SOCIAL INTEGRATION OF THE ELDERLY

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Abstract. Social integration is a policy of the society towards retired seniors capable to remain active after the age of 60 - which aims to provide a social framework necessary for conducting an useful activity social activity. Social reintegration of the elderly refers to the category of elderly with poor health status. Therefore it is necessary to have a selective redefine of the possibilities of an elderly with a poor functional status, giving it the proper concrete possibilities of carrying out certain activities. To solve the problem of integration and social reintegration of the elderly contributes several factors such as: preventive or curative geriatric care, good physical and mental health status, family environment and administrative bodies. *Objectives:* The impact that it has institutionalizing concerning the elderly's social integration and how it helps in changing of the quality of elderly lifes. *Subjects:* The research was conducted on a total of 30 subjects aged between 65 and 89. Total plot consisted of two groups of equal size institutionalized persons and uninstitutionalized persons. Following research noticed that the elderly's social integration is much larger at the uninstitutionalized persons because they interact with other peers of their own, or simply get in touch with the real world, while institutionalized elderly are isolated, often also because of helplessness, and feelings of worthlessness, and are more difficult to integrate.
Key-words: integration, elderly, quality of life.

Rezumat. Integrarea sociala reprezinta politica societatii fata de varstnicii pensionari capabili sa ramana activi dupa varsta de 60 de ani - care urmareste asigurarea unui cadru social necesar desfasurarii unei activitati utile din punct de vedere social. Reintegrarea sociala se refera la categoria de varstnici cu o stare de sanatate deficitara. Drept urmare se impune o redefinire selectiva a posibilitatilor varstnicului cu imposibilitatea de a ramane activ, de a-si pastra constiinta utilitatii sociale, oferindu-i-se corespunzator acestuia posibilitati concrete de desfasurare a unor activitati. La rezolvarea problemei integrarii si reintegrarii sociale a varstnicului contribuie mai multi factori: asistenta geriatrica profilactica sau curativa, o buna stare a sanatatii fizice si psihice, mediul familial si organele administrative. Obiective: Primul obiectiv este impactul pe care il are institutionalizarea asupra integrarii sociale a varstnicului si un al doilea obiectiv ar fi observarea contributiei institutionalizarii la schimbarea calitatii vietii varstnicului. Subiecti: S-a folosit un numar de 30 de subiecti cu varste cuprinse intre 65 si 89 de ani. Lotul total a fost format din doua loturi egale ca numar, persoane institutionalizate si persoane neintitutionalizate. In urma cercetarii realizate s-a observat o mai buna integrare sociala a varstnicilor neinstitutionalizati, deoarece acestia interactioneaza cu alti semeni de-ai lor, sau pur si simplu intra in contact cu lumea reala, pe cand varstnicii institutionalizati se izoleaza, de multe ori si din cauza neputintei, si a sentimentului de inutilitate, si sunt mult mai greu de integrat.
Cuvinte-cheie: integrare, varstnici, calitatea vietii.

INTRODUCTION

Social integration in this paper refers to the elderly and pensioners who stopped having the social position and behavior during the professional activity. In the retired elderly population, we distinguish two groups:
• Elderly with a good state of physical and mental health, able to remain active after the age of 60;
• Elderly with poor physical health status which doesn't allow them to to stay active, but differentied, selective and for a very short period of time.
The social integration of the elderly who are capable to be still active, means the status and role's transfer during the professional activity, in the retirement. The realization of such a transfer depends on maintaining social utility consciousness of the elderly and not ultimately the pleasure of living.

In tackling the social integration of the elderly contributes several factors like: geriatric nurse prophylaxis and therapy, good physical and mental health status, family background and administrative bodies.

General notions

A stage classification of age's regression involves the following three steps (1):
• The transition to old age: 65-74 years
• Average Aging: 75-84 years

• Great old age or longtime stage: over 85 years. (C. Bogdan, 1997)

Aging as a phenomenon can be observed in the biological, social and last but not least, psychologically. All these transformations of the elderly at every level, are the subject of gerontology.

It's been found that maintaining a very active lifestyle is a prerequisite of a successful aging. Social commitment is defined by: maintaining social relationships and engaging in productive activities. Quality of life, subjective wellbeing and satisfaction of living are important factors of social commitment. (R. Fontaine, 2008)

The great French sociologist Durkhein (1897) meant in his research that isolation and lack of relationships with others are predictors of suicidal behavior. Research results would be: isolation is a risk factor for health, emotional social media can have effects on health and no effective support for all individuals.

Psychology of ages

According to psychology of ages, the aging period, the one that is the subject of this work, is carried out after the age of 65. During this period, personal integrity crisis occurs, the opposite of despair. It appears various retrospectives such as lifetime achievements, and how life was lived. It is considered fully integrated in this age, a person who has a sense of acceptance of life itself. (Schiopu U., Verza E., 1995)

In the post-adult period, besides psychic changes occur "retirement shock" in which professional subidentity fade and appear fatigue and physical wear. This represents the strongest period of transition in terms of status.

Before talking about psychological changes that occur with aging, we have to talk about the most important and most visible changes, namely biological changes. The first "symptom" of aