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EXPLORATION OF HEALTHY AGEING DETERMINANTS IN BALTIC STATES

Madara Mikelsone
Riga Stradins University, Statistics Unit, Latvia

Diana Baltmane
Riga Stradins University, Statistics Unit, Latvia

Ieva Reine
Riga Stradins University, Statistics Unit, Latvia

Sigita Snikere
University of Latvia, Institute of Philosophy and Sociology, Latvia

Andrejs Ivanovs
Riga Stradins University, Statistics Unit, Latvia

Signe Tomsone
Riga Stradins University, Faculty of Rehabilitation, Latvia

Abstract. *According to the WHO, healthy ageing is characterized by such interrelated determinants as intrinsic capacity, functional ability and environment. An individual's intrinsic capacity is a powerful predictor of the future ageing process and includes 5 areas - cognitive, psychological, sensory, locomotion and vitality. Exploration of these areas can provide necessary information for therapeutic and preventive actions that can be tailored to an individual's needs, priorities and values to support participation and quality of life. The objective of this study was to evaluate and compare healthy ageing determinants of older individuals in the Baltic States. The research was based on the sample of older individuals (50 years and older) from wave 8 of the Survey of Health, Ageing and Retirement in Europe (SHARE) during the period from November 2019 to March 2020. The obtained results indicate a low level/poor results in such determinants as locomotion, sensory, vitality and functional ability (more than 50% of the respondents among the Baltic countries has poor health, various long-term illnesses, limitations in daily activities, suffer from moderate or severe pain, requires help to meet daily needs, etc.), has various behavioral risks, however has higher assessment of cognitive and psychological determinants.*
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Introduction

Since 2015, the World Health Organization (WHO) has developed Healthy Ageing Strategy, which defines healthy ageing as “the process of developing and

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maintaining the functional ability that enables wellbeing in older age" (World Health Organization, 2020).

Based on the WHO definition, intrinsic capacity (IC) is a composite of all physical and mental attributes not only in older age, but throughout lifespan (Fig. 1).

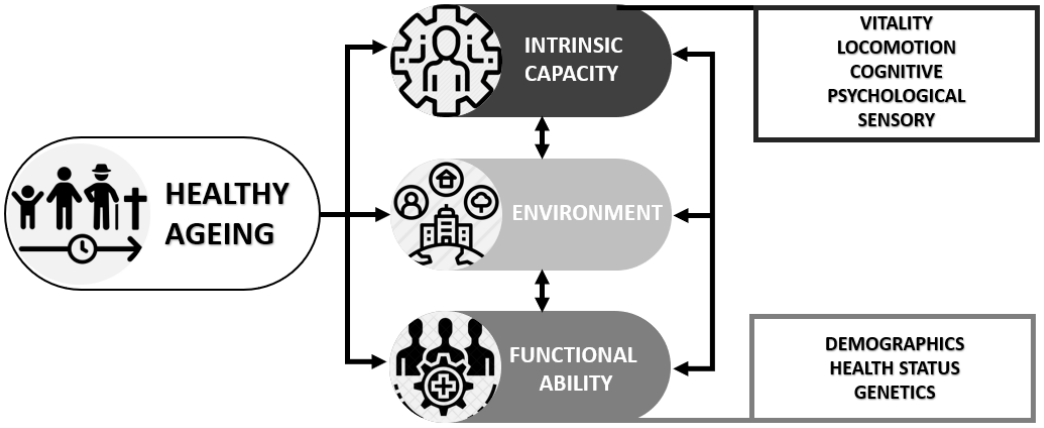

Figure 1 ***Determinants of Healthy Ageing (author's interpretation)*** *(Cesari, 2018)*

The five determinants of IC should not be considered as independent, as each of them interacts closely with the others as part of a dynamic interconnected environment. Each specific determinant individually will not provide a comprehensive view of an individual's ageing, mainly because it would omit information provided by interactions between different determinants.

The ageing process of each individual is different, and in developing an effective healthy ageing strategy, a tool for assessing healthy ageing is vital, however systematic reviews indicate that till now there is neither a unanimous definition nor a standardised metric for the evaluation of healthy ageing due to lack of measurement procedures (Cosco et al., 2015; Daskalopoulou et al., 2019a; Daskalopoulou et al., 2019b; Sowa et al., 2016; Tyrovolas et al., 2014).

