DOI: 10.20419/2024.33.588
CC: 2860, 2340
UDK: 159.922.62:159.95

Psihološka obzorja / Horizons of Psychology, 33, 35–40 (2024)

Znanstveni raziskovalnoempirični članek / Scientific empirical article

Fluid and crystallized abilities as predictors of everyday cognitive competence in middle-aged adults

Luka Juras*, Marina Martincević, Andrea Vranić, and Blaž Rebernjak
Department of Psychology, Faculty of Humanities and Social Sciences, University of Zagreb, Croatia

Abstract: The competence to independently solve everyday tasks is crucial for prosperous aging. Less is known about the contribution of fluid abilities and crystallized abilities to everyday cognitive competence in middle-aged adults. The current preliminary study examines the relative contributions of fluid intelligence and crystallized ability to everyday cognitive competence in a sample of 59 middle-aged adults (age range 49–65 years). Fluid intelligence and crystallized ability had statistically significant bivariate correlations with the everyday cognitive competence in our sample. Surprisingly, neither of two cognitive predictors had an independent contribution in predicting everyday cognitive competence when simultaneously introduced in hierarchical regression analysis. Our preliminary results call for future investigation of the complex relationship between various basic cognitive abilities and everyday cognitive competence.

Keywords: everyday cognitive competence, cognition, middle adulthood, Everyday Problems Test

Fluidne in kristalizirane sposobnosti kot napovedniki vsakodnevne spoznavne kompetentnosti v srednji odraslosti

Luka Juras*, Marina Martincević, Andrea Vranić in Blaž Rebernjak
Oddelek za psihologijo, Fakulteta za humanistiko in družbene vede, Univerza v Zagrebu, Hrvaška

Izvleček: Sposobnost samostojnega reševanja vsakodnevnih nalog je izrednega pomena za kakovostno staranje. Manj pa je znanega o prispevku fluidnih in kristaliziranih sposobnosti k vsakodnevni spoznavni kompetentnosti pri posameznikih v srednji odraslosti. Pričujoča preliminarna študija preučuje relativni prispevek fluidne inteligentnosti ter kristaliziranih sposobnosti k vsakodnevni spoznavni kompetentnosti pri vzorcu 59 posameznikov v obdobju srednje odraslosti (starih med 49 in 65 let). Fluidna inteligentnost in kristalizirana sposobnost sta pri našem vzorcu bivariatno pomembno korelirali z vsakdanjo spoznavno kompetentnostjo. Presenetljivo pa nobeden od obeh napovednikov pri vključitvi v hierarhično linearno regresijo ni imel samostojnega prispevka pri napovedovanju vsakodnevne spoznavne kompetentnosti. Naši preliminarni rezultati kličejo po dodatnih raziskavah o kompleksnem odnosu med različnimi bazičnimi spoznavnimi sposobnostmi in vsakodnevno spoznavno kompetentnostjo.

Ključne besede: vsakodnevna kognitivna kompetentnost, kognicija, srednja odraslost, Test vsakodnevnih problemov

*Naslov/Address: Luka Juras, Department of Psychology, Faculty of Humanities and Social Sciences, University of Zagreb, Ivana Lučića 3, 10000 Zagreb, e-mail: ljuras@ffzg.hr

Everyday cognitive competence (ECC) is crucial for maintaining functional independence in the rapidly growing share of the older population. Verhaegen et al. (2012, p. 4) argue that the "…disconnect[ion] between "pure" cognition in the lab and the "true" cognition in the wild is one of the most important puzzles in the study of cognitive aging". Concerns related to the use of traditional neuropsychological tests of cognitive abilities in predicting performance in everyday life are well-known in psychology (Denney & Palmer, 1981). The low ecological validity, as well as the low content validity of traditional neuropsychological tests raises many questions regarding their utility in predicting everyday functioning (Chaytor & Schmitter-Edgecombe, 2003).

Administrating an accessible and standardized measure of ECC has become of pivotal interest in health, social care, and legal settings (Giles et al., 2020). Detecting changes in ECC can be particularly demanding in high functioning adults. However, performance-based measures of ECC are sensitive to subtle intra- and interindividual changes in ECC (Chen et al., 2019). Utilizing standardized real-life materials and practical problem-solving tasks that require instrumental skills, such as following a recipe or choosing more affordable telephone tariff, performance-based measures can provide a more objective assessment of the ECC compared to self- or informant-based reports. Moreover, the results on these measures can predict a range of real-life outcomes, from minor outcomes as forgetting to take the medication in younger adults (Neupert et al., 2011) to severe ones, such as higher mortality risk in older adults with dementia (Allaire & Willis, 2006).

The consequences of age-related decline in cognitive abilities on ECC are still not fully understood. Life span theories postulate that experience-based knowledge could compensate for the decline in fluid abilities (Baltes et al., 1999). These theories state that older adults mostly deal with predictable everyday context, and the practical demands of their daily life require them to rely heavily on their accumulated knowledge. For example, Castel (2005) found that the recall of common grocery items listed with unrealistic prices was lower in older than in younger adults, while the difference was not significant for items listed with the usual prices. Previous research shows that basic cognitive abilities and accumulated knowledge underline performance on ECC tasks (Chen et al., 2017; Gross et al., 2011; Yam et al., 2014). Fluid reasoning has been recognized as one of the most consistent predictors of ECC (Allaire & Marsiske, 1999; Gross et al., 2011; Kimbler, 2013). Everyday situations that demand significant cognitive effort involve advanced reasoning skills to identify, analyze and manipulate extracted information. Further along, longitudinal data has shown similar age-related trajectories of fluid reasoning and ECC (Yam et al., 2014).

Although life span theory emphasizes the compensatory role of crystallized abilities, empirical evidence is somewhat ambiguous regarding its relation to ECC (e.g., Chen et al., 2017; Kimbler, 2013). Mixed results could be the consequence of the age of the participants employed within these studies, since various cognitive abilities could differently predict ECC across the life span. Chen et al. (2017) found that fluid abilities consistently explained variance across all age groups, while crystallized abilities were increasingly more important in predicting ECC as a function of age.

Investigating the contribution of basic cognitive abilities in predicting ECC in middle adulthood has received little attention. Previous research shows that individuals improve in their ability to solve cognitively demanding everyday tasks throughout adult lifespan, and this improvement peaks in middle adulthood. However, after the age of 50, a gradual decline in these abilities can be observed (Borella et al., 2017; Chen et al., 2017). Late middle adulthood is characterized by a subtle decline in fluid and a peak of crystallized abilities, which makes it crucial in understanding of the shift in the utilization of different cognitive processes in younger and older adults (Salthouse, 2019). Investigating the contribution of different abilities in interindividual differences in the ECC of late middle-aged adults could support the development of preventive strategies to postpone age-related deficits in ECC and thus improve the identification of individuals at risk for non-normative cognitive aging. The preliminary data shown in this paper examines the relative contributions of fluid intelligence and crystallized abilities to EEC in a sample of middle-aged adults. We hypothesized that, after controlling for sociodemographic variables, fluid intelligence and crystallized abilities would have a significant contribution to predicting ECC in these participants.

Method

Participants

A convenience sample of middle-aged participants (N = 59, 78% female; M_{age} = 55.07 years, SD_{age} = 3.99 years, total range = 49–65 years), with different educational attainment (3.4% elementary school, 33.9% high school, 22% BA, and 40.7% MA or higher), took part in the study.

Material

Everyday Problems Test (EPT; Willis & Marsiske, 1993) is a paper-pencil performance-based measure of ECC. It taps seven domains of instrumental activities of daily living: household care, meal preparation, medication use, telephone use, shopping, financial management, and transportation. Each of these seven domains is represented by one type of test material (task), such as instructions on how to use cough medicine. Each test material is followed by two questions. For example, in the case of cough medicine instruction, participants need to determine the maximum dosage an adult should take within 24 hours, and whether this medicine is appropriate for smokers. Two culturally adapted brief versions of the EPT, featuring 14 items each (Juras et al., 2022), were administered. The final score for each of the brief versions is the sum of correct answers (maximum of 14). In our sample, the average score was 10.86 (SD = 2.45, total range = 4–14). Reliability assessed via Cronbach alpha coefficient was α = .66. Low internal consistency coefficient was expected due to the relatively small sample and heterogeneous test material.

Culture Fair Intelligence Test—Scale 2 (CFIT-2;

Cattell, 2000) is a non-verbal test of fluid intelligence. It consists of four individually timed subtests: Series (3 min), Classifications (4 min), Matrices (3 min), and Topology (2.5 min). Both parallel forms (A and B) were administered. The composite score, which can be converted into a standardized IQ, was calculated as a sum of raw scores on each subtest. In our sample, results ranged from 35 to 87 (M = 63.2, SD = 10.44) and Cronbach alpha coefficient was α = .89.

Mill Hill Vocabulary Scale (MHVS; Raven et al., 1988, as cited in Križan & Matešić, 2001). The MHVS is a measure of verbal abilities and it was used as a proxy of crystallized abilities. Form B of the MHVS, composed of 32 open-ended items, was administered. Participants had to provide a definition for each presented item (e.g., cruel). A total score is the sum of correct answers across all items. In our sample, the average score was 22.71 (SD = 5.38, total range = 6–32). Cronbach's alpha coefficient in this study was α = .81.

Procedure

Participants were recruited via acquaintances and using the snowball method. Data for this study was obtained within a larger project on working memory training in middle adulthood. Here, we present preliminary results from a pretest of the first wave of the study, and only results from EPT, CFIT-2, and MHVS are included in the analysis. The study was approved by the Ethical Committee of the research institution and all participants gave their written informed consent in accordance with the Declaration of Helsinki.

Results

Descriptive statistics for the three instruments used are presented in Table 1, while correlations between the observed variables are shown in Table 2. Participants with higher education tended to score higher on the MHVS. Higher EPT score was moderately associated with a better performance on CFIT-2 and MHVS, and these two measures were strongly positively correlated. Higher age was associated with a slightly lower CFIT-2 score. Male participants have marginally outperformed females on MHVS.

To explore the effects of fluid and crystallized abilities on everyday functioning, we performed a hierarchical regression analysis. Participants' age, gender and education level were entered in the first step, in order to statistically control for their effects. Results on the CFIT-2 and the MHVS, used to operationalize fluid and crystallized abilities, were entered in the second step. All of the above were regressed on the result of the EPT.

The amounts of variances explained for both steps with the omnibus tests are presented in Table 3. Age, gender, and educational level introduced in the first step accounted for less than 5% of the variance in EPT, and their linear combination did not significantly predict the outcome. This is not surprising given the restricted variability in our sociodemographic variables.

Adding the two ability measures in step two led to a statistically significant increase in the variance explained in the outcome, with R^2 of .22. Thus, a linear combination of fluid and crystallized abilities adds significantly to the explanation of the variability in ECC. Table 3 also shows model parameters for all the variables entered in both steps. Even though the second step shows a statistically significant improvement, neither CFIT-2 nor MHVS had a statistically significant unique contribution to explaining the variability of the outcome.

Table 1
Descriptive statistics for observed variables (N=59)

Test	*M*	*SD*	Min	Max
EPT	10.86	2.45	4	14
CFIT-2	63.2	10.44	35	87
MHVS	22.71	5.38	6	32

Note. EPT – Everyday Problems Test, brief form (14-items), CFIT-2 – Culture Fair Intelligence Test—Scale 2, MHVS – The Mill Hill Vocabulary Scale (Form B).

Table 2
Intercorrelations amongst the variables of interest (N = 59)

	1	2	3	4	5
1 Age	—				
2 Gender	–.012	—			
3 Education	.063	–.058	—		
4 EPT	–.018	.071	.252	—	
5 CFIT-2	–.260*	–.096	.205	.372**	—
6 Mill-Hill	–.094	–.266*	.284*	.390**	.619**

Note. Gender coding = male (1), female (2); education coding = unfinished elementary school (1), elementary school (2), high school (3), BA (4), MA (5), PhD (6). EPT – Everyday Problems Test, brief form (14-items), CFIT-2 – Culture Fair Intelligence Test—Scale 2, MHVS – The Mill Hill Vocabulary Scale (Form B). Correlations with educational level are calculated as Spearman's rho.
*p < .05. **p < .01.

Table 3
Summary of the hierarchical regression analysis for variables predicting EPT score (N = 59)

Criterion	EPT	
	1st step (β)	2nd step (β)
Age	–.029	.062
Gender	.082	.174
Education	.201	.064
CFTI-2		.209
Mill-Hill		.294
R	.213	.465
R^2	.046	.216
ΔR^2	.046	.170
ΔF	0.88	5.76**

Note. See notes to Table 2.

Discussion

ECC represents an ability of successfully solving cognitively demanding tasks encountered in daily life. The EPT is a performance-based measure of ECC. It requires individuals to read, retain, identify, and effectively process information that is presented in familiar formats, such as recipes, prescriptions, and appliance manuals (Willis & Marsiske, 1993). Traditionally, researchers have been interested in studying the changes in ECC among older adults, as well as in identifying its predictors. However, to fully comprehend cognitive aging, it is important to understand the changes occurring before the steep decline in cognitive abilities is evident, usually in more advanced age. Therefore, we aimed to investigate the relative contribution of fluid intelligence and crystallized abilities to ECC in a sample of middle-aged adults.

Regarding the correlations observed, a higher educational level was associated with higher crystallized ability. This is expected since crystallized abilities are more strongly correlated with education than fluid intelligence (Cattell, 1963). Female participants scored lower on MHVS. This result is likely a statistical artifact related to the sample size and a small proportion of male participants (22%). A negative correlation between age and CFIT-2 score can be explained by an age-related decline in processing speed (Salthouse, 1996). CFIT-2 is a time-constrained measure. The manual does not list adult age-related norms, so the instrument is sensitive to age-related differences in processing speed. Scores on CFIT-2 (fluid intelligence) and MHVS (crystallized abilities) had statistically significant bivariate correlations with the EPT score in our sample. Fluid reasoning is found as a consistent predictor of ECC in a wide range of aging studies (e.g., Allaire & Marsiske, 1999; Chen et al., 2017; Gross et al., 2011). Regarding crystallized abilities, studies showed mixed support for the contribution of crystallized abilities to ECC (e.g., Chen et al., 2017; Kimbler, 2013). Our preliminary results indicate that crystallized abilities and fluid intelligence had similar correlations with the ECC. EPT features tasks pertaining to a range of everyday domains, and participants might vary in their familiarity and experience with these tasks. Everyday situations include solving both novel and familiar tasks (Marsiske & Willis, 1998). While fluid intelligence might be instrumental in solving unfamiliar and novel tasks, experience-based knowledge (i.e. crystallized abilities) may be more significant in solving routine tasks.

Sociodemographic variables did not have a statistically significant bivariate correlation with EPT neither was their contribution to the EPT score significant in the hierarchical regression analysis. The insignificant role of age as a predictor or ECC in this study might be explained by the fact that our sample consisted of only middle-aged adults. Previous research has showed a relation between age and ECC in case of a wider age range (Borella et al., 2017; Kimbler, 2013). Education probably failed to reach a significant contribution to EPT score due to the relatively small and education-wise homogeneous sample in our study. Cognitive variables introduced in the second step of the hierarchical regression analysis explained a significant amount of criterion variance, but neither CFIT-2 nor MHVS had an independent contribution. Fluid intelligence and crystallized abilities are highly correlated in our sample. Since they both showed similar levels of correlation with the criterion, and they overlap to such a large extent, no unique contributions were observed. A high amount of shared variances between those two abilities is reported in earlier research (Bühner et al., 2006; Cunningham et al., 1975; Kaufman et al., 1996). Some authors even suggest that the dedifferentiation of cognitive abilities is a common phenomenon in advanced age (de Frias et al., 2007). For instance, Hülür et al. (2015) found that older age is associated with coupling between fluid and crystallized abilities. Contrary to theoretical perspectives postulating independent trajectories of fluid and crystallized abilities, a growing body of empirical support has demonstrated dependency between the age-related changes in different cognitive abilities (Tucker-Drob et al., 2019, 2022).

When interpreting our results, one should keep in mind that the EPT was originally developed to assess ECC in older adults and individuals who face difficulties in performing cognitively demanding daily tasks. Given that our sample consisted mostly of highly educated middle-aged adults, relatively high scores on the EPT were obtained. The average difficulty index of EPT was $p = .78$, which is similar to the scores found in other studies which have administered EPT in the same age group ($p = .87$, Borella et al., 2017; $p = .89$, Chen et al., 2017). The positive correlation between EPT scores and both fluid intelligence and crystallized abilities, as well as their combined contribution, in predicting EPT scores suggest that EPT can capture meaningful ECC differences even in healthy and highly functioning middle-aged adults. However, additional studies should investigate more directly whether EPT can predict real-life outcomes in this age group.

The sample size in our study was relatively small and homogenous, so a study with more statistical power could detect the unique contributions using the same variable setup. Our sample consisted of healthy middle-aged adults. Participants with lower educational levels, as well as male participants, were largely underrepresented in our sample, thus generalizations to the middle-aged population based on our results should be taken with caution. Here observed results might not reflect the contribution of cognitive abilities in the prediction of ECC of individuals with cognitive impairment and mental health issues. Moreover, the cross-sectional design of our study is not suitable for the examination of age-related changes in ECC. Our preliminary results call for additional investigation of the relationship between fluid intelligence and crystallized abilities in middle-aged adults and its relation to ECC. Future research with larger samples and longitudinal design is needed to explain complex relations between various basic cognitive abilities and ECC. Additional research effort should be put into the investigation of the structural invariance of cognitive abilities and their predictability of ECC in different age groups.

