

Daily moderate-intensity physical activities and optimism promote healthy ageing in rural northern Sweden: a cross-sectional study.

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ABSTRACT

The aim of our study was to explore the association between self-reported health factors and self-rated health (SRH) among an older rural population in northern Sweden and whether confounders optimistic outlook or daily moderate-intensity physical activity could moderate the association between self-reported health factors and SRH, controlling for age. The study is based on a sample (N = 1946) from the "Health on Equal Terms" Västernorrland survey 2018 aged 65–84. Prevalence and multivariate logistic regression analyses were performed. The results indicated most rural older people perceived very good or good SRH, though physical and mental health issues and impaired mobility increased with advanced age. Mental well-being exhibited a stronger association with poor SRH than physical health or impaired mobility. In addition, confounders optimistic outlook and daily moderate-intensity physical activity, separately and together could moderate the association between health factors and poor SRH. In conclusion, older people in a rural setting perceived good health, despite common physical and mental health issues. Promoting daily moderate-intensity physical activity and activities contributing to an optimistic outlook can protect against poor SRH in old age.

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Introduction

Sweden, along with other European countries, has an increasingly ageing population and face major health challenges due to increased healthcare burden, healthcare utilisation, and the use of social systems [1–3]. The proportion of people 65 years and older in Sweden is presently 20%. Demographic development varies between regions and many rural municipalities have large ageing populations [4]. Previous studies have shown that urban and rural areas face different healthcare challenges [5] i.e. rural areas experience lower availability to healthcare, physician shortage, and have longer distances to specialised care [6]. This urban-rural healthcare inequality also applies to Sweden, healthcare provision varies between rural and urban areas, and the shortage of qualified physicians in rural areas is a common challenge for local governments [7]. In addition, a recent study of the effects of the Swedish health-care market reform has focussed on the freedom to choose public or private health-care provider, showed that rural areas are not equally provided [6].

Self-rated health (SRH), a self-assessment of current health status often used in medical surveys, is an

important tool for health-care promotions planning and planning for future medical consumption [8–10]. Research of predictors of SRH among people over age 65 has primarily focussed on disease prevalence, socio-economic conditions, mental wellbeing and lifestyle factors such as physical activity [11–13]. In addition, SRH has been shown to be associated with the social environment [14]. While several studies indicate that urban residents reported higher SRH, rural residents with a social network assessed better health [5,14].

Previous studies have shown that in developing a public-health response to healthy ageing, it is important not just to consider approaches that ease up the losses associated with older age but also those that may reinforce recovery, adaptation and psychosocial growth [1]. Physical activity as a way of supporting functional capacity and increase health is well established [10,11], and physical inactivity has been connected to premature mortality [15]. Physical activity can be divided into light, moderate and vigorous-intensity physical activity. Among older people, moderate or vigorous-intensity physical activity, such as brisk walking, has been associated with lower mortality [16].

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In addition, sedentary behaviours, common in old age, are associated with increased risks of chronic conditions, and mortality [15,17,18]. Among an older population research has shown that daily moderate-intense physical activity (60–75 min) seemed to eliminate the increased risk of death associated with sedentary behaviour [18], thus providing further evidence of the benefits of physical activity in health promotion for healthy ageing. However, besides ensuring the good physical health of older adults, subjective self-perceived health and wellbeing also needs to be ensured [19]. Scandinavian research has demonstrated that, as well as, the fact that younger cohorts of older people appears to be ageing with better overall functional capacity, a decline in activities of daily living and cognitive functions does not necessarily affect well-being and happiness negatively in older ages [13,20]. In addition, findings may suggest that being more positive in one's outlook on life, increases the chance of longevity [13].

The association between SRH and psychological factors has previously been investigated [12,19]. Steptoe et al. (2015) showed that SRH was positively associated with optimistic views when studying community-dwelling older people. Optimistic older people engaged in healthy health behaviour (nonsmoking, moderate alcohol consumption, brisk walking and physically active lifestyle), engaged in social networks and utilised healthcare. An optimistic view has therefore been suggested to protect against poor SRH [12]. Previous cross-sectional research among older Scandinavian populations has primarily focussed on associations between SRH and self-reported health factors in urban areas [2,3] and less is known about self-reported health factors for older people in rural Scandinavian countries. Studies has indicated that a sedentary lifestyle is more common in a rural Swedish population compared to an urban population [5,21] but to our knowledge no studies have investigated whether daily moderate-intensity physical activity or mental wellbeing in the form of optimism would change associations between self-reported health factors and SRH. However, only a few studies have examined mental well-being, such as an optimistic outlook, as predictors of SRH [12] or daily moderate-intensity physical activity as a possible moderator on the relationship between self-reported health factors and SRH [22] and not in a rural Swedish context. Our aim was to explore the association between self-reported health factors, such as disease, mobility, physical activity, as well as, self-perceived health and well-being and SRH among an older rural population, aged 65–84, in Västernorrland, Sweden. Additionally, our second aim was to investigate whether confounders, an optimistic outlook on life in combination with daily moderate-intensity physical activity (i.e.

brisk walking, cycling, or gardening) could moderate the association between self-reported health factors and poor SRH, controlling for age, in a rural population.

Materials and methods

Materials

We used data from the Västernorrland Public-Health Survey “Health on Equal Terms” 2018 [23], a population-based cross-sectional study conducted by the Swedish Public-Health Agency in collaboration with the regional council. Most municipalities in northern Västernorrland Country are classified as rural by the Swedish Association of Local Authorities and Regions (SALAR) (municipalities with a population of less than 15,000 people in the largest urban area), but there are also two small towns (municipalities with a population of at least 15,000 inhabitants) (SALAR, 2020, <http://www.skr.se>) Sundsvall at 62.4° N and Härnösand at 62.6°N. The region has an overall population of 245,219 inhabitants (approx. 11 inhabitants per km²), of whom 24.2% (59,343) are above 65 years old [23]. A postal health questionnaire was distributed to a random area-stratified population sample of inhabitants aged 16–84. To account for the area- and age-stratified sampling, weights were used [24]. Kelfve et al. previously found that the survey represented the population well until age 85 [25]. The response rates among older people aged 65–84 were 66.5% (N = 1946) (men 66.7%; women 66.2%) [23]. The oldest-old were defined as 80 years and above in accordance with previous research [1,26]. Previous reports from the health survey “Health on Equal Terms” has shown that the tendency to respond did not differ between lower and higher populated areas [25].

Variables

The Västernorrland Public-Health Study “Health on Equal Terms” questionnaire [23] was used to measure different health-related variables. The participants self-reported their perception of SRH, and prevalence of physical and mental health, disease, and mobility at the time of the survey. SRH was assessed by the question “How would you describe your health in general?” On a five-degree scale (Very good, Good, Fair, Poor and Very poor) and dichotomised into good SRH (Very good and Good) and poor SRH (Fair, Poor, and Very poor) as in previous studies [27].

Several dimensions of self-reported health factors were assessed; self-reported general health, mobility, physical activity and self-perceived health and well-

being. The prevalence of self-reported diabetes mellitus and high blood pressure was measured. The answer options were “No”, “Yes, but no discomfort”, “Yes, minor discomfort” and “Yes, severe discomfort”. The combined proportion of respondents answering “Yes, but no discomfort”, “Yes, minor discomfort” and “Yes, severe discomfort” were presented. Additionally, the prevalence of mental health issues such as sleeping difficulties or anxiety, worry or anguish, respectively, were measured. The answer options were “No”, “Yes, minor discomfort” and “Yes, severe discomfort”. The proportions of combined “Yes, minor discomfort” and “Yes, severe discomfort” were presented.

Self-reported mobility was assessed based on dichotomous answers to three questions: “Can you take a short walk, about 5 min relatively fast walk?” (walking difficulty), “Can you run 100 m?” (ability to run) and “Do you need any aids or the help of another person to move around outdoors?” (walking aids). The response options were “Yes” or “No” and the proportion participants answering “No” were presented for the first two questions and proportion of participants answering “Yes” to using walking aids. Physical activity during a normal week was assessed based on two questions, adapted from the international Physical Activity Questionnaires (IPAQ) and used in previous reports [23]. The first question was “How much time do you spend on physical training that leaves you out of breath, for example, running or fitness training?” Respondents could answer: “>120 min”, “90–119 min”, “60–89 min”, “30–59 min”, “<30 min” or “No time”. The second question was: “How much time do you spend in a normal week on daily moderate-intensity physical activities that makes you warm, for example, brisk walking, swimming, or gardening?” Respondents could answer: “>300 min”, “150–299 min”, “90–149 min”, “60–89 min”, “30–59 min”, “<30 min”, or “No time”. The first question about physical fitness was dichotomised into two groups: physically active (>59 min/week) or physically inactive (≤59 min/week) and the second question about daily moderate-intensity physical activity into active (daily activities >149 min/week) and inactive ≤149 min/week in accordance with the Swedish Medical Society Guidelines [28] for exercise and training activities. Sedentary behaviour as assessed by the question “How much time do you sit during a normal day, not counting sleep?” Respondent answers were: “>15 h”, “13–15 h”, “10–12 h”, “7–9 h”, “4–6 h”, “1–3 h” and “Never”. Participant answers were dichotomised into two groups: sedentary >9 h daily or ≤9 h daily as in a previous report [29].

In addition, questions focusing on self-perceived health and well-being were adapted from the Warwick–Edinburgh Mental Wellbeing scale (WEMWBS) [30] but were not evaluated using that

scale. Respondents were asked to state how well the following statements corresponded to their perceived health during the last 2 weeks. The statements were: “I’ve been feeling optimistic about the future” (optimistic outlook in this study) “I’ve been feeling useful”, “I’ve been feeling relaxed”, “I’ve been dealing with problems well”, “I’ve been thinking clearly”, “I’ve been feeling close to other people” and “I’ve been able to make up my mind about things”. The answer options were: “All of the time”, “often”, “Some of the time”, “Rarely” and “None of the time”. All answers were dichotomised into two groups: “Often” (comprise respondents answer options: “All of the time” and “Often”) and “Seldom” (comprise respondents answer options: “Some of the time”, “Rarely” and “None of the time”).

Statistical analysis

Frequencies and percentage distributions, as well as mean and standard deviations, were presented. Prevalence was calculated as the proportions of respondents reporting SRH and health problems in the included health measurements, together with 95% confidence intervals (CI). The association between poor SRH and self-reported health factors; physical and mental health, mobility, physical activity and self-perceived health and well-being were analysed using logistic regression. Confounders daily activities or statement of optimistic outlook were analysed as interaction terms into the fully adjusted model. All analyses were adjusted for survey weights and statistical analysis was performed using SPSS version 24. An alpha level of 0.05 was used to determine statistical significance.

Ethical approval

The regional ethics committee in Umeå approved this study (Dnr 2018/338-31).

Results

Descriptive statistics of gender, civil status, economic status, mean age and age group of older people, aged 65–84 and oldest-old aged 80–84 [22] are presented in Table 1. More women than men participated in the survey. Most of the respondents were married and the mean age was 73 years.

Self-rated health and self-reported health factors

The prevalence of SRH and self-reported health factors; physical and mental health, mobility, physical activity,

Table 1. Main characteristics of the survey population in the questionnaire health on equal term Västernorrland.

Variables	(65–84 years)	
Participants		
	<i>Men</i>	948 (48.7%)
	<i>Women</i>	994 (51.3%)
	<i>Total N</i>	1946
Civil status		
	<i>Married</i>	1176
	<i>Single</i>	766
		73.0
Mean age		
Age group		
65–69	<i>Men</i>	293 (49.2%)
	<i>Women</i>	302 (50.8%)
	<i>Total</i>	595
70–74	<i>Men</i>	314 (50.9%)
	<i>Women</i>	303 (49.1%)
	<i>Total</i>	617
75–79	<i>Men</i>	215 (47.7%)
	<i>Women</i>	236 (52.3%)
	<i>Total</i>	451
80–84	<i>Men</i>	126 (44.5%)
	<i>Woman</i>	157 (55.5%)
	<i>Total</i>	283

and sedentary behaviour, as well as, self-perceived health and well-being are presented in Table 2 (average percentage and 95% CI). While a majority of the older people reported very good or good SRH (59.6%), SRH decreased with age from the youngest older people aged 65–69 to the oldest-old. However, self-reported health issues were common among older people in rural Västernorrland, 52.5% reported long-term illness, disability or other chronic diseases and the prevalence of health issues increased with age ($p < 0.000$). While between 49.2% and 57.0% older people experienced high blood pressure only between 13.1% and 18.1% had diabetes mellitus. The proportion of older people who experienced sleep difficulties was between 38.8% and 40.4% and between 29.4% and 33.8% suffered from anxiety, worry or anguish ($p < 0.000$). (See Table 2).

Both the walking difficulties (not able to take a short 5 min 'walk) and decreased ability to run (not able to run 100 m) increased with age ($p < 0.000$). A significant age-dependent increase in older people who used walking aids was found, 11.9% among the 65–69-year-olds vs 27.8% among the oldest-old. The self-report results showed that only 25.5% of the older people in rural Västernorrland fulfilled the recommended Swedish Physical Activity guidelines of at least 60 min physical training/week, and 35.3% fulfilled the recommended at least 150 min moderate-intensity physical activity/week [28]. Opposite trajectories were found as the proportion of older people self-reporting physical training at a recommended level decreased with age, while older people self-reporting recommended moderate-intensity physical activity increased with age. In addition, on

average 11.5% of the older people self-reported as sedentary more than 9 h, not including sleep, and participants reporting sedentary behaviour increased with age ($p < 0.000$).

In addition, most older people were found to self-perceived good health and mental well-being in old age when asked about their current situation within the last 2 weeks. While 82.1% of the respondents had felt optimistic about the future, 85.0% answered that they had felt relaxed, 82.1% had been dealing with problems well, 89.6% had been thinking clearly, and 93.3% had able to make up their own min. However, less had felt useful (74.3%) and some respondents had experienced social isolation (21.5%). An optimistic outlook was more common among the youngest older people (85.8%) and decreased with age, among the oldest-old 75.1% self-reported that they felt optimistic about the future (Table 2).

Association between self-reported health factors and poor SRH

Self-reported health factors associated with poor SRH among older people and the oldest-old are presented in Table 3. Logistic regression analysis showed that long term, persistent or chronic disease was strongly associated with poor SRH in older people and the oldest old (odds ratios were statistically significantly between six and seven-fold higher).

