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Frailty and depressive symptoms in older adults: data from the FIBRA study - UNICAMP

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Abstract

The relationship between the presence of depression, as measured by total score on the GDS-15 scale, and both pre-frailty and frailty status in community-dwelling elderly was determined. Two thousand four hundred and two elderly residents from seven Brazilian cities (M = 72.3 years, SD = 5.5; 66 % female) were evaluated according to the five criteria comprising the frailty phenotype. Participants answered a self-report inventory of diseases, of performance on advanced and instrumental activities of daily living, and the Geriatric Depression Scale (GDS-15). The number and types of depressive symptoms were found to be higher among frail and pre-frail elderly. Thus, besides variability in depression prevalence among the frailty profiles there were also characteristic depressive symptoms for each profile of the syndrome.

Keywords: Aged, Frailty, Pre-frailty, Depressive symptoms

Background

Regarding the processes of human aging in clinical and research settings, the syndrome of frailty in the elderly is an area which, although recently included formally in the literature, has been the focus of consolidated efforts to define the concept and identify associated factors, as well as physical and psychological outcomes. Frailty has been associated with risk for adverse health outcomes in aging, such as falls, reduced mobility, loss of independence, hospitalization, disability and death (Fried et al. 2001). Currently, the most frequently adopted model of frailty is the Biological Syndrome developed by Fried et al. (2001), in which frailty is identified based on a specific phenotype. The prevalence of frailty is associated with reduced resistance to stressors of the reserve capacity of homeostasis of the organism, which leads to cumulative declines in various physiological systems, vulnerability and other negative clinical consequences.

As understanding on the biological aspects of frailty is furthered, other questions emerge regarding how frailty is related with other social and psychological aspects that can be associated with the aging process. Efforts to identify psychological aspects include studies in the literature aimed at determining potential psychological markers of frailty on two main fronts.

The first of these fronts involves research devoted to elucidating cognitive functioning in frailty and the relationships between frailty and dementia (Yassuda et al. 2012; Kelaiditi et al. 2013).

The second front, addressed in the present study, concerns characterization of emotional and sociocognitive aspects of frailty. Measures of depressive symptoms and sense of control are the main variables explored in these studies with the aim of characterizing the subjective effects of frailty and also to better understand the effects of psychological resources on the way individuals cope with the pathological condition (Puts 2006). These studies also seek to corroborate with clinical intervention, primary and secondary prevention efforts, and gerontological research.

While acknowledging the importance of identifying psychological markers and more specifically, taking as reference the relationships between depression and frailty, the complexity of this investigation is evident in as far as these two conditions can overlap, hampering the identification of mutual influence or the direction of causality.

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Depression is a psychiatric syndrome which involves psychological, behavioral and physical symptoms that can vary according to the stage of life, exhibiting peculiarities in presentation in late life (Canineu 2007). The prevalence of alternative depressive symptoms that do not meet strict diagnostic criteria tends to be greater among the elderly, associated with aging-related factors, such as a greater proportion of women, physical disabilities, cognitive impairments, low socioeconomic level, and frequent somatic complaints exacerbated in depressed elderly (Gallo and Rabins 1999; Blazer 2009; Batistoni 2010).

In Brazil, assessments using the GDS (Geriatric Depression Scale) and CES-D (Center for Epidemiological Studies - Depression) have detected a prevalence of depressive symptoms in community-dwelling elderly of around 15 % and 34 %, respectively. Thus, the prevalence of depressive symptoms varies not only due to the content of the items of the different screening scales used (Batistoni et al. 2007) but also to the heterogeneity of the depression syndrome, particularly variation in the manifestation of symptoms by age.

Generally speaking, depression in later life shares some characteristics with frailty which also leads to deficits that change the course of normal aging, such as cognitive impairment (Andersen et al. 2005); disability (Bruce 2001), fractures (Whooley et al. 1999), pain, isolation (Tavares 2004), mortality (Laursen et al. 2007) and frailty. The relationship between frailty and depression among elderly is known but not yet clear. Also, the causal relationship, i.e. whether frailty precedes depression or vice-a-versa, has yet to be established.

With the aim of establishing the relationship between depression and frailty among elderly, and identifying the causal direction to better understand risk factors, Mezuk et al. (2012a) sought to pool the body of research on the two syndromes in a review of the literature. All the studies analyzed, including both cross-sectional and cohort investigations, revealed a positive association between depressive symptomatology andfrailty status.

Mezuk et al. (2012b) analyzed the relationship between the constructs of depression and frailty based on data from the fourth wave, spanning 2004–2005, of the Baltimore Epidemiologic Catchment Area Study, by conducting a confirmatory latent class analysis, and suggested that depression and frailty are inter-related concepts but constitute separate symptoms that are not a single construct.

Feng et al. (2014) analyzed data of 1,827 Chinese adults, aged 55 years or older, participants in the Singapore Longitudinal Aging Study-I, a prospective, population-based cohort study. Frailty, assessed according to the criteria of Fried et al. (2001), as well as depressive symptoms, assessed using the GDS-15, were

determined at baseline (2003–2005) then reassessed after two (2005–2007) and four (2007–2009) years. Cross-sectional analysis of the study showed that the pre-frail and frail participants had a greater prevalence of depressive symptoms compared to non-frail individuals, after controlling for sociodemographic factors, comorbidities, and functional capacity. The longitudinal analysis also revealed that pre-frail and frail individuals were more prone to presenting new and persistent depressive symptoms at follow-ups than non-frail individuals. Exhaustion, frailty, sluggishness and low physical activity were the components of physical frailty that proved independent predictors of the onset or persistence of depressive symptoms. The results of the study support the hypothesis that frailty and depression are comorbid geriatric syndromes, while frailty represents a risk factor for the development and persistence of depressive symptoms. The authors emphasized that frailty and depression are separate clinical entities, but recognized the syndromes shared many of the same symptoms and risk factors. Frail subjects may be more prone to developing depressive symptoms due to impaired functional abilities, physical inactivity (sedentarism), and social isolation. Besides psychosocial factors, dysregulation of the neuroendocrine system is a major predisposing biological factor that precipitates and perpetuates depression in later life.

