Frailty in aging and its influence on perceived stress exposure and stress-related symptoms: evidence from the Swiss Vivre/Leben/Vivere study

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Abstract

Frailty is a core concept in understanding vulnerability and adjustment to stress in older adults. Adopting the perspective provided by the transactional model of stress and coping (Lazarus and Folkman in *Stress, appraisal, and coping*, Springer, New York, 1984), the present study examined three aspects of frailty in older adults: (1) the link between frailty and perceived stress exposure (PSE); (2) the link between frailty and stress-related symptoms (SRS); and (3) the role of frailty in the link between PSE and SRS. Participants were 2711 adults aged between 64 and 101 years who were taking part in the Swiss Vivre/Leben/Vivere study. As well as assessing frailty, we measured PSE and SRS during the 4 weeks preceding the administration of the questionnaires, together with the covariates age, sex, educational attainment, language of the canton, and type of canton (urban vs. rural). Regression analyses revealed higher levels of PSE in frail older adults than in non-frail older adults. In addition, frail older adults reported more SRS than non-frail older adults. As expected, the association between PSE and SRS differed as a function of the frailty status: The positive relation between PSE and SRS being stronger for frail older adults than for non-frail older adults. These results suggest that frailty is related to perceived discrepancy between resources and demands, and to ability to cope with PSE. Our findings have implications for interventions to help frail older adults manage stress.

Keywords Perceived stress exposure · Stress-related symptoms · Frailty · Vivre/Leben/Vivere study

Introduction

Frailty is a multidimensional, interdisciplinary concept describing a clinical syndrome prevalent in older populations and resulting in dysregulations in several interdependent systems (e.g., Rolland et al. 2011; Walston et al. 2006), and by a variety of observable deficits, including sarcopenia, weakness, slowness, poor balance, lack of energy/low activity, and cognitive impairment. Usually inferred from the presence of several such deficits (accumulation of deficits model; Rockwood et al. 1994; Sternberg et al. 2011), it is often viewed as an intermediary stage between independence and dependence, or as a “precursor state” to dependence. In fact, frailty can have a profound influence on functional loss or even death (e.g., Bortz 2002; Buchner and Wagner 1992). Consequently, it is an important issue with respect to human development and aging, and a major focus for researchers, practitioners, and policymakers, who are looking for ways to prevent frailty, and to identify and care for frail older adults.

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Given the detrimental effects of frailty on quality of life, the ultimate aim of research in this field is to find ways of halting the processes underlying frailty, before they lead to serious consequences. However, in order to achieve this goal, it is first necessary to develop a more complete understanding of these processes. The present study contributes to an important aspect of this research—determining how frail older adults perceive and react to adverse stressors such as stressful events or chronic conditions—by investigating the role played by stress perception and stress management in the frailty process.

The way frail adults experience stress events is central to the definition of frailty. The approaches used to define and study frail individuals share the idea that “the core feature of frailty is increased vulnerability to stressors due to impairments in multiple, inter-related systems that lead to decline in homeostatic reserve and resiliency” (Bergman et al. 2007). In other words, frail people have a lower capacity to adapt (e.g., Avila-Funes et al. 2008; Clegg et al. 2013; Fried et al. 2001; Morley et al. 2013; Rolland et al. 2011). This view is supported by empirical research, showing a higher risk of adverse outcomes among frail elders after hospitalization (e.g., Dasgupta et al. 2009; Evans et al. 2014; Lee et al. 2010). Other empirical evidence confirms the particularities of the stress process among frail individuals. For example, according to Johar et al. (2014), after taking into account age, sex, education, body mass index (BMI), smoking, and multimorbidity, frail individuals aged between 60 and 90 years characteristically display dysregulated cortisol excretion patterns, with reduced levels of cortisol in the morning and higher levels in the evening. Cortisol is a biomarker of stress, and this type of dysregulation in its diurnal secretion patterns is typically associated with health problems. Another study (Chaves et al. 2008) reported a link between frailty in older women and decreased heart rate variability, suggesting an association between frailty status and the mechanisms involved in stress reactivity.

Although frailty is seen as a source of individual differences, in terms of adaptation to stressful events, it has not been systematically examined in the light of current perspectives on stress. One such perspective is provided by the transactional model of stress and coping (Lazarus and Folkman 1984, 1987), which builds on classic biological approaches (Cannon 1929; Selye 1956) by integrating the notion of stressor appraisal. According to this model, stress reactions depend on how people appraise adverse events or situations, with stress occurring when there is a discrepancy between perceived situational demands (*primary appraisal*) and perceived resources to cope with the stressor (*secondary appraisal*). More specifically, primary appraisal concerns the perceived nature and degree of risk a stressor poses to personal goals, whereas secondary appraisal concerns perceptions of the controllability and efficacy of potential

responses to the stressor. Stress reactions occur when people perceive an event as harmful, but feel that their potential responses will be inadequate or uncertain.

The goal of the present study was to examine frailty status as a risk factor in terms of appraisal. We did this by analyzing data collected as part of a large, Switzerland-wide survey of older adults, which included measures of frailty, perceived stress exposure (PSE), and stress-related symptoms (SRS). First, in the light of the transactional perspective on stress and coping, we expected frail older adults to experience stress more frequently than non-frail older adults, because frail older adults are more likely to feel they have limited resources for coping and are therefore more likely to perceive an event or a situation as stressful. Consequently, we hypothesized that PSE would be higher for frail older adults than for non-frail older adults (hypothesis 1). Second, according to the transactional model of stress and coping, after the appraisal stage people adopt strategies to cope with and facilitate recovery from the stress, we postulated that frail older adults would be more likely, than non-frail older adults, to have limited actual coping strategies and therefore be more likely to experience stress-related consequences. Consequently, our second hypothesis was that SRS would be greater for frail older adults than for non-frail older adults (hypothesis 2). In addition, greater SRS at a given moment should be related to higher PSE, at this same moment. Because frail older adults could be expected to adapt less well to PSE than non-frail older adults, the relation between this PSE and SRS should be stronger for frail older adults than for non-frail older adults. Consequently, we hypothesized that the effect of the frailty–PSE interaction on SRS would result in the link between PSE and SRS being stronger for frail older adults than for non-frail older adults (hypothesis 3).

Method

Participants

Participants in the present study were selected from the large, representative sample of older adults recruited to take part in the Vivre/Leben/Vivere (VLV) study. VLV is a major interdisciplinary survey of health and vulnerability factors in older adults that was set up to assess life conditions of older adults and explore the factors influencing variations in life conditions (Ludwig et al. 2014). Participants for this study were recruited from Switzerland’s three main language areas (French speaking = Geneva and Valais cantons; German speaking = Bern and Basel cantons; Italian speaking = Ticino canton). The analyses for the present study were carried out on a subsample of 2711 participants from the VLV survey ($N = 3080$), obtained by excluding

Table 1 Description of the items measuring frailty and the criteria used to determine whether a domain is impaired

Domains	Items	Modality of responses	Criteria to determine whether a domain is impaired (0: not impaired, 1: impaired)
Mobility	Going up and down stairs Moving around outside Walking 200 meters	No Yes but with difficulty Yes but without major difficulty	Response “no” or “yes but with difficulty” on at least one item
Sensorial capabilities	Reading a text Hearing a conversation between two persons Hearing a conversation between more than two persons	No Yes but with difficulty Yes but without major difficulty	Response “no” or “yes but with difficulty” on at least one item
Energy	I feel tired I have a good appetite	Never Sometimes Often Always	Response “often” or “always” to the fatigue item, or response “never” or “sometimes” to the appetite item
Memory	Memory complaints	Never Sometimes Often Always	Response “often” or “always”
Physical disorders	Pain, cramping, trembling, or swelling of the lower limbs (feet, legs, knees, hips, etc.) Pain, cramping, trembling, or swelling of the upper limbs (hands, wrists, elbows, arms, shoulders) Headaches or pains at the face level Back pains Cardiac arrhythmia: palpitations and pains Respiratory problems: asthma, chronic coughs, sore throat Stomach pain, diarrhea, constipation Pain, discomfort or malfunction of the genitals or urinary system Pain in the chest, feeling pressure Temperature	No, not at all Yes, a little Yes, a lot	Response “yes, a lot” on at least one item

participants who had dependency issues ($N = 94$) as measured by the five items of the activities of daily living scale (ADL, Katz et al. 1970) or who had not provided information about their frailty status ($N = 52$). From the remaining sample, we also excluded the participants who had not provided complete data on the other variables of interest ($N = 223$: 172 participants who had at least an entire measure missing and 51 participants who had some missing data on at least 50% of the items for a given scale). Characteristics of our analysis sample and of the excluded participants are presented in the results section.

Measures

Data were collected via interviews conducted by trained interviewers (i.e., age, sex, cantons, Perceived Stress Scale), self-administered questionnaires (i.e., educational attainment, General Health Questionnaire), and a combination of interviews and self-administered questionnaires (i.e.,

frailty). These data were collected at the same time as other measures used for other studies.

Frailty

We operationalized frailty via a cumulative model (Lalivé d’Epinay and Spini 2008, see Guilley et al. 2008 for a similar score¹) comprising indicators covering five domains. Details about the items are presented in Table 1. In order to differentiate between non-frail and frail individuals, we calculated a “frailty score” (ranging from 0 to 5) by computing the sum of the impairment scores for each of the five domains. This score has been shown to predict dependence (Guilley et al. 2008). Applying the criteria recommended by Lalivé d’Epinay and Spini (2008), we categorized participants with

¹ The main difference is that the score we used contains two extra items measuring physical disorders. Several items were also reworded.

a maximum score of one (i.e., impairment in no more than one of the five domains) as “non-frail” and participants with a score of two or more (i.e., impairment in two or more of the five domains) as “frail”.

Perceived stress exposure (PSE)

We used the four items of the short version of the Perceived Stress Scale (PSS, Cohen 1986; Cohen et al. 1983) to measure levels of PSE. Participants had to estimate how frequently four statements applied to them during the previous 4 weeks (0 = *never*, 1 = *almost never*, 2 = *sometimes*, 3 = *often*, 4 = *very often*). The items captured PSE, that is, exposure to situational demands that exceeded personal resources. Participants had to respond to “how often have you felt: (1) you were unable to control the important things in your life, (2) confident about your ability to handle your personal problems, (3) that things were going your way, and (4) that difficulties were piling up so high you could not overcome them”. We reversed items 2 and 3 and then calculated the mean of the responses to the four items (Cronbach’s $\alpha = .587$). Higher scores indicate higher levels of PSE.

Stress-related symptoms (SRS)

The General Health Questionnaire (GHQ, Goldberg et al. 1997; Goldberg and Hiller 1979) was constructed to assess major classes of mental health phenomena that result in the “inability to carry out one’s normal ‘healthy’ functions” and “the appearance of new phenomena of a distressing nature” (Goldberg and Hiller 1979, p. 139). For the purposes of the present study, we decided to assess SRS via three of the four dimensions covered by the 28-item GHQ, that is, somatic symptoms, anxiety and insomnia, and social dysfunction. Hence, we used a shortened, 21-item version of the GHQ to obtain sub-scores for these three dimensions. Participants were asked to report the frequency with which they had experienced a series of health-related symptoms during the previous 4 weeks. They gave their responses on 4-point scales ranging from 1 (e.g., *better than usual, more so than usual, not at all*) to 4 (e.g., *much worse than usual, much less than usual, much more than usual*). We reversed the scores for the first item and then calculated the mean for each subscale. Higher scores indicate more somatic symptoms ($\alpha = .741$), higher anxiety and insomnia ($\alpha = .829$), and lower social dysfunction ($\alpha = .769$).

Covariates

We standardized age and educational attainment and then controlled for sex by coding women = 1 and men 1. In order to control for the language of the region, we created two orthogonal contrasts: C1 = 1 (*French-speaking*

region) versus = 1 (*German-speaking region*) versus 0 (*Italian-speaking region*), and C2 = = 1 (*French-speaking region*) versus = 1 (*German-speaking region*) versus 2 (*Italian-speaking region*). The type of region was coded = 1 (*urban cantons: Geneva, Basel, and the Bern-Mittelland area of the canton of Bern*) versus 1 (*rural cantons: Valais, Ticino, and the Bern-Oberland and Bern-Seeland areas of the canton of Bern*).

