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LEISURE ACTIVITIES AND SUPERAGING IN WOMEN: PRELIMINARY DATA

VOLNOČASOVÉ AKTIVITY A SUPERAGING U ŽEN: PŘEDBĚŽNÁ DATA

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Abstract

SuperAger (SA) is a term for an individual in advanced age with superior cognitive abilities. Several factors contribute to its formation, among which leisure activities are mentioned in the literature. Physical exercise has been linked to mental health and the prevention of dementia syndrome. Existing studies report differences between men and women in prevalence (more SA are women) and brain neuroanatomy.

This study aims to identify which leisure activities were most frequently engaged in by women who were physically active during their lifetime and to explore the potential association between the most frequently mentioned activities and SuperAging.

The sample consists of 77 cognitively healthy women over age 80 who have engaged in moderate physical activity at least three times a week for a total of 150 minutes a week throughout their lives. A retrospective self-assessment was used to obtain data on mental and physical leisure activities performed from age 30 onwards at five-year intervals. SuperAging was defined according to the criteria of the Northwestern University SuperAging Program.

The most frequently mentioned physical activities were exercising, hiking, cycling, swimming, and skiing. The most often mentioned mental activities were reading, cultural engagement, crosswords, self-education, and handcraft. The results showed no significant association between the most frequently stated activities and SuperAging. A small association emerged between cultural engagement and SA $\phi = 0.203$ (95% CI [-0.022, 0.409], $p = 0.125$). Our sample, physically active women, included a significantly higher percentage of SA (32.5%) than estimated in the general healthy population (14%). Our results suggest a higher likelihood of achieving SuperAging with an active lifestyle regardless of the specific leisure activity.

Keywords: healthy ageing; lifestyle; cognitive abilities

Abstrakt

SuperAger (SA) je označení pro jedince v pokročilém věku s vynikajícími kognitivními schopnostmi, a tedy vyšší kognitivní rezervou. Na její tvorbě se podílí řada faktorů, mezi kterými se v literatuře uvádí i volnočasové aktivity. Do souvislosti s duševním zdravím a prevencí syndromu demence je dáván fyzický pohyb. Dosavadní studie uvádějí rozdíly mezi muži a ženami v prevalenci (více SA je žen) i v neuroanatomii mozku.

Cílem příspěvku je zjistit, jakým volnočasovým aktivitám se v průběhu života nejčastěji věnovaly ženy, které byly fyzicky aktivní, a prozkoumat potencionální souvislost mezi nejčastěji zmiňovanými aktivitami a SuperAgingem.

Vzorek tvoří 77 kognitivně zdravých žen starších 80 let, které v průběhu života vykonávaly mírnou fyzickou aktivitu, alespoň třikrát týdně v celkovém trvání alespoň 150 minut. Na základě retrospektivního sebehodnocení byly získány údaje o duševních a fyzických volnočasových aktivitách prováděných ve věku od 30 dále v pětiletých intervalech. SuperAging byl definován podle kritérií Northwestern University SuperAging Programu.

Nejčastěji vyjmenované fyzické aktivity byly cvičení, pěší turistika, jízda na kole, plavání a lyžování a nejčastěji vyjmenované duševní aktivity byly čtení, kulturní vyžití, křížovky, sebevzdělávání a ruční práce. Výsledky neukázaly žádnou signifikantní souvislost mezi nejčastěji vyjmenovanými aktivitami a SuperAgingem. Určitá souvislost se objevila mezi kulturním vyžitím a SA $\phi = 0.203$ (95% CI [-0.022, 0.409], $p = .125$). Náš vzorek, fyzicky aktivní ženy, zahrnoval výrazně vyšší procento SA (32,5

%), než se odhaduje v běžné zdravé populaci (14 %). Naše výsledky naznačují vyšší pravděpodobnost dosažení SuperAgingu při aktivním životním stylu bez ohledu na konkrétní volnočasovou aktivitu.

Klíčová slova: zdravé stárnutí; životní styl; kognitivní schopnosti

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In recent decades, researchers have focused on cognitively healthy, elite, superior aging, or SuperAging (SA). SuperAger (SA) is the term coined by Northwestern University SuperAging Program. It is used for individuals of advanced age whose cognitive abilities are and remain excellent or youthful (Gefen et al., 2014; Harrison et al., 2012; Sun et al., 2016).