Regular assessment of the ageing process of older individuals provides an opportunity to better understand the individual's functional abilities and vulnerabilities, especially before the Covid-19 outbreak. In order to implement the necessary measures for reducing and preventing the consequences of the Covid-19 pandemic, the information on the current ageing status is needed (Nestola et al., 2020; Thiyagarajan et al., 2019).

Previous studies on the effects of large-scale epidemics (Ebola virus, SARS) indicate that in long-term individuals may develop cognitive and psychological disorders such as sadness, depression and risk of suicide (Van Bortel et al., 2016; Wu et al., 2009).

The WHO describes the close relationship between *physical (locomotion)* and *cognitive* determinants and social participation in society. Social participation is defined as active participation in religious, sport, cultural, recreational, political and voluntary community organizations. Cognitive impairment can lead to decrease in functional abilities (Sepúlveda-Loyola et al., 2020).

Lack of social support and social activities can cause loneliness, which is a serious and widespread public health problem even before the Covid-19 outbreak. It is associated with negative outcomes in older individuals, including higher rates of depression, decrease in physical abilities and higher mortality. The key factor is individual's personal social networks, as it increases the emotional well-being of older individuals (English & Carstensen, 2014, Gerst-Emerson & Jayawardhana, 2015; Wang et al., 2020).

Lack of physical activity among older individuals is the fourth highest risk factor for mortality worldwide and a major contributor to disability. Physical activity is important for older individuals, especially those aged 85 and more, to maintain their level of independence, mental health, and well-being (Fingerman et al., 2020).

Sensory status is associated with other determinants of IC, as they can lead to reduced mobility, connections with the environment due to sensory impairment and cognitive processes caused by loneliness and isolation.

Vitality is one of the areas of an individual's IC that encompasses the individual's physiological changes in the context of biological ageing. Co-morbidities and functional abilities can play an important role (Ping et al., 2020).

Material and Methods

The aim of the study is to evaluate and compare healthy ageing determinants of older individuals in the Baltic States.

The tasks of the study are the following: 1) to develop brief characteristics of IC determinants and describe their potential interaction; 2) to analyze and compare determinants of individuals' IC among the Baltic States in order to evaluate healthy ageing status before the impact of the Covid-19 outbreak.

Study was based on the sample of older individuals (50 years and older) from wave 8 of the Survey of Health, Ageing and Retirement in Europe (SHARE) during the period from November 2019 to March 2020.

Respondents who participated in the longitudinal survey with computer-assisted personal interviewing (CAPI) and were at least 50 years old were selected for the research. Sample consisted of 4947 respondents from Latvia (n=714), Estonia (n=2891) and Lithuania (n=1342).

In order to ensure the representativeness of the data, weighting procedure for data was performed by using calibrated (cross-sectional) individual weight - CAPI

interview only, that are computed separately by country to match the size of national target populations of individuals across eight gender-age groups (i.e., males and females in the age classes "50-59", "60-69", "70-79", "80+" and across NUTS-1 (major socio-economic regions) (Bergmann et al., 2019).

Descriptive statistics as well as inferential statistics (Chi-square test, univariate and multivariate binary logistic regression) were used to analyze the results. $P < 0.05$ was set as the significance level. Based on a large sample size, in order to evaluate statistically significant result for Chi-square test, strength of association (Cramer's V) was provided.

This paper is based on the preliminary SHARE wave 8 release 0 data. Therefore, the analyses, conclusions and results are preliminary.

Research Results

Latvia	Estonia	Lithuania
Age (median (IQR)): 65 (58-75)	**Age** (median (IQR)): 66 (59-75)	**Age** (median (IQR)): 64 (58-75)
Male: 39.3%	**Male**: 40.6%	**Male**: 40.0%
Female: 60.7%	**Female**: 59.4%	**Female**: 60.0%
Widowed. divorced or never married: 51.4%	**Widowed. divorced or never married:** 51.4%	**Widowed. divorced or never married:** 40.8%
Education:	**Education:**	**Education:**
None: 1.5%	**None:** 2.2%	**None:** 6.9%
Incomplete or completed basic: 28.4%	**Incomplete or completed basic:** 12.8%	**Incomplete or completed basic:** 10.7%
Secondary: 49.8%	**Secondary:** 82.3%	**Secondary:** 63.8%
Higher: 20.3%	**Higher:** 2.7%	**Higher:** 18.6%

