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Research Letters

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. Lockdowns were imposed across many countries for extended periods of time during the pandemic to reduce the risk of infection. 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. 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.

Frailty is a geriatric syndrome characterized by cumulative age-related health deficits, decreased physiological reserve, and increased vulnerability to stressors. Although social isolation and frailty are common in older adults, evidence is limited in the literature regarding the associations between social isolation and frailty. 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” 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 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 (I² = 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, 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. 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, 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.

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
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 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
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 20161          | 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 20202          | 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 20203       | 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: nonfrail)                                    |
| Merchant 20204         | Singapore         | 202         | 78.2      | 74.1 (≥60)  | LSNS-6 (0–30) (SI = 0–12)  | mCHS CS         |                         | Unadjusted logistic regression model - cOR = 1.16 (0.62–2.16) of SI for being frail (ref: nonfrail) - 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 20215           | 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: nonfrail) - 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 20186             | 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 20217           | 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 frail to prefrail - aOR = 0.93 of average SI for frail to prefrail - aOR = 0.84 of average SI for frail to prefrail - aOR = 1.14 of average SI for frail to prefrail - aOR = 1.35 of high SI for robust to prefrail - aOR = 2.06 of high SI for robust to frail - aOR = 1.50 of high SI for prefrail to frail - aOR = 0.89 of high SI for prefrail to frail - aOR = 0.96 of high SI for frail to prefrail - aOR = 0.82 of high SI for frail to robust - 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 |
| Uno 20218              | 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) |                         | (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<sup>7</sup> PHI Survey | Singapore | 606 | 57.6 | 70.1 (<60) | LSNS-6 family subscale and friends subscale | CFS<sup>z</sup> | 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 |

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<sup>aOR</sup>, adjusted odds ratio; <sup>CFS</sup>, Clinical Frailty Scale; <sup>cOR</sup>, 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.

<sup>1</sup>Sweden, Denmark, Austria, Germany, France, Switzerland, Belgium, Luxembourg, Czech Republic, Slovenia, Spain, Italy, and Israel.

<sup>2</sup>P < .05.

<sup>3</sup>CFS as a 7-level ordered variable.