Archives of Gerontology and Geriatrics 87 (2020) 103994

Contents lists available at ScienceDirect

Archives of Gerontology and Geriatrics

journal homepage: www.elsevier.com/locate/archger

The relationship between gender roles and self-rated health: A perspective from an international study

Megan Willerth[a,*], Tamer Ahmed[a,f], Susan P. Phillips[b], Mario Ulises Pérez-Zepeda[c,d], Maria Victoria Zunzunegui[e], Mohammad Auais[a]

[a] School of Rehabilitation Therapy, Queen's University, Louise D Acton Building, 31 George St, Kingston, Ontario, K7L 3N6, Canada
[b] Department of Family Medicine, Queen's University, 220 Bagot St, Kingston, Ontario, K7L 3G2, Canada
[c] Geriatric and Epidemiological Research Department, Research Division, Instituto Nacional de Geriatría, Periférico Sur No. 2767, Col. San Jerónimo Lídice, Del. Magdalena Contreras, 10200, Mexico City, Distrito Federal, Mexico
[d] Geriatric Medicine Research, Dalhousie University and Nova Scotia Health Authority, 1427-5955 Veterans' Memorial Lane, Halifax, Nova Scotia, B3H 2E1, Canada
[e] Department of Social and Preventive Medicine, University of Montreal, C.P. 6l28, Succursale Centre-ville, Montréal, Québec, H3C 3J7, Canada
[f] Department of Community Health Sciences Centre de recherche – Hôpital Charles - Le Moyne Université de Sherbrooke, Longueuil, Quebec, J4K 0A8, Canada

ARTICLE INFO

Keywords:
Gender roles
Gender stereotypes
Older adults
Self-rated health

ABSTRACT

Objectives: To examine the relationship between gender roles and self-rated health in older men and women from different contexts.
Methods: 2002 community-dwelling older adults from the International Mobility in Aging Study were recruited from 5 research sites. Gender role was measured with the 12-item Bem Sex Role Inventory, which categorized study participants into four gender roles: Masculine, Feminine, Androgynous, and Undifferentiated. Self-rated health was collapsed into a dichotomous variable (Very Good/Good and Fair/Poor/Very Poor). Prevalence risk ratios (PRR) of self-rated health relative to gender roles were estimated with Poisson regression models adjusted for all relevant confounders.
Results: After complete adjustment, feminine (PRR 1.22 (95 % CI 1.01–1.49)) and undifferentiated (PRR 1.25 (95 % CI 1.05–1.50)) gender roles were associated with poorer relative self-rated health.
Discussion: Gender roles confer independent risks and benefits for self-rated health in older adults.

1. Introduction

The concept of gender is increasingly considered a determinant of health, separate from sex. Sex refers to biological differences between men and women, while gender is a social construct based on roles, behaviours, and traits that are ascribed to men and women in a particular cultural context (Canadian Institutes of Health Research, 2018). Similarly, gender roles refer to personality attributes and behaviours that are socially and culturally assigned to men and women (Lindsey, 2005). In many studies across time and place, sex has been shown to be a different construct than gender or gender roles (Ahmed, Vafaei, Belanger, Phillips, & Zunzunegui, 2016; Gentile, 1993; Hunt, Piccoli, Gonsalkorale, & Carnaghi, 2015; Kling, Holmqvist Gattario, & Frisén, 2017; Prince, 2005; Steinfeldt, Zakrajsek, Carter, & Steinfeldt, 2011). While initially conceptualized as a dichotomy of masculinity or femininity, in 1974 American psychologist Dr. Sandra Bem suggested a model consisting of four gender roles (Bem, 1974). Rather than being mutually exclusive concepts, masculinity and femininity can co-exist as part of one's gender role. Individuals whose responses to a series of questions about gender roles are consistently 'masculine' are classified as such; those with high femininity scores are said to be 'feminine', people low in both masculinity and femininity are 'undifferentiated', and those high in both measures are 'androgynous'. Dr. Bem hypothesized that androgynous individuals would be more adaptable, since they possess traits that are considered socially desirable for both men and women, and therefore have better mental health and greater flexibility and competence (Bem, 1977).

There have been several recent studies supporting an extension of Bem's hypothesis that androgyny is related to improved physical and mental health (Ahmed, Vafaei, Auais, Guralnik, & Zunzunegui, 2016; Ahmed et al., 2018; Lefkowitz & Zeldow, 2006; Price, Gregg, Smith, & Fiske, 2018; Shimonaka, Nakazato, & Homma, 1996; Vafaei, Ahmed, Freire, Zunzunegui, & Guerra, 2016) and life satisfaction and wellness (Gale-Ross, Baird, & Towson, 2009). Androgyny has been positively

* Corresponding author.
E-mail addresses: 17mew@queensu.ca (M. Willerth), tia@queensu.ca (T. Ahmed).

https://doi.org/10.1016/j.archger.2019.103994
Received 31 March 2019; Received in revised form 26 November 2019; Accepted 7 December 2019
Available online 09 December 2019

linked to lower depressive scores in older adults (Price et al., 2018; Vafaei et al., 2016), successful aging in Japanese centenarians (Shimonaka et al., 1996), better physical performance in older adults (Ahmed, Vafaei, Auais et al., 2016; Ahmed et al., 2018), better general wellness and life satisfaction in women in Ontario (Gale-Ross et al., 2009), higher levels of optimal mental health (Lefkowitz & Zeldow, 2006), better health practices (Shifren & Bauserman, 1996), and better mobility and physical and mental health in an older Spanish population (Vafaei et al., 2016). However, there have also been studies showing advantageous health outcomes of either femininity or masculinity. For example, masculinity has been associated with better physical health (Annandale & Hunt, 1990) and self-assessed general health (Nicholson, 1993). In contrast, Hunt et al. found a protective effect of higher femininity scores in men with respect to cardiovascular disease mortality risk, and higher mortality among men classified as masculine (Hunt, Lewars, Emslie, & Batty, 2007). The association between gender roles and physical function was found to be mediated by smoking, physical activity, the number of chronic conditions, high body mass index, and depression in the International Mobility in Aging Study (IMIAS) sample (Ahmed et al., 2018)