Data analysis

As a first step, we examined the descriptive results for the participants included in our analysis sample and for those excluded from the analyses. Second, we tested the association between frailty and PSE (hypothesis 1) via a multiple linear regression model with PSE as the outcome. Frailty was included as a predictor along with a set of control variables: age, sex, educational attainment, language of the canton, and type of canton (rural vs. urban). Third, we tested three separate multiple linear regression models, one for each GHQ outcome. The predictors of these multiple regressions were frailty (to test hypothesis 2: association between frailty and SRS), PSE and the interaction between frailty and PSE (to test hypothesis 3: the moderating role of frailty on the link between PSE and SRS), the above-mentioned control variables, and the interaction between age and PSE. We controlled for the variance accounted for by the interaction between age and PSE, because the link between PSE and SRS may depend on age as well as on frailty, with younger-old adults and older-old adults experiencing PSE differently. For example, the link between PSE and SRS may be stronger for younger-old adults because their concerns about aging (e.g., coping with retirement) may affect them more strongly or because they may employ less adaptive strategies. On the other hand, the link between PSE and SRS may be stronger for older-old adults because they feel more vulnerable. Because frailty could be expected to increase with age, we controlled for the interaction between PSE and age, so we could eliminate any effect of age when assessing the impact of frailty on the relation between PSE and SRS. In the regression analyses, we coded frailty = .5 (non-frail) versus .5 (frail), standardized the continuous variables, and coded the other dichotomous variables as described in the covariates section. We decomposed the simple effects constituting the effect of the frailty–PSE interaction on SRS (hypothesis 3) by testing the effect of PSE on the SRS sub-scores for frail adults (regression analyses recoding: = 1 = non-frail vs. 0 = frail, and calculation of the interaction) and non-frail adults (regression analyses recoding 0 = non-frail vs. 1 = frail, and calculation of the interaction).

Table 2 Description of the population

Variables	Participants included in the analyses (<i>N</i> = 2711)	Participants not included in the analyses (<i>N</i> = 369) ^a	
	Mean (SD) or %	<i>N</i>	Mean (SD) or %
Age	<i>M</i> = 77.72 (SD = 8.19)	369	<i>M</i> = 83.09 (SD = 8.84)
Sex	47.2% women	369	55.6% women
Level of education	<i>M</i> = 3.63 (SD = 1.47)	327	<i>M</i> = 3.12 (SD = 1.53)
Language of region	French = 37.4%, German = 43.9%, Italian = 18.6%	369	French = 37.7%, German = 35.0%, Italian = 27.4%
Type of region	49.0% rural	369	55.8% rural
Frailty	34.6% frail	223	50.7% frail
PSE	<i>M</i> = .85 (SD = .62)	307	<i>M</i> = 1.03 (SD = .76)
SRS—somatic symptoms	<i>M</i> = 1.53 (SD = .41)	209	<i>M</i> = 1.69 (SD = .53)
SRS—anxiety and insomnia	<i>M</i> = 1.46 (SD = .48)	203	<i>M</i> = 1.61 (SD = .64)
SRS—social dysfunction	<i>M</i> = 2.93 (SD = .27)	251	<i>M</i> = 2.79 (SD = .42)

PSE perceived stress exposure; SRS stress-related symptoms

^aSome participants were excluded from the analyses because they were dependent; others were excluded because the data they provided were incomplete. As a result, the sizes of the samples analyzed differed according to the variable being investigated

Results

Descriptive data: samples and measures

Table 2 presents percentages or means/standard deviations for the different variables describing the participants included in our analysis sample and the participants excluded from the analysis. Although data for the excluded participants sample are only partially complete (this sample includes participants for whom some data are missing), more vulnerable older adults (e.g., older participants, frail participants, participants with high PSE scores) appear to be overrepresented in this sample. The participants included in our analysis sample were generally in quite good health. For example, 65.4% of the older adults in this group were non-frail and 34.6% were frail.

Association between frailty and PSE (hypothesis 1)

The regression analysis showed a positive link between frailty and PSE [$\beta = .282$, $t(2698) = 14.308$, $p < .001$], with levels of PSE during the 4 weeks preceding the questionnaire being significantly higher in the frail older adults than in the non-frail adults.

Association between frailty and SRS (hypothesis 2)

The links between frailty and somatic symptoms [$\beta = .255$, $t(2686) = 13.001$, $p < .001$], anxiety and insomnia [$\beta = .155$, $t(2674) = 8.020$, $p < .001$], and low social dysfunction [$\beta = -.169$, $t(2627) = -8.344$, $p < .001$] were significant.

Hence, we can conclude that during the 4 weeks preceding the questionnaire the frail older adults experienced more somatic symptoms, more anxiety and insomnia, and higher social dysfunction than the non-frail older adults.

The moderating role of frailty on the link between PSE and SRS (hypothesis 3)

The effects of the frailty–PSE interaction on somatic symptoms [$\beta = .052$, $t(2686) = 2.796$, $p = .005$], anxiety and insomnia [$\beta = .069$, $t(2674) = 3.773$, $p < .001$], and social dysfunction [$\beta = -.108$, $t(2627) = -5.496$, $p < .001$] were all significant.

