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## Influence of “third age” person’s education on cognitive aging and psychological well-being

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### Abstract

Influence of standard regular education of elderly adults (aged 55+) on psychological well being and cognitive aging is studied. The hypothesis that education can slow-down the process of cognitive aging has been verified. By the example of longitudinal study, the dynamics of worry domains, their content as well as cognitive functioning improvement have been studied.

**Keywords:** elderly adults, education, psychological well-being, cognitive aging, cognitive functioning.

### Introduction

According to National Institute on Aging research over the twentieth century there has been both a doubling in average human longevity and the near prospect of our planet having more seniors than young children. The first decade of the twenty-first century has been marked by a dramatic interest and growing concern over an unprecedented human transformation: the global aging of human populations.

Aging is a fundamental biological process that is inseparably linked with the genetic makeup and metabolic workings of the organism and at the same time is sensitive to environmental influences (Strehler, 1986; Yu & Yang, 1996 Arking, 1991). In

literature words “old age” and “aging” are often used as close synonyms to describe conditions and processes that can be individual or societal. However, unlike man, societies can become younger, man ages over his life course.

Transformations of the aging body are obvious: face becomes wrinkled, the hairs turn white, step become heavy and body shape becomes fuzzy. Man becomes ailing, his character changes. Even ancient philosophers noticed significant age transformations. More than two thousand years ago in his work “An essay on old age” Cicero wrote: “When I consider the several causes which are usually supposed to constitute the infelicity of old age, they may be reduced, I think, under four general articles: it incapacitates a man for acting in the affairs of the world; it produces great infirmities of body; it disqualifies him for the enjoyment of the sensual gratifications; and it brings him within the immediate verge of death.” (Cicero). In Plato’s Republic, it is also noted that most old people complain about their old age, but he puts their troubles down not to old age but to their character (Plato).

Thus, external obvious signs of aging are described and have been studied over centuries. Aging of cognitive functions is not so obvious. Even Aesculapius and his associates did not find the brain and higher cognitive functions sufficiently important to be included in the list of geriatric troubles (Craik, 2000). Cognitive aging become an issue of researches in the past three decades of the XX-th century. A number of theoretical notions, theories, researches and even new research topics have been suggested. The results of researches have been periodically surveyed and summarized but the results sometimes are partial and contradictory. Although there are ample studies confirming that different kinds of occupational activity improved successful aging and psychological well-being, less is known about the influence of regular university education of the elderly on cognitive aging. The goals of the current study were twofold. The first one was to examine the role of elderly adults’ education in cognitive aging. The second goal was to investigate the influence of education on person’s well-being.

The hypothesis that standard regular education of elderly adults (aged 55+) can slow-down the process of cognitive aging has been tested. By the example of longitudinal study (2.5 years), the dynamics of cognitive functioning as well as subjective well-being have been studied.

## **Method**

*Participants.* Older adults aged (N=21) aged 51-63 ( $M=57.6$ ) took part in the research. All respondents were students of special educational program “Practical psychology”. Duration of the program was 2.5 years. The program started in October 2014 and lasted till December 2016. All participants were on a pension and none of them worked. All students had first higher education in economy, engineering, education etc. None of them had psychological education and this was a key moment for the program. Thus, psychology was a new sphere for these adults.

## Measures

Battery of psychological techniques was used. The *Worry Domains Questionnaire* (WDQ) (Tallis, Eysenck, Mathews, 1992) was used to study worry across five domains in everyday activity: relationships, lack of confidence, aimless future, work, and financial issues. WDQ consists of 25 items with five point Likert scale. The Questionnaire was adapted for Russian-speaking sample; its psychometric properties were verified, its factorial structure was confirmed.