Self-rated health is a measure of one's perception of overall health. It captures both physical and mental aspects of health and is a valid indicator of health status (Idler & Benyamini, 1997; Mossey & Shapiro, 1982). Low self-rated health has been shown to predict mortality (Bond et al., 2006; Bopp et al., 2012; Cesari et al., 2008; DeSalvo, Bloser, Reynolds, He, & Muntner, 2006; Ferraro & Kelley-Moore, 2001; Giltay, Vollaard, & Kromhout, 2012; Halford et al., 2012; Idler & Benyamini, 1997; Idler & Kasl, 1995; Idler, Hudson, & Leventhal, 1999; Idler, Russell, & Davis, 2000; Long & Marshall, 1999; Martinez, Kasl, Gill, & Barry, 2010; Mossey & Shapiro, 1982; Sanchez-Santos, Zunzunegui, Otero-Puime, Cañas, & Casado-Collado, 2011; Sargent-Cox, Anstey, & Luszcz, 2010; Stenholm et al., 2014; Wang & Satariano, 2007) and morbidity (Hubbard, Inoue, & Diehr, 2009; Idler & Kasl, 1995; Idler et al., 2000). Self-rated health correlates well with physicians' assessments (LaRue, Bank, Jarvik, & Hetland, 1979), and better predicts mortality than physician-rated health assessments (Giltay et al., 2012; Mossey & Shapiro, 1982), type or number of symptoms experienced (Elliott, Hannaford, Smith, Wyke, & Hunt, 2006), or quality of life measures (Kaplan et al., 2007). Within the IMIAS cohort, self-rated health has previously been found to be correlated to sex, study site, economic adverse childhood experiences, current income sufficiency, current depressive symptoms, current physical function, and current resilience (Lau, Guerra, Barbosa, & Phillips, 2018).

Previous analyses of the International Mobility in Aging Study (IMIAS) have validated the BSRI (Bem Sex Role Inventory) for this population and demonstrated that feminine and undifferentiated gender roles are associated with mobility disability and poor physical performance compared to the androgynous role and separate from sex (Ahmed, Vafaei, Auais et al., 2016, 2018). In this study, we hypothesize that those endorsing undifferentiated roles will be more likely to report poor self-rated health compared to androgynous participants. We expected that this relationship will not be modified by sex or study site. Although gender is a social and cultural construct, previous analysis of the association between gender role and physical function in the IMIAS population found their relationship was not modified by study site (Ahmed, Vafaei, Auais et al., 2016). To our knowledge, this is the first study to examine the relationship between self-rated health and gender roles. Thus, the aim of this investigation is to build on previous literature on the association between gender roles and other health variables to specifically examine the relationship between gender roles and self-rated health in an international sample of community-dwelling older adults.

2. Methods

2.1. Population and samples

The data used are from the International Mobility in Aging Study (IMIAS). The purpose of IMIAS is to investigate gender differences in mobility and physical function using a life course perspective. Data were collected from populations in five cities: Kingston (Ontario, Canada), Saint-Hyacinthe (Quebec, Canada), Manizales (Colombia), Natal (Brazil), and Tirana (Albania). Two hundred men and two hundred women aged between 65–74 years were randomly recruited from lists of registered individuals at local neighbourhood health centers. Response rates were higher than 90 % in the non Canadian research sites and 30 % in the Canadian sites (Gomez et al., 2018). Baseline data were collected in 2012, with follow-ups in 2014 and 2016. This article includes analysis of the 2012 baseline data, which included 2002 participants. Objectives, rationale and study design have been described in detail in previous publications (Ahmed, Vafaei, Auais et al., 2016; Bélanger, Ahmed, Filiatrault, Yu, & Zunzunegui, 2017; Gomez et al., 2018).

2.1.1. Ethical considerations

The IMIAS study was approved by the research ethics committees at the University of Caldas in Colombia, the Universidad Federal do Rio Grande do Norte in Brazil, the Albanian Institute of Public Health in Albania, Queen's University in Canada, and the University of Montreal Hospital Research Centre in Canada. Written informed consent was obtained from all subjects prior to their participation.

2.2. The exploratory variable

Gender roles were assessed with an abbreviated 12-item Short Form of the BSRI (Mateo & Fernández, 1991). The validity properties of this measure have previously been demonstrated in Spanish and Brazilian older adults (Carver, Vafaei, Guerra, Freire, & Phillips, 2013; Vafaei et al., 2014), and with IMIAS participants from the five included sites (Ahmed, Vafaei, Belanger et al., 2016).

The BSRI includes six items – stereotypical gender traits – for each of the masculine (acting as a leader, being dominant, having leadership abilities, having a strong personality, defending one's own beliefs, and making decisions easily) and the feminine (being gentle, warm, sympathetic, tender, affectionate, and sensitive to others' needs) sub-scales (Ahmed, Vafaei, Belanger et al., 2016). Participants score each item on a scale of 1 (never or almost never true) to 7 (always or almost always true). The scale was administered in this study with visual aids for each item. The mean of the six items for each gender produces independent 'masculinity' (instrumentality) and 'femininity' (expressivity) scores. The internal reliability of both scales was acceptable, with Cronbach's alpha reliability coefficient for the masculine scale equal to 0.75 and for the feminine scale 0.76 (Ahmed, Vafaei, Belanger et al., 2016).

Using the median split method recommended by Bem to interpret the results, scores equal to or greater than the median were classified as "high" and those below the median as "low" (Bem, 1981). This created four groups: masculine (high masculinity, low femininity), feminine (high femininity, low masculinity), androgynous (high masculinity and femininity), and undifferentiated (low masculinity and femininity) (Bem, 1981). The median value of each IMIAS research site was used to account for site-specific differences.

2.3. The outcome variable

Self-rated health was assessed using the question "Would you say your health is Very Good, Good, Fair, Poor or Very Poor?". For our analysis, the five responses were collapsed into a dichotomous variable to form the following categories: good self-rated health (Very Good/Good) and fair/poor self-rated health (Fair/Poor/Very Poor).

2.4. Confounders

According to the literature the following variables could be confounders of the association between SRH and gender roles since they are well known correlates of self-rated health and have been previously associated with gender roles (Ahmed, Vafaei, Auais et al., 2016) and are not likely to be in the causal pathway between gender roles and self-rated health: age, sex, income sufficiency, years of formal education, and study site. Income sufficiency was assessed with the question "To what extent is your income sufficient to meet your ends?". Possible answers were very sufficient, sufficient, and insufficient.