Figure 2 ***Respondent Characteristics***

Latvia	Estonia	Lithuania
Mother alive: 18.5%	**Mother** alive: 19.2%	**Mother** alive: 19.3%
Health poor or fair: 83.0%	Health poor or fair: 80.9%	Health poor or fair: 85.4%
Father alive: 3.3%	**Father** alive: 5.1%	**Father** alive: 4.4%
Health poor or fair: 91.5%	Health poor or fair: 86.0%	Health poor or fair: 62.4%
Contact with **mother** daily or several times a week: 66.7%	Contact with **mother** daily or several times a week: 55.0%	Contact with **mother** daily or several times a week: 73.8%
Contact with **father** daily or several times a week: 76.4%	Contact with **father** daily or several times a week: 33.5%	Contact with **father** daily or several times a week: 67.5%
Living together or < 1 km away:	**Living together or < 1 km away:**	**Living together or < 1 km away:**
With **mother**: 26.9%	With **mother**: 24.8%	With **mother**: 31.4%
With **father**: 26.5%	With **father**: 23.1%	With **father**: 35.6%
No brothers: 52.8%	**No brothers**: 31.0%	**No brothers**: 45.2%
No sisters: 47.0%	**No sisters**: 24.7%	**No sisters**: 47.0%
Children: 72.4%	**Children**: 64.2%	**Children**: 70.3%
Grandchildren: 25.0%	**Grandchildren**: 39.7%	**Grandchildren**: 27.9%

Figure 3 ***Family Characteristics***

The main demographic characteristics of the respondents are provided in Figure 2 and the family characteristics in Figure 3. The results indicate that more than 50% of the respondents, regardless of their nationality, in the future could be more exposed to loneliness due to lack of individual social network.

Locomotion

Overall *difficulties in daily tasks* were reported by 25.6% of the respondents from Estonia, 20.7% from Lithuania, and 21% from Latvia, and the main difficulties were associated with such physical tasks as - *stooping, kneeling, crouching, climbing several flights of stairs, lifting or carrying weights over 5 kilos, getting up from chair, pushing or pulling large objects*.

44.8% of the respondents from Estonia, 36.3% from Lithuania and 37.4% from Latvia required assistance in *daily activities*, but 64.6% of the respondents from Estonia, 48.5% from Lithuania and 51.7% from Latvia required assistance to *meet needs* all the time.

80.3% of respondents from Estonia, 86.4% from Lithuania and 89.1% from Latvia reported they use aids in daily life. The main necessary aid was *walking stick or a cane* (Estonia- 42.2%, Lithuania- 53.5%, Latvia- 62.5%).

Performance in *sports or vigorous activities* was hardly ever or never reported by 44.9% of the respondents from Estonia, 42.7% from Lithuania and 29.4% from Latvia.

Performance in *activities requiring a moderate level of energy* was hardly ever or never reported by 13.1% of the respondents from Estonia, 16.0% from Lithuania and 13.6% from Latvia.

Sensory status

The *needs to wear glasses or contact lenses* were reported by 85.1% of the respondents from Estonia, 68.5% from Lithuania and 71.5% from Latvia. The *needs to use hearing aid* was reported by 60.9% of the respondents from Estonia, 57.8% from Lithuania and 62.7% from Latvia.

Eyesight distance as good, very good and excellent was rated by 73.5% of the respondents from Estonia, 84.2% from Lithuania and 68.2% from Latvia. The obtained results indicate a tendency that only 8% of the respondents from Latvia rated their eyesight distance as very good (7.4%) or excellent (0.8%) compared to Lithuania (respectively, 22.4% and 18.2%) and Estonia (respectively, 20.3% and 10.3%) ($p<0.001$, Cramer's $V=0.240$).