In order to facilitate interpretation of these interactions, we tested the link between stress and SRS for both frail and non-frail older adults by conducting two further regressions on each SRS sub-score. Results show that the relationship between PSE and SRS was stronger for the frail participants than for the non-frail participants, and that this was the case for all three components of SRS: somatic symptoms—frail participants: $\beta = .304$, $t(2686) = 10.676$, $p < .001$; non-frail participants: $\beta = .195$, $t(2686) = 7.795$, $p < .001$; anxiety and insomnia—frail participants: $\beta = .443$, $t(2674) = 15.788$, $p < .001$; non-frail participants: $\beta = .299$, $t(2674) = 12.185$, $p < .001$; social dysfunction—frail participants: $\beta = -.285$, $t(2627) = -9.412$, $p < .001$; non-frail participants: $\beta = -.062$, $t(2627) = -2.447$, $p = .014$.

The results of the three regression analyses testing the hypotheses 2 and 3 are presented in Table 3. Interestingly, when the covariates were entered in the model, age was significantly associated with anxiety and insomnia as well as

Table 3 Results of the multiple regression models with three SRS dimensions as outcomes

Predictors	Outcomes								
	Somatic symptoms			Anxiety and insomnia			Social dysfunction		
	β	t (2686)	p	β	t (2674)	p	β	t (2627)	p
Frailty	.255	13.001	.000 < .001	.155	8.020	<.001.000	– .169	– 8.344	<.001.000
PSE	.249	13.493	<.001.000	.371	20.380	<.001.000	– .174	– 8.999	<.001.000
Age	– .028	– 1.512	.131	– .099	– 5.373	<.001.000	– .123	– 6.358	<.001.000
Sex ^a	– .060	– 3.312	.001	– .027	– 1.524	.128	– .008	– .448	.654
Level of education	– .018	– 1.004	.316	.022	1.243	.214	– .017	– .893	.372
Rurality ^b	.026	1.235	.217	.029	1.404	.160	.008	.384	.701
Language-C1 ^c	.024	1.332	.183	.025	1.419	.156	.072	3.794	<.001.000
Language-C2 ^c	– .014	– .688	.492	.048	2.425	.015	.060	2.839	.005
Age x PSE interaction	– .075	– 4.022	<.001.000	– .115	– 6.322	<.001.000	– .002	– .115	.909
Frailty x PSE interaction	.052	2.796	.005	.069	3.773	<.001.000	– .108	– 5.496	<.001.000

PSE perceived stress exposure

^aSex is coded: women = – 1 and men = 1

^bThe type of region is coded urban = – 1 and rural = 1

^cThe two orthogonal contrasts coding for the language of the region are: C1 = 1 (*French-speaking region*) versus – 1 (*German-speaking region*) versus 0 (*Italian-speaking region*), and C2 = – 1 (*French-speaking region*) versus – 1 (*German-speaking region*) versus 2 (*Italian-speaking region*)

social dysfunction, but not with somatic symptoms. Older adults suffer less from anxiety and insomnia but have higher levels of social dysfunction. In addition, the interaction between age and PSE was significant in terms of somatic symptoms, anxiety and insomnia but not social dysfunction.²

Discussion

The present study used data from a large sample of older adults to investigate the link between frailty, PSE, and SRS, and to what extent frailty moderates the association between PSE and SRS. Based on the transactional model of stress and coping (Lazarus and Folkman 1984), we hypothesized that compared to non-frail individuals, frail older adults would report higher PSE and higher SRS. In addition, we expected among frail older adults, higher levels of PSE to result in more SRS. Our findings support these hypotheses. First,

we found a relationship between frailty and PSE, with frail adults reporting higher levels of PSE than non-frail adults. According to the transactional model, stress occurs when individuals perceive risks as exceeding resources; hence, our interpretation of this result is that frailty in older adults is associated with a higher likelihood of perceiving a disparity between risks and resources. This could be due to frail older adults feeling they have fewer resources than non-frail older adults. For example, difficulties in moving or low energy levels may alter people's perceptions of how well they can deal with a situation (e.g., obtain information, seek social support). Consequently, frail older adults are more likely to appraise potential stressors as stressful. Our results support this prediction. However, given the low value of the Cronbach's alpha for PSE, our results must be viewed with caution. In addition, further studies should focus on the differences between frail and non-frail older adults, for each type of appraisal (primary or secondary), in order to better understand the relative impacts of a stressor's perceived severity, and/or low self-evaluations of available resources on frail adults' perceptions of a stressor as stressful. The frail older adults in our sample also reported more SRS than the non-frail older adults, indicating that the frail older adults were more vulnerable to stress than the non-frail older adults.