2.5. Statistical analysis

Data analysis was performed using IBM Statistical Package for Social Sciences (SPSS) version 24 and Stata version 14 (StataCorp, College Station, Texas). Only participants who were not missing any data for the BSRI items or any confounders were included in the analysis, leaving 1970 participants across the five IMIAS sites. The participants excluded due to missing values did not differ from the analysed sample in terms of age, sex, education, occupation, income sufficiency, or research site ($p > 0.05$).

Descriptive statistics were examined by gender roles. The associations between confounders by gender role groups were analyzed using chi-square tests and ANOVA tests, as suitable. The androgynous group was considered as the reference category in all multivariate analysis. Bivariate statistics and a series of Poisson regression models with robust variance were used. Poisson regression was selected over logistic regression because it provides more conservative confidence intervals of prevalence ratios in cross-sectional designs and prevalence ratios are easier to interpret compared to the odds ratio obtained through logistic regression (Barros & Hirakata, 2003). We also tested the significance of multiplicative interaction terms to determine whether study site or sex modified the effect of gender roles on self-rated health.

3. Results

Of the 2002 participants recruited in the IMIAS study at baseline, twenty-seven participants had missing data on gender roles, three were missing self-rated health data, and two had missing data on both gender roles and self-rated health. Therefore, our total analytical sample was 1970 participants. Gender roles distribution was significantly different in men and women ($p < 0.001$). Equal proportions of men and women were classified as undifferentiated (50 % each) and slightly more women than men were classified as androgynous (53.25%–46.75 %). More men than women were classified as masculine (62.06 % vs. 37.94, respectively), whereas more women than men were classified as feminine (67.55 % vs. 32.45 %, respectively). Mean number of years of education was significantly different between groups ($p = 0.003$), with the androgynous group having the highest (10.26; SD = 5.80), followed by masculine (9.88; SD = 6.02), feminine (9.30; SD = 5.30), then undifferentiated (9.08; SD = 5.87). Income sufficiency was significantly different between groups ($p = 0.002$), with the undifferentiated group having the highest prevalence of "insufficient" income (49.33 %) and lowest prevalence of "very sufficient" income earners (19.89 %) and the androgynous group having the lowest frequency of participants with "insufficient" income (40.06 %) and the highest frequency with "very sufficient" (26.71 %). Self-rated health also differed significantly across gender roles ($p < 0.001$). The androgynous gender role had the highest proportion of "good" self-rated health (64.03 %), followed by masculine (55.53 %), then feminine (53.75 %, and finally undifferentiated (49.05 %).

The proportion of participants within each gender role category did not differ significantly between study sites ($p = 0.3$). Mean age was also similar across groups ($p = 0.7$) (Table 1).

Women had a higher prevalence of fair/poor self-rated health at all IMIAS sites (Fig. 1). There was a higher prevalence of fair/poor self-rated health at Tirana (58.8 % M, 71 % W), Manizales (44.8 % M, 54.2 % W), and Natal (64.2 % M, 77.3 % W) across both sexes and in total, compared to Kingston (12.6 % M, 16 % W) and St-Hyacinthe (15.7 % M, 19.1 % W) in Canada (Fig. 1). This increased prevalence of fair/poor self-rated health at non-Canadian sites was also evident across all four gender roles (Fig. 2). Fig. 2 also illustrates a generally lower prevalence of fair/poor self-rated health in the androgynous group across most sites compared to other gender roles (i.e. 60.1 % vs. 72.6 % (masculine), 75.3 % (feminine), 81.3 % (undifferentiated); Natal).

Table 2 describes the association between gender roles and fair/poor self-rated health. The unadjusted model demonstrates that, compared to the reference category of androgynous, the other three gender roles are more likely to have fair/poor self-rated health. Participants with masculine gender role had a 24 % higher prevalence rate of fair/poor self-rated health compared to androgynous participants (95 % CI 1.02–1.50). Those endorsing the feminine gender role had a 29 % higher prevalence rate (95 % CI 1.10–1.56), and undifferentiated participants had a 42 % higher rate (95 % CI 1.19–1.69). When adjusted for sex, the prevalence risk ratios were relatively unchanged (feminine: 1.25 (1.03–1.52), masculine: 1.28 (1.05–1.56), undifferentiated: 1.43 (1.19–1.70).

When adjusted for all confounders – sex, age, years of education, income sufficiency, and study site – the association between the masculine gender role and fair/poor self-rated health did not reach statistical significance at $p < 0.05$. The relationship between the feminine role and self-rated health was unchanged. The prevalence risk ratio for the undifferentiated group slightly decreased to 1.32 (95 % CI 1.10–1.58) but still showed a statistically significant association. The relationship between sex and fair/poor self-rated health was statistically significant when adjusted for all confounders, with women reporting higher prevalence ratios of fair/poor self-rated health compared to men. No evidence of multiplicative interaction between gender roles and either sex or research site was detected (p value of interaction terms > 0.05).

4. Discussion

4.1. Summary of results

We examined the association between gender roles and self-rated health in international populations of older adults. Our findings partially aligned with our hypothesis that, compared to the androgynous group, those ascribing to feminine and undifferentiated gender roles were more likely to report fair/poor self-rated health. This is consistent with the findings of previous studies of gender roles and physical function in the IMIAS sample (Ahmed, Vafaei, Auais et al., 2016; Ahmed et al., 2018).

4.2. Significance of study findings

Generally, our findings support Bem's androgyny model (Bem, 1974, 1977). Individuals with high levels of both masculine and feminine traits (i.e. androgyny) are expected to experience better physical and mental health outcomes (Bem, 1974, 1977). Those whose gender role is 'undifferentiated' are expected to have poorer health outcomes. We found the androgynous type had better self-rated health compared to the undifferentiated and feminine types. This is in line with previous studies showing relationships between androgyny and better physical performance (Ahmed, Vafaei, Auais et al., 2016; Ahmed et al., 2018), mobility (Vafaei et al., 2016), physical and mental health (Vafaei et al., 2016), and general wellness and life satisfaction among women in Ontario (Gale-Ross et al., 2009). These comparable findings with previous literature are expected since self-rated health is a valid measure of general health (Blakely, Lochner, & Kawachi, 2002; Gale-Ross et al., 2009; Subramania, Kawachi, & Kennedy, 2001) and functional status

Table 1
Distribution of IMIAS participants by gender roles according to self-rated health and confounders.