In conclusion, although research on cognitive predictors of ECC in middle adulthood got little research attention so far, it might be crucial for our comprehension of changes in older population ECC. Fluid intelligence and crystallized abilities are both related to ECC, but our analyses suggest

that it is unattainable, within our sample, to disentangle the effects of the two on the outcome. It may be that the overlap between fluid intelligence and crystallized abilities is what relates to everyday functioning, so no unique contributions were observed.

Acknowledgement

Funding provided by Croatian Science Foundation (grant number: IP-2020-02-6883).

Publisher's note

This paper is based on the research presented at the 14th Alps-Adria Psychology Conference held in September 2022 in Milan, Italy.

References

Allaire, J. C., & Marsiske, M. (1999). Everyday cognition: Age and intellectual ability correlates. *Psychology and Aging*, *14*(4), 627–644. https://doi.org/10.1037/0882-7974.14.4.627

Allaire, J. C., & Willis, S. L. (2006). Competence in everyday activities as a predictor of cognitive risk and mortality. *Aging, Neuropsychology, and Cognition*, *13*(2), 207–224. https://doi.org/10.1080/13825580490904228

Baltes, P. B., Staudinger, U. M., & Lindenberger, U. (1999). Lifespan psychology: Theory and application to intellectual functioning. *Annual Review of Psychology*, *50*, 471–507. https://doi.org/10.1146/annurev.psych.50.1.471

Borella, E., Cantarella, A., Joly, E., Ghisletta, P., Carbone, E., Coraluppi, D., Piras, F., & De Beni, R. (2017). Performance-based everyday functional competence measures across the adult lifespan: The role of cognitive abilities. *International Psychogeriatrics*, *29*(12), 2059–2069. https://doi.org/10.1017/S1041610217000680

Bühner, M., Krumm, S., Ziegler, M., & Plücken, T. (2006). Cognitive abilities and their interplay: Reasoning, crystallized intelligence, working memory components, and sustained attention. *Journal of Individual Differences*, 27, 57–72. https://doi.org/10.1027/1614-0001.27.2.57

Castel, A. D. (2005). Memory for grocery prices in younger and older adults: The role of schematic support. *Psychology and Aging*, *20*(4), 718–721. https://doi.org/10.1037/0882-7974.20.4.718

Cattell, R. B. (2000). *Priručnik za ljestvice 2 i 3* [Manual for Culture Fair Intelligence Test—Scales 2 and 3]. Naklada Slap.

Cattell, R. B. (1963). Theory of fluid and crystallized intelligence: A critical experiment. *Journal of Educational Psychology*, *54*(1), 1–22. https://doi.org/10.1037/h0046743

Chaytor, N., & Schmitter-Edgecombe, M. (2003). The ecological validity of neuropsychological tests: A review of the literature on everyday cognitive skills. *Neuropsychology Review*, *13*(4), 181–197. https://doi.org/10.1023/B:NERV.0000009483.91468.fb

Chen, X., Hertzog, C., & Park, D. C. (2017). Cognitive predictors of everyday problem solving across the lifespan. *Gerontology*, *63*(4), 372–384. https://doi.org/10.1159/000459622

Chen, B., Huang, Y., Wang, D., & Deng, W. (2019). Comparison of performance-based observed assessment, self-report, and paper–pencil measures of everyday problem solving in Chinese older adults. *Journal of Adult Development*, *26*(2), 129–138. https://doi.org/10.1007/s10804-018-9305-1

Cunningham, W. R., Clayton, V., & Overton, W. (1975). Fluid and crystallized intelligence in young adulthood and old age. *Journal of Gerontology*, *30*(1), 53–55. https://doi.org/10.1093/geronj/30.1.53

de Frias, C. M., Lövdén, M., Lindenberger, U., & Nilsson, L. G. (2007). Revisiting the dedifferentiation hypothesis with longitudinal multi-cohort data. *Intelligence*, *35*(4), 381–392. https://doi.org/10.1016/j.intell.2006.07.011

Denney, N. W., & Palmer, A. M. (1981). Adult age differences on traditional and practical problem-solving measures. *Journal of Gerontology*, *36*(3), 323–328. https://doi.org/10.1093/geronj/36.3.323