Hearing as good, very good or excellent was rated by 73.2% of the respondents from Estonia, 84.8% from Lithuania and 81.1% from Latvia. The obtained results indicate a tendency that only 17.4% of the respondents from Latvia rated their hearing as very good (15.6%) or excellent (1.8%) compared to

Lithuania (respectively, 25.5% and 21.9%) and Estonia (respectively, 17.5% and 9.8%) ($p<0.001$, Cramer's V=0.237).

Vitality

Self-rated health in general as good, very good or excellent was reported by 33.8% of the respondents from Estonia, 45.4% from Lithuania and 28.0% from Latvia. The obtained results indicate a tendency that only 2.2% of the respondents from Latvia rated their health as very good (2.1%) or excellent (0.1%) compared to Lithuania (respectively, 5.1% and 1.9%) and Estonia (respectively, 5.1% and 2.3%) ($p<0.001$, Cramer's V=0.146).

Existing long-term illness was reported by 70.4% of the respondents from Estonia, 62.6% from Lithuania and 52.9% from Latvia ($p<0.001$, Cramer's V=0.131). *Existing limitations in activities because of health* were reported by 58.9% of the respondents from Estonia, 47.5% from Lithuania and 59.9% from Latvia. Among them, severe limitations were reported by 26.0% of the respondents from Estonia, 15.3% from Lithuania and 22.4% from Latvia ($p<0.001$, Cramer's V=0.100). *Health problems limiting paid work* were reported by ~33% of all respondents, regardless of their nationality.

Existing diseases were reported by 27.4% of the respondents from Estonia, 24.3% from Lithuania and 27.1% from Latvia. Among them, combination of one to five diseases was reported by 69.7% of the respondents from Estonia, 72% from Lithuania and 72.4% from Latvia. Most common diseases were high blood pressure or hypertension (Estonia- 31.4%, Lithuania- 30.2%, Latvia- 36.8%), high blood cholesterol (Estonia- 12.1%, Lithuania- 12.9%, Latvia- 10.7%), diabetes or high blood sugar (Estonia- 7.8%, Lithuania- 5.8%, Latvia- 6.7%), rheumatoid arthritis (Estonia- 7.5%, Lithuania- 4.8%, Latvia- 6.3%), cataracts (Estonia- 5.7%, Lithuania- 5.3%, Latvia- 4%). Alzheimer's disease, dementia, senility or others affective/emotional disorders were reported only by 7.7% of the respondents from Estonia, 5.5% from Lithuania and 2.2% from Latvia. Less than 5% of the respondents, regardless of their nationality, have been diagnosed with stroke.

Taking at least 5 different drugs a typical day was reported by 26.6% of the respondents from Estonia, 22.1% from Lithuania and 24.9% from Latvia. The drugs were most commonly used for diseases of the cardiovascular system (high blood pressure, coronary disease, other heart disease) (Estonia- 43%, Lithuania- 45.5% and Latvia- 46.2%) and high blood cholesterol (Estonia- 10.1%, Lithuania- 8.3%, Latvia- 8.0%).

Bothered with frailty were 52.3% of the respondents from Estonia, 61.6% from Lithuania and 55.8% from Latvia. Most often the frailty was associated with *fatigue* (Estonia- 37%, Lithuania- 27.4%, Latvia- 28.7%), *dizziness, faints or blackouts* (Estonia- 24.8%, Lithuania- 29.4%, Latvia- 28.7%), *fear of falling*

down (Estonia- 25.2%, Lithuania- 26.8%, Latvia- 20.9%), less often it was associated with *falling down* (Estonia- 13%, Lithuania- 16.4%, Latvia- 8.7%).

Cognitive and psychological status

Self-rated reading skills were reported as good by 33.2% of the respondents from Estonia, 38.8%, from Lithuania and 56.4% from Latvia, but all respondents from Estonia aged 70 years and older rated those skills as excellent, if compared to Lithuania (19.0%) and Latvia (5.5%) ($p<0.001$, Cramer's $V=0.161$).

Self-rated writing skills were reported as good by 42.1% of the respondents from Estonia, 41.8% from Lithuania and 54.8% from Latvia, but all respondents from Estonia aged 70 years and older rated those skills as excellent, compared to Lithuania (14.9%) and Latvia (4.4%) ($p<0.001$, Cramer's $V=0.148$).

Overall excellent, very good and good *memory* was reported by 39.8% of the respondents from Estonia, 66.5% from Lithuania and 50.9% from Latvia. Results indicate a tendency that 60% of Estonian respondents aged 80 years and older rate their memory as fair, compared to Lithuania (49.7%) and Latvia (49.9%).

Feelings of sadness and depression during the last month were most expressed among the respondents and were reported by 46.5% of the respondents from Estonia, 45.9% from Lithuania and 46.2% from Latvia.

Besides, *suicidal feelings or wish to be dead* was reported by 5.6% of the respondents from Estonia, 6.2% from Lithuania and 4.8% from Latvia. *Lack of companionship* was often reported by 10.6% of the respondents from Estonia, 8.4% from Lithuania and 7.7% from Latvia. *Feeling of loneliness* was often reported by 8.4% of the respondents from Estonia, 6.3% from Lithuania and 11.3% from Latvia, but respondents aged 80 years and older reported feeling of loneliness twice often than on average (Latvia- 20.8%, Estonia- 16.0% and Lithuania- 13.4%).

Satisfaction with life from 0 to 5 points was reported by 20.8% of the respondents from Estonia, 24.4% from Lithuania and 18.2% from Latvia. Detailed results will be provided in further analysis. Statistically significant associations ($p<0.001$) were found between education and various cognitive and vitality factors, regardless of a nationality. Larger proportion of the respondents with higher level of education, compared to lower level of education:

- higher rated satisfaction with life
- (Cramer's V: Estonia=0.095, Lithuania=0.137, Latvia=0.175);
- less reported health problems limiting paid work
- (Cramer's V: Estonia=0.114, Lithuania=0.143, Latvia=0.131);
- less reported necessity for assistance in daily activities
- (Cramer's V: Estonia=0.207, Lithuania=0.233, Latvia=0.068);
- less reported received assistance in personal care

- (Cramer's V: Estonia=0.236, Lithuania=0.174, Latvia=0.167);
- less reported 1-5 comorbidities
- (Cramer's V: Estonia=0.134, Lithuania=0.129, Latvia=0.074);
- less reported cognitive diseases (Alzheimer's disease, dementia or other)
- (Cramer's V: Estonia=0.138, Lithuania=0.146, Latvia=0.083);
- less reported concentration difficulties
- (Cramer's V: Estonia=0.129, Lithuania=0.159, Latvia=0.158);
- less reported feeling of isolation
- (Cramer's V: Estonia=0.125, Lithuania=0.150, Latvia=0.149);
- less reported feeling of loneliness
- (Cramer's V: Estonia=0.114, Lithuania=0.137, Latvia=0.137);
- less reported financial problems to meet household needs
- (Cramer's V: Estonia=0.008, Lithuania=0.174, Latvia=0.119).

For further analysis, respondents were divided into 2 following groups, based on satisfaction with life: low satisfaction with life (0-5 points) and high satisfaction with life (6-10 points) in order to compare demographic and IC determinants. The most important demographic factors are provided in Table 1.

Table 1 ***Comparison of Demographic Factors Based on Satisfaction with Life***

Demographic factors	LOW satisfaction with life			HIGH satisfaction with life		
	Latvia	Estonia	Lithaunia	Latvia	Estonia	Lithaunia
Male	42.4%	46.6%	38.1%	37.9%	37.8%	40.6%
Female	57.6%	52.1%	61.9%	62.1%	62.2%	59.4%
Age Median (IQR)	69 (61-79)	69 (69-84)	65 (59-77)	65 (58-74)	65 (59-74)	64 (58-74)
Married and living together	29.9%	35.6%	47.2%	50.4%	46.9%	59.3%
Basic or lower education	47.2%	21.3%	23.2%	26.0%	13.0%	15.1%
Employed	12.2%	21.5%	25.1%	35.8%	46.6%	41.2%
Ability to make ends with some or great difficulty	90,0%	74.4%	75.2%	69.5%	41.2%	38.4%
Level of income /pension Median (IQR)	300 (276-355)	460 (400-500)	300 (250-361)	333 (280-430)	476 (450-520)	350 (280-450)
Physical activities hardly ever or never: moderate	28.3%	21.7%	29.0%	10.4%	9.9%	11.0%
Physical activities hardly ever or never: vigorous	46.4%	58.2%	57.1%	25.6%	40.5%	38.8%
Looking after grandchildren	14.8%	29.2%	16.5%	27.4%	42.7%	31.8%
Participation in social activities	46.7%	85.4%	71.1%	63.6%	94.2%	85.6%
Social support - provided help to others	5.5%	16.0%	10.4%	12.5%	24.5%	15.7%

The results of this study indicate a statistically significant association ($p<0.001$) between social participation and such cognitive, psychological and vitality factors as:

- higher level of self-rated reading skills

- (Cramer's V: Estonia = 0.347, Lithuania = 0.342, Latvia = 0.251);
- higher level of self-rated writing skills
- (Cramer's V: Estonia= 0.267, Lithuania = 0.326, Latvia = 0.269);
- higher level of memory
- (Cramer's V: Estonia = 0.245, Lithuania = 0.169, Latvia = 0.202);
- higher level for satisfaction with life
- (Cramer's V: Estonia = 0.133, Lithuania = 0.162, Latvia = 0.134);
- lower level of depression
- (Cramer's V: Estonia = 0.146, Lithuania = 0.166, Latvia = 0.140);
- less feeling of loneliness
- (Cramer's V: Estonia = 0.103, Lithuania = 0.08, Latvia = 0.131);
- higher hope for future
- (Cramer's V: Estonia = 0.205, Lithuania = 0.173, Latvia = 0.069);
- less difficulties in daily tasks
- (Cramer's V: Estonia = 0.130, Lithuania = 0.073, Latvia = 0.006);
- less comorbidities
- (Cramer's V: Estonia = 0.133, Lithuania = 0.054, Latvia = 0.144);
- less provided assistance in daily tasks
- (Cramer's V: Estonia = 0.284, Lithuania = 0.231, Latvia = 0.306).

Table 2 represents data on individuals showing the biggest differences between life satisfactions groups after comparison of various IC determinants.

Table 2 ***Comparison of IC Determinants Based on Satisfaction with Life***

IC determinants	LOW satisfaction with life			HIGH satisfaction with life		
	Latvia	Estonia	Lithaunia	Latvia	Estonia	Lithaunia
Age prevents from doing things	59.8%	36.6%	41.7%	16.0%	13.4%	17.2%
Poor memory	26.6%	14.1%	6.4%	4.6%	5.7%	2.9%
Troubles with sleep	54.2%	68.2%	62.8%	40.1%	47.3%	42.3%
Less apetite	14.6%	15.4%	12.2%	6.3%	7.7%	8.0%
Severely limited/limited in activities because of health	85.5%	81.1%	63.3%	53.4%	85.1%	42.0%
Difficulties with physical tasks	71.4%	74.4%	65.3%	50.1%	45.3%	44.7%
Difficulties with daily tasks	36.8%	42.7%	33.2%	16.7%	20.2%	15.9%
Someone in household helped with personal care	52.2%	33.0%	23.0%	9.1%	21.3%	14.7%
Poor health	52.5%	38.1%	21.8%	14.3%	10.7%	5.3%
1-5 diseases	83.5%	79.8%	77.0%	70.1%	79.8%	70.1%
Taking 5 drugs a day	39.7%	38.6%	32.3%	21.4%	22.4%	17.9%
Frailty: fear of falling down	28.2%	36.2%	31.1%	11.7%	17.7%	16.0%
Frailty: fatique	42.5%	50.9%	32.2%	26.1%	26.3%	16.3%
Suicidal feelings	15.0%	14.2%	12.2%	4.2%	3.1%	4.2%
Sad or depressed	73.7%	69.6%	64.3%	39.7%	40.4%	39.9%
Feels isolated	41.1%	33.3%	27.2%	17.4%	13.4%	10.3%
Feels lonely	68.2%	44.3%	43.7%	32.2%	22.5%	21.6%
No hopes for future	30.5%	41.1%	50.3%	10.7%	14.1%	23.7%
Life has meaning	21.6%	31.7%	26.4%	47.6%	66.4%	59.8%

The results of this study indicate a statistically significant association ($p<0.001$) between vigorous physical activities at least once a week and such cognitive and vitality factors as:

- less provided assistance in daily tasks
- (Cramer's V: Estonia = 0.173, Lithuania = 0.189, Latvia = 0.323);
- less limitations in daily activities due to an age
- (Cramer's V: Estonia = 0.194, Lithuania = 0.181, Latvia = 0.187);
- less difficulties in daily tasks
- (Cramer's V: Estonia = 0.395, Lithuania = 0.328, Latvia = 0.319);
- higher level of energy
- (Cramer's V: Estonia = 0.203, Lithuania = 0.191, Latvia = 0.267);
- higher level of memory
- (Cramer's V: Estonia = 0.175, Lithuania = 0.132, Latvia = 0.189);
- larger proportion of the respondents with no long-term illness
- (Cramer's V: Estonia = 0.284, Lithuania = 0.273, Latvia = 0.268);
- larger proportion of the respondents with no comorbidities
- (Cramer's V: Estonia = 0.261, Lithuania = 0.161, Latvia = 0.220).

Maintaining mobility at an old age is necessary because it can prevent loss of independence. It is proven that physical activity can protect not only against loss of independence, progression of disability, but also maintain cognitive functioning (Goethals et al., 2020).

The results of this study indicate several associations:

- *presence of long-term illness* increases odds for **depression** in Estonia: OR 2.56 (95% CI 2.54-2.61), Lithuania: OR 2.52 (95% CI 2.50-2.54) and Latvia: OR 2.24 (95% CI 2.24-2.22),
- *presence of comorbidities* increases odds for **depression** in Estonia: OR 2.62 (95% CI 2.58-2.66), Lithuania: OR 3.54 (95% CI 3.50-3.58) and Latvia: OR 2.38 (95% CI 2.35-2.41).
- *presence of long-term illness* increases odds for **limited functional abilities** in Estonia: OR 2.87 (95% CI 2.83-2.904), Lithuania: OR 2.68 (95% CI 2.66-2.70) and Latvia: OR 4.31 (95% CI 4.27-4.35),
- *presence of comorbidities* increases odds for **limited functional abilities** in Estonia: OR 3.25 (95% CI 3.21-3.29), Lithuania: OR 3.00 (95% CI 2.97-3.03) and Latvia: OR 3.94 (95% CI 3.89-3.98).
- *presence of long-term illness* increases odds for **needing assistance of others** in Estonia: OR 2.44 (95% CI 2.40-2.48), Lithuania: OR 4.44 (95% CI 4.37-4.51) and Latvia: OR 2.87 (95% CI 2.83-2.91).
- *presence of comorbidities* increases odds for **needing assistance of others** in Estonia: OR 2.47 (95% CI 2.42-2.51), Lithuania: OR 3.88 (95% CI 3.80-3.96) and Latvia: OR 2.41 (95% CI 2.37-2.46).

Assessment of healthy ageing of older individuals is a complex multidimensional process as there are many IC factors, which need to be evaluated independently as well as in interaction with others. To assess the most important IC determinants that might have negative impact on healthy ageing, predictions associated with low satisfaction with life were made. Based on the results, the main negative factors that increase odds towards low satisfaction with life for each Baltic country are provided in Table 3.

Table 3 ***Main Negative Predictive Factors towards Low Satisfaction with Life***

	Unadjusted OR (95%CI)		
	Latvia	Estonia	Lithaunia
"life has no meaning"	**7.21** (7.11-7.30)	**3.63** (3.57-3.69)	**5.62** (5.55-5.68)
"age prevents from doing things"	5.24 (5.16-5.32)	2.98 (2.94-3.03)	2.84 (2.81-2.87)
"poor health"	**7.92** (7.74-8.01)	**5.15** (5.04-5.25)	**2.93** (2.91-2.96)
"more than 5 drugs per day"	2.42 (2.39-2.45)	2.18 (2.14-2.21)	2.20 (2.17-2.22)
"bothered by frailty"	2.35 (2.33-2.38)	3.38 (3.33-3.43)	2.50 (2.48-2.52)
"sad or depressed"	4.24 (4.19-4.30)	3.39 (3.34-3.44)	2.71 (2.69-2.74)
"suicidal feelings"	**6.45** (6.31-6.59)	**5.13** (5.01-5.26)	**3.21** (3.16-3.26)
"feels lonely"	**6.29** (6.20-6.39)	**5.17** (5.07-5.28)	**4.38** (4.31-4.45)
"Education" reference category: Higher			
No education	1.43 (1.34-1.53)	2.82 (2.65-3.00)	4.59 (4.50-4.68)
Incomplete or completed basic	6.06 (5.93-6.19)	2.28 (2.17-2.40)	2.95 (2.89-2.99)
Secondary	2.83 (2.77-2.89)	1.30 (1.24-1.37)	2.27 (2.45-2.31)

Based on the binary logistic regression results (Table 3), the authors first identified 9 factors, which have the biggest impact on the respondent's satisfaction with life - "meaning of life", "age prevents from doing things", "poor health", "more than 5 drugs per day", "frailty", "sadness or depression", "suicidal feelings", "loneliness" and "level of education".

In the subsequent analysis, the four most important factors were identified (Table 4). The results indicated that for all Baltic countries these four factors were the same; however, have different level of impact. In Latvia and Lithuania, the most important factor was "life has no meaning", but in Estonia the most important factor was "poor health".

Table 4 ***Most Important Negative Predictive Factors towards Low Satisfaction with Life***

	Adjusted OR (95%CI)		
	Latvia	Estonia	Lithaunia
"life has no meaning"	**4.49** (4.42-4.56)****	**2.31** (2.27-2.36)**	**4.41** (4.35-.4.46)****
"poor health"	**5.48** (5.35-5.60)***	**3.99** (3.91-4.08)****	**2.53** (2.50-2.55)***
"suicidal feelings"	**1.99** (1.94-2.05)*	**2.69** (2.62-2.77)*	**1.99** (1.94-2.05)*
"feels lonely"	**2.53** (2.48-2.58)**	**3.12** (3.04-3.19)***	**2.53** (2.48-2.58)**

*less important - ****most important (based on Wald statistics)

Discussion

This is one of the few studies that evaluated interactions between the IC determinants of healthy ageing. Present findings indicate that there exists interaction between such IC determinants as age, limitations in physical and daily tasks due to age and poor health, comorbidities, less physical activities, lack of social network and social activities, sadness or depression, feelings of loneliness and isolation as well as lower level of education, unemployment, lower levels of income and financial difficulties, regardless of their nationality. Various studies (Bergman & Segel-Karpas, 2018; Hawkley & Cacioppo, 2010; Sepúlveda-Loyola et al., 2020) have also reported similar findings in associations between social support and cognitive functions.

The results of a study conducted in China (Ping et al., 2020) indicate that age is associated with higher risk for anxiety and depression, less management of self-care and decreased functional ability of older individuals. In the present study, age has very little or no impact on depression, limited functional abilities and the need for assistance of others. They also concluded that depression was most common for respondents with three or more chronic diseases (46.3%) and less common for respondents who were unemployed (26.4%), divorced or widowed (31.6%), with low income (15.3%) and low level of education (18.7%), while the present study indicates the opposite result, which could be explained by unequal age of respondents and also cross-cultural differences.

Findings from a population-based cohort study (Daskalopoulou et al., 2019) suggests during the development of healthy ageing index such IC determinants as physical impairment, cognitive and psychological functions (including depression), comorbidities (arterial hypertension, arthritis, stroke, dementia etc.) and self-rated health must be included as they can predict the health outcome and even mortality. Findings from the present study also indicate a tendency for the above factors to predict health status and satisfaction with life, but also, unlike the above study, some demographic factors such as level of education, level of income and financial difficulties also have an important role in satisfaction with life. Based on the findings from present and similar studies, the authors identified two best healthy ageing profiles.

Profile 1 - “absence of all 8 predictors (Table 3) + level of education secondary or higher and high satisfaction with life”: less than 5% of all respondents, regardless of their nationality, matched these criterions.

Profile 2 - “absence of all 4 predictors (Table 4) + level of education secondary or higher and high satisfaction with life”: 30.6% respondents from Estonia, 23.8% from Lithuania and 30.6% from Latvia matched these criterions.

However, further longitudinal research is needed as exploration of these areas can provide necessary information for therapeutic and preventive actions

that can be tailored to an individual's needs, priorities and values to support participation and quality of life.

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