	Gender Roles								
	Undifferentiated		Masculine		Feminine		Androgynous		P value
	n	%	n	%	n	%	n	%	
Self-rated health									< 0.001
Good: Very good and good	259	49.05	221	55.53	222	53.75	404	64.03	
Fair/poor: Fair, poor, and very poor	269	50.95	177	44.47	191	46.25	227	35.97	
Sex									< 0.001
Men	264	50.00	247	62.06	134	32.45	295	46.75	
Women	264	50.00	151	37.94	279	67.55	336	53.25	
Age[a]	528	69.03 (2.78)	398	69.13 (2.88)	413	69.25 (2.88)	631	69.09 (2.90)	0.7
Years of formal education[a]	528	9.08 (5.87)	398	9.88 (6.02)	413	9.30 (5.30)	631	10.26 (5.80)	0.003
Income sufficiency									0.002
Very sufficient	104	19.89	104	26.26	83	20.15	168	26.71	
Barely sufficient	161	30.78	114	28.79	156	37.86	209	33.23	
Insufficient	258	49.33	178	44.95	173	41.99	252	40.06	
Study site									0.3
Kingston	106	20.08	67	16.83	80	19.37	139	22.03	
St-Hyacinthe	98	18.56	81	20.35	91	22.03	122	19.33	
Natal	112	21.21	73	18.34	73	17.68	143	22.66	
Manizales	105	19.89	92	23.12	84	20.34	117	18.54	
Tirana	107	20.27	85	21.36	85	20.58	110	17.43	

[a] Mean (SD).

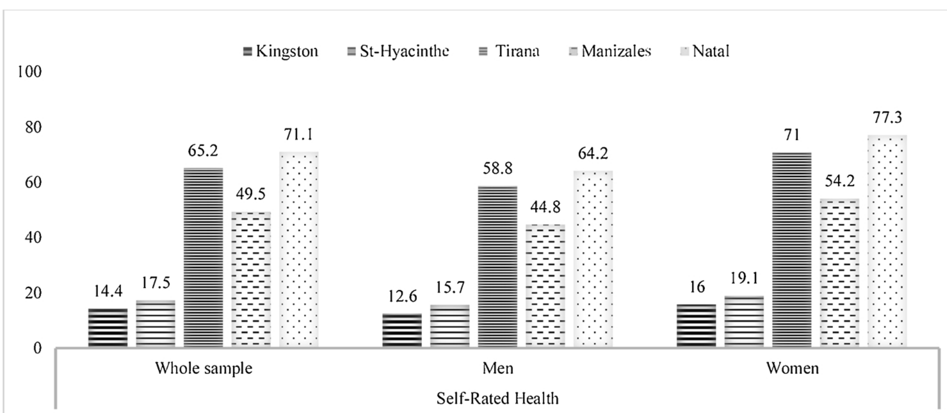

Fig. 1. Total and sex specific prevalence of fair/poor self-rated health (%) across different sites of IMIAS.

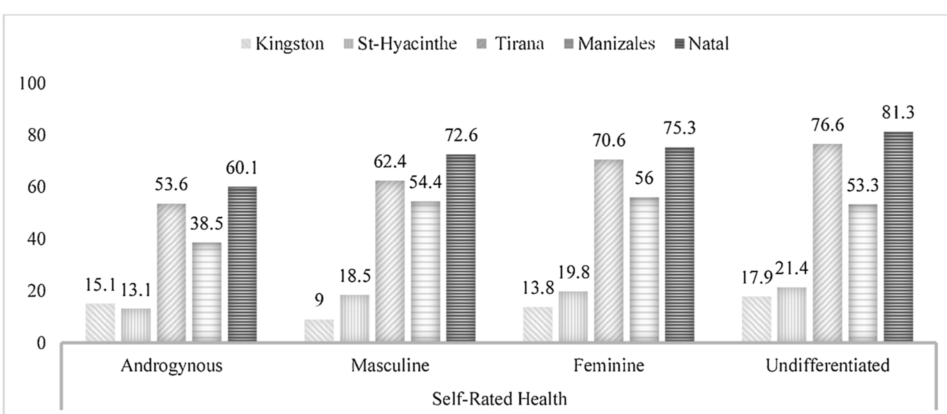

Fig. 2. Gender roles specific prevalence of fair/poor self-rated health (%) across different sites of IMIAS.

(Atchley & Scala, 1998; Brenowitz et al., 2014; Dening et al., 1998; Hillen, Davies, Rudd, Kieselbach, & Wolfe, 2003; Idler & Kasl, 1995; Idler et al., 2000; Pérez-Zepeda et al., 2016; Spiers, Jagger, & Clarke, 1996).

The significant associations between masculine, feminine and undifferentiated gender roles and fair/poor self-rated health in the unadjusted model were relatively unchanged after adjusting for sex. This demonstrates that the gender role measure (BSRI) represented a

Table 2
Prevalence risk ratios (95 % confidence interval) for the relationship between gender roles and self-rated health using Poisson regression with robust variance.