The *Metacognitions Questionnaire* (MCQ-30) (Wells, Cartwright-Hatton, 2004) was used to study the range of metacognitive processes and metacognitive beliefs about worry. The questionnaire consists of five subscales, three of which assess beliefs, including:

Positive beliefs about worry (*Worrying helps me cope*);

Negative beliefs about worry (*My worrying is dangerous for me*);

Cognitive confidence (*I do not trust my memory*);

Need to control thoughts (*I should be in control of my thoughts all of the time*);

Cognitive self-consciousness (*I pay close attention to the way my mind works*).

Four-point Likert response scale: 1 (do not agree); 2 (agree slightly); 3 (agree moderately); 4 (agree very much) is used. Russian version of the Questionnaire demonstrates good psychometric properties (satisfactory internal consistency and convergent validity, and had a good test-retest reliability). Confirmatory factor analysis affirmed its five-factor solution.

Different procedures were used for cognitive abilities measurement: perceptual style and analytical ability, cognitive flexibility, attention, memory, reasoning etc. The Embedded Figures Test (EFT) was used to measure perceptual style and analytical ability (Witkin, 1969). Cognitive flexibility was measured by means of Stroop Color and Word Test. For memory assessment the Spot the Difference for Cognitive Decline (SDCD) test was used. The test was elaborated by a group of Japanese scientists and proved its accuracy for the identification of cognitive impairment in older adults (Shu Nishiguchi, 2014). Bourdon and Munsterberg tests were used for attention assessment and Kraepelin's calculating test was used for mental activity evaluation.

## Procedure

Questionnaires and cognitive tasks were presented to the participants at the beginning and at the end of each term. To exclude the effect of learning the tasks were modified.

## Results

The results of the first testing in October 2014 are presented below. For items of The Worry Domains Questionnaire summary statistics are presented in Table 1 and Fig. 1.

**Table 1: Summary Statistics for *Worry Domains Questionnaire* scales**

	Average	Standard deviation
Relationships	14.59	4.14
Lack of confidence	15.67	4.27
Aimless future	14.32	3.75
Work	11.08	3,75
Financial	9.45	4.37
Total worry	65.13	9.46

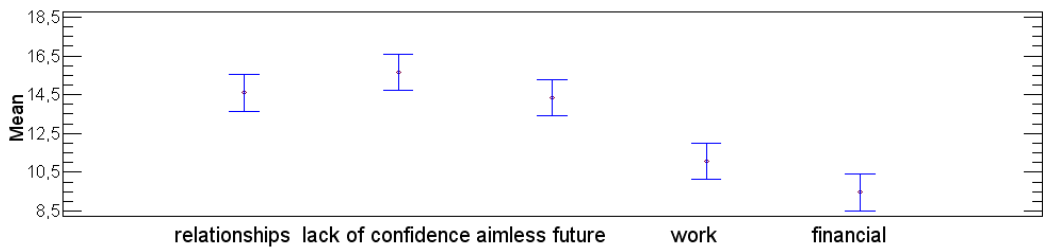


Fig. 1. Comparative analysis of subscales' means at the beginning of the education

The results show that our respondents are not confident in their abilities, they consider their future as aimless and they are not sure in their relations. Financial and work issues are not so important for them. The total worry score above 65 indicates that people have problems and even are chronic worries (Leahy, 2005). So we can conclude that upon the whole they worry much enough about their life and therefore, they are rather anxious because worry is considered as the principle component of anxiety disorders and depression (Eysenck, 1992). It is impossible to image a person with high level of worry and with high level of well-being. Worry is a major detractor from wellbeing.

The second stage of the research was conducted at the end of their first term. The same tests' battery was given. The results of comparative analysis indicate that the total level of worry decrease as well as worries in different domains. The results of comparative analysis are presented in at Fig. 2.

