mixed results, most of which did not reach statistical significance.

Discussion

The current review and meta-analysis pooling data from 3 cross-sectional studies suggests that socially isolated older adults are significantly more likely to be frail compared with their counterparts.

There is little evidence on longitudinal associations between social isolation and frailty,[9] and how these 2 entities are associated is not known. One study of 2346 older adults in England showed that only men with high social isolation level had an increased risk of becoming frail.[10] Although we could not find previous studies that investigated if baseline frailty may contribute to the development of social isolation, it may be plausible to consider the direction of the pathway. Frail older people tend to have impaired physical functions,[3] such as slow gait speed or difficulty in activities of daily living, which may limit interaction and socialization with others, increasing risk of social isolation.[9]

Strengths of this study include the use of comprehensive methodology following the PRISMA statements, search strategy using the MeSH and text terms, identification of a study from another source, screening by 2 investigators, assessment of risk of bias, heterogeneity, publication bias, and successful performance of a meta-analysis to provide pooled evidence. As for limitations, a small number of studies were used for the meta-analysis, which

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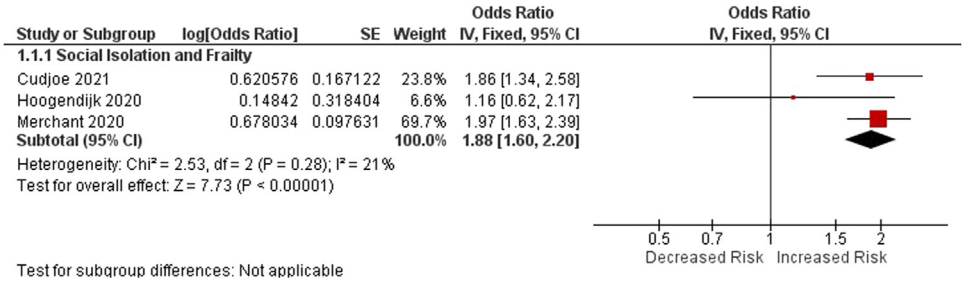

Fig. 1. Forest plot of ORs of cross-sectional association between social isolation and frailty.

hinders sensitivity, and subgroup and meta-regression analyses. It was not possible to combine results of longitudinal studies due to different methodologies; therefore, the directionality cannot be inferred. All ORs used for the meta-analysis were not adjusted for important confounders.

This is the first pooled evidence of significant cross-sectional association between social isolation and frailty in community-dwelling older adults. More research, especially longitudinal studies, is clearly needed to enable the enhancement of our understanding of the underlying mechanisms and pathophysiology of social isolation and frailty.

Author Contributions

Study concept and design: GK, RA, and MT. Analysis and interpretation of data: GK, RA, and MT. Drafting the article: GK. Revising the article critically for important intellectual content: GK, RA, and MT. Final approval of the version to be published: GK, RA, and MT.

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Further readings

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Gotaro Kojima, PhD*
Department of Research, Dr. AGA Clinic, 1-4-4-9F Shimbashi, Minato-ku, Tokyo, 105–0004, Japan
* Address correspondence to Gotaro Kojima, PhD, Department of Research, Dr. AGA Clinic, 1-4-4-9F Shimbashi, Minato-ku, Tokyo, 105–0004, Japan.
E-mail address: gotarokojima@yahoo.co.jp

Reijiro Aoyama, PhD
Department of Japanese Studies, The Chinese University of Hong Kong, Shatin, Hong Kong

Marianne Tanabe, MD
Veterans Affairs Pacific Islands Health Care System, Honolulu, HI, USA

Supplementary Table 1
Summary of Included Studies on Social Isolation and Frailty

