Neglect and self-rated health among older adults — a cross-sectional study in Poland

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Abstract: The aim of this cross-sectional study is to examine if neglect is associated with self-rated health (SRH) and if neglect mediates the association between selected factors and self-rated health, among older men and women. The analyses were based on face-to-face computer-assisted personal interviews conducted with 1632 randomly selected community-dwelling individuals aged 65 years and more from among the general population of Lesser Poland. The regression models' analysis revealed that elder neglect was associated with self-rated health, and the mediation analysis demonstrated that neglect mediates the association between frequency of church attendance and SRH, as well as between marital status (being a widower vs being married) and SRH, among men. These observations can be helpful in better understanding of the broad context of elder neglect in order to develop instruments for an efficient improvement of older adults' health and quality of life. In addition to this, the study underlines the role of social networks and social engagement as factors which might protect against neglect, and thus improve self-rated health of older people.

Keywords: elder neglect, self-rated health, social network, quality of life, mediation analysis.

Introduction

Self-rated health, as a commonly used indicator of health status and quality of life, has been given a lot of attention by researchers who aim to identify determinants of healthy aging and risk factors of age-related disorders. As the percentage of the world's older population is growing rapidly, the solutions for increasing life expectancy in good

health are of major interest of the gerontological studies. Along with the aging population, the problem of elder abuse and neglect is growing. More and more people have specific care needs which are not met [1]. This fact has implications for health and quality of life of older adults. However, scarce is research investigating the association between neglect and self-rated health among older adults, especially in East-Central Europe. This paper is an attempt to gain an insight into this important topic.

Elder neglect prevalence and its implications for health

Elder neglect (EN) is defined as "intentional act or omission of care occurring in a relationship of trust, which causes harm or serious risk of harm to an older adult or deprives an older adult of basic needs OR failure to meet the elder's needs by a responsible caregiver" [2].

Neglect is the most unreported, yet not the least important, type of abuse throughout the world [3, 4]. The current worldwide prevalence of elder neglect is estimated by the World Health Organization at 3.2% which is the third most frequent (after psychological and financial) type of elder abuse [4]. In some countries, the problem is even larger, as reported by some researchers, e.g.: 7.6% in USA [5], 15.8% in China [6], 16% in Spain [7], 24.2% in Israel [8], 42.4% in Egypt [9]. In Poland, elder neglect was considered to be a serious social problem by 58.1% of social workers and healthcare professionals, according to a study by Tobiasz-Adamczyk *et al.* [10].

Neglected people are generally subject to lower quality of life and poorer self-rated health [11]. Serious physical and psychological consequences of neglect (e.g. injuries, malnutrition, dehydration, bedsores, lesions, over or undermedication, weight loss, depression, poor mental functioning) should prompt researchers to search for identification and minimization of the impact of neglect on older adults' lives [1, 11–15].

Factors associated with self-rated health and neglect — what we know from the literature?

There have been a relatively large number of studies investigating the association between self-rated health and different socio-demographic or health-related factors. For instance, Aguilar-Palacio *et al.* [16] demonstrated that female gender and low educational level, among other factors, presented the strongest association with low self-rated health. Marital status is also related to SRH: in a population-based study by Lindström [17], the never married and the divorced have significantly higher age-adjusted odds ratios of poor self-rated health than the married group. However, a study in China by Cai *et al.* [18] indicated that married or single respondents were less likely to report good self-rated health. In a large cross-sectional Italian study, researchers observed that low perceived income adversely affected subjective health [19]. Also,

some studies revealed that religiosity is related to SRH: older adults in Colombia who consider themselves more religious were less likely to perceive their physical health as poor compared to those who are less religious [20]. Similarly, Kent *et al.* [21] stated that religion/spirituality is associated with self-rated and mental health, and Krause [22] indicated that the way in which older people view their health may be traced in part to the virtues that are part of most faith traditions. Dong *et al.* [23] suggest that the main determinants of SRH among elders include social support and health status.

Poorer health condition is highlighted by many researchers as a key predictor of poorer self-rated health. A recent study by Yang *et al.* [24] indicated that poor self-rated health among older adults was associated with chronic diseases, poor mental health, and poor social relationships. According to van der Linde *et al.* [25], self-rated health is strongly associated with cardiovascular disease events after adjustment for socio-demographic, clinical, and behavioral risk factors. Esteban y Peña *et al.* [26] demonstrated that SRH was considerably poorer among adults with diabetes vs those without diabetes. Another recent study by Peleg & Nudelman [27] indicated that depressive symptoms predict self-rated health among older adults. In a cross-sectional study by Abu *et al.* [28], older adults with higher multimorbidity and worse physical frailty more often rated their health as poor.

Loneliness is another significant contributor to poor SRH: in a longitudinal study by Nummela *et al.* [29], never or seldom experiencing loneliness was a strong predictor of good SRH among older adults. Increased risk of poor self-rated health was also confirmed in a large Danish study among lonely middle-aged and older adults [30].