In parallel, another approach to the study of the relationships between frailty and depression, incipient in national and international studies, is the search for peculiarities of depression that present among frail and pre-frail older adults. This approach may provide insights into the psychological impacts or subjective experiences of frailty, and promote the search for psychological markers of the syndrome. Methodologically, these studies examine with greater specificity those depressive symptoms, comprising screening scales or clinical inventories of depression, that are most characteristic in frail elderly. Collard et al. (2013), for instance, identified two groups of items independently associated with frailty:one group of items represents the affective-cognitive dimension, encompassing negative cognitions in relation to self and interpersonal sensitivity. Based on a cross-sectional study, the investigation included 378 depressive and 132 non-depressive subjects, according to the criteria from the Diagnostic and Statistical Manual and Mental Disorders (DSM-IV). Depressive severity was measured using the 30-item Inventory of Depressive Symptomatology (IDS). The results suggested that frail elderly had a self-perception of being less healthy, increasing the chances of negative feelings and cognitions about themselves and others; as well as changes in appetite and weight, which overlapped with the frailty criteria.

St. John et al. (2013) investigated whether depressive symptoms were associated with frailty, whether there is a gradient effect on the continuum of depressive symptoms,

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and whether the association between the syndromes is specific for certain depressive symptoms, such as positive and negative affects, somatic complaints and interpersonal relationships. The data used in the study were drawn from the baseline of the Manitoba Study of Health and Aging (1991), whose primary objectives were to estimate the prevalence and incidence of dementia in Manitoba, a province of Canada, and to examine questions related to informal caregiving. A total of 1,705 older community-dwelling adults aged over 65 years of age took part in the study. Two measures of frailty were employed, a derivative of the Canadian Study of Health and Aging, which classifies frailty into four levels (non-frail, incontinent, mild frailty, moderate frailty and severe frailty) as well as the Frailty Index for complementary analysis. Depressive symptoms were measured using the Center for Epidemiologic Studies Depression Scale (CES-D). The authors noted a strong association between the syndromes, which had a gradual effect not limited to the association between somatic complaints and frailty but also on negative and positive affects. These results suggest that the depressives symptoms can cause changes in behavior and social engagement reflecting worsening functional status and frailty.

In Brazil, based on partial analysis of data from the study in Frailty in Brazilian Elderly (FIBRA) involving older adults from the District of Ermelino Matarazzo - São Paulo, Nascimento (2011) identified two possible markers for frailty derived from two depressive symptoms screening scales (CES-D and GDS-15), namely, negative cognitions concerning interpersonal sensitivity, i.e. of challenge to adaptive resources, represented by item 14 of the CES-D (feel lonely) and item 15 of the GDS (think others are better off), and the other of somatic-affective symptoms concerning loss of direct action resources, represented by item 7 of the CES-D (feel that managing usual tasks is an effort) and 13 of the GDS (do not feel full of energy).

Efforts devoted to this approach are in-line with calls for research into social and psychological aspects advocated by Puts et al. (2006), whose study revealed that for elderly, the psychological markers of frailty related to personal attitudes to life and highlighted several subjective criteria including being dissatisfied with life, feeling bad in some way and being pessimistic. The study also showed that measures of sense of control have been cited as being changed in frailty, representing not only a psychological marker but also a potential mediator and moderator of the relationship between frailty and depression (Jang et al. 2002). This is the case because, as pointed out by Schuurmans et al. (2004), from a psychological standpoint, frailty can be considered a loss in direct resources of action or primary control over events (as occurs in physical and psychological ability) and as a challenge to adaptive resources and recruitment of indirect resources (such as coping ability and dealing with losses), having negative implications for subjective sense of well-being of individuals.

In summary, despite an overlapping of frailty and depression criteria and the fact that both syndromes are associated with impairments and adverse outcomes for health, there remains a major gap in the current field of research on their relationships. In general, studies have been limited to the indication of depression prevalence among frail elderly or frailty among depressed elderly, with few initiatives seeking to ascertain the most characteristic depressive symptoms of the syndrome, as evidenced in the studies of Schuurmans et al. (2004), Puts (2006), Nascimento (2011), St. John et al. (2013) and Collard et al. (2013). Another gap concerns the comparison of depressive symptoms among elderly considered pre-frail and frail, since these represent different states on the same pathological continuum.

In this regard, the aim of the present study was to identify the relationships of the presence of depression, as measured by total score on the GDS-15, with frailty and pre-frailty among community-dwelling elderly. Another objective was to identify, among the specific symptoms of depression in the GDS-15, those symptoms most associated to frailty and pre-frailty, controlling for the presence of diseases, disabilities and sociodemographic variables.

Methods

Casuistic and procedure

This cross-sectional descriptive study was based on data from the electronic database of the FIBRA Network (Network for the study of Frailty in Brazilian Elderly), a population-based descriptive multi-center investigation conducted in 17 Brazilian cities (Neri et al. 2013). The study involved 2,402 elderly (≥65 years) without cognitive deficits suggestive of dementia, as measured by the Mini-Mental State Exam (MMSE), who fulfilled the variables of interest and resided in the seven cities investigated by the State University of Campinas (Unicamp), namely: Campinas (SP), Belém (PA), Parnaíba (PI), Campina Grande (PB), Poços de Caldas (MG), Ermelino Matarazzo (SP) and Ivoti (RS).

The present study was approved as a supplement to the FIBRA study by the Research Ethics Committee of the State University of Campinas (Unicamp).

Instruments

Data on the following target variables were collected: sociodemographics characterizing the sample by sex, age (stratified into three age groups: 65–69 years; 70–79 years; > 80 years), marital status, schooling (0 years; 1–4; 5–8; 9 or more years) and family income; the variable comprising the frailty phenotypes, according to the five criteria defined by Fried et al. (2001):1) non-intentional weight loss of ≥ 4.5 kg or 5 % of body weight during the

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past year; 2) fatigue assessed by self-report elicited by two questions (7 and 20) from the CES-D depression screening scale (Radloff 1977; Batistoni 2007), where fatigue was characterized by the affirmation, on three or more days of the week, that the individual felt it was an effort to carry out the 47 tasks or could not "get going" on their usual tasks; 3) low grip strength in the dominant hand measured by hand-held hydraulic dynamometer, adjusted for sex and body mass index (BMI) (Rauen et al. 2008); 4) low level of energy expenditure in kilocalories, adjusted for sex and assessed based on self-report of physical exercises and domestic chores performed in the past seven days, on the *Minnesota Leisure Time Activities Questionnaire* (Taylor et al. 1978; Ainsworth et al. 2000; Lustosa et al. in press), 5) slow gait evidenced by mean time taken to walk a distance of 4.6 m three times, adjusted for sex and height (Guralnik et al. 1994; Nakano 2007); self-reported diseases, identified based on an inventory of most prevalent diseases in the elderly population participating in the FIBRA study (Lebrão and Duarte 2003); performance of advanced and instrumental activities of daily living (AADLs and IADLs) (Lawton and Brody 1969; Reuben et al. 1990; Baltes et al. 1993); and the Geriatric Depression Scale – GDS-15 (Sheikh and Yesavage 1986; Almeida and Almeida 1999).

Statistical analysis

Descriptive analysis of frequency was employed for categorical variables, expressed as absolute frequency and percentages, whereas measures of central tendency were used for numeric variables. The Chi-square test or Fisher's exact test (for expected values < 5) was used to compare categorical variables, the Mann-Whitney test employed to compare numeric variables between two groups, and the Kruskal-Wallis for comparisons of three or more groups. Prevalence ratios of frailty and pre-frailty were explored using multivariate and univariate Poisson regression analysis with Stepwise selection criteria. The level of significance adopted for the statistical tests was 5 %, i.e. $p < 0.05$.

Results

A description of the 2,402 elderly participants is given in Table 1. The majority of the sample was from the city of Campinas (26.7 %), followed by the city of Belém (22.6 %), Ermelino Matarazzo (12 %), Poços de Caldas (11.7 %), Parnaíba (11.5 %), Campina Grande (9.1 %) and Ivoti (6.4 %). Around 66 % of the participants were female. Mean age for the overall sample was 72.3 years (SD = 5.5) and most participants were in the 65–69 and 70–74 year age ranges. In terms of frequency, there was a predominance of low schooling (1–4 years), married or widow/widower marital status and family income of 1–3 minimum wages. Mean number of disabilities was four (SD = 2.4), where over half of the sample had more than

Table 1 Sample description according to sociodemographic variables, number of disabilities and self-reported diseases, GDS and frailty profiles (*n* = 2402). FIBRA Unicamp, Elderly, 2008–2009

	Total sample (%)	Mean	Standard Deviation
City			
Campinas	642 (26.7)		
Belém	543 (22.6)		
Parnaíba	274 (11.5)		
Campina Grande	219 (9.1)	-	-
Poços de Caldas	281 (11.7)		
Ermelino Matarazzo	289 (12.0)		
Ivoti	153 (6.4)		
Sex			
Female	1579 (65.7)	-	-
Male	823 (34.3)		
Age (years)			
65–69	913 (38.0)	72.3	5.5
70–74	746 (31.1)		
75–79	456 (19.0)		
> = 80	287 (11.9)		
Schooling (years)			
0	472 (19.7)	4.4	4.0
1–4	1184 (49.3)		
5–8	433 (18.0)		
> = 9	311 (13.0)		
Marital Status			
Single	200 (8.4)	-	-
Married	1219 (50.8)		
Divorced	173 (7.2)		
Widowed	806 (33.6)		
Family Income			
<=1.0 MW	230 (11.0)	4.0	5.0
1.1–3.0 MW	1003 (48.2)		
3.1–5.0 MW	460 (22.1)		
5.1–10.0 MW	260 (12.5)		
> 10.0 MW	128 (6.2)		
No. of disabilities			
0	149 (6.2)	4.0	2.4
1–3	1200 (50.0)		
> = 4	1051 (43.8)		
No. of diseases			
0	269 (11.2)	2.2	1.5
1–2	1190 (49.6)		
> = 3	941 (39.2)		
GDS			
Yes	486 (20.2)	3.5	2.7
No	1916 (79.8)		
Frailty profile			
Frail	167 (6.9)	-	-
Pre-frail	1203 (50.2)		
Non-frail	1029 (42.9)		

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Table 2 Sample description according to prevalence of depressive symptoms (*n* = 2402). FIBRA Unicamp, Elderly, 2008–2009

	Prevalence of depression	*p*-value*
Sex		
Female	359 (22.7 %)	<0.001
Male	127 (15.4 %)	
Age (years)		
65–69	181 (19.8 %)	=0.023
70–74	132 (17.7 %)	
75–79	114 (25.0 %)	
> = 80	59 (20.6 %)	
Schooling (years)		
0	142 (30.1 %)	<0.001
1–4	228 (19.3 %)	
5–8	89 (20.5 %)	
> = 9	26 (8.4 %)	
Marital Status		
Single	42 (21.0 %)	=0.006
Married	216 (17.7 %)	
Divorced	32 (18.5 %)	
Widowed	194 (24.1 %)	
Family Income		
<=1.0 MW	72 (31.3 %)	<0.001
1.1–3.0 MW	229 (22.8 %)	
3.1–5.0 MW	71 (15.4 %)	
5.1–10.0 MW	41 (15.8 %)	
> 10.0 MW	9 (7.0 %)	
No. of disabilities		
0	15 (10.1 %)	<0.001
1–3	188 (15.7 %)	
> = 4	282 (26.8 %)	
No. of diseases		
0	39 (14.5 %)	<0.001
1–2	169 (14.2 %)	
> = 3	278 (29.5 %)	
Frailty profiles		
Frail	76 (45.5 %)	<0.001
Pre-frail	285 (23.7 %)	
Non-frail	125 (12.1 %)	
Criteria		
Weight loss		
Frail	125 (29.5 %)	<0.001
Non-frail	333 (17.8 %)	

Table 2 Sample description according to prevalence of depressive symptoms (*n* = 2402). FIBRA Unicamp, Elderly, 2008–2009 *(Continued)*

Weak hand-grip strength		
Frail	115 (28.6 %)	<0.001
Non-frail	367 (18.5 %)	
Fatigue		
Frail	189 (38.4 %)	<0.001
Non-frail	287 (15.5 %)	
Slow gait		
Frail	119 (29.2 %)	<0.001
Non-frail	365 (18.4 %)	
Low level of physical activity		
Frail	98 (23.4 %)	=0.075
Non-frail	388 (19.6 %)	

one disability and reported having 1–2 diseases, with a mean number of 2.2 diseases (SD = 1.5). The overall prevalence of depression as measured by the GDS-15 in the whole sample was 20.2 %, with a mean score of 3.5 on the scale (SD = 2.7). Regarding frailty profile, just over half of the sample (50.2 %) were classified as pre-frail whereas 6.9 % were considered frail.

A comparison between study variables and the presence of depressive symptoms is shown in Table 2. Participants who were female, aged 75–79 years, with lower schooling and income, widow/widowers, higher number of disabilities and diseases, and those who met the criteria for frailty and pre-frailty, had higher prevalences of depression.

Comparison between study variables and frailty profiles is given in Table 3. No differences in profiles were found for gender. However, there was a higher frequency of older old, individuals with lower family income and greater number of disabilities, among the pre-frail and frail groups. Individuals with no formal schooling were more prevalent among the frail group.

Table 4 shows the comparison of answers for the items of the GDS-15 (specific depressive symptoms) with frailty profile. Notably, the frail group differed to the other profiles for negative content of answers to the items. Pre-frail and frail groups differed to the non-frail group (or healthy) on GDS items 7 (feel happy), 13 (feel full of energy), 14 (feel situation is hopeless) and 15 (think others are better off).

The results depicted in Table 5 show that the prevalence of pre-frailty was influenced by the variables age, GDS7 (feel happy), GDS15 (thinks others are better off) and GD13 (feel full of energy). There was a 21 % higher prevalence of pre-frailty in the 75–79 years age group, 43 % greater among those aged 80 years or older, 28 % greater among those who did not feel happy, 19 %

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Table 3 Comparison among sociodemographic characteristics and frailty profiles (n = 2399). FIBRA Unicamp, Elderly, 2008–2009

	Frail	Pre-frail	Non-frail	p-value*
Sex				
Female	116 (7.4)	795 (50.4)	666 (42.2)	=0.458
Male	51 (6.2)	408 (49.6)	363 (44.2)	
Age				
65–69	40 (4.4)	414 (45.4)	458 (50.2)	<0.001
70–74	42 (5.6)	379 (50.9)	323 (43.4)	
75–79	40 (8.8)	246 (53.9)	170 (37.3)	
> = 80	45 (15.7)	164 (57.1)	78 (27.2)	
Schooling				
0	59 (12.5)	237 (50.2)	176 (37.3)	<0.001
1–4	72 (6.1)	618 (52.2)	493 (41.7)	
5–8	23 (5.3)	197 (45.5)	213 (49.2)	
> = 9	12 (3.9)	150 (48.5)	147 (47.6)	
Marital Status				
Single	16 (8.0)	102 (51.0)	82 (41.0)	=0.006
Married	74 (6.1)	596 (49.0)	547 (44.95)	
Divorced	5 (2.9)	81 (46.8)	87 (50.3)	
Widowed	71 (8.8)	422 (52.4)	312 (38.8)	
Family Income				
<=1.0 MW	20 (8.7)	121 (52.6)	89 (38.7)	=0.005
1.1–3.0 MW	76 (7.6)	526 (52.5)	400 (39.9)	
3.1–5.0 MW	32 (7.0)	216 (47.2)	210 (45.8)	
5.1–10.0 MW	6 (2.3)	123 (47.3)	131 (50.4)	
> 10.0 MW	7 (5.5)	58 (45.3)	63 (49.2)	
No. of disabilities				
0	5 (3.4)	68 (45.6)	76 (51.0)	<0.001
1–3	50 (4.2)	556 (46.4)	593 (49.5)	
> = 4	111 (10.6)	579 (55.1)	360 (34.3)	
No. of diseases				
0	10 (3.7)	120 (44.6)	139 (51.7)	<0.001
1–2	71 (6.0)	567 (47.7)	550 (46.3)	
> = 3	86 (9.1)	515 (54.8)	339 (36.1)	

greater among those who felt others were better off than them, and 18 % greater among those who did not feel full of energy.

Based on the results given in Table 6, it is evident that frailty prevalence was influenced by the variables age, number of diseases, GDS13 (feel full of energy), GDS3 (feel life is empty), GDS15 (think others are better off) and GDS2 (drop activities/interests). There was an 88 % higher prevalence of frailty in the 75–79 years age group, 3.1 times higher among those aged 80 years or older, 2.7 times greater among those with 3 or more diseases, 2.1 times greater among those who did not feel full of energy, 76 % greater in those who feel life is empty, 72 % higher among those who think others are better off than them, and 71 % higher among individuals who dropped activities/interests.

Discussion

The sociodemographic profile of the sample studied is congruent with the reality of Brazilian elderly and also with profiles found in other population-based studies (Lebrão and Duarte 2003; PNAD/IBGE, 2010).

Regarding the frailty profiles of the present sample, the prevalence of frailty and pre-frailty was 6.9 % and 50.2 %, respectively, similar to rates reported by other national and international studies (Fried et al. 2001; Chen et al. 2010; Duarte et al. 2010; Moreira and Lourenço 2013; Jung et al. 2014).

The strict analysis of the frailty profiles and their relationships with the sociodemographic characteristics, replicated all the variables identified in the literature as risk factors for the syndrome (Fried et al. 2001; Espinoza and Fried 2007; Chen et al. 2010; Duarte et al. 2010), i.e., the prevalence of frailty was associated with age of 75–79 years or 80 years and older; with illiteracy; widowhood; low income; and with having a higher number of disabilities and diseases. In relation to the pre-frailty profile, an association with age of 75–79 years or 80 years and older; having a higher number of disabilities and diseases was observed, factors which together can compromise functioning and predispose to frailty.

The prevalence of depression among participants of this sample, as measured by the GDS-15, was 20.2 %, a similar rate to that found in another population of community-dwelling elderly, where a depression prevalence of 15 %, measured using same scale, was determined (Lebrão and Duarte 2003; Batistoni et al. 2007; Yassuda et al. 2012). Presence of depression was associated with female gender; age of 75–79 years; illiteracy; widowhood; low income; and a higher number of disabilities and diseases, characteristics previously established as risk factors for frailty (Espinoza and Fried 2007) and predicting depressive symptoms in older adults (Rombaldi et al. 2010; Ucella 2013).

The analyses of the constructs of frailty and depression were investigated from three perspectives, namely, the relationships: 1) between frailty criteria and depression prevalence; 2) between frailty profiles and depression prevalence; and 3) of specific symptoms of depression with specific criteria of frailty.

Regarding the first perspective, the results corroborated the evidence from earlier studies reviewed in the literature. Given that the literature shows an overlapping of identification criteria for frailty and depression, particularly for those criteria related to self-reported fatigue, the prevalence of depression was found to be greater among individuals reporting this symptom (38 %). There were also significant relationships between the prevalence of depression and the criteria of weight loss, slow gait and weakness, which may reflect impairments caused by the disease itself.

Mirroring the latest evidence on the relationship between frailty syndrome and depression, it was found that, even in the cross-sectional investigation performed

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Table 4 Presence or absence of specific depressive symptoms on the GDS among the different frailty profiles (*n* = 2399). FIBRA Unicamp, Elderly, 2008–2009

GDS-15	Frail	Pre-frail	Non-frail	*p*-value
1 – Satisfied with life				
Yes	137 (6.2)	1089 (49.7)	968 (44.1)	<0.001
No	30 (14.6)	114 (55.6)	61 (29.8)	
2 – Dropped activities/interests				
Yes	102 (10.7)	508 (53.0)	348 (36.3)	<0.001
No	65 (4.5)	695 (48.2)	681 (47.3)	
3 – Feel life is empty				
Yes	87 (11.9)	390 (53.3)	255 (34.8)	<0.001
No	80 (4.8)	813 (48.8)	774 (46.4)	
4- Often get bored				
Yes	80 (9.5)	461 (54.7)	302 (35.8)	<0.001
No	87 (5.6)	742 (47.7)	727 (46.7)	
5 – Feel in good spirits				
Yes	127 (6.1)	1037 (49.8)	919 (44.1)	<0.001
No	40 (12.7)	166 (52.5)	110 (34.8)	
6- Afraid something bad is going to happen				
Yes	81 (8.6)	498 (53.2)	358 (38.2)	<0.001
No	86 (5.9)	705 (48.2)	671 (45.9)	
7 – Feel happy				
Yes	136 (6.3)	1060 (48.9)	970 (44.8)	<0.001
No	31 (13.3)	143 (61.4)	59 (25.3)	
8 – Feel helpless				
Yes	45 (10.0)	254 (56.7)	149 (33.3)	<0.001
No	122 (6.3)	949 (48.6)	880 (45.1)	
9 – Prefer to stay at home rather than going out				
Yes	109 (7.7)	751 (53.1)	555 (39.2)	<0.001
No	58 (5.9)	452 (45.9)	474 (48.2)	
10- Feel that have more memory problems				
Yes	67 (11.8)	295 (51.9)	206 (36.3)	<0.001
No	100 (5.5)	908 (49.6)	823 (44.9)	
11- Think it is wonderful to be alive				
Yes	154 (6.6)	1171 (50.1)	1013 (43.3)	<0.001
No	13 (21.3)	32 (52.5)	16 (26.2)	
12- Feel worthless now				
Yes	48 (12.8)	214 (56.9)	114 (30.3)	<0.001
No	119 (5.9)	989 (48.9)	915 (45.2)	
13 – Feel full of energy				
Yes	106 (5.4)	954 (48.5)	906 (46.1)	<0.001
No	61 (14.1)	249 (57.5)	123 (28.4)	
14- Feel situation is hopeless				
Yes	40 (11.6)	204 (59.1)	101 (29.3)	<0.001
No	127 (6.2)	999 (48.6)	928 (45.2)	
15 – Think people are better off than you				
Yes	64 (11.1)	325 (56.4)	187 (32.5)	<0.001
No	103 (5.6)	878 (48.2)	842 (46.2)	

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Table 5 Hierarchical model with multivariate Poisson regression for pre-frailty (n = 1931). FIBRA Unicamp, Elderly, 2008–2009

Variables	First step			Second step			Third step		
	PR*	95 % CI	p value	PR*	95 % CI	p value	PR*	95 % CI	p value
Age									
65–69	1.00	-	-	1.00	-	-	1.00	-	-
70–74	1.15	0.99–1.33	0.071	1.15	0.99–1.33	0.071	1.15	0.99–1.33	0.071
75–79	1.22	1.03–1.45	0.025	1.21	1.02–1.44	0.028	1.21	1.02–1.44	0.033
> = 80	1.44	1.19–1.75	<0.001	1.45	1.19–1.76	<0.001	1.43	1.18–1.74	<0.001
No. of diseases									
0				1.00	-	-	1.00	-	-
1–2				1.06	0.86–1.30	0.592	1.06	0.86–1.30	0.593
> = 3				1.24	1.01–1.53	0.040	1.19	0.96–1.47	0.106
GDS7									
No							1.28	1.06–1.55	0.012
Yes							1.00	-	-
GDS15									
No							1.00	-	-
Yes							1.19	1.04–1.37	0.013
GDS13									
No							1.18	1.01–1.37	0.043
Yes							1.00	-	-

Note.*PR = Prevalence ratio for pre-frailty; (n = 891 non-frail and n = 1040 pre-frail)

PR 95 % CI = 95 % confidence interval for prevalence ratio. Stepwise criteria for variable selection. Ref. reference level

Variables considered in step 1: Age, sex, schooling, marital status and family income; step 2: Number of diseases and number of disabilities; step 3: items GDS1 to GDS15

in the present study, that the approach adopted identified overlapping populations, i.e. that exhibited both syndromes. However, the prevalence of depression is greater among frail than non-frail individuals, and differs significantly from those not presenting these conditions. The study of Collard et al. (2013) for example, found that among the depressed participants investigated, 27 % were frail. Another study by Collard (2010) found a 21.3 % prevalence of frail elderly among depressed individuals. National data reported by the SABE study (2010) revealed that 31.8 % of frail elderly presented depressive symptoms, as assessed by the GDS-15. It is noteworthy that the rate of depression among frail elderly found in the present study differed to the prevalence reported in other studies, a disparity which may be due to the criteria used for diagnosing depression or to peculiarities of the group investigated, considering possible exposures to vulnerabilities, frailty, and limited access to coping resources which can lead to depression.

In an effort to gain deeper insights, the present study encompassed the third perspective of identifying specific depressive symptoms that characterize the different frailty profiles.

Three specific depressive symptoms were retained in the pre-frail model, namely, items 7 (feel happy), 13 (feel full of energy) and 15 (think that others are better off).

These three symptoms indicate lower positive feelings, somatic perception and interpersonal sensitivity, respectively. On the other hand, four specific symptoms were retained in the frailty model, items 2 (dropped activities and interests), 3 (feel life is empty), 13 (feel full of energy) and 15 (think others are better off). Items 2 and 3 indicate anhedonia (term used in Psychiatry to describe loss of interest or pleasure in everyday activities).

Considering frailty as a pathological continuum on which pre-frailty is a preceding condition, the number and types of depressive symptoms explaining these conditions also worsen in a continuous manner. Although both conditions have been associated with the symptoms of somatic perception and interpersonal sensitivity, in the transition from pre-frailty to frailty, a "substitution" of lower positive feeling by anhedonia occurs.

Psychosocial explanations of a psychosocial nature can be proposed for the persistence of these symptoms in the frailty profiles and in the concomitant worsening of depression and frailty. Previous studies indicate that frail elderly have a self-perception of being less healthy, increasing the chances of negative feelings and cognitions about themselves and others. From the perspective of social engagement, data from the FIBRA study FIBRA – Unicamp, reported in a previous study (Ribeiro et al. 2013) showed that frail and pre-frail elderly tend to have

Table 6 Hierarchical model with multivariate Poisson regression for frailty (*n* = 1030). FIBRA Unicamp, Elderly, 2008–2009

Variables	First step			Second step			Third step		
	PR*	95 % CI	*p* value	PR*	95 % CI	*p* value	PR*	95 % CI	*p* value
Age									
65–69	1.00	-	-	1.00	-	-	1.00	-	-
70–74	1.42	0.90–2.26	0.136	1.44	0.90–2.28	0.126	1.30	0.81–2.06	0.275
75–79	2.02	1.25–3.28	0.004	2.02	1.25–3.28	0.004	1.88	1.16–3.06	0.011
> = 80	3.71	2.30–5.99	<0.001	3.65	2.27–5.88	<0.001	3.05	1.88–4.95	<0.001
Schooling									
0	2.55	1.28–5.09	0.008	2.29	1.15–4.58	0.019	1.56	0.77–3.15	0.218
1–4	1.64	0.84–3.21	0.146	1.52	0.78–2.96	0.224	1.14	0.58–2.25	0.705
5–8	1.39	0.65–2.96	0.399	1.26	0.59–2.70	0.547	1.01	0.47–2.17	0.986
> = 9	1.00	-	-	1.00	-	-	1.00	-	-
No. of diseases									
0				1.00	-	-	1.00	-	-
1–2				2.00	0.91–4.37	0.084	2.01	0.92–4.42	0.081
> = 3				3.28	1.51–7.14	0.003	2.74	1.26–5.97	0.011
GDS13									
No							2.09	1.46–3.00	<0.001
Yes							1.00	-	-
GDS3									
No							1.00	-	-
Yes							1.76	1.24–2.51	0.002
GDS15									
No							1.00	-	-
Yes							1.72	1.21–2.44	0.003
GDS2									
No							1.00	-	-
Yes							1.71	1.19–2.44	0.004

Note.*PR = Prevalence ratio for frailty; (*n* = 891 non-frail and *n* = 139 frail)
PR 95 % CI = 95 % confidence interval for prevalence ratio. *Stepwise* criteria for variable selection. Ref. reference level
Variables considered in step 1: age, sex, schooling, marital status and family income; step 2: number of diseases and number of disabilities; step 3: items GDS1 to GDS15

a more withdrawn social life compared to non-frail elderly, discontinuing activities that involve trips, parties, meetings and cultural events. These symptoms reflect losses in primary control over events, adaptive difficulties and problems recruiting resources, resulting from the process of frailty.

Self-reported energy loss in the context of assessments of depression, can be considered a correlate of the fatigue criterion making up the frailty phenotype, and thus is common to both conditions. In addition to this symptom, comparing oneself socially with others constitutes a mechanism used by the self to derive a personal sense of adjustment and adaptation to the transitions and adverse events of life. Deeming oneself worse off than other people, as expressed by the self-report "think that others are better off" (item 15), can reflect failures to adapt to the realities brought on by the onset of frailty.

More specifically, in pre-frailty the symptoms of energy and interpersonal sensitivity combine to produce a lessening of positive feelings, "do not feel happy" (item 7), indicating the absence of positive feelings, yet not the presence of negative feelings, as held by the theory of balance affects (Diener and Diener 1996). Since frailty is more exacerbated condition, more severe symptoms of anhedonia manifest in the presence of negative affects.

Addressing the manifestation of depression in later life in the present study, and its relationships with frailty, two interesting aspects related to the consolidation of depressive symptoms in the presence of frailty are apparent: 1) the variability in the prevalence of depression depending on the

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frailty profile found; and 2) the characteristic depressive symptoms in elderly with frail and pre-frail profiles.

With these findings, the present study corroborates and contributes to the previous research efforts of Schuurmans et al. (2004); Puts (2006); Collard (2010) and Nascimento (2011) in the identification of possible psychological markers of frailty. However, it is important to point out that this was a cross-sectional study thus precluding any further investigation of the causal relationship between the syndromes. Moreover, this study involved a high number of female participants, a trait known to predispose to both conditions. The gerontological literature highlights the greater depressive symptoms of a motivational nature among elderly women, warranting more in-depth analysis of gender in future investigations. It should also be noted that the instrument used for identifying depression is limited to screening for depressive symptomatology as opposed to diagnosing the disease itself, given that it does not take into account any previous history of depression. Therefore, future studies should seek to improve the method employed and follow-up of the evolution and consequences of overlaps in frailty and depression over time. The fields related to aging, epidemiology and mental health could benefit from these findings, and also lead to clinical developments based on this evidence.

Conclusions
The investigation about the relationship of specific symptoms of depression with specific criteria of frailty showed that there is variability in the prevalence of depression among frailty profiles, and there are depressive symptoms characteristics of each syndrome profile.

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References
Ainsworth BE, Haskell WL, Whitt MC, Irwin ML, Swartz AM, Strath SJ, et al. Compendium of physical activities: an update of activity codes and MET intensities. Med Sci Sports Exerc. 2000;32(9):S498–516. doi:10.1097/00005768-200009001-00009.

Almeida OP, Almeida AS. Confiabilidade da versão brasileira da escala de depressão em geriatria (GDS) versão reduzida. Arquivos de Neuropsiquiatria. 1999;57(2-B):421–6. doi:10.1590/S0004-282X1999000300013.