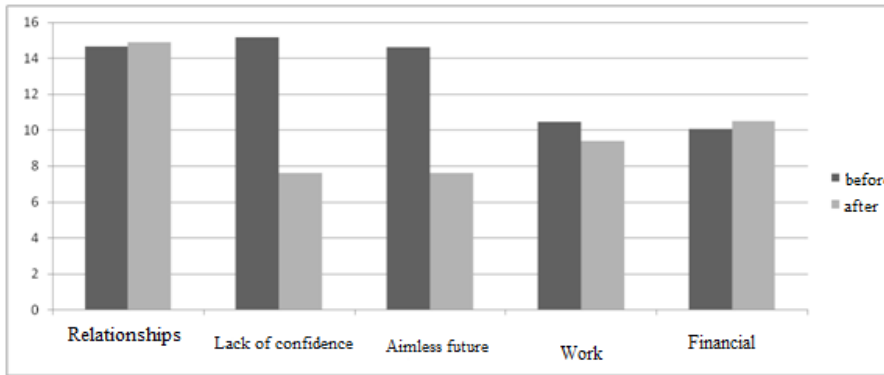


Fig. 2. Comparative analysis of worry domains at the beginning and the end of the first term

Significant decrease in the *Lack of confidence* and *Aimless future* worry domains was revealed. The above changes are statistically significant ( $(W=8.14$  u  $6.27$  respectively;  $p\text{-value} \leq 0.01$ ). Worry about *relationships* stayed unchangeable and even increased. This result puzzled researchers, but it was clarified by the participants' interviews. It was revealed that not all family members welcomed changes of their mothers' and fathers' (grand mothers and grand fathers for some members) status. Crisis situations connected with limited possibility to fulfill customary functions appeared in some families. It turned out that grandmother should go to the library (to write essay, for example) instead of picking up the child from the school or leading him to hobby/sport group. The necessity to change habitual day order not only by elderly students but by their family members as well resulted in some tension in extended families and affected the measured index. But later on in the majority of cases this problem was solved.

In toto index of total worry decreased significantly (Fig. 3).

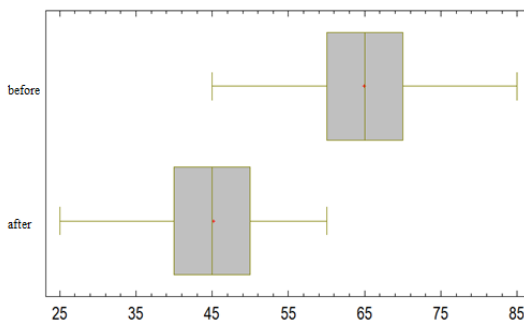


Fig. 3. Comparative analysis of total worry indices at the beginning of education and after the first term

( $W = -4450.5$ ;  $P\text{-value} = 0.0$ )

By means of *Metacognitions Questionnaire* causes of this worry were revealed. The results of the first profile are presented at Fig. 4.

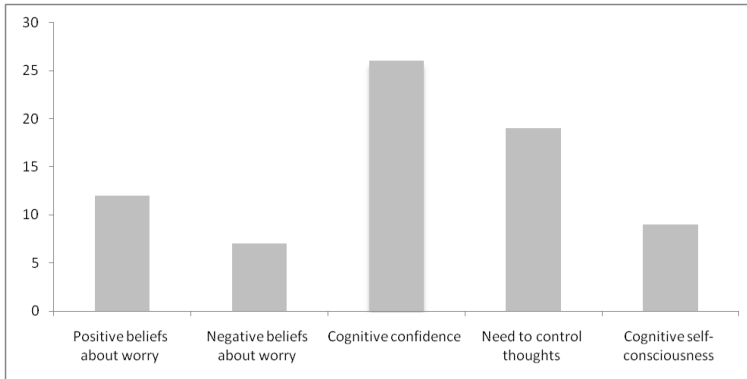


Fig. 4. Histogram of causes of worry

Cognitive incompetence is the main sphere of worry for participants. They acknowledge the necessity to control their thoughts constantly as well. Other spheres are no so important. Thus, at the beginning of education, elderly students worry much and the main sphere was the sphere of cognitive functioning.