Prevalence risk ratio (95 %CI) of fair/poor self-rated health			
Variables	Unadjusted	Adjusted by sex [a]	Fully Adjusted [b]
Gender roles (ref, androgynous)			
Feminine	**1.29 (1.10–1.56)***	**1.25 (1.03–1.52)***	**1.24 (1.02–1.51)***
Masculine	**1.24 (1.02–1.50)***	**1.28 (1.05–1.56)***	1.22 (1.00–1.50)
Undifferentiated	**1.42 (1.19–1.69)*****	**1.43 (1.19–1.70)*****	**1.32 (1.10–1.58)****
Sex (ref, men)		**1.22 (1.07–1.40)****	**1.17 (1.01–1.34)***
Age			1.01 (0.99–1.04)
Years of education			0.98 (0.96–1.00)
Income sufficiency (ref, very sufficient)			
Barely sufficient			1.33 (0.98–1.79)
Insufficient			**1.66 (1.21–2.27)****
Study site (ref, Kingston)			
St-Hyacinthe			1.09 (0.76–1.56)
Tirana			**3.02 (2.15–4.24)*****
Manizales			**2.09 (1.43–3.04)*****
Natal			**2.96 (2.04–4.30)*****

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.
[a] Model adjusted for sex only.
[b] Model adjusted for sex, age, years of education, income sufficiency, and research site.

different characteristic than biological sex. Our analysis found that biological sex was also associated with self-rated health: women were more likely to report poor perceived health status, which is consistent with previous literature on self-rated health (Malmusi, Artazcoz, Benach, & Borrell, 2012; Palloni & McEniry, 2007; Zunzunegui, Alvarado, Béland, & Vissandjee, 2009) and other health outcomes (Alvarado, Guerra, & Zunzunegui, 2007; Zunzunegui et al., 2009). The fact that this association decreased considerably in the fully adjusted model suggests gender roles (e.g. femininity) and socioeconomic position might help explain lower self-rated health in women in our population compared to men. Similarly, other authors have suggested the association between self-rated health and women is diminished or abolished when socioeconomic variables such as education, race, employment and social network are accounted for (Bardage et al., 2005).

Our analyses yielded a significant relationship between masculinity and fair/poor self-rated health, compared to the androgynous group, when adjusted for sex. However, this relationship did not hold when we adjusted for all other confounders. This could be due to a lack of statistical power. Indeed, although the final model was not significant, the PRR only changed slightly from the unadjusted to fully adjusted model: from 1.24 to 1.22. The lack of association in the final model could also potentially be explained by the fact that the BSRI is not based on traits associated with hegemonic masculinity – a dominant form of masculinity that appears in a minority of men which has been linked to negative health behaviours (Courtenay, 2000). Instead, many of the 'masculine' or instrumental traits included on the BSRI, such as self-sufficiency, leadership and independence, would positively affect health. We hypothesize that older adults who endorse these masculine traits would be less likely to view themselves as dependent on others, which could be relevant to their health perception as many older adults become increasingly dependent on family or friends for care. The lack of association between masculinity and fair/poor self-rated health is also somewhat in line with some previous literature, which has been inconsistent in finding positive or negative effects of masculinity. Masculinity has been previously associated with positive health effects: better self-assessed mental health (Annandale & Hunt, 1990; Nezu & Nezu, 1987; Stoppard & Paisley, 1987), physical health (Annandale & Hunt, 1990), self-assessed general health (Nicholson, 1993), and self-esteem (Whitley, 1983). However, Hunt et al. also found higher chronic heart disease mortality among men classified as masculine (Hunt et al., 2007).

Our findings emphasize the need to study gender-related traits in addition to biological sex when investigating self reported health. We hypothesize that gender roles could affect health status perception through intermediate pathways. Further research is required to examine the mediators of these relationships using a longitudinal analysis of data. These mediators may be similar to what previous authors found to explain the associations between gender roles and physical function, including smoking, physical activity, the number of chronic conditions, body mass index, and depression (Ahmed et al., 2018).

Resilience/coping could also be an important variable in this pathway, as it has been previously linked to self-rated health in the IMIAS population (Lau et al., 2018). Biological factors, such as stress physiology, may play a role as well, although currently little is known about such associations. Persistent exposure to chronic stress results in wear and tear on the body's regulatory systems (McEwen, 2012), leading to higher allostatic load levels and consequently to poor health. One study has suggested that the highest levels of allostatic load (a measure of the cumulative physiological toll of maintaining physiological stability and adapting to life's demands (McEwen & Seeman, 1999; Mcewen & Stellar, 1993)) were observed among undifferentiated men (Juster et al., 2016). Higher femininity was also associated in this study with higher allostatic loads compared to androgynous individuals (Juster et al., 2016). This could be an area for further investigation.

4.3. Strengths and limitations

To our knowledge, this is the first study to examine the relationship between self-rated health and gender roles. We used data from large, diverse international populations of older adults for this investigation.

The results of this study should be considered bearing in mind some limitations. Most important is the controversy over what the BSRI actually measures. In determining that certain traits are 'masculine' while others are 'feminine' the BSRI might be seen to be ossifying and reinforcing gender stereotypes rather than merely determining which characteristics each participant holds. Some have suggested that what matters is dissonance with cultural norms rather than the norms, themselves. However, the BSRI has been used extensively for four decades and validated repeatedly, including in the IMIAS study population, as well as other similar populations. It is clearly measuring something distinct from biological sex and this something is as good an indicator of gender roles as we have.

As the design was cross-sectional, we cannot establish a causal relationship and our results do not capture how gender role or self-rated health may change over the lifespan. However, since gender roles are constructed over the course of one's life, their formation likely precedes changes in health related to older age.

4.4. Conclusions

Feminine and undifferentiated gender roles, as distinct from sex, are independent risk factors for fair/poor self-rated health in older adults, across locations and socioeconomic status indicators. These findings suggest that gender norms, which are based on culture and accepted behaviours, traits and attitudes ascribed to each sex, are related to self-perceived health status. Further research is required to examine the mediation pathways of these relationships using a longitudinal analysis of data.

Funding

This work was supported by The Canadian Institutes of Health Research (Grant AAM 108751).

Declaration of Competing Interest

The authors declare that there are no conflicts of interest.

References

Ahmed, T., Vafaei, A., Auais, M., Guralnik, J., & Zunzunegui, M. V. (2016). Gender roles and physical function in older adults: Cross-sectional analysis of the international mobility in aging study (IMIAS). *PloS One, 11*(6), e0156828. https://doi.org/10.1371/journal.pone.0156828.

Ahmed, T., Vafaei, A., Auais, M., Phillips, S. P., Guralnik, J., & Zunzunegui, M. V. (2018). Health behaviors and chronic conditions mediate the protective effects of masculinity for physical performance in older adults. *Journal of Aging and Health, 30*(7), 1062–1083. https://doi.org/10.1177/0898264317704750.

Ahmed, T., Vafaei, A., Belanger, E., Phillips, S. P., & Zunzunegui, M.-V. (2016). Bem sex role inventory validation in the international mobility in aging study. *Canadian Journal on Aging / La Revue canadienne du vieillissement, 35*(3), 348–360. https://doi.org/10.1017/S0714980816000404.