Over a century of research on pathological cognitive aging has established a solid knowledge base, including modifiable preventive lifestyle factors. The literature suggests preventive measures that could reduce the risk of cognitive impairment or dementia, such as reducing alcohol consumption, stopping smoking, or exercising regularly (Alvares Pereira et al., 2022; Livingston et al., 2020). Lifestyle, particularly leisure activities, have been shown to contribute to cognitive reserve, which is defined as the ability of the brain to withstand the consequences of brain damage with pre-existing cognitive processes or neural networks (Alvares Pereira et al., 2022; Stern, 2002). Namely, physical activity has been associated with a reduced risk of dementia (Livingston et al., 2020; Najar et al., 2019), and is considered one of the most evidence-based interventions for risk reduction of cognitive decline and dementia (World Health Organization, 2019). However, almost null is known about what controllable lifestyle factors have the potential to influence cognitive aging in ways that increase people's chances of maintaining excellent cognitive function into old age, becoming SuperAger.

Our study is inspired by findings related to studies of cognitive decline in aging and dementia. Thus, we expect to observe

similar positive effects of leisure activities in SuperAging. There are some documented gender differences in brain neuroanatomy, cognitive function, and the prevalence of SuperAgers (Lee et al., 2022). To test both sexes, our sample of men and women would have to be significantly more extensive, and such research would not be feasible, so we decided to focus on only one sex. Given that physical activity has been well researched and, among other things, women tend to live longer (CZSO, 2020), this study focuses on physically active women.

Preliminary data on the association between leisure activities and SuperAging will be revealed. We aim to

- 1) identify which activities older women spontaneously report most frequently as performed throughout their adult life,
- 2) determine whether certain activities are related to SuperAger status, and
- 3) compare the prevalence of SA in this particular group and general healthy population of the same age-band.

METHODS

SAMPLE

The project has received the approval of the Institutional Review Board PVŠPS Nr. 3/2021. All participants were provided with information about the research and signed informed consent. Participants were recruited through websites, social networks, and by approaching senior clubs (Active Age Club, Sokol, etc.). The cohort consisted of 77 cognitively healthy women over the age of 80 who have engaged in physical activities since the age of 30. The age of participants ranged from 80 to 92

years ($M = 83.53$; $SD = 3.34$). The enrolment inclusion criteria were to meet the WHO recommendation for adults, which is to engage in moderate-intensity physical activity at least three times a week for at least 150 minutes. Exclusion criteria for medical history were severe mental or physical illness or disability (e.g., dementia, currently treated cancer, hemodialysis), alcohol or drug abuse, head trauma with unconsciousness, and/or uncorrected visual or hearing impairment. Information about medical history was self-reported.

MEASURES

All participants completed the Mini-Mental State Examination (MMSE; Folstein et al., 2001; Štěpánková et al., 2015) and the Functional Activities Questionnaire (FAQ; Pfeffer et al., 1982) to check that the inclusion criteria were met. All participants met the criteria.

Based on meeting the criteria defined by Northwestern University SuperAging program, participants were divided into two groups: SuperAgers (SA) and non-SuperAgers (nonSA) (Harrison et al., 2012). Participants in the SA group were 80 years old and older, whose performance in the delayed recall of Rey Auditory Verbal Learning Test (RAVLT; Frydrychova et al., 2018) was at or above average normative values for 60 years old, i.e., at least nine words. Further, their performance on non-memory tests, specifically, the completion time of the Trail Making Test - Part B (TMT; Bezdicek et al., 2017), the total score of correct responses and correct responses elicited with a semantic prompt in the Boston Naming Test-30 (BNT-30; Nikolai et al., 2018), and the number of stated animals in Category Fluency - Animals (Nikolai et al., 2015), was within one standard deviation of the average range for their age group and education level.

Data on leisure activities, both mental and physical, were obtained using a retrospective self-assessment questionnaire

developed particularly for the project Cognitive SuperAging in physically active women (Georgi et al., 2022; Schneiderová et al., 2022). The method maps the leisure activities performed during the life course (from age 30) and consists of two questions:

1. "What physical and mental leisure activities have you engaged in the most during your adult life (since the age of 30)?" Participants freely recalled 1-3 physical and mental activities and were then asked:
 2. "When and at what age did you do this activity most often? When a little less?"
- The frequency of performing each activity was reported on a timeline from age 30 years at five-year intervals ranging from (1) never or occasionally to (5) every day or almost every day. For the purpose of this study, only the first part of the questionnaire was analysed.