Health issues such as diabetes mellitus, high blood pressure, sleep difficulties, and anxiety, worry or anguish, respectively, were associated with poor SRH in older people ($p < 0.000$). In addition, impaired physical mobility such as the need for walking aids (OR = 3.26, 95%CI: 2.21–4.80), walking difficulties (OR = 6.31, 95%CI: 4.23–9.41), decreased ability to run (OR = 6.88, 95%: 5.59–8.45) or less than recommended levels of physical training (OR = 2.81, 95%CI: 2.22–3.59) or daily moderate-intensity physical activity (OR = 2.68, 95% CI: 2.21–3.27) showed associations with poor SRH among older people ($p < 0.000$). While sedentary behaviour showed an increased risk for poor SRH among old people (OR = 2.58, 95%CI: 1.93–3.46) ($p < 0.000$), no significant association was found among the oldest-old. In general, both older people exhibited a stronger association between decreased self-perceived mental well-being, for example, lack of optimistic outlook, and poor SRH, than between self-reported disease and poor SRH ($p < 0.000$).

Among the oldest-old diabetes mellitus, high blood pressure, sleep difficulties and anxiety, worry and anguish, respectively, were shown to be associated with poor SRH ($p < 0.000$). The association between

Table 2. Prevalence of self-rated health items by age group for the survey year 2018 (with 95% confidence interval).

Age group	Survey year 2018 (%)
Very good or good self-rated health	
65–69	67.7 (63.9–71.5)
70–74	62.0 (58.2–65.8)
75–79	52.5 (47.9–57.1)
80–84	48.1 (42.2–54.0)
Total	59.6 (57.4–61.8)
Long-term illness, disability, or chronic disease	
65–69	51.0 (47.0–55.0)
70–74	50.0 (46.0–53.9)
75–79	54.8 (50.2–59.4)
80–84	57.7 (51.9–63.5)
Total	52.5 (50.3–54.7)
Minor or severe problems with diabetes mellitus	
65–69	13.1 (10.4–15.8)
70–74	15.5 (12.6–18.4)
75–79	14.1 (10.9–17.3)
80–84	18.1 (13.6–22.6)
Total	14.8 (13.2–16.4)
Minor or severe problems with high blood pressure	
65–69	49.2 (45.2–53.2)
70–74	55.8 (51.9–59.7)
75–79	57.0 (52.4–61.6)
80–84	54.5 (48.7–60.3)
Total	53.9 (51.7–56.1)
Presence of minor or severe sleeping difficulty	
65–69	38.8 (34.9–42.7)
70–74	38.0 (34.2–41.8)
75–79	38.5 (34.0–43.0)
80–84	40.4 (34.6–46.2)
Total	38.7 (36.5–40.9)
Presence of minor or severe anxiety, worry or anguish	
65–69	29.4 (25.7–33.1)
70–74	28.6 (25.0–32.2)
75–79	33.8 (29.4–38.2)
80–84	32.5 (27.0–38.0)
Total	30.6 (28.6–32.7)
Walking difficulties not able to take a 5-min walk	
65–69	18.4 (16.7–20.1)
70–74	19.1 (17.4–20.8)
75–79	26.3 (24.3–28.3)
80–84	29.3 (27.3–31.3)
Total	22.9 (21.0–24.8)
Running difficulties not able to run 100m	
65–69	26.6 (24.6–28.6)
70–74	37.9 (35.7–40.1)
75–79	49.1 (46.9–51.3)
80–84	65.9 (63.8–68.0)
Total	40.9 (38.7–43.1)
Need of walking aids or assistance with walking	
65–69	11.9 (9.3–14.5)
70–74	12.9 (10.3–15.5)
75–79	19.3 (15.7–22.9)
80–84	27.8 (22.5–33.1)
Total	17.5 (15.8–19.2)
Physically active for more than 59 min weekly	
65–69	32.3 (28.5–36.1)
70–74	26.5 (23.0–30.0)
75–79	23.2 (19.3–27.1)
80–84	14.9 (10.7–19.1)
Total	25.5 (23.6–27.4)
Daily moderate intensity physical activities more than 149 min weekly	
65–69	35.3 (31.5–39.1)
70–74	31.8 (28.1–35.5)
75–79	40.8 (36.3–45.3)
80–84	46.3 (40.5–52.2)
Total	35.3 (33.4–37.4)
Sedentary for more than 9h, not counting sleep	
65–69	9.5 (7.1–11.9)
70–74	10.8 (8.4–13.3)

(Continued)

Table 2. (Continued).