As far as elder neglect is concerned, it has been demonstrated that sociodemographic characteristics, such as gender, age, education, income, as well as social support (including living with others and having trusted relationships), and health status (most particularly chronic illnesses) are associated with EN, and so they should be considered as potential confounders in the analyses [31–34]. In a study realized by Ron Acierno *et al.* [35] among adults aged 60 years and more, poor income, poor health, and lack of social support were indicated as predictors of neglect. Another research on a large sample (4156 adults aged 60 years and more in USA) demonstrated that elder neglect was associated with younger age and lower education level, among others [5]. Garre-Olmo *et al.* [7], in a research carried out in Spain, found that social isolation and lack of contact with trusted persons increased the risk of neglect among adults aged 75 years and more. Sooryanarayana *et al.* [31] highlighted the association between elder neglect and depression (elder neglect was identified in 31.1% of respondents with depression). Furthermore, the researchers indicated that EN was more frequent among older adults who suffered from at least one chronic disease [31]. Also, the results of a study by Chokkanathan & Lee [36] confirmed the association between elder neglect and depression and generally lower satisfaction of life. Additionally, the study revealed that women experienced neglect more often than men [36].

Some factors can be associated both with self-rated health and neglect. Little is known about the potential role of neglect in the association between previously identified determinants of SRH and SRH. The knowledge about these potential correlations might be helpful in better understanding of the broad context of elder neglect in order to develop instruments for an efficient improvement of older adults' health and quality of life.

Aim of the study

The aim of the study is to find out what is the actual association between neglect and self-rated health, among older men and women, taking into consideration the selected confounding variables. The study also aims to verify if neglect mediates the association between selected factors and self-rated health.

Materials and Methods

Study design

A cross-sectional study titled "Elder neglect and self-neglect — challenges for formal and informal caregivers and the medical and social professional care system" was conducted in Lesser Poland, in 2017. The analyses were based on face-to-face computer-assisted personal interviews conducted with 2001 randomly selected community-dwelling individuals aged 65 years and more (1632 were taken into account for the analyses after removal of records done with proxy respondents and with missing data). A structured questionnaire measuring different aspects of health and quality of life was used to collect data. The data were weighted to generalize the study sample to the older Polish population. A detailed study design was described elsewhere [37].

Measurements

Self-rated health (as dependent variable) was assessed with the following question: "Compared to other people in your age, would you say that your health is…?" and a 5-point Likert scale ranging from 'very good' (1) to 'very poor' (5).

Neglect (as the main independent variable and mediator) was assessed with the Self-Reported Neglect Scale (SRNS). The scale has two 2-factor structure which covers basic needs and psychological needs dimensions. The scale score can be interpreted as the level of self-reported neglect which occurred within the last 12 months [37]. Higher scores mean higher level of neglect (0 — lack of signs of neglect, 100 — very high level of neglect).

The percentage of nonzero values of the SRNS score makes it possible to estimate the prevalence of persons at risk of, or suffering from, neglect. Thus, for descriptive statistics, we also considered neglect as a dichotomous variable by categorization of the results into 'yes' = signs of neglect (nonzero values) and 'no' = no signs of neglect.

Sociodemographic characteristics, such as age, marital status, education, and income (personal net monthly income in PLN) were selected as other independent variables based on their association with self-rated health and/or elder neglect demonstrated in previous studies (mentioned in the introduction section).

The number of residents in the household and the number of people whom the respondent can count on were used to determine social networks.

Frequency of church attendance was assessed with one question: "How often have you attended church within the last 12 months?", excluding such occasional events as weddings or funerals. The response categories were from 'everyday' to 'never'. This variable can be considered as indicator of social participation, on the one hand, and as a measure of religiosity, on the other hand [38, 39].

Presence of cardiovascular diseases, cancer, and/or diabetes, which were selected as the most frequent causes of death among older adults in Poland [40], was measured with self-reported information in order to evaluate health condition. Respondents were asked whether they suffered from these diseases diagnosed within the 12 months prior to the interview.

Being at risk of depression was measured with the shortened 15-item Geriatric Depression Scale (GDS) [41]. Higher scores indicated more depressive symptoms reported by the respondent.

The feeling of loneliness was assessed by the De Jong Gierveld scale [42]. Scores range from 0 to 100, where higher scores indicate a higher level of feeling of loneliness. Loneliness has been reported in previous studies as strongly correlated with poor health and quality of life in old age [29, 30].

Will to live was measured with a 6-category scale from 'no will to live' to 'very strong'. This variable was considered as potential confounder, due to its strong correlation with depression, poor satisfaction of life, and general well-being, negatively impacting self-rated health [43, 44].

Depression, loneliness, and will to live were measured as psychosocial variables.

Statistical analysis

The profiles of men and women according to self-rated health (recoded to 'good' and 'less than good') and different variables were determined based on the Chi2 test or U Mann–Whitney test.

To verify the association between neglect and self-rated health, multivariable linear regression models were performed. In the first step, sociodemographic char-

acteristics were considered as confounding variables (Model 1). Secondly, variables related to social relationships and health characteristics were added into the model (Model 2). Finally, psychosocial variables (depression, loneliness, and will to live) were added (Model 3).

Additionally, the Sobel test of the indirect effect to assess the significance of the mediation effect of neglect was used [45].

The mediating effect of neglect was verified according to the models considering all independent variables, neglect as mediator, and self-rated health as outcome (see Fig. 1). At first, unadjusted models were made for every independent variable. In case of variables for which significant mediation effects of neglect were found, further adjusted models were carried out.
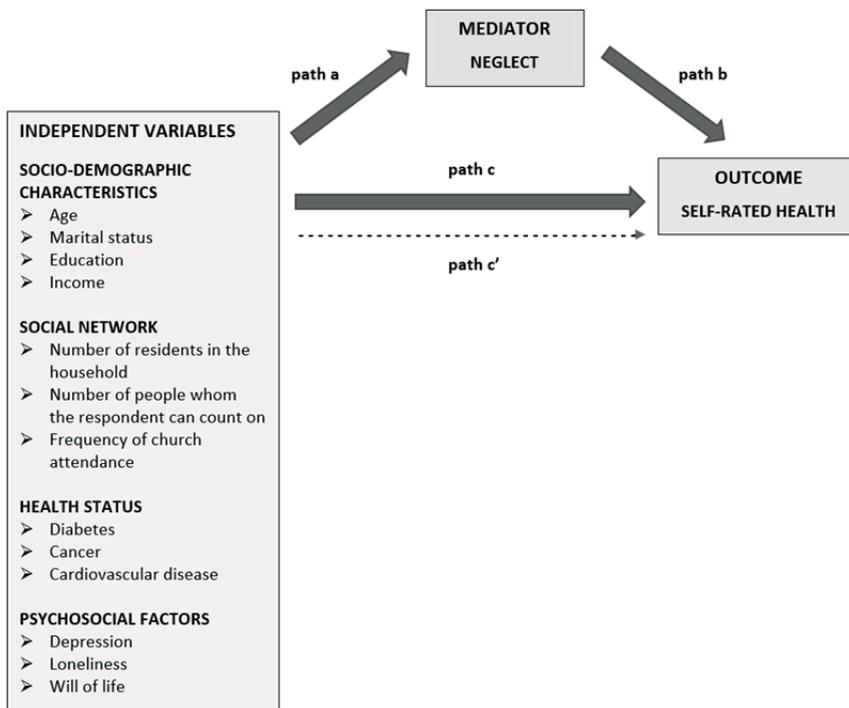
path a   — the relationship between independent variables and neglect (mediator)
path b   — the association between neglect and self-rated health (outcome)
path c   — the effect of neglect on the association between independent variables and self-rated health (direct effect)
path c'   — the total effect of the independent variables on self-rated health

Fig. 1. Path diagram of the mediation analysis model.

To investigate the potential mediating effect of neglect on the association between independent variables and self-rated health, three pathways (a, b, and c) were used.

Path a evaluated the relationship between independent variables and neglect (mediator). Path b measured the association between neglect and self-rated health (outcome). The effect of neglect on the link between independent variables and self-rated health was assessed through path c (direct effect). Path c' evaluated the total effect of the independent variables on self-rated health. We considered the value of $p < 0.05$ as significant.

Statistical analyses were conducted with the Mplus Base Program v. 7.0.

Results

The characteristics of the groups of men and women according to self-rated health and different variables revealed a statistically significant association between SRH and education, diabetes, and cardiovascular disease for men. In the female group, the tests showed a significant association between SRH and cancer, as well as between SRH and neglect (both as dichotomous and continuous variable). Income, number of people whom the respondent can count on, frequency of church attendance, will to live, age, depression, and loneliness were found to be associated with SRH for both groups (see Table 1).

The results of a multivariable linear regression analysis allowed to verify some of the relationships (see Table 2). As far as neglect is concerned, the results of the linear regression models revealed that higher level of neglect was significantly associated with poorer self-rated health (B = 0.011, $p < 0.05$) only in men, not in women. The results were statistically significant after controlling for sociodemographic variables (Model 1). The association did not remain significant after further adjustment for social network variables as well as health and psychosocial characteristics (Model 2 and 3).

Additionally, we observed an association of diabetes, cancer, cardiovascular disease, and depression with SRH for men. Marital status was also associated with SRH, even after controlling for social support and psychosocial variables (Model 2 and 3): married men evaluated their SRH better than the never married. Income was found to be associated with SRH in both men and women. A higher number of people whom the respondent can count on was found to be a strong predictor of better SRH in Model 2, in both groups. Finally, will to live correlated strongly with SRH in both groups, after adjustment for socio-demographics, social networks, and other psychosocial factors (Model 3).

At the final step of the analyses, we verified if neglect mediates the relationship between the considered independent variables (socio-demographic, social network, health and psychosocial characteristics) and self-rated heath. The results of the mediation analysis demonstrate that a significant indirect effect of neglect was found in men when the association between marital status (B = 0.05, $p < 0.05$) or frequency of church attendance (B = –0.01, $p < 0.05$) and self-rated health was taken into account (see Table 3). In case of marital status, widowed men in comparison to the married

Table 1. Self-rated health in relation to selected sociodemographic characteristics and other variables including neglect, in the general population, men and women (data weighted; % counted in rows).

		women				men			
		Total	SRH		p	Total	SRH		p
			good	less than good			good	less than good	
Age		N = 946	median (Q1:Q3)		**0.016**[MW]	N = 686	median (Q1:Q3)		**0.010**[MW]
			75 (70:83)	76 (72:84)			73 (69:79)	75 (71:81)	
			%				%		
Marital status (N$_w$ = 944; N$_m$ = 686)	never married	50	90.2	9.8	0.347	32	97.5	2.5	0.159[F]
	married	350	88.9	11.1		482	89.9	10.1	
	widow/widower	521	87.2	12.8		159	85.1	14.9	
	separated/divorced	23	95.2	4.8		13	100	0.0	
Education (N$_w$ = 946; N$_m$ = 686)	primary (completed or not)	451	85.7	14.3	**<0.001**	228	88.4	11.6	0.371
	vocational college (secondary)	224	84.7	15.3		257	88.0	12.0	
	high school/technical (secondary)	171	93.6	6.4		122	91.9	8.1	
	university	100	97.5	2.5		78	94.1	5.9	
Income (in PLN) (N$_w$ = 776; N$_m$ = 570)	<1000	135	80.0	20.0	0.009	60	81.1	18.9	**<0.001**
	1001–2000	586	87.9	12.1		363	86.7	13.3	
	2001–3000	48	95.2	4.8		118	97.3	2.7	
	>3000	7	100	0.0		29	97.2	2.8	

Table 1. cont.

		women				men			
		Total	SRH		p	Total	SRH		p
			good	less than good			good	less than good	
Number of residents in the household (Nw = 946; Nm = 686)	1	318	88.3	11.7	0.981	118	88.8	11.2	0.104
	2	298	88.8	11.2		325	91.7	8.3	
	3–5	235	88.2	11.8		152	84.3	15.7	
	>6	95	86.9	13.1		91	91.2	8.8	
Number of people whom the respondent can count on (Nw = 945; Nm = 686)	0	82	85.1	14.9	<0.001	47	75.7	24.3	0.002
	1–2	159	75.5	24.5		111	86.1	13.9	
	3–5	317	89.0	11.0		234	93.6	6.4	
	>5	387	93.5	6.5		294	90.2	9.8	
Frequency of church attendance (Nw = 943; Nm = 682)	everyday	32	96.8	3.2	<0.001	10	87.4	12.6	<0.001
	1–2 times per week	561	91.5	8.5		401	93.8	6.2	
	1–2 times per month/ year	200	87.4	12.6		163	90.1	9.9	
	never	150	77.0	23.0		108	71.0	29.0	
Diabetes (Nw = 946; Nm = 686)	yes	200	83.0	17.0	0.008$^{\chi2Y}$	110	85.4	14.6	0.249$^{\chi2Y}$
	no	746	89.7	10.3		576	90.3	9.7	
Cancer (Nw = 946; Nm = 686)	yes	24	75.3	24.7	0.062^{F}	20	54.0	46.0	<0.001^{F}
	no	922	88.6	11.4		666	90.6	9.4	
Cardiovascular disease (Nw = 946; Nm = 686)	yes	231	83.7	16.3	0.013$^{\chi2Y}$	147	85.6	14.4	0.108$^{\chi2Y}$
	no	715	89.8	10.2		539	90.6	9.4	

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Table 1. cont.

		N	median (Q1:Q3)		p	N	median (Q1:Q3)		p
Geriatric Depression Scale (GDS)		N = 878	3 (1:5)	8 (6:12)	**<0.001**MW	N = 640	1 (0:3)	5 (3:10)	**<0.001**MW
Loneliness		N = 937	32.9 (22.9:45.4)	50.8 (42.1:57.9)	**<0.001**^{MW}	N = 683	29.2 (17.5:40.0)	39,6 (24.2:53.8)	**<0.001**^{MW}
Will to live		N = 945	4 (3:4)	2 (2:3)	**<0.001**^{MW}	N = 686	4 (4:5)	3 (3:4)	**<0.001**^{MW}
Level of neglect		N = 930	0.0 (0.0:0.0)	0.0 (0.0:0.0)	**0.239**^{MW}	N = 674	0.0 (0.0:0.0)	0.0 (0.0:0.0)	**0.002**^{MW}
			%				%		
Signs of neglect (N_w = 930; N_m = 674)	yes	83	91.2	8.8		47	75.3	24.7	
	no	847	87.8	12.2	0,347$^{\chi^{2Y}}$	627	90.4	9.6	**0.007**^{F}

Note: SRH — self-rated health; N_w — number of women; N_m — number of men

p — p-value for the Pearson's chi-squared test

$_F$ — exact Fisher's test; ^{MW} — U Mann–Whitney test; χ^{2Y} — Yates's correction for continuity (*Yates's chi-squared test*)

Table 2. Neglect and other variables as determinants of self-rated health — multivariable linear regression models.

Independent variables	men			women		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
	B (SE)	B (SE)	B (SE)	B (SE)	B (SE)	B (SE)
Neglect	0.011 (0.004)*	0.004 (0.003)	0.003 (0.003)	-0.001 (0.003)	-0.006 (0.004)	-0.007 (0.004)
Age	0.012 (0.006)*	0.005 (0.005)	0.000 (0.005)	0.011 (0.007)	0.006 (0.008)	0.000 (0.007)
Marital status: divorced/separated vs married	-0.012 (0.262)	-0.289 (0.205)	-0.178 (0.226)	-0.402 (0.238)	-0.527 (0.271)	-0.307 (0.230)
never married vs married	-0.548 (0.233)*	-0.655 (0.205)**	-0.552 (0.209)**	-0.008 (0.170)	-0.162 (0.162)	-0.088 (0.137)
widow/widower vs married	0.016 (0.112)	-0.027 (0.098)	-0.118 (0.098)	0.074 (0.099)	0.040 (0.087)	-0.066 (0.078)
Education: vocational school vs primary	0.066 (0.092)	0.017 (0.083)	0.042 (0.077)	0.085 (0.136)	0.040 (0.123)	0.025 (0.106)
high school vs primary	-0.073 (0.132)	-0.156 (0.116)	-0.090 (0.120)	-0.071 (0.099)	-0.067 (0.098)	0.093 (0.091)
university vs primary	-0.453 (0.353)	-0.509 (0.287)	-0.463 (0.292)	-0.148 (0.142)	-0.117 (0.132)	0.064 (0.130)
Income	-0.034 (0.009)***	-0.031 (0.008)***	-0.019 (0.008)*	-0.027 (0.013)*	-0.029 (0.012)*	-0.021 (0.011)*
Number of residents in the household		-0.005 (0.005)	-0.003 (0.006)		0.016 (0.013)	0.013 (0.014)

Table 2. cont.

Independent variables	men			women		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
	B (SE)	B (SE)	B (SE)	B (SE)	B (SE)	B (SE)
Number of people whom the respondent can count on		-0.207 (0.047)***	-0.114 (0.054)*		-0.188 (0.048)***	0.019 (0.046)
Frequency of church attendance		-0.079 (0.042)	-0.007 (0.042)		-0.100 (0.055)	-0.001 (0.041)
Diabetes		0.379 (0.105)***	0.325 (0.100)**		0.191 (0.091)*	0.105 (0.090)
Cancer		0.997 (0.191)***	0.909 (0.215)***		0.250 (0.186)	0.146 (0.189)
Cardiovascular disease		0.168 (0.073)*	0.148 (0.070)*		0.082 (0.096)	0.068 (0.091)
Depression (GDS)			0.043 (0.016)**			0.024 (0.014)
Loneliness			-0.001 (0.003)			0.004 (0.004)
Will to live			-0.193 (0.059)**			-0.333 (0.068)***

Note: Model 1 — adjusted to age, marital status, level of education, and income

Model 2 — adjusted to variables from Model 1 and number of residents in the household, number of people whom the respondent can count on, frequency of church attendance

Model 3 — adjusted to variables from Model 2 and depression, loneliness, and will to live

* — $p < 0.05$, ** — $p < 0.01$, *** — $p < 0.001$

Higher value means poorer SRH (1 — very good, 2 — good, 3 — average, 4 — bad, 5 — very bad).

Table 3. Results of mediation analysis where neglect is considered as mediator (self-rated heath is a dependent variable; models are unadjusted).

Independent variables	men					women				
	Indirect effect B (SE)	Path a B (SE)	Path b B (SE)	Path c (direct effect) B (SE)	Path c' (total effect) B (SE)	Indirect effect B (SE)	Path a B (SE)	Path b B (SE)	Path c (direct effect) B (SE)	Path c' (total effect) B (SE)
Age	<0.001 (<0.001)	0.021 (0.035)	0.011 (0.004)	0.009 (0.009)	0.010 (0.010)	<0.001 (0.001)	0.171 (0.070)*	-0.003 (0.003)	0.013 (0.006)*	0.013 (0.006)*
Marital status: divorced/separated vs married	0.004 (0.009)	0.396 (0.924)	0.009 (0.004)*	-0.188 (0.287)	-0.184 (0.291)	-0.004 (0.007)	1.623 (2.061)	-0.003 (0.003)*	-0.191 (0.257)	-0.195 (0.255)
never married vs married	0.043 (0.029)	4.522 (2.364)		-0.588 (0.230)	-0.545 (0.235)*	-0.003 (0.004)	0.970 (1.226)		-0.317 (0.191)	-0.320 (0.190)
widow/widower vs married	**0.047 (0.020)***	4.938 (1.831)**		0.119 (0.131)*	0.166 (0.131)	-0.010 (0.013)	3.727 (1.254)**		0.110 (0.085)	0.100 (0.084)
Education: vocational school vs primary	0.002 (0.007)	0.305 (0.995)	0.007 (0.003)	-0.141 (0.102)	-0.139 (0.103)	0.004 (0.007)	-1.194 (1.592)	-0.003 (0.003)	-0.044 (0.130)	-0.041 (0.132)
high school vs primary	-0.007 (0.006)	-0.915 (0.739)		-0.344 (0.113)	-0.351 (0.113)**	0.010 (0.013)	-3.258 (1.376)*		-0.143 (0.094)	-0.133 (0.094)
university vs primary	-0.010 (0.007)	-1.408 (0.686)		-0.746 (0.267)	-0.757 (0.269)**	0.009 (0.012)	-3.024 (1.681)		-0.514 (0.088)***	-0.505 (0.088)***
Income	-0.001 (0.001)	-0.088 (0.040)*	0.010 (0.003)**	-0.047 (0.010)***	-0.048 (0.010)***	<0.001 (<0.001)	0.092 (0.116)	<0.001 (0.003)	-0.041 (0.011)***	-0.041 (0.011)***

Table 3. cont.

Independent variables	men					women				
	Indirect effect B (SE)	Path a B (SE)	Path b B (SE)	Path c (direct effect) B (SE)	Path c' (total effect) B (SE)	Indirect effect B (SE)	Path a B (SE)	Path b B (SE)	Path c (direct effect) B (SE)	Path c' (total effect) B (SE)
Number of residents in the household	-0.002 (0.001)	-0.201 (0.126)	0.009 (0.004)*	0.004 (0.011)	0.002 (0.011)	0.001 (0.002)	-0.539 (0.266)*	-0.002 (0.003)	0.018 (0.018)	0.019 (0.018)
Number of people whom the respondent can count on	-0.006 (0.008)	-2.356 (0.809)**	0.002 (0.004)	-0.248 (0.059)***	-0.254 (0.058)***	0.016 (0.014)	-3.273 (0.910)***	-0.005 (0.003)	-0.150 (0.054)**	-0.134 (0.050)**
Frequency of church attendance	**-0.008 (0.004)***	-0.977 (0.328)**	0.008 (0.004)*	-0.050 (0.074)	-0.058 (0.073)	0.007 (0.007)	-1.703 (0.601)**	-0.004 (0.003)	-0.104 (0.045)*	-0.097 (0.044)*
Diabetes	-0.002 (0.008)	-0.222 (0.839)	0.009 (0.004)**	0.421 (0.120)***	0.419 (0.120)**	-0.001 (0.003)	0.535 (1.274)	-0.002 (0.003)	0.209 (0.102)*	0.208 (0.102)*
Cancer	0.011 (0.021)	1.306 (2.386)	1.024 (0.233)***	1.024 (0.233)***	1.035 (0.229)***	0.006 (0.011)	-3.406 (0.691)***	-0.002 (0.003)	0.172 (0.216)	0.178 (0.216)
Cardiovascular disease	-0.002 (0.007)	-0.239 (0.759)	0.009 (0.003)**	0.379 (0.114)**	0.377 (0.115)**	0.002 (0.005)	-1.213 (1.178)	-0.002 (0.003)	0.235 (0.092)*	0.237 (0.092)*
Depression (GDS)	0.001 (0.002)	0.473 (0.156)**	0.002 (0.004)	0.114 (0.014)***	0.115 (0.014)***	-0.007 (0.005)	0.792 (0.281)**	-0.008 (0.004)*	0.090 (0.014)***	0.083 (0.014)***
Loneliness	<0.001 (<0.001)	0.165 (0.045)***	-0.008 (0.003)*	0.019 (0.003)***	0.017 (0.003)***	-0.001 (0.001)	0.128 (0.033)***	0.001 (0.003)	0.017 (0.003)***	0.018 (0.003)***
Will to live	-0.002 (0.005)	-1.716 (0.539)**	0.001 (0.003)	-0.453 (0.041)***	-0.458 (0.041)***	0.027 (0.017)	-2.685 (0.959)**	-0.010 (0.004)**	-0.414 (0.045)***	-0.412 (0.046)***

Note: Self-rated health (SRH): 1 — very good, 2 — good, 3 — average, 4 — bad, 5 — very bad
Neglect: higher value means higher level of neglect
* — p <0.05, ** — p <0.01, *** — p <0.001

presented a higher level of neglect (B = 4.94, p <0.01) (path a) which is significantly associated with poorer self-rated health (B = 0.01, p <0.05) (path b). In case of frequency of church attendance, it correlated negatively with neglect (B = −0.98, p <0.01) (path a) which was also associated with self-rated health (B = 0.01, p <0.05) (path b) (see Table 3).