ANALYSIS

All reported physical and mental activities were independently ordered from the most often reported activity to the least often reported ones by their counts (i.e., the number of participants that reported said activity at least once). The five most frequently reported physical and five most frequently reported mental activities were retained for further analysis. To test whether there is a statistically significant association between binary variables SA and presence of each of the five most often reported physical and mental leisure activities we calculated Chi-Square contingency table test with continuity correction. The magnitude of each association was characterised by the ϕ correlation coefficient. To test whether the proportion of women meeting the criteria for SA in our sample differs from the estimated proportion of women meeting the criteria for SA in the Czech general population (Tichá et al., 2023), we used the Chi-Square Goodness of Fit Test. Tests result-

ing in p-values smaller than 0.05 were considered to indicate statistically significant effects.

RESULTS

In our sample, there were 25 (32.5%) participants who met the criteria for SA, which is a proportion that statistically sig-

nificantly differs from the estimated ratio of SA in older women in the Czech population (14%, $\chi^2(1) = 21.81$; $p < 0.001$).

The mean of years of education was 14.42 ± 2.64 for SA and 13.38 ± 2.67 for non-SA. The results of the cognitive tests used to assess SA status are shown in Table 1.

Table 1.

	SA M(SD)	SA Md	non-SA M(SD)	non-SA Md
MMSE	29.08 (1.15)	29	28.48 (1.49)	29
FAQ	0.20 (0.65)	0	0.50 (1.09)	0
RAVLT 1-5	47.40 (8.77)	48	38.46 (7.42)	39
RAVLT - delayed recall	10.56 (1.29)	11	7.02 (2.36)	7
TMT - A time	50.73 (14.97)	50	53.58 (20.58)	50.50
TMT - B time	107.45 (33.26)	110	142.54 (54.15)	133.50
BNT30	28.44 (1.19)	28	24.69 (3.38)	25
Verbal fluency test - animals	22.72 (4.21)	23	18.83 (5.47)	18

Notes. SA = SuperAging; MMSE = Mini-Mental State Examination; FAQ = Functional Activities Questionnaire; RAVLT = Rey Auditory Verbal Learning Test; TMT = Trail Making Test; BNT30 = Boston Naming Test-30

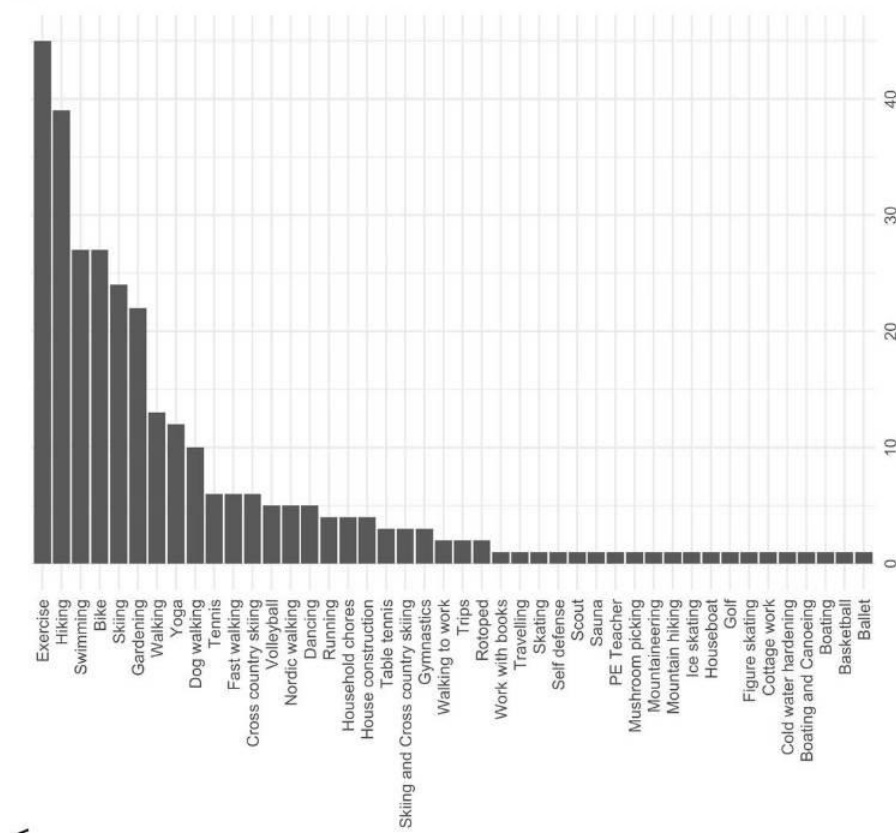
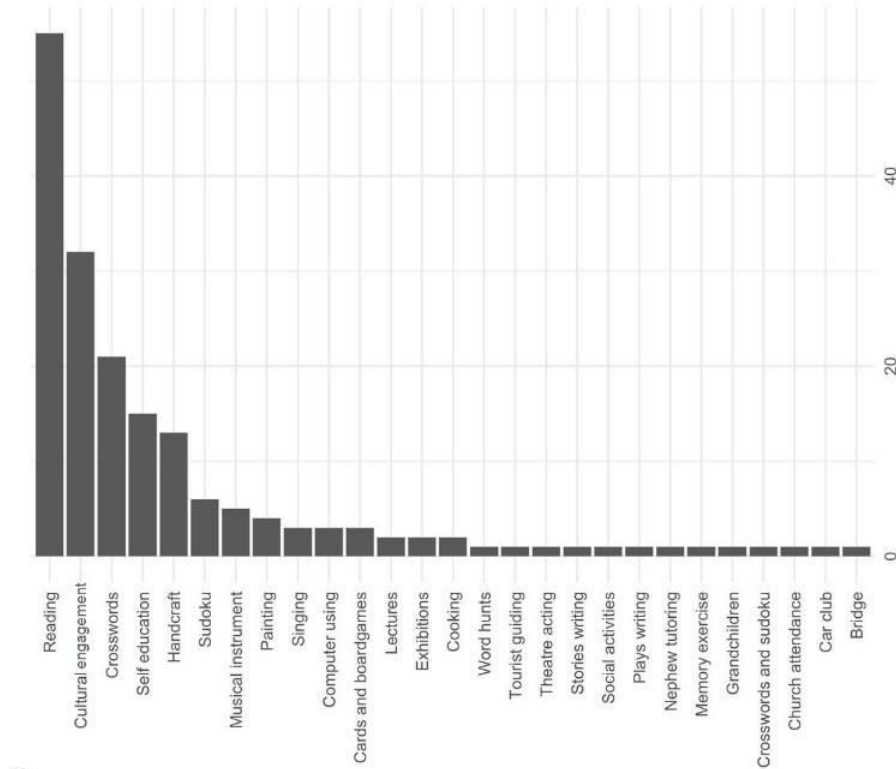
The results of cognitive tests

The most frequently spontaneously reported activities were exercise ($n = 45$; 58.4%), hiking ($n = 39$; 50.6%), cycling ($n = 27$, 35.1%), swimming ($n = 27$; 35.1%), skiing ($n = 24$; 31.2%) for physical activities and reading ($n = 54$; 70.1%), cultural engagement ($n = 32$; 41.6%), crosswords ($n = 21$, 27.3%), self-education ($n = 15$, 19.5%) and handcraft ($n = 13$, 16.9%) for mental activities. All reported leisure activities, ordered from most to least reported, are shown in graph 1.

Table 2 summarises associations between each leisure activity and SA status. There was no clear association between participants reporting any of the leisure activities and their SA status. Chi-Square contingency table tests detected no statistically significant association. The activity that seems most likely to associate with SA status in our data set was cultural engagement which showed a small association with SA status $\phi = 0.203$ with 95 % confidence interval of the estimate being compatible with trivial ($|\phi| < 0.1$) as well as small ($0.1 < \phi < 0.3$) to medium ($0.3 < \phi < 0.5$) positive association.

Graph 1.

Physical and mental activities ordered from most to least reported.