Age group	Survey year 2018 (%)
75–79	13.2 (10.1–16.3)
80–84	14.7 (10.5–18.9)
Total	11.5 (10.1–12.9)
Had been feeling optimistic about the future in the last two weeks	
65–69	85.8 (83.0–88.6)
70–74	82.1 (79.1–85.1)
75–79	81.3 (77.7–84.9)
80–84	75.1 (70.0–80.2)
Total	82.1 (80.4–83.8)
Had been feeling useful in the last two weeks	
65–69	78.9 (75.6–82.2)
70–74	76.8 (73.5–80.1)
75–79	71.1 (66.9–75.3)
80–84	63.9 (58.3–69.5)
Total	74.3 (72.4–76.2)
Had been feeling relaxed in the last two weeks	
65–69	86.2 (83.4–89.0)
70–74	85.2 (82.4–88.0)
75–79	85.1 (81.8–88.4)
80–84	81.8 (77.3–86.3)
Total	85.0 (83.4–86.6)
Had been dealing with problems well in the last two weeks	
65–69	86.7 (84.0–89.4)
70–74	82.1 (79.1–85.1)
75–79	81.3 (77.7–84.9)
80–84	75.1 (70.0–80.2)
Total	82.1 (80.4–83.8)
Had been thinking clearly in the last two weeks	
65–69	92.5 (90.4–94.6)
70–74	92.5 (90.4–94.6)
75–79	91.9 (89.4–94.4)
80–84	90.8 (87.4–94.2)
Total	89.6 (88.2–91.0)
Had felt close to other people within the last two weeks	
65–69	79.1 (86.7–98.3)
70–74	78.6 (75.4–81.8)
75–79	78.4 (74.6–82.2)
80–84	77.1 (72.2–82.0)
Total	78.5 (76.7–80.3)
Had been able to make up mind about things within the last two weeks	
65–69	92.5 (90.4–94.6)
70–74	93.5 (91.6–95.5)
75–79	94.5 (92.4–96.6)
80–84	92.8 (89.8–95.8)
Total	93.3 (92.2–94.4)

need for walking aids and poor SRH was at a similar level as among older people (OR = 2.71, 95% CI: 1.37–5.36) ($p < 0.05$), the association between walking difficulties, and decreased ability to run, respectively, and poor SRH were weaker than for older people ($p < 0.000$). The association between less than recommended levels of physical training and moderate-intensity physical activity and poor SRH was at a similar level as among older people ($p < 0.000$), while no significant association was found between sedentary behaviour and poor SRH among the oldest-old ($p < 0.000$).

In addition, the oldest-old exhibited stronger association between decreased self-perceived mental well-being, “not able to feel relaxed” and “hard to think clearly” and poor SRH, then between self-reported long term or chronic disease and poor SRH ($p < 0.000$). A stronger

Table 3. Determinants of poor self-rated health (SRH) among older people aged 65–84 and the oldest-old aged 80–84 ($p < 0.000$).

Variables	Poor SRH	Poor SRH
	OR (95%CI)	OR (95%CI)
	65–84	80–84
General health		
<i>Long-term or chronic disease</i>	7.27 (5.85–9.03)	5.95(3.45–10.26)
<i>Diabetes mellitus</i>	1.91 (1.47–2.78)	2.07(1.07–4.00) ²
<i>High blood pressure</i>	2.32 (1.92–2.82)	1.79 (1.09–2.93) ²
<i>Sleeping difficulty</i>	2.72 (2.24–3.29)	3.43 (2.03–5.79)
<i>Anxiety, worry or anguish</i>	3.48 (2.83–4.27)	2.32 (1.35–4.01)
Mobility		
<i>Need for walking aids or assistance</i>	3.26 (2.21–4.80)	2.71 (1.37–5.36) ¹
<i>Can't take a short 5 min walk</i>	6.31 (4.23–9.41)	4.86 (2.29–10.33)
<i>Can't run 100m</i>	6.88 (5.59–8.45)	4.41 (2.54–7.65)
Physical activity		
<i>Less than 59 min PT/week</i>	2.81 (2.22–3.59)	2.69 (1.25–5.78)
<i>Less than 149 min PA/week</i>	2.68 (2.21–3.27)	3.14 (1.69–5.83)
<i>More than 10h sedentary behaviour</i>	2.58 (1.93–3.46)	NS
Self-perceived health and well-being		
<i>Seldom optimistic about the future</i>	6.47 (4.92–8.53)	5.21 (2.65–10.24)
<i>Seldom feels useful</i>	4.76 (3.80–5.97)	4.97 (2.81–8.77)
<i>Seldom, or never relaxed</i>	5.76 (4.29–7.74)	9.83 (3.72–25.97)
<i>Hard to deal with problems well</i>	4.90 (3.69–6.50)	4.51 (2.12–9.58)
<i>Hard to think clearly</i>	5.74 (3.67–8.05)	7.47 (2.16–25.87) ¹
<i>Seldom feels close to other people</i>	3.65 (2.42–3.85)	3.74 (1.91–7.32)
<i>Hard to make decisions</i>	3.89 (2.60–5.80)	5.17(1.46–18.33) ²

NS= statistically nonsignificant association. Walking aids= need for walking aids or assistance of another person when walking outside. PT= Physical training. PA= moderate-intensity physical activity. Physical training and moderate-intensity physical activity is presented per week and sedentary behaviour per day. ¹ $p < .05$; ² $p < .01$

association was noted between “not able to feel relaxed” and poor SRH among the oldest-old (OR = 9.83, 95%CI: 3.72–25.97) compared to older people as a group (OR = 5.76, 95%CI: 4.29–7.74) and between “hard to think clearly” and poor SRH among the oldest-old (OR = 7.47, 95%CI: 2.16–25.87) compared to older people (OR = 5.74, 95%CI: 3.67–8.05).