In addition, our results showed that the link between PSE and SRS was stronger for frail adults than for non-frail adults. Hence, when faced with stress, frail adults are more likely to suffer from SRS than non-frail adults, which suggests that frail adults have greater difficulty adjusting to and recovering from stressful situations. Compared with

² Two additional analyses performed separately for different age groups (the continuous age variable was recoded by assigning the value of 0 to either the younger-old or older-old group) showed that the relationship between PSE and SRS was stronger for younger-old adults for somatic symptoms – younger-old adults: $\beta = .323$, t (2686) = 11.966, $p < .001$; older-old adults: $\beta = .176$, t (2686) = 7.017, $p < .001$ and for anxiety and insomnia – younger-old adults: $\beta = .485$, t (2674) = 18.205, $p < .001$; older-old: $\beta = .257$, t (2674) = 10.449, $p < .001$. This was not the case for social dysfunction – younger-old adults: $\beta = -.171$, t (2627) = – 6.062, $p < .001$; older-old: $\beta = -.176$, t (2627) = – 6.831, $p < .001$.

non-frail adults, frail adults are maybe more likely to use less suitable strategies or to have less resources to deal with the perceived stress—and therefore have a stronger effect of the PSE—for example, if they do not have the energy or the capacities needed to implement a strategy effectively. It would be useful to investigate the types of strategies frail and non-frail adults use to cope with stressors, and how effectively they use these strategies.

One potential limitation of our study arises from our assumption that frailty determines PSE, as the reverse causality is also possible. For example, perceiving a stressor such as an accident as stressful may impact an individual's frailty by impairing one or several dimensions (e.g., mobility, energy). However, we partly ruled out this reasoning by asking participants to report stressors during just a short period (4 weeks) before they completed the questionnaire. It is unlikely that any events that occurred during this short period would have been able to substantially modify as complex a concept as a participant's frailty status. In addition, a reverse causal relation between SRS and PSE may also occur, as, in addition to PSE triggering a SRS, the presence of a SRS may increase PSE. However, a SRS cannot be assumed to be stressful per se, as whether the SRS leads to increased PSE will depend on an individual's appraisal of the symptom as a stressor. In addition, some people may be more realistic about both their frailty, and the occurrence of stressors and the impact of these stressors on their health. According to this reasoning, frail adults are those who are more realistic about their frailty state. However, this does not contradict the transactional model of stress, as estimations that one has insufficient resources to cope with a potentially stressful event may be realistic.

Another of our study's limitations is the lack of information about whether frail and non-frail older adults have had to face similar stressful events. It would be interesting to examine differences and similarities between the events the frail and non-frail older adults have encountered, as well as differences and similarities in the ways frail and non-frail older adults perceive similar events. By exploring the different coping strategies older adults implement when exposed to events with different characteristics (e.g., controllability), future studies could also investigate why frail older adults are more vulnerable to stress than non-frail older adults. Such studies would provide further insights into how people use their resources to cope with negative life events (see, for example, Jopp and Schmitt 2010). In addition, we examined only the relations between frailty, PSE, and SRS. It may be that the relations between frailty and PSE also apply to other chronic health issues or long-term consequences on mental health. Another promising line for future research would be to investigate the short-term consequences of frailty and PSE on other related dimensions, such as engagement in daily life activities or need for professional care. Finally given that the

variables included do not explain all the PSE and SRS variance, further studies are needed to examine other individual and situational factors affecting older adults' PSE, and the ways in which they adapt to stress.

Conclusion

The present study investigated the often assumed but rarely tested hypothesis that frailty is associated with PSE and adaptation to stress. Results confirmed small but significant links between frailty and PSE and adaptation to stress, suggesting that efforts to prevent vulnerability in aging should target frail adults, possibly by developing interventions to attenuate or reverse frailty itself (e.g., Beswick et al. 2008). This would require identifying the most prominent aspects of frailty with respect to the stress process, and creating interventions targeting these aspects. Another possibility would be to draw on work in the field of stress management (e.g., Munz et al. 2001) in order to develop interventions to reduce the impact of stress on frail adults. Such interventions could be used to help frail people suffering from high levels of stress recognize stressors, and choose and implement effective coping strategies. Finally, in order to provide a better understanding of the dynamics of the links between frailty and stress and thereby address the issue of vulnerability among older adults, there is a need for further research focusing on the stressors experienced by older individuals. The results of such research would allow interventions to be tailored to each individual's life course and specific needs.

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