Alvarado, B. E., Guerra, R. O., & Zunzunegui, M. V. (2007). Gender differences in lower extremity function in Latin American elders: Seeking explanations from a life-course perspective. *Journal of Aging and Health, 19*(6), 1004–1024. https://doi.org/10.1177/0898264307308618.

Annandale, E., & Hunt, K. (1990). Masculinity, femininity and sex: An exploration of their relative contribution to explaining gender differences in health. *Sociology of Health & Illness, 12*(1), 24–46. https://doi.org/10.1111/1467-9566.ep10844865.

Atchley, R. C., & Scala, M. A. (1998). Long-range antecedents of functional capability in later life. *Journal of Aging and Health, 10*(1), 3–19. https://doi.org/10.1177/089826439801000101.

Bardage, C., Pluijm, S. M. F., Pedersen, N. L., Deeg, D. J. H., Jylhä, M., Noale, M., ... Otero, Á. (2005). Self-rated health among older adults: A cross-national comparison. *European Journal of Ageing, 2*(2), 149–158. https://doi.org/10.1007/s10433-005-0032-7.

Barros, A. J., & Hirakata, V. N. (2003). Alternatives for logistic regression in cross-sectional studies: An empirical comparison of models that directly estimate the prevalence ratio. *BMC Medical Research Methodology, 3*, 21. https://doi.org/10.1186/1471-2288-3-21.

Bélanger, E., Ahmed, T., Filiatrault, J., Yu, H.-T., & Zunzunegui, M. V. (2017). An empirical comparison of different models of active aging in Canada: The international mobility in aging study. *The Gerontologist, 57*(2), 197. https://doi.org/10.1093/geront/gnv126.

Bem, S. L. (1974). The measurement of psychological androgyny. *Journal of Consulting and Clinical Psychology, 42*(2), 155–162. https://doi.org/10.1037/h0036215.

Bem, S. L. (1977). On the utility of alternative procedures for assessing psychological androgyny. *Journal of Consulting and Clinical Psychology, 45*(2), 196–205. https://doi.org/10.1037/0022-006X.45.2.196.

Bem, S. L. (1981). *Bem sex-role inventory: Professional manual.* Palo Alto, CA: Consulting Psychologists Press.

Blakely, T. A., Lochner, K., & Kawachi, I. (2002). Metropolitan area income inequality and self-rated health–a multi-level study. *Social Science & Medicine, 54*(1), 65–77.

Bond, J., Dickinson, H. O., Matthews, F., Jagger, C., Brayne, C., & Mrc, C. (2006). Self-rated health status as a predictor of death, functional and cognitive impairment: A longitudinal cohort study. *European Journal of Ageing, 3*(4), 193–206. https://doi.org/10.1007/s10433-006-0039-8.

Bopp, M., Braun, J., Gutzwiller, F., Faeh, D., Swiss National Cohort Study, G, & for the Swiss National Cohort Study, G (2012). Health risk or resource? Gradual and independent association between self-rated health and mortality persists over 30 years. *PloS One, 7*(2), e30795. https://doi.org/10.1371/journal.pone.0030795.

Brenowitz, W. D., Hubbard, R. A., Crane, P. K., Gray, S. L., Zaslavsky, O., & Larson, E. B. (2014). Longitudinal associations between self-rated health and performance-based physical function in a population-based cohort of older adults. *PloS One, 9*(11), e111761. https://doi.org/10.1371/journal.pone.0111761.

Canadian Institutes of Health Research (2018). *How to integrate sex and gender into research.* Retrieved fromhttp://www.cihr-irsc.gc.ca/e/50836.html.

Carver, L. F., Vafaei, A., Guerra, R., Freire, A., & Phillips, S. P. (2013). Gender differences: Examination of the 12-item bem sex role inventory (BSRI-12) in an older Brazilian population. *PloS One, 8*(10), e76356. https://doi.org/10.1371/journal.pone.0076356.

Cesari, M., Onder, G., Zamboni, V., Manini, T., Shorr, R. I., Russo, A., ... Landi, F. (2008). Physical function and self-rated health status as predictors of mortality: Results from longitudinal analysis in the ilSIRENTE study. *BMC Geriatrics, 8*(1), https://doi.org/10.1186/1471-2318-8-34 34-34.

Courtenay, W. H. (2000). Constructions of masculinity and their influence on men's well-being: A theory of gender and health. *Social Science & Medicine, 50*(10), 1385–1401. https://doi.org/10.1016/S0277-9536(99)00390-1.

Dening, T. R., Chi, L. Y., Brayne, C., Huppert, F. A., Paykel, E. S., & O'Connor, D. W. (1998). Changes in self-rated health, disability and contact with services in a very elderly cohort: A 6-year follow-up study. *Age and Ageing, 27*(1), 23–33. https://doi.org/10.1093/ageing/27.1.23.

DeSalvo, K. B., Bloser, N., Reynolds, K., He, J., & Muntner, P. (2006). Mortality prediction with a single general self-rated health question: A meta-analysis. *Journal of General Internal Medicine, 21*(3), 267–275. https://doi.org/10.1111/j.1525-1497.2005.00291.x.

Elliott, A. M., Hannaford, P. C., Smith, B. H., Wyke, S., & Hunt, K. (2006). Symptom experience and subsequent mortality: Results from the West of Scotland twenty-07 study. *BMC Health Services Research, 6*(1), https://doi.org/10.1186/1472-6963-6-158 158-158.

Ferraro, K. F., & Kelley-Moore, J. A. (2001). Self-rated health and mortality among black and white adults: Examining the dynamic evaluation thesis. *The Journals of Gerontology Series B, Psychological Sciences and Social Sciences, 56*(4), S195–S205. https://doi.org/10.1093/geronb/56.4.S195.

Gale-Ross, R., Baird, A., & Towson, S. (2009). Gender role, life satisfaction, and wellness: Androgyny in a southwestern Ontario sample. *Canadian Journal on Aging, 28*(2), 135–146. https://doi.org/10.1017/S0714980809090187.