Andersen K, Lolk A, Kragh-Sorensen P, Petersen NE, Green A. Depression and the risk of Alzheimer disease. Am J Epidemiol. 2005;16:233–8. doi:10.1097/01.ede.0000152116.32580.24.

Baltes MM, Mayr U, Borchelt M, Maas I, Wilms HU. Everyday competence in old and very old age: An inter-disciplinary perspective. Aging Soc. 1993;13:657–80. doi:10.1017/S0144686X00001392.

Batistoni SST, Neri AL, Cupertino APFB. Validade da escala de depressão do Center for Epidemiological Studies entre idosos brasileiros. Rev Saude Publica. 2007;41(4):598–605.

Batistoni SST. Sintomas depressivos entre idosos: estudo prospectivo de suas relações com variáveis sociodemográficas e psicossociais (Tese de Doutorado). 2007. Disponível em, http://www.bibliotecadigital.unicamp.br/.

Batistoni SST. Depressão. In: Guariento ME, Neri AL, editors. Assistência ambulatorial ao idoso. Campinas, SP: Alínea; 2010. p. 235–42.

Blazer DG. Depression in the late life: review and commentary. Focus The American Journal of Psychiatry. 2009;7(1):118–36. doi:10.1176/foc.7.1.foc118.

Bruce ML. Depression and disability in later life: directions for future research. Am J Geriatr Psychiatry. 2001;9:102–12. doi:10.1097/00019442-200105000-00003.

Canineu PR. Depressão no idoso. In: Papaléo Netto M, editor. Tratado de Gerontologia. Revista e ampliada. 2nd ed. São Paulo: Atheneu; 2007. p. 293–9.

Chen CY, Wu SC, Chen LJ, Lue BH. The prevalence of subjective frailty and factors associated with frailty in Taiwan. Arch Gerontol Geriatr. 2010;50(1):S43–7. doi:10.1016/S0167-4943(10)70012-1.

Collard RM. Frailty and depression in later life. (Master thesis, Utrecht University, Department of Nursing Science University Medical Center Utrecht, Netherlands). 2010. Retrieved from http://dspace.library.uu.nl/handle/1874/178793

Collard RM, Comijs HC, Naarding P, Voshaar RCO. Physical frailty: vulnerability of patients suffering from late-life depression. Aging Ment Health. 2013;18(5):570–8. doi:10.1080/13607863.2013.827628.

Diener E, Diener C. Most people are happy. Psychol Sci. 1996;7:181–5. doi:10.1111/j.1467-9280.1996.tb00354.x.

Duarte YAO, Nunes DP, Corona LP, Lebrão ML. Como estão sendo cuidados os idosos frágeis de São Paulo? A visão mostrada pelo estudo SABE (Saúde, Bem-estar e Envelhecimento). In: Camarano AA, editor. Cuidados de longa duração para a população idosa: um novo risco social a ser assumido? Rio de Janeiro: IPEA; 2010. p. 123–44.

Espinoza SE, Fried LP. Risk factors for frailty in the older adult. Clin Geriatr Med. 2007;15(6):37–44. Retrieved from http://www.researchgate.net/profile/Sara_Espinoza4/publication/252764592_Risk_Factors_for_Frailty_in_the_Older_Adult/links/54f9cae10cf21ee4fdedf8d3.pdf.

Feng L, Nyunt MSZ, Feng L, Mmed KBY, Ng TP. Frailty predicts new and persistent depressive symptoms among community-dwelling older adults: findings from Singapore Longitudinal Aging Study. J Am Med Dir Assoc. 2014;15:76.e7–76.e12. doi:10.1016/j.jamda.2013.10.001.

Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, Seeman T, Tracy R, Kop WJ, Burke G, and McBurnie, MA. Frailty in older adults: evidence for a phenotype. J Gerontol A Biol Sci Med Sci. 2001;56(3):M146–56. doi:10.1093/gerona/56.3.M146.

Gallo JJ, Rabins PV. Depression without sadness: alternative presentations of depression in late life. Am Fam Physician. 1999;60:820–6. Retrieved from http://www.aafp.org/afp/1999/0901/p820.html.

Guralnik JM, Simonsick EM, Ferrucci L, Glynn RJ, Berkman LF, Blazer DG, et al. A short physical performance battery assessing lower extremity function: association with self-reported disability and prediction of mortality and nursing home admission. J Gerontol. 1994;49(2):M85–94. doi:10.1093/geronj/49.2.M85.

Instituto Brasileiro de Geografia e Estatística. Síntese de Indicadores Sociais: Uma análise das condições de vida da população brasileira. Estudos e Pesquisas: Informação demográfica e socioeconômica, número 27. Rio de Janeiro: IBGE; 2010. Disponível em http://www.ibge.gov.br/home/estatistica/populacao/condicaodevida/indicadoresminimos/sinteseindicsociais2010/SIS_2010.pdf.

Jang Y, Haley WE, Small BJ, Mortimer JA. The role of mastery and social resources in the associations between disability and depression in later life. The Gerontologist. 2002;42:807–13. doi:10.1093/geront/42.6.807.

Jung H-W, Kim S-W, Ahn S, Lim J-Y, Han J-W, Kim T-H, et al. Prevalence and outcomes of frailty in Korean Elderly Population: comparisons of a multidimensional frailty index with two phenotype models. PLoS One. 2014; 9(2). doi: 10.1371/journal.pone.0087958

Kelaiditi E, Cesari M, Canevelli M, Abellan Van Kan G, Ousset P-J, Gillette-Guyonnet S, Ritz P, Duveau F, Soto ME, Provencher V, Nourhashemi F, Salva A, Robert P, Andrieu S, Rolland Y, Touchon J, Fitten JL, and Vellas B. Cognitive frailty: rational and definition from an (IANA/IAGG) international consensus group. J Nutr Health Aging. 2013;17(9):726–34. doi:10.1007/s12603-013-0367-2.

Laursen TM, Munk-Olsen T, Nordentoft M, Mortensen PB. Increased mortality among patients admitted with major psychiatric disorders: a register-based study comparing mortality in unipolar depressive disorder, bipolar affective disorder, schizoaffective disorder, and schizophrenia. J Clin Psychiatry. 2007; 68:899–907. doi:10.4088/JCP.v68n0612.