In five months of education indices of cognitive incompetence decreased significantly. Indices of cognitive self-consciousness and need to control thoughts increased. At Fig. 5 the results of comparative analysis of causes of worry are presented.

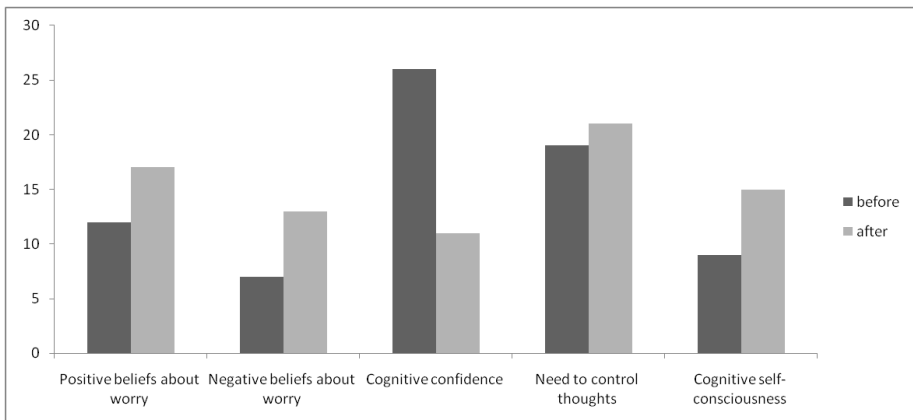


Fig. 5. Histogram of causes of worry

The most significant result of this comparison indicates striking decrease in cognitive confidence. Our participants became surer in their cognitive abilities after a five month of regular learning. The most surprising thing is that their real cognitive functioning did not change. Their cognitive abilities, cognitive flexibility, attention

and memory remained just the same. No significant differences were revealed in the tasks' indices.

Changes of psychological status of participants continued during the first year of their education and then remained stable until their graduation.

The dynamics of worry domains indices during the first year of learning is presented at Fig. 6.

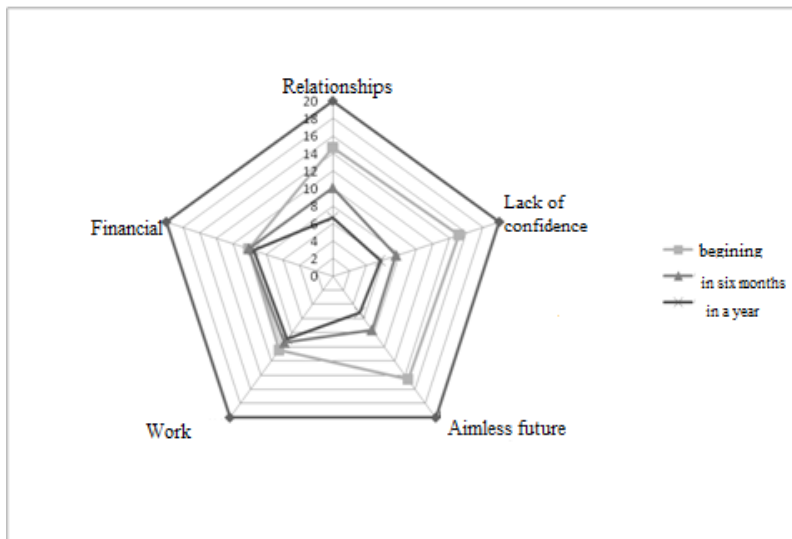


Fig. 6. Dynamics of worry domains

All changes presented at fig. 6 were statistically significant and were confirmed by the Kruskal-Wallis test with the significance level  $p \leq 0.01$ .

As the result of worry decreasing the participants become less anxious, less depressive, improve their relationships, consider future not so aimless and become confident in their abilities especially in cognitive ones. So they feel themselves psychologically better and their subjective well being increased. No changes occurred in financial sphere; this sphere is a perennial problem for the seniors. This fact was quite natural for 2014-2016 economic crises. But in consideration of modern socio-psychological situation this result can be considered as **positive** because no increases in these worry domains were marked. At the same time the increase in these worry domains were marked for population in tote according to sociological surveys (data of Levada-centre, 2016).