Gentile, D. A. (1993). Just what are sex and gender, anyway? A call for a new terminological standard. *Psychological Science, 4*(2), 120–122. https://doi.org/10.1111/j.1467-9280.1993.tb00472.x.

Giltay, E. J., Vollaard, A. M., & Kromhout, D. (2012). Self-rated health and physician-rated health as independent predictors of mortality in elderly men. *Age and Ageing, 41*(2), 165–171. https://doi.org/10.1093/ageing/afr161.

Gomez, F., Zunzunegui, M. V., Alvarado, B., Curcio, C. L., Pirkle, C. M., Guerra, R., ... Guralnik, J. (2018). Cohort profile: The international mobility in aging study (IMIAS). *International Journal of Epidemiology, 47*(5), 1393. https://doi.org/10.1093/ije/dyy074.

Halford, C., Wallman, T., Welin, L., Rosengren, A., Bardel, A., Johansson, S., ... Centrum för klinisk forskning i, S (2012). Effects of self-rated health on sick leave, disability pension, hospital admissions and mortality. A population-based longitudinal study of nearly 15,000 observations among Swedish women and men. *BMC Public Health, 12*(1), 1103. https://doi.org/10.1186/1471-2458-12-1103.

Hillen, T., Davies, S., Rudd, A. G., Kieselbach, T., & Wolfe, C. D. (2003). Self ratings of health predict functional outcome and recurrence free survival after stroke. *Journal of Epidemiology and Community Health (1979-), 57*(12), 960–966. https://doi.org/10.1136/jech.57.12.960.

Hubbard, R. A., Inoue, L. Y., & Diehr, P. (2009). Joint modeling of self-rated health and changes in physical functioning. *Journal of the American Statistical Association, 104*(487), 912. https://doi.org/10.1198/jasa.2009.ap08423.

Hunt, C. J., Piccoli, V., Gonsalkorale, K., & Carnaghi, A. (2015). Feminine role norms among Australian And Italian women: A cross-cultural comparison. *Sex Roles, 73*(11), 533–542. https://doi.org/10.1007/s11199-015-0547-0.

Hunt, K., Lewars, H., Emslie, C., & Batty, G. D. (2007). Decreased risk of death from coronary heart disease amongst men with higher' femininity' scores: A general population cohort study. *International Journal of Epidemiology, 36*(3), 612–620. https://doi.org/10.1093/ije/dym022.

Idler, E. L., & Benyamini, Y. (1997). Self-rated health and mortality: A review of twenty-seven community studies. *Journal of Health and Social Behavior, 38*(1), 21–37.

Idler, E. L., Hudson, S. V., & Leventhal, H. (1999). The meanings of self-ratings of health: A qualitative and quantitative approach. *Research on Aging, 21*(3), 458–476. https://doi.org/10.1177/0164027599213006.

Idler, E. L., & Kasl, S. V. (1995). Self-ratings of health: Do they also predict change in functional ability? The journals of gerontology. *Series B, Psychological Sciences and Social Sciences, 50*(6), S344.

Idler, E. L., Russell, L. B., & Davis, D. (2000). Survival, functional limitations, and self-rated health in the NHANES I Epidemiologic Follow-up Study, 1992. First National Health and Nutrition Examination Survey. *American Journal of Epidemiology, 152*(9), 874.

Juster, R. P., Pruessner, J. C., Desrochers, A. B., Bourdon, O., Durand, N., Wan, N., ... Lupien, S. J. (2016). Sex and gender roles in relation to mental health and allostatic load. *Psychosomatic Medicine, 78*(7), 788–804. https://doi.org/10.1097/psy.0000000000000351.

Kaplan, M. S., Berthelot, J.-M., Feeny, D., McFarland, B. H., Khan, S., & Orpana, H. (2007). The predictive validity of health-related quality of life measures: Mortality in a longitudinal population-based study. *Quality of Life Research, 16*(9), 1539–1546.

https://doi.org/10.1007/s11136-007-9256-7.
Kling, J., Holmqvist Gattario, K., & Frisén, A. (2017). Swedish women's perceptions of and conformity to feminine norms. *Scandinavian Journal of Psychology, 58*(3), 238–248. https://doi.org/10.1111/sjop.12361.
LaRue, A., Bank, L., Jarvik, L., & Hetland, M. (1979). Health in old age: how do physicians' ratings and self-ratings compare? *Journal of Gerontology, 34*(5), 687–691.
Lau, S. Y. Z., Guerra, R. O., Barbosa, J. F., & Phillips, S. P. (2018). Impact of resilience on health in older adults: A cross-sectional analysis from the International Mobility in Aging Study (IMIAS). *BMJ Open, 8*(11), e023779. https://doi.org/10.1136/bmjopen-2018-023779.
Lefkowitz, E. S., & Zeldow, P. B. (2006). Masculinity and femininity predict optimal mental health: A belated test of the androgyny hypothesis. *Journal of Personality Assessment, 87*(1), 95–101. https://doi.org/10.1207/s15327752jpa8701_08.
Lindsey, L. L. (2005). *Gender roles: A sociological perspective* (4th ed.). Maryville, MO: Pearson Prentice Hall.
Long, M. J., & Marshall, B. S. (1999). The relationship between self-assessed health status, mortality, service use, and cost in a managed care setting. *Health Care Management Review, 24*(4), 20–27. https://doi.org/10.1097/00004010-199902440-00003.
Malmusi, D., Artazcoz, L., Benach, J., & Borrell, C. (2012). Perception or real illness? How chronic conditions contribute to gender inequalities in self-rated health. *European Journal of Public Health, 22*(6), 781–786. https://doi.org/10.1093/eurpub/ckr184.
Martinez, D. J., Kasl, S. V., Gill, T. M., & Barry, L. C. (2010). Longitudinal association between self-rated health and timed gait among older persons. *The Journals of Gerontology Series B, Psychological Sciences and Social Sciences, 65B*(6), 715–719. https://doi.org/10.1093/geronb/gbp115.
Mateo, M., & Fernández, J. (1991). La dimensionalidad de los conceptos de masculinidad y feminidad [The dimensionality of the masculinity and femininity concepts]. *Investigaciones Psicológicas, 9*, 95–116.
McEwen, B. S. (2012). Brain on stress: How the social environment gets under the skin. *Proceedings of the National Academy of Sciences of the United States of America, 109*(Suppl. 2), 17180–17185. https://doi.org/10.1073/pnas.1121254109.
McEwen, B. S., & Seeman, T. (1999). Protective and damaging effects of mediators of stress. Elaborating and testing the concepts of allostasis and allostatic load. *Annals of the New York Academy of Sciences, 896*, 30–47.
Mcewen, B. S., & Stellar, E. (1993). Stress and the individual – Mechanisms leading to disease. *Archives of Internal Medicine, 153*(18), 2093–2101. https://doi.org/10.1001/archinte.153.18.2093.
Mossey, J. M., & Shapiro, E. (1982). Self-rated health: A predictor of mortality among the elderly. *American Journal of Public Health, 72*(8), 800–808.
Nezu, A. M., & Nezu, C. M. (1987). Psychological distress, problem solving, and coping reactions: Sex role differences. *Sex Roles, 16*(3-4), 205–214. https://doi.org/10.1007/BF00289650.
Nicholson, J. (1993). *Men and women: How different are they?* (2nd ed.). New York;Oxford: Oxford University Press.
Palloni, A., & McEniry, M. (2007). Aging and health status of elderly in Latin America and the Caribbean: Preliminary findings. *Journal of Cross-cultural Gerontology, 22*(3), 263–285. https://doi.org/10.1007/s10823-006-9001-7.
Pérez-Zepeda, M. U., Belanger, E., Zunzunegui, M.-V., Phillips, S., Ylli, A., & Guralnik, J. (2016). Assessing the validity of self-rated health with the short physical performance battery: A cross-sectional analysis of the international mobility in aging study. *PloS One, 11*(4), e0153855. https://doi.org/10.1371/journal.pone.0153855.
Price, E. C., Gregg, J. J., Smith, M. D., & Fiske, A. (2018). Masculine traits and depressive symptoms in older and younger men and women. *American Journal of Men's Health, 12*(1), 19–29. https://doi.org/10.1177/1557988315619676.
Prince, V. (2005). Sex vs. Gender. *The International Journal of Transgenderism, 8*(4), 29–32. https://doi.org/10.1300/J485v08n04_05.
Sanchez-Santos, M. T., Zunzunegui, M. V., Otero-Puime, A., Cañas, R., & Casado-Collado, A. J. (2011). Self-rated health and mortality risk in relation to gender and education: A time-dependent covariate analysis. *European Journal of Ageing, 8*(4), 281–289. https://doi.org/10.1007/s10433-011-0198-0.
Sargent-Cox, K. A., Anstey, K. J., & Luszcz, M. A. (2010). The choice of self-rated health measures matter when predicting mortality: Evidence from 10 years follow-up of the Australian longitudinal study of ageing. *BMC Geriatrics, 10*(1), https://doi.org/10.1186/1471-2318-10-18 18-18.
Shifren, K., & Bauserman, R. L. (1996). The relationship between instrumental and expressive traits, health behaviors, and perceived physical health. *Sex Roles, 34*(11-12), 841–864. https://doi.org/10.1007/BF01544319.
Shimonaka, Y., Nakazato, K., & Homma, A. (1996). Personality, longevity, and successful aging among Tokyo metropolitan centenarians. *International Journal of Aging & Human Development, 42*(3), 173. https://doi.org/10.2190/UMWD-64W7-3M2K-2MKJ.
Spiers, N., Jagger, C., & Clarke, M. (1996). Physical function and perceived health: Cohort differences and interrelationships in older people. *The Journals of Gerontology Series B, Psychological Sciences and Social Sciences, 51*(5), S226–S233. https://doi.org/10.1093/geronb/51B.5.S226.
Steinfeldt, J. A., Zakrajsek, R., Carter, H., & Steinfeldt, M. C. (2011). Conformity to gender norms among female student-athletes: Implications for body image. *Psychology of Men & Masculinity, 12*(4), 401–416. https://doi.org/10.1037/a0023634.
Stenholm, S., Pentti, J., Kawachi, I., Westerlund, H., Kivimäki, M., Vahtera, J., ... Stressforskningsinstitutet (2014). Self-rated health in the last 12 years of life compared to matched surviving controls: The Health and Retirement Study. *PloS One, 9*(9), e107879. https://doi.org/10.1371/journal.pone.0107879.
Stoppard, J. M., & Paisley, K. J. (1987). Masculinity, femininity, life stress, and depression. *Sex Roles, 16*(9-10), 489–496. https://doi.org/10.1007/BF00292483.
Subramania, S. V., Kawachi, I., & Kennedy, B. P. (2001). Does the state you live in make a difference? Multilevel analysis of self-rated health in the US. *Social Science & Medicine, 53*(1), 9–19.
Vafaei, A., Ahmed, T., Freire, A. N. F., Zunzunegui, M. V., & Guerra, R. O. (2016). Depression, sex and gender roles in older adult populations: The international mobility in aging study (IMIAS). *PloS One, 11*(1), e0146867. https://doi.org/10.1371/journal.pone.0146867.
Vafaei, A., Alvarado, B., Tomás, C., Muro, C., Martinez, B., & Zunzunegui, M. V. (2014). The validity of the 12-item Bem Sex Role Inventory in older Spanish population: An examination of the androgyny model. *Archives of Gerontology and Geriatrics, 59*(2), 257–263. https://doi.org/10.1016/j.archger.2014.05.012.
Wang, C., & Satariano, W. A. (2007). Self-rated current and future health independently predict subsequent mortality in an aging population. *The Journals of Gerontology Series A, Biological Sciences and Medical Sciences, 62*(12), 1428–1434. https://doi.org/10.1093/gerona/62.12.1428.
Whitley, B. E. (1983). Sex role orientation and self-esteem: A critical meta-analytic review. *Journal of Personality and Social Psychology, 44*(4), 765–778. https://doi.org/10.1037/0022-3514.44.4.765.
Zunzunegui, M.-V., Alvarado, B.-E., Béland, F., & Vissandjee, B. (2009). Explaining health differences between men and women in later life: A cross-city comparison in Latin America and the Caribbean. *Social Science & Medicine, 68*(2), 235–242. https://doi.org/10.1016/j.socscimed.2008.10.031.