Association between self-reported health factors and poor SRH in the presence of confounder

Multivariate analysis showed that while both confounders moderate-intensity physical activity and an optimistic outlook on life moderated the association

between self-reported diabetes mellitus and poor SRH among older people (–8.4%). No effect was found on the association between self-reported high blood pressure and poor SRH. In addition, no significant effect was found for the oldest-old. However, an optimistic outlook moderated the association between self-reported anxiety, worry or anguish and poor SRH with –29.3% in older people (OR = 3.48, 95%CI: 2.83–4.27) vs. (OR = 2.46, 95%CI: 1.96–3.07) ($p < 0.000$) and –22.0% among the oldest-old (OR = 2.32, 95%CI: 1.35–4.01) vs. (OR = 1.81, 95%CI: 1–60–3.24) ($p < 0.000$). In comparison, moderate-intensity physical activity decreased the association by 7.5% among older people ($p < 0.000$) and no significant association was found among the oldest-old (Table 4).

Moderate-intensity physical activity as a confounder could moderate the association between impaired physical mobility, i.e. need to use walking aids, walking difficulties, and decreased ability to run, respectively, and poor SRH, respectively, among both older people (–18.5%, –11.1%, –8.3%, $p < 0.000$), while only the association between walking aids and poor SRH was significantly weakened among the oldest-old (–18.5%, $p < 0.000$) (Table 4). Additionally, our results also showed that an optimistic outlook could weaken the association between walking aids, walking difficulties and decreased ability to run and poor SRH in both age groups.

In the presence of both confounders the association between walking difficulties and poor SRH weakened with –46.3% (OR = 3.39, 95%CI: 1.51–7.52) vs (OR = 6.31, 95%CI: 4.23–9.41) ($p < 0.000$), compared to –30.2% among the oldest-old. (OR = 4.86, 95%CI: 2.29–10.33) vs (OR = 3.39, 95%CI: 1.51–7.52) ($p < 0.000$). In addition, both daily moderate-intensity physical activity and an optimistic outlook decreased the association between sedentary behaviour and poor SRH (–14.0% and –18.2%) among older people. A combination of both confounders decreased the risk of poor SRH by 27.9% (Table 4).

Discussion

The first aim of this study was to explore the association between self-reported health factors and SRH among an older rural population in Northern Sweden. The second aim was to investigate whether confounders, an optimistic outlook on life in combination with daily moderate-intensity physical activity could moderate the association between self-reported health factors and poor SRH, controlling for age, in a rural population.

Both SRH and self-reported well-being decreased with advanced age, while the self-reported prevalence of disease and impaired physical mobility increased, supporting previous European studies [2,3,12,22].

Table 4. Self-reported health determinants of poor self-rated health (SRH) among older people aged 65–84 and the oldest-old aged 80–84 in the presence of separate and combined confounders: self-reported optimistic outlook (Optimistic) and self-reported moderate-intensity physical activity (DA) ($p < 0.000$).

Variables	Poor SRH OR (95% CI)	Confounders	Poor SRH OR (95% CI)	Rel. change
65–84				
Diabetes mellitus	1.91 (1.47–2.78)	+Optimistic	1.87 (1.41–2.47)	–
		+ DA	1.75 (1.33–2.29)	–8.4%
		both	1.70 (1.27–2.27)	–11.0%
High blood pressure	2.32 (1.92–2.82)	+Optimistic	2.27 (1.85–2.75)	–
		+ DA	2.22 (1.82–2.72)	–
		both	2.21 (1.77–2.74)	–
Sleep difficulties	2.72 (2.24–3.29)	+Optimistic	2.39 (1.91–2.89)	–12.1
		+DA	2.62 (2.15–3.20)	–
		both	2.29 (1.86–2.83)	–15.8%
Anxiety	3.48 (2.83–4.27)	+Optimistic	2.46 (1.96–3.07)	–29.3%
		+DA	3.22 (2.64–4.04)	–7.5%
		both	2.40 (1.91–3.00)	–31.0%
Walking difficulties	6.31 (4.23–9.41)	+Optimistic	4.95 (3.23–7.50)	–21.6%
		+DA	5.61 (3.74–8.41)	–11.1%
		both	3.39 (1.51–7.52)	–46.3%
Running difficulties	6.88 (5.59–8.45)	+Optimistic	6.18 (4.97–7.69)	–10.2%
		+DA	6.31 (5.07–7.83)	–8.3%
		both	5.76 (4.58–7.24)	–16.3%
Need walk aids	3.26 (2.21–4.80)	+Optimistic	2.61 (1.72–3.96)	–20.0%
		+ DA	2.67 (1.79–3.98)	–18.1%
		both	2.19 (1.43–3.36)	–32.8 %
Sedentary behaviour	2.58 (1.93–3.46)	+Optimistic	2.22 (1.62–3.04)	–14.0%
		+DA	2.11 (1.56–2.85)	–18.2%
		both	1.86 (1.35–2.56)	–27.9%
80–84				
Diabetes mellitus	2.07 (1.07–4.00)	+Optimistic	NS	–
		+ DA	NS	–
		both	NS	–
High blood pressure	1.79 (1.09–2.93) ²	+Optimistic	1.75 (1.02–2.98)	–
		+ DA	1.39 (0.83–2.33)	–
		Both	NS	–
Sleep difficulties	3.43 (2.03–5.79)	+Optimistic	3.38 (1.94–5.91)	–
		+DA	3.07 (1.79–5.27)	–10.5%
		both	3.07 (1.73–5.44)	–10.5%
Anxiety	2.32 (1.35–4.01)	+Optimistic	1.81 (1.60–3.24) ²	–22.0%
		+DA	2.92 (1.54–5.54) ¹	–
		both	NS	–
Walking difficulties	4.86 (2.29–10.33)	+Optimistic	3.55 (1.61–7.81)	–27.0%
		+DA	4.62 (2.13–9.99)	–5.0%
		both	3.39 (1.51–7.52) ¹	–30.2%
Running difficulties	4.41 (2.54–7.65)	+Optimistic	3.84 (2.13–6.92)	–12.9%
		+DA	4.13 (2.29–7.47)	–6.3%
		both	3.79 (2.00–7.20)	–14.1%
Walk aids	2.71 (1.37–5.36) ¹	+Optimistic	2.13 (1.02–4.46) ²	–14.8%
		+ DA	2.21 (1.09–4.47) ²	–18.5%
		both	NS	–
Sedentary behaviour		+Optimistic	NS	–
		+DA	NS	–
		both	NS	–