Giles, G. M., Edwards, D. F., Baum, C., Furniss, J., Skidmore, E., Wolf, T., & Leland, N. E. (2020). Making functional cognition a professional priority. *The American Journal of Occupational Therapy*, *74*(1), 7401090010p1–7401090010p6. https://doi.org/10.5014/ajot.2020.741002

Gross, A. L., Rebok, G. W., Unverzagt, F. W., Willis, S. L., & Brandt, J. (2011). Cognitive predictors of everyday functioning in older adults: Results from the ACTIVE cognitive intervention trial. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *66*(5), 557–566. https://doi.org/10.1093/geronb/gbr033

Hülür, G., Ram, N., Willis, S. L., Schaie, K. W., & Gerstorf, D. (2015). Cognitive dedifferentiation with increasing age and proximity of death: Within-person evidence from the Seattle Longitudinal Study. *Psychology and Aging*, *30*(2), 311–323. https://doi.org/10.1037/a0039260

Juras, L., Martincević, M., Vranić, A., Rebernjak, B., & Hromatko, I. (2022). The brief case for everyday problems: A proposal of two brief alternate forms of the Everyday Problems Test. *European Journal of Ageing*, *19*, 1519–1528. https://doi.org/10.1007/s10433-022-00734-x

Kaufman, A. S., McLean, J. E., & Lincoln, A. (1996). The relationship of the Myers-Briggs Type Indicator (MBTI) to IQ level and the fluid and crystallized IQ discrepancy on the Kaufman Adolescent and Adult Intelligence Test (KAIT). *Assessment*, *3*(3), 225–239. https://doi.org/10.1177/1073191196003003004

Kimbler, K. J. (2013). Everyday problem solving and instrumental activities of daily living: Support for domain specificity. *Behavioral Sciences*, *3*(1), 170–191. https://doi.org/10.3390/bs3010170

Križan, L., & Matešić, K. (2001). *Priručnik za Ravenove progresivne matrice i ljestvice rječnika. Mill Hill ljestvica rječnika* [Manual for Raven's progressive matrices and vocabulary scales]. Naklada Slap.

Marsiske, M., & Willis, S. L. (1998). Practical creativity in older adults' everyday problem solving: Life-span perspectives. In C. E. Adams-Price (Ed), *Creativity and successful aging: Theoretical and empirical approaches* (pp. 73–113). Springer.

Neupert, S. D., Patterson, T. R., Davis, A. A., & Allaire, J. C. (2011). Age differences in daily predictors of forgetting to take medication: The importance of context and cognition. *Experimental Aging Research*, *37*(4), 435–448. https://doi.org/10.1080/0361073X.2011.590757

Salthouse, T. A. (2019). Trajectories of normal cognitive aging. *Psychology and Aging*, *34*(1), 17–24. https://doi.org/10.1037/pag0000288

Salthouse, T. A. (1996). The processing-speed theory of adult age differences in cognition. *Psychological Review*, *103*(3), 403–428. https://doi/10.1037/0033-295X.103.3.403

Tucker-Drob, E. M., Brandmaier, A. M., & Lindenberger, U. (2019). Coupled cognitive changes in adulthood: A meta-analysis. *Psychological Bulletin*, *145*(3), 273–301. https://doi.org/10.1037/bul0000179

Tucker-Drob, E. M., De la Fuente, J., Köhncke, Y., Brandmaier, A. M., Nyberg, L., & Lindenberger, U. (2022). A strong dependency between changes in fluid and crystallized abilities in human cognitive aging. *Science Advances*, *8*(5), Article eabj2422. https://doi.org/10.1126/sciadv.abj2422

Verhaeghen, P., Martin, M., & Sędek, G. (2012). Reconnecting cognition in the lab and cognition in real life: The role of compensatory social and motivational factors in explaining how cognition ages in the wild. *Aging, Neuropsychology and Cognition*, *19*(1–2), 1–12. https://doi.org/10.1080/13825585.2011.645009

Willis, S. L., & Marsiske, M. (1993). *Manual for the everyday problems test.* Department of Human Development and Family Studies, Pennsylvania State University.

Yam, A., Gross, A. L., Prindle, J. J., & Marsiske, M. (2014). Ten-year longitudinal trajectories of older adults' basic and everyday cognitive abilities. *Neuropsychology*, *28*(6), 819–828. https://doi.org/10.1037/neu0000096

Prispelo/Received: 28. 10. 2022
Sprejeto/Accepted: 7. 8. 2023