In women, neglect was not found as mediator for the association between any of the considered independent variables and self-rated health.

The indications of the paths in the table correspond to indications on Figure 1: path a = independent variables → neglect (mediator); path b = neglect (mediator) → self-rated health (outcome); path c = independent variables → self-rated health (outcome) (direct effect); path c' = independent variables → self-rated health (outcome) (total effect).

Table 4 presents a further analysis of the mediation effects of neglect on the association between the variables, for which the effect was significant in unadjusted models (marital status and frequency of church attendance in men), and self-rated health. We verified if the mediating effect of neglect for the two variables was still significant after controlling for other variables added subsequently in the models, as in Table 2: age, marital status (when frequency of church attendance is considered as the main independent variable), education, income, number of residents in the household, number of people whom the respondent can count on, frequency of church attendance (when marital status is the main independent variable), depression, loneliness, and will to live (see Table 4).

In case of marital status (widowed men compared to married men), the indirect effect was statistically significant (B = 0.04, p <0.05) after controlling for age, education, and income, but was not found significant after further adjustment to social network, health, and other psychosocial factors. Similar results were obtained with regard to frequency of church attendance: the indirect effect was statistically significant only in case of adjustment to socio-demographic characteristics (age, marital status, education, and income) (B = −0.01, p <0.05).

Table 4. cont.

Independent variables	men					women				
	Indirect effect B (SE)	Path a B (SE)	Path b B (SE)	Path c (direct effect) B (SE)	Path c' (total effect) B (SE)	Indirect effect B (SE)	Path a B (SE)	Path b B (SE)	Path c (direct effect) B (SE)	Path c' (total effect) B (SE)
never married vs married	0.012 (0.015)	3.911 (2.910)		−0.551 (0.209)**	−0.539 (0.205)**	0.013 (0.013)	−1.946 (1.585)		−0.058 (0.140)	−0.045 (0.141)
widow/widower vs married	0.009 (0.009)	2.845 (1.868)		−0.118 (0.098)	−0.109 (0.097)	−0.002 (0.005)	0.304 (0.696)		−0.074 (0.078)	−0.076 (0.078)
Frequency of church attendance[1]	−0.008 (0.003)*	−0.814 (0.301)**	0.009 (0.004)**	−0.109 (0.048)*	−0.117 (0.048)*	0.004 (0.005)	−1.245 (0.489)*	−0.003 (0.003)	−0.109 (0.052)*	−0.105 (0.052)*
Frequency of church attendance[2]	−0.002 (0.002)	−0.523 (0.282)	0.004 (0.003)	−0.079 (0.042)	−0.081 (0.042)	0.005 (0.004)	−0.811 (0.453)	−0.006 (0.004)	−0.092 (0.050)	−0.087 (0.051)
Frequency of church attendance[3]	−0.001 (0.001)	−0.226 (0.310)	0.003 (0.003)	−0.007 (0.042)	−0.008 (0.042)	0.006 (0.004)	−0.827 (0.516)	−0.007 (0.004)	0.000 (0.038)	0.006 (0.039)

Note: Self-rated health (SRH): 1 — very good, 2 — good, 3 — average, 4 — bad, 5 — very bad; Neglect: higher value means higher level of neglect
[1] — model adjusted to age, marital status (when frequency of church attendance is considered as the main independent variable), level of education and income
[2] — model adjusted to variables from the previous models and number of residents in the household, number of people whom the respondent can count on, frequency of church attendance (when marital status is the main independent variable)
[3] — model adjusted to variables from the previous models and depression, loneliness, and will to live
* — p <0.05, ** — p <0.01, *** — p <0.001

Discussion

In the study, we demonstrated that self-rated health was associated with elder neglect (when controlling for socio-demographic characteristics), as well as with age, marital status, chronic illnesses (such as diabetes, cancer, cardiovascular diseases, and depression), income, social support (measured with the number of people whom the respondent can count on and frequency of church attendance), and will to live, among men. Furthermore, we found that neglect mediates the association between frequency of church attendance and SRH, as well as between marital status (being a widower vs being married) and SRH.

As far as women are concerned, SRH was significantly associated only with income, number of people whom the respondent can count on, diabetes, and will to live. A mediating effect of neglect, among women, was not observed for any of the variables.