Note: SRH=Self-rated health; DA=self-reported daily moderate-intensity physical activity; Optimistic= self-reported positive outlook. Walking aids include both use of walking assistive technologies and need of assistance to walk outdoors. Anxiety included anxiety, worry or anguish. Only relative changes >5% are shown in the table. ¹ $p < .05$; ² $p < .01$.

Physical and mental decline, i.e. decreased mobility, loss of physiological function, and increased incidence of long term, persistent and chronic disease is a natural part of ageing [1,2]. But despite that our results showed most older people in rural Västernorrland County rated their health as good or very good.

In addition, our study indicates that self-reported mental well-being exhibit a statistically stronger association with poor SRH than self-reported

physical diseases or self-reported impaired physical mobility. These results support previous Swedish research in an older urban population that found a weak relationship between physical health and mental well-being among the oldest-old [3,31]. In addition, previous Scandinavian research has demonstrated that a decline in activities of daily living and cognitive functions does not necessarily affect well-being in older ages [13,20].

The associations between self-reported physical and mental health and perceived health pose challenges for the planning of preventive healthcare and promoting healthy ageing. Notably, our results showed that an optimistic outlook on life significantly weakened the association between self-reported health factors such as sleep difficulties, anxiety, use of walking aids, walking difficulty, decreased ability to run, physical inactivity, and sedentary behaviour, respectively, and poor SRH. This was true among both older and the oldest-old in Västernorrland County. The pattern is corroborated by previous evidence from Finland, Poland, and Spain, to the effect that poor health status is significantly associated with negative emotional states and reduced life satisfaction and well-being [32]. The strong association between a pessimistic outlook and poor SRH supports results from an older Irish population that showed the importance of personality for subjective health [12] and a recent study of an older rural population in northern Iceland that showed an association between decreased mental health and poor SRH [33]. Previous research from northern Finland has also showed the importance of physical, social and symbolic support for the well-being of home-dwelling older people in a rural setting [34]. In addition, previous reports have suggested that an optimistic outlook in old age is connected to healthy ageing [19].

In addition, Engberg et al., for example, found that optimistic nonagenarians lived longer than their more neutral counterparts, the results being more pronounced in women [35]. Other studies suggest that being more positive in one's outlook on life increases the chance of longevity [13]. The association between unhappiness and cognitive decline can also be modified by social factors such as a close family network [36] and a previous report has shown that rural residents with a social network assessed better health [14]. Additionally, a positive perception of ageing can promote good health [11] and studies have shown both cross-sectional [37], as well as, longitudinal relationships between physical activity and subsequent-improved levels of psychological well-being later in life [38,39].

The prevalence of sedentary behaviour in old age is well established [14,17,18] and partly due to biological factors associated with ageing, i.e. decreased bone loss, loss of muscle tone, and loss of energy [40]. Sedentary behaviour has been associated with an increased risk of diabetes, obesity, cancer and cardiovascular disease, and mortality [17,18]. Research has shown that older adults spend more than 60% of their waking day in sedentary behaviours, that do not increase energy expenditure significantly (<1.5 METS), such as sitting

or lying down, watching TV, computer use or travel [41]. Physical activity is recommended as a way to decrease the risk of osteoporosis, frailty and loss of physical function in old age [42]. A study from rural northern Finland has shown that habitual exercise can decrease the risk of fall-related injury [43].

Promoting physical activity is a well-established way to promote healthy ageing [17,18,44]. We choose to use self-reported weekly moderate-intensity physical activity, comprising, for example, gardening, brisk walking or cycling, as the other confounder in our study. Less than recommended weekly physical training and moderate-intensity physical activity both showed a strong association with poor SRH both among older people and the oldest-old in our study. However, we only found that sedentary behaviour was associated with poor SRH among older people, not the oldest-old. Although moderate-intensity physical activity weakened the association between all investigated self-reported health factors, except high blood pressure and poor SRH among older people, the same pattern was not found among the oldest-old. Combining both protective confounders, an optimistic outlook and recommended moderate-intensity physical activity weakened the association between self-reported health factors and poor SRH even more.