Author/Year/Study Name	Location	Sample Size	Female, %	Age (Range)	Social Isolation Measures	Frailty Criteria	Study Design (Follow-up)	Findings
Cross-sectional studies								
Mulasso 2016[1] Act on Ageing	Italy	210	66.2	73.4 (≥65)	Friendship Scale (0–24)	mCHS	CS	- Mean score ± SD for robust, prefrail, and frail participants were 19.82 ± 4.21, 18.25 ± 4.55, and 16.45 ± 4.50
Hayashi 2020[2]	Japan	380	47.9	72.3 (-)	LSNS-6 (0–30) (SI = 0–12)	mCHS	CS	Unadjusted logistic regression model - cOR = 1.50 (0.91–2.47) of SI for being frail/prefrail (ref: robust)
Hoogendijk 2020[3] LASA	Netherlands	1427	57.3	75.5 (≥65)	Original scale (0–3) (SI = 2–3)	mCHS	CS	Unadjusted logistic regression model - cOR = 1.86 (1.34–2.58) of SI for being frail (ref: nonfrailty)
Merchant 2020[4]	Singapore	202	78.2	74.1 (≥60)	LSNS-6 (0–30) (SI = 0–12)	FRAIL	CS	Unadjusted logistic regression model - cOR = 1.16 (0.62–2.16) of SI for being frail (ref: nonfrailty) - cOR = 2.33 (0.61–8.89) of SI for being frail (ref: robust) - cOR = 1.10 (0.59–2.06) of SI for being prefrail (ref: robust)
Cudjoe 2021[5] NHATS	USA	4648	55.4	76.0 (≥65)	Berkman-Syme Social Network Index (SI = 1 or higher)	mCHS	CS	Unadjusted logistic regression model - cOR = 1.97 (1.63–2.39) of SI for being frail (ref: nonfrailty) - cOR = 2.45 (1.98–3.03) of SI for being frail (ref: robust) - cOR = 1.64 (1.34–2.01) of SI for being prefrail (ref: robust)
Longitudinal studies								
Gale 2018[6] ELSA	UK	2346	56.9	69.3 (≥60)	Original scale (0–5)	mCHS	LT (4 y)	Multinomial logistic regression models of baseline loneliness for worsening frailty (ref: low social isolation, robust) - aOR = 0.92 (0.73–1.15) of average SI for prefrailty - aOR = 0.88 (0.57–1.36) of average SI for frailty - aOR = 1.19 (0.93–1.53) of high SI for prefrailty - aOR = 1.12 (0.70–1.78) of high SI for frailty
Jarach 2021[7] SHARE	European countries*	27,468	54.6	70.5 (≥60)	Original scale (0–3)	mCHS	LT (2 years)	Multinomial logistic regression models of baseline SI for frailty change ([†]$P < .05$) - aOR = 1.17 of average SI for robust to prefrail[†] - aOR = 1.84 of average SI for robust to frail[†] - aOR = 1.62 of average SI for prefrail to frail[†] - aOR = 0.93 of average SI for prefrail to robust - aOR = 0.84 of average SI for frail to prefrail - aOR = 1.14 of average SI for frail to robust - aOR = 1.35 of high SI for robust to prefrail[†] - aOR = 2.06 of high SI for robust to frail[†] - aOR = 1.90 of high SI for prefrail to frail[†] - aOR = 0.89 of high SI for prefrail to robust - aOR = 0.96 of high SI for frail to prefrail - aOR = 0.82 of high SI for frail to robust
Uno 2021[8]	Japan	229	53.7	69.3 (≥60)	LSNS-6 family (0–15) (family SI = 0–6) LSNS-6 friend (0–15) (friend SI = 0–6)	mCHS	LT (1 year)	- aOR = 0.61 (0.23–1.63) of family SI for incident prefrailty - aOR = 4.58 (2.11–9.92) of friend SI for incident prefrailty

(*continued on next page*)

Supplementary Table 1 (*continued*)

Author/Year/Study Name	Location	Sample Size	Female, %	Age (Range)	Social Isolation Measures	Frailty Criteria	Study Design (Follow-up)	Findings
Ge 2022[9] PHI Survey	Singapore	606	57.6	70.1 (≥60)	LSNS-6 family subscale and friends subscale	CFS[†]	LT (3 years)	Fixed-effects ordinal logistic regression of baseline SI for worsening frailty - aOR = 1.05 (0.97−1.14), $P = .231$ for LSNS-6 Family - aOR = 0.99 (0.92−1.07), $P = .782$ for LSNS-6 Friends

aOR, adjusted odds ratio; CFS, Clinical Frailty Scale; cOR, calculated odds ratio; CS, cross-sectional study design; ELSA, English Longitudinal Study of Ageing; LSNS-6, 6-item Lubben Social Network Scale; LT, longitudinal study design; mCHS, Modified Cardiovascular Health Study criteria; NHATS, National Health and Aging Trends Study; PHI Survey, Population Health Index Survey; SI, social isolation.

*Sweden, Denmark, Austria, Germany, France, Switzerland, Belgium, Luxembourg, Czech Republic, Slovenia, Spain, Italy, and Israel.

[†]$P < .05$.

[‡]CFS as a 7-level ordered variable.