Note: A = physical activities, B = mental activities

Table 2.*Association of leisure activities with cognitive super-aging*

Activity	SA n = 25	non-SA n = 52	χ^2	Df	p	ϕ	95% CI
swimming	6 (24%)	21(40%)	1.336	1	0.248	-0.161	[-0.371, 0.066]
exercise	16 (64%)	29(56%)	0.193	1	0.660	0.078	[-0.148, 0.297]
hiking	15(60%)	24(46%)	0.800	1	0.371	0.130	[-0.097, 0.344]
skiing	6(24%)	18(35%)	0.461	1	0.497	-0.107	[-0.324, 0.120]
cycling	10(40%)	17(33%)	0.140	1	0.708	0.072	[-0.155, 0.291]
reading	19(76%)	36(69%)	0.120	1	0.729	0.070	[-0.156, 0.290]
handcraft	2(8%)	11(21%)	1.250	1	0.264	-0.164	[-0.375, 0.062]
self-education	4(16%)	11(21%)	0.052	1	0.820	-0.061	[-0.281, 0.165]
cultural engagement	14(56%)	18(35%)	2.359	1	0.125	0.203	[-0.022, 0.409]
crosswords	7(28%)	14(27%)	<0.001	1	1.000	0.011	[-0.213, 0.235]

Notes. SA = SuperAging; χ^2 = chi-square test statistic; df = degrees of freedom; p = p-value; ϕ = association coefficient phi; CI = confidence interval; values in columns SA and non-SA represent number and percentage of participants who reported the relevant activity.

DISCUSSION

Firstly, this study aimed to identify which leisure activities women who had been physically active throughout their lives engaged in most frequently during their lifetime. Further, to test their potential association with SuperAger status, and finally, to compare the prevalence of SA in this particular sample and the general population.

The most frequently mentioned physical activities practiced since the age of 30 were exercising, hiking, cycling, swimming, and skiing. The most frequently mentioned mental activities practiced since 30 years of age were reading, cultural engagement, crosswords, self-education, and handcraft. According to our results, none of the five most frequently reported physical or mental activities was significantly associated with SA. However, it is worth mentioning that the prevalence of

SA in our sample was significantly higher compared to the general population (Ticha et al., 2023).

The first Czech study regarding leisure activities and SA was carried out by Heissler et al. (2021). They used a questionnaire from the COBRA study (Cognition, Brain, and Aging Study; Nevalainen et al., 2015) to assess leisure activities. In contrast to our study, they only focused on activities participants engaged in within the last few years. Based on their results, SA participated in more cognitive activities than their peers, with reading and doing crossword puzzles as the most frequently practiced along with other cognitive activities. However, both groups participated in physical and social activities at about the same level, and above the average level of their peers, which may have biased the results. Reading and doing crossword puzzles were also among the most frequently mentioned leisure activities in our study.

It is worth noting that in our study, the closest positive relationship with SA was found for cultural engagement, though this relationship was not statistically significant. Despite the fact that the association was not significant, our findings are somewhat consistent with studies indicating the benefits of cultural activities such as music, theatre, art gallery, etc., especially in improving general cognitive function (Alain et al., 2019; Delfa-Lobato et al., 2021). However, the SA prevalence in our sample of physically active women may imply a higher likelihood of achieving SA with an active lifestyle regardless of the specific leisure activity. Nevertheless, we do not present any clear evidence on what specific leisure activities might contribute to a higher likelihood of achieving SA.

Participants in this study did not report any social activity very often. Interestingly, participants did not consider social activities nearly at all. A possible explanation may be that participants recalled activities spontaneously and were not explicitly asked about social activities. Although, some of these activities may have included social participation, such as hiking, exercise, or cultural engagement, which may have enhanced the positive effect of cultural activities themselves.

This pilot study has several limitations. We tested only the most frequently stated activities. There is a need to focus on other less frequent activities and analyse them with more complex statistical modelling to find out whether the trajectory of the intensity of these activities has an effect. Also, the cultural engagement category is quite broad. Since the cultural engagement variable showed the strongest association, for further study, partici-

pants should be encouraged to elaborate on their cultural habits to distinguish whether different types of culture (cinema, theatre, art, museum, etc.) may have distinct effects.

Furthermore, the representation of social activities was almost nil, so the association between social activities and SA could not be examined. Last but not least, we tested differences in the homogenous group as our sample included cognitively healthy women who had been physically active across their lifespans. The lack of contrast in groups is a possible reason why no significant difference was found. Despite these limitations, this study offered additional insights into the association between leisure activities and SuperAging.