Stessman et.al. has found that not only continuing but initiating physical activity in old age delays functional incapacitation and improves survival even among the oldest-old [45]. In addition, for older women the most recent physical activity levels are more important predictors of longevity than past levels; however, the benefit of increasing physical activity did not extend beyond 75 years old [46]. Similarly, a positive effect on survival was associated with increasing recent physical activity levels among participants in their early 70s [47,48]. Other studies that failed to show benefits from increasing recent physical activity levels [49] nevertheless described increased mortality associated with decreasing levels. In contrast, a Scandinavian study found that increased recent physical activity was associated with higher mortality from ischaemic heart disease among older-aged 65–74, a finding yet to be reproduced [18,50]. However, a recent meta-analysis provided evidence of the benefits [18].

In our study, both an optimistic outlook and active daily life, moderate-intensity physical activity were found to protect older people using walk aids against poor SRH. This was true both for the modifying confounders individually but also together, the latter even with an increased effect. Previous research has shown the importance of walking ability in old age [51–53]. Previous studies show that moderate-intensity physical

activity, such as walking, has been associated with lower mortality [16,51]. In addition, studies show that though functional decline increases with age, subjective well-being could be more important than a physical disease in regard to how older people perceive their SRH [13,20,51,54]. Previous research has also proposed that positive self-perceptions of ageing among older people were associated with increased physical activity [11] and thereby promoted increased SRH. In addition, a positive personality has been shown to be associated with higher SRH [12].

Further, our study provides important information for regional planning of preventive measures in rural and remote areas to promote healthy lifestyle behaviours among older people and the oldest-old. Health promotion in rural Västernorrland County has focussed on regular healthcare and health dialogue interventions in order to decrease cardiovascular risk factors and promote lifestyle changes among the middle-aged [55]. Our results suggest a public-health policy should focus on preventing mobility impairment, increased daily physical activity, as well as, promoting activities and social support that contributes to an optimistic outlook in old age. This could be part of health dialogue interventions among older people.

Methodological considerations

The study has some shortcomings, the main one being its design. Cross-sectional studies always present several shortcomings, but for the prevalence of the disease, self-rated mobility and the association with SRH, they have so far been essentially the only method that has been used. As this study is cross-sectional it cannot determine the cause and effect and interpretations about causality.

The problem of nonresponse is general in all population-based surveys. The response rate in our study was 66.5%, higher than the common response rate of 50% in population studies [56]. A previous study, using data from the Swedish Public-Health Survey, has shown that nonresponders answered fairly similar to those who did answer. In addition, Statistics Sweden has used calibration weightings to, reduce the possible differences, allowing for the use of health surveys with low response rates [57]. In addition, Lee (2009) has also demonstrated, using an American large-scale population-based survey, that nonresponse did not affect the representativeness or usefulness of their results [58]. Further, Kelfe et al. [19] also found that data from the Swedish National Survey of Public Health were representative of the older population.

Self-report surveys also have shortcomings as participants may over- or under-estimate their health [59]. In addition, studies have shown that poor SRH may be more common among nonresponders [57,60]. Another possible limitation is the survey questions about different health issues, which, for instance, did not include a specification of relevant-connected symptoms.

However, the strength of this study is the large population-representative sample, with both sexes reporting from different stages of later life and with a comprehensive list of health-related variables. These variables gave the possibility to control for possible confounders and isolate the potential associations between health factors and SRH. Survey participants did not answer the survey due to specific health-related problems or impairment, but because they were answering a questionnaire about their general living conditions. Therefore, in a study with participants with specific problems, may have created a greater bias [61]. In addition, the use of SRH is a well-known instrument and a large number of health variables were investigated [8].

Conclusions

This study provides information about the association between self-reported health and SRH among an older rural population in northern Sweden. Our results suggest that while a majority of older people in rural Västernorrland self-perceived good or very good SRH, health factors affecting poor SRH can vary between different age groups within old age. The most important message emerging from our study is that both an optimistic outlook and moderate-intensity physical activity, separately and together can moderate the association between self-reported health variables, such as physical and mental health, impaired physical mobility, walking difficulties, and physical inactivity, and poor SRH in old age. An optimistic outlook can also modify the association between lack of physical activity and daily physical activities and poor SRH. Our results could therefore be interpreted to propose that future health-promoting initiatives to address poor health among older rural people should not only focus on physical activity, in turn affecting other health pathways such as diseases or disability but focus on both physical function and mental well-being. Increased social interaction and promoting an optimistic outlook on future activities could be an important part of promoting health among older rural people. However, this study is a cross-sectional and to date mechanisms of the pathways connecting SRH, physical activity, and optimism are not

understood and future studies monitoring health trends are warranted.

Ethical approval

The regional ethics committee in Umeå approved this study (Dnr 2018/338-31).

Disclosure statement

No, potential conflict of interest was reported by the authors.

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