The fact that neglect is associated with SRH among men, but not among women, might be related to gender differences which can be considered from different perspectives. There have been many studies demonstrating various subjective health assessments among men and women, yet comparisons in the context of neglect have been lacking. Previous studies confirm that perceived social support, social network size, the quality of social contacts (intimate relationships), and their effects on SRH differ between older men and women, indicating that the positive effect of social networks on health was more relevant for men than women [46, 47].

On the one hand, man and women differ in perceptions of the signs of an illness and its consequences for health [48]. Men tend to refer more often to physical functioning and assess activity limitations more heavily than women [49]. Also, men and women differ in health behaviors which play an important role in subjective health assessment [50]. Finally, differences in evaluation might depend on the life stage: some studies demonstrate that women evaluate their health better as they age [50]. A possible explanation is that women's social roles are less demanding and generate less stress in older age, which allows them to invest more in their health and might improve their health perceptions [50].

On the other hand, gender differences in SRH can be explained by the influence of social networks. Generally, women seek company and support from other people more often than men [48]. Consequently, they have larger and more varied social networks, as well as closer relationships [46, 51]. In our study, the mediating effect of neglect on SRH among men, not women, can find explanation in the Berkman's Conceptual Model of Social Networks and Health [52]. Berkman *et al.* [52] demonstrated that health behaviors as well as psychological and physiologic pathways impacting health are directly influenced by the mechanisms related to social network.

According to Berkman *et al.* [52], social network influences physical and mental health mainly through social support. It is acknowledged that active daily contact with friends and/or family is positively associated with better SRH among older adults [51]. Caetano *et al.* [46] state that low social support and reduced social network result in less frequent use of health services, poor functional capacity, somatic health problems, and unhealthy behaviors which are all factors influencing health assessment. Conversely, social connectedness can protect against stress and illnesses [47].

Previous studies have demonstrated that the benefits of marriage are not equal between women and men. Generally, the positive association between health outcomes and being married is greater for men than women, because women find social support more easily than men outside marriage, whereas for men, marriage is more often the only source of support and care [53]. Women lead a healthier lifestyle and have a more significant family role in making emotional connections [53]. When a female spouse dies, the widower is more at risk of social isolation and neglect, which can have impact on his SRH [48].

As far as church attendance is concerned, it has been demonstrated that membership in formal or informal networks, such as religious groups/communities, can benefit health, as they foster trust, self-esteem, and cooperation [46]. The study by Caetano *et al.* [46] indicated that non-participation in group activities appeared to be an important aspect of social life that negatively affected SRH in older men. Participation in religious activities such as church attendance is a form of social engagement that protects from isolation or neglect as it provides company and support from the community of faith [54]. In our mediation analysis, the effect of church attendance on SRH was significant for women, but it was not mediated by neglect. For men, the effect of neglect appears to be more meaningful, as the association between church attendance and SRH was only significant when explained by the influence of neglect. Taking into account the aforementioned considerations, we can assume that older men attending church might receive support protecting them from the risk or impact of neglect, which consequently improves their SRH. Conversely, lower frequency of church attendance might result in smaller social network, less support, and less potential caregivers, which can lead to neglect and — via neglect — to poorer SRH.

A strength of the study is that it was relatively large and based on a representative sample of older people from the general population of Poland. We used valid and reliable scales to measure such variables as neglect, depression, and feeling of loneliness. Moreover, the study was conducted in the Central European region, where studies about elder neglect are scarce.

As far as limitations are concerned, the cross-sectional design of the study does not allow us to establish any causal relationship. Furthermore, the data collected on neglect and health conditions were self-reported which might have led to misclassi-

fication. Finally, the study was conducted among noninstitutionalized individuals; thus, those with the worst health status were rather unlikely to be included in the study.

Conclusions

The current study demonstrates that elder neglect is significantly associated with SRH in men and that it is an important factor mediating the effect of marital status (being widower) and church attendance on SRH. As far as other variables are concerned, the mediating role of neglect was not confirmed.

In response to the public-health need to identify potential determinants of healthy aging, our study indicates the role and the importance of prevention of elder neglect. In addition to this, the study underlines the role of social networks and social engagement as factors which might protect against neglect and thus improve self-rated health of older people.

Nonetheless, further research is needed to explore more closely the interrelationships between neglect and different factors influencing subjective health assessment.

Authors' contribution

All authors contributed to the study conception, design, or analysis. Conceptualization: T.G. and B.T.-A.; Methodology, preparation of the material, data collection and analysis: A.S., K.Z, and B.W.; Writing — original draft preparation: A.S.; Writing — review and editing: A.S., K.Z.; T.G.; Supervision: T.G. All authors read and approved the final manuscript.

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Compliance with Ethical Standards and Informed Consent

The study was approved by the Bioethical Committee of the Jagiellonian University, Krakow, Poland (122.6120.19.2015). Written informed consent was obtained from each participant of the study.

Conflict of interest

None declared.

Data availability

The corresponding datasets of this study are available from the corresponding author on reasonable request.

Abbreviations

EN   — elder neglect
SRH   — self-rated health

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