As for cognitive functioning, real improvement was recorded only by the end of the second term of learning. Multiple Range Tests were used to determine which means are significantly different from others. The some results are presented in Table 2.

**Table 2/ Multiple Range Tests**

Contrast	Sig.	Difference	+/- Limits
EET_before - EET_1st_term		-0.27027	0.561114
EET_before - EET_2_term	*	-2.24324	0.561114
EET_1st_term - EET_2_term	*	-1.97297	0.561114
flexibility_before - flexibility_1st_term		-1.08108	5.1238
flexibility_before - flexibility_2_term	*	25.7568	5.1238
flexibility_1st_term - flexibility_2_term	*	26.8378	5.1238
memory_before - memory_1st_term		-0.162162	0.699107
memory_before - memory_2_term	*	-1.62162	0.699107
memory_1st_term - memory_2_term	*	-1.45946	0.699107

\* denotes a statistically significant difference,  $p \leq 0.01$

Students improve their cognitive abilities – the number of right answers in EET test increased significantly. They become more flexible – index of interferential decreased significantly. Their memory become more infallible – the number of correctly identified differences increased significantly. Indices of attention and mental activity increased as well.

### Discussion

Obtained data confirm the hypothesis that regular education of elderly people can improve their subjective well-being. Increase in subjective well-being was registered after the first month in university though improvement in cognitive functioning became observable only after six months of learning. The results are presented at Fig. 7.



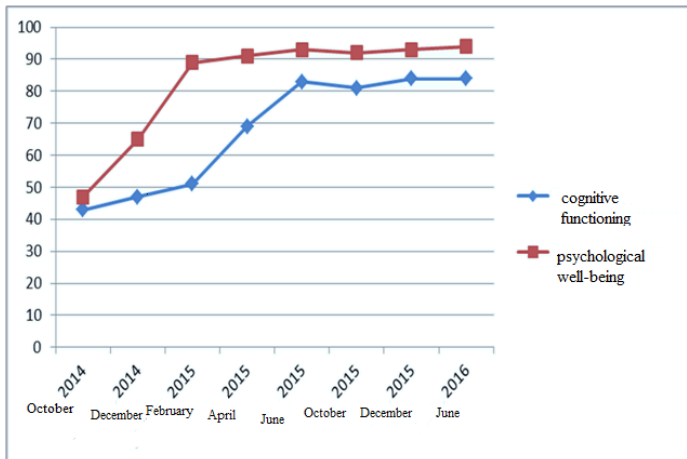


Fig. 7. Dynamics of integral indices of psychological well-being and cognitive functioning during education

The current data and analyses confirm the authors' hypothesis that regular education of elderly people can improve their psychological health and thereby improve person's subjective well-being. They select a new goal; organize their lives around the achievement of the goal. They had to visit lectures, read special literature, fulfill practical tasks, and conduct scientific researches – so they had to optimize their efforts toward their goal by using their own resource and asking for the help of others. Some researches consider the orchestration of this processes to be central in achieving adaptive mastery and continued lifelong development (Freund, etc., 2009, Matsumoto, 2011). Thus the results of the research reveal the possibilities of enhancement of life satisfaction among those whose age is 55+ through participation in regular education.

### Conclusion

The results of the research reveal the possibilities of enhancement of life satisfaction among those whose age is 55+ through participation in regular education. Moreover, obtained results confirmed the hypothesis that regular education can improve cognitive functioning of the elders. It should be mentioned that significant changes in cognitive functioning became evident only after a year of regular education.

Thus, the research shows that person's well-being can be improved in a short-term educational program while if the objective of education is prevention of cognitive aging – education should be continuous.

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