Lawton MP, Brody P. Assessment of older people: Self maintaining and instrumental activities of daily living. The Gerontologist. 1969;9:179–86. doi:10.1093/geront/9.3_Part_1.179.

Lebrão ML, Duarte YAO. SABE – Saúde, Bem-estar e Envelhecimento. O projeto SABE no município de São Paulo: uma abordagem inicial. Brasília: OPAS/MS; 2003. Disponível em http://www.ciape.org.br/artigos/projeto_sabe.pdf.

Lustosa LP, Pereira DS, Dias RC, Britto RR, Pereira LSM. (no prelo). Tradução, adaptação transcultural e análise das propriedades psicométricas do Questionário *Minnesota* de Atividades Físicas e de Lazer. Cadernos de Saúde Pública.

Mezuk B, Edwards L, Lohman M, Choi M, Lapane K. Depression and frailty in later life: a synthetic review. Int J Geriatr Psychiatry. 2012a;27(9):879–92. doi:10.1002/gps.2807.

Mezuk B, Lohman M, Dumenci; Lapane K. Are depression and frailty overlapping syndromes in mid- and late-life? A latent variable analysis. Am J Geriatr Psychiatry. 2012; 1-10. doi: 10.1097/JGP.0b013e31824afd4b

Moreira VG, Lourenço RA. Prevalence and factors associated with frailty in an older population from the city of Rio de Janeiro, Brazil: the FIBRA-RJ Study. Clinics. 2013;68(7):979–85. doi:10.6061/clinics/2013(07)15.

Nascimento PPP. Fragilidade e Bem-estar subjetivo: dados do estudo FIBRA com idosos residentes no distrito de Ermelino Matarazzo (Trabalho de Conclusão de Curso, Escola de Artes, Ciências e Humanidades da Universidade de São Paulo, São Paulo). 2011. Manuscrito não publicado

Nakano MM. Versão Brasileira da *Short Physical Performance Batttery*-SPPB: adaptação cultural e estudo de confiabilidade (Dissertação de Mestrado). 2007. Disponível em, http://www.bibliotecadigital.unicamp.br/.

Neri AL, Yassuda MS, Araújo LF, Eulálio MC, Cabral BE, Siqueira MEC, Santos GA, and Moura JGA. Metodologia e perfil sociodemográfico, cognitivo e de fragilidade de idosos comunitários de sete cidades brasileiras: estudo FIBRA. Caderno de Saúde Pública. 2013;29(4):778–92. doi:10.1590/S0102-311X2013000400015.

Puts MT. General introduction. In: Frailty: biological risk factors, negative consequenses and quality of life. Amsterdam: Vrije Universiteit; 2006. p. 07–26.

Puts MT, Shekary N, Widdershoven G, Heldens J, Lips P, Deeg DJ. Frailty and successful aging, what do these concepts mean to older community-dwelling adults? In: Frailty: biological risk factors, negative consequences and quality of life. Amsterdam: Vrije Universiteit; 2006. p. 145–62.

Radloff LS. The CES-D Scale: a self-report depression scale for research in the general population. Appl Psychol Meas. 1977;1(3):385–401. doi:10.1177/014662167700100306.

Rauen MS, Moreira EAM, Calvo MC, Lobo AS. Avaliação do estado nutricional de idosos institucionalizados. Rev Nutr. 2008;21(3):303–10.

Reuben DB, Laliberte L, Hiris J, Mor V. A hierarchical exercise scale to measure function at the advanced activities of daily living (AADL) level. J Am Geriatr Soc. 1990;38(8):855–61. doi:10.1111/j.1532-5415.1990.tb05699.x.

Ribeiro LHM, Neri AL, Pinto JM, Falsarella GR, Spósito G, Freitas DCCV. Desempenho em atividades de vida diária e fragilidade. In: Neri AL, editor. Fragilidade e Qualidade de Vida na Velhice. Campinas, SP: Alínea; 2013. p. 189–207.

Rombaldi AJ et al. Prevalência e fatores associados a sintomas depressivos em adultos do sul do Brasil: estudo transversal de base populacional. Revista Brasileira de Epidemiologia. 2010;13(4):620–9. doi:10.1590/S1415-790X2010000400007.

Schuurmans H, Steverink N, Slaets JPJ, Lindenberg S, Frieswijk K, Buunk BP. Maintaining well-being in frail elderly people: does self-management ability help? In: Schuurmans H. Promoting well-being in frail elderly people: theory and intervention. Groningen Intervention Program (GRIP). Dissertation, University of Groningen; 2004. Available at: http://www.rug.nl/research/portal/files/2968427/c4.pdf.

Sheikh JI, Yesavage JA. Geriatric Depression Scale (GDS): recent evidence and development of a shorter version. Rev Clin Gerontol. 1986;5(1/2):165–73.

St. John PD, Tyas SL, Montgomery PR. Depressive symptoms and frailty. Int J Geriatr Psychiatry. 2013. doi:10.1002/gps.3866.

Taylor HL, Jacobs DR, Schucker B, Knudsen J, Leon AS, Debacker G. A questionnaire for the assessment of leisure time physical activities. J Chronic Dis. 1978;31:741–55. doi:10.1016/0021-9681(78)90058-9.

Tavares SS. Sintomas depressivos entre idosos: relações com classe, mobilidade e suporte social percebidos e experiência e eventos estressantes (Dissertação de Mestrado). 2004. Disponível em, http://www.bibliotecadigital.unicamp.br/document/?code=vtls000343269.

Ucella EC. Condições de vida de idosos residentes na comunidade e suas relações com depressão: dados do FIBRA polo UNICAMP (Dissertação de Mestrado). 2013. Disponível em, http://www.bibliotecadigital.unicamp.br/document/?code=000911998.

Yassuda MS, Lopes A, Cachioni M, Falcão DVS, Batistoni SST, Guimarães VV, and Neri AL. Frailty criteria and cognitive performance are related: data from the FIBRA study in Ermelino Matarazzo, São Paulo, Brasil. J Nutr Health Aging. 2012;16(1):55–61. doi:10.1007/s12603-012-0003-6.

Whooley MA, Kip KE, Cauley JA, Ensrud KE, Nevitt MC, Browner WS. Depression, falls, and risk of fracture in older women. Arch Intern Med. 1999;159:484–90. doi:10.1001/archinte.159.5.484.