CONCLUSION

This study showed preliminary data on the association between leisure activities and SuperAging. None of the most repeatedly recalled physical and mental activities were significantly associated with SA. Although we did not provide any evidence on what specific leisure activities lead to SA, an active lifestyle per se may contribute to SA because the prevalence of SA in our sample of physically active women was significantly higher than in the general population. Nevertheless, our study focused solely on physically active women, therefore, our findings cannot be generalized to the general population. What particular leisure activities increase the likelihood of becoming SA is still unknown, and further research is needed in this area.

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LITERATURE

- Alain, C., Moussard, A., Singer, J., Lee, Y., Bidelman, G. M., & Moreno, S. (2019). Music and visual art training modulate brain activity in older adults. *Frontiers in Neuroscience, 13*, 182. <https://doi.org/10.3389/fnins.2019.00182>
- Alvares Pereira, G., Silva Nunes, M. V., Alzola, P., & Contador, I. (2022). Cognitive reserve and brain maintenance in aging and dementia: An integrative review. *Applied Neuropsychology: Adult, 29*(6), 1615–1625. <https://doi.org/10.1080/23279095.2021.1872079>
- Bezdicek, O., Stepankova, H., Axelrod, B. N., Nikolai, T., Sulc, Z., Jech, R., Růžička, E., & Kopecek, M. (2017). Clinimetric validity of the Trail Making Test Czech version in Parkinson's disease and normative data for older adults. *The Clinical Neuropsychologist, 31*(sup1), 42–60. <https://doi.org/10.1080/13854046.2017.1324045>
- CZSO. (2020). Life expectancy in the Czech Republic by sex and age [Naděje dožití v ČR podle pohlaví a věku—Časová řada]. In Mortality Tables [Úmrtnostní tabulky]. Český statistický úřad. https://www.czso.cz/csu/czso/umrtnostni_tabulky
- Delfa-Lobato, L., Guàrdia-Olmos, J., & Feliu-Torruella, M. (2021). Benefits of cultural activities on people with cognitive impairment: A systematic review. *Frontiers in Psychology, 12*, 762392. <https://doi.org/10.3389/fpsyg.2021.762392>
- Folstein, M. F., Folstein, S. E., McHugh, P. R., & Fanjiang, G. (2001). *Mini-Mental State Examination User's Guide*. Psychological Assessment Resources.
- Frydrychova, Z., Kopecek, M., Bezdicek, O., & Štěpánková Georgi, H. (2018). České normy pro revidovaný Reyův auditorně-verbální test učení (RAVLT) pro populaci starších osob [Czech normative study of the revised Rey Auditory Verbal Learning Test (RAVLT) in older adults]. *Československá Psychologie, 62*(4), 330–349.
- Gefen, T., Shaw, E., Whitney, K., Martersteck, A., Stratton, J., Rademaker, A., Weintraub, S., Mesulam, M.-M., & Rogalski, E. (2014). Longitudinal neuropsychological performance of cognitive SuperAgers. *Journal of the American Geriatrics Society, 62*(8), 1598–1600. <https://doi.org/10.1111/jgs.12967>
- Georgi, H., Schneiderová, M., Vojtěchová, I., & Daďová, K. (2022). Retrospektivní sebehodnocení volnočasových aktivit. *Psychologické dny 2022, 39*. <https://drive.google.com/file/d/1sHFLDoCGSeAls6yVsGUNyV8ihzUoWv/view>
- Harrison, T. M., Weintraub, S., Mesulam, M.-M., & Rogalski, E. (2012). Superior memory and higher cortical volumes in unusually successful cognitive aging. *Journal of the International Neuropsychological Society, 18*(6), 1081–1085. <https://doi.org/10.1017/S1355617712000847>
- Heissler, R., Kopeček, M., & Georgi, H. (2021). Leisure activities of SuperAgers. *Ageing 2021, 77–86*. http://www.konferencestarnuti.cz/files/Starnuti_2021_sbornik.pdf
- Lee, B. H., Richard, J. E., de Leon, R. G., Yagi, S., & Galea, L. A. M. (2023). Sex Differences in Cognition Across Aging. *Current topics in behavioral neurosciences, 62*, 235–284. https://doi.org/10.1007/7854_2022_309
- Livingston, G., Huntley, J., Sommerlad, A., Ames, D., Ballard, C., Banerjee, S., Brayne, C., Burns, A., Cohen-Mansfield, J., Cooper, C., Costafreda, S. G., Dias, A., Fox, N., Gitlin, L. N., Howard, R., Kales, H. C., Kivimäki, M., Larson, E. B., Ogunniyi, A., ... Mukadam, N. (2020). Dementia prevention, intervention, and care: 2020 report of the Lancet Commission. *The Lancet, 396*(10248), 413–446. [https://doi.org/10.1016/S0140-6736\(20\)30367-6](https://doi.org/10.1016/S0140-6736(20)30367-6)
- Najar, J., Östling, S., Gudmundsson, P., Sundh, V., Johansson, L., Kern, S., Guo, X., Hällström, T., & Skoog, I. (2019). Cognitive and physical activity and dementia: A 44-year longitudi-

- nal population study of women. *Neurology*, 92(12), e1322–e1330.
<https://doi.org/10.1212/WNL.0000000000007021>
- Nevalainen, N., Riklund, K., Andersson, M., Axelsson, J., Ögren, M., Lövdén, M., Lindenberg, U., Bäckman, L., & Nyberg, L. (2015). COBRA: A prospective multimodal imaging study of dopamine, brain structure and function, and cognition. *Brain Research*, 1612, 83–103. <https://doi.org/10.1016/j.brainres.2014.09.010>
- Nikolaj, T., Stepankova, H., Kopecek, M., Sulc, Z., Vyhnalek, M., & Bezdicek, O. (2018). The Uniform Data Set, Czech version: Normative data in older adults from an international perspective. *Journal of Alzheimer's Disease*, 61(3), 1233–1240.
<https://doi.org/10.3233/JAD-170595>
- Nikolaj, T., Štěpánková, H., Michalec, J., Bezdíček, O., Horáková, K., Marková, H., Růžička, E., & Kopeček, M. (2015). Testy verbální fluence, česká normativní studie pro osoby vyššího věku. *Česká a slovenská neurologie a neurochirurgie*, 78/111(3), 292–299.
<https://doi.org/10.14735/amcsnn2015292>
- Pfeffer, R. I., Kurosaki, T. T., Harrah, C. H., Chance, J. M., & Filos, S. (1982). Measurement of functional activities in older adults in the community. *Journal of Gerontology*, 37(3), 323–329. <https://doi.org/10.1093/geronj/37.3.323>
- Schneiderová, M., Mana, J., & Georgi, H. (2022). Reliabilita nového nástroje pro retrospektivní sebehodnocení volnočasových aktivit. *Psychologické dny 2022*, 39, 36–37.
<https://drive.google.com/file/d/1sHFLDoCGSeAlsLs6yVsGUNyV8ihzUoWv/view>
- Stern, Y. (2002). What is cognitive reserve? Theory and research application of the reserve concept. *Journal of the International Neuropsychological Society*, 8(3), 448–460.
<https://doi.org/10.1017/S1355617702813248>
- Sun, F. W., Stepanovic, M. R., Andreano, J., Barrett, L. F., Touroutoglou, A., & Dickerson, B. C. (2016). Youthful brains in older adults: Preserved neuroanatomy in the default mode and salience networks contributes to youthful memory in Superaging. *Journal of Neuroscience*, 36(37), 9659–9668. <https://doi.org/10.1523/JNEUROSCI.1492-16.2016>
- Štěpánková, H., Nikolaj, T., Lukavsky, J., Bezdicek, O., Vrajová, M., & Kopeček, M. (2015). Mini-Mental State Examination – česká normativní studie. *Česká a slovenská neurologie a neurochirurgie*, 78/111(1), 57–63.
- Ticha, Z., Georgi, H., Schmand, B., Heissler, R., & Kopecek, M. (2023). Processing speed predicts SuperAging years later. *BMC Psychology*, 11(1), 34.
<https://doi.org/10.1186/s40359-023-01069-7>
- World Health Organization. (2019). *Risk Reduction of Cognitive Decline and Dementia: WHO Guidelines*. World Health Organization. <https://apps.who.int/iris/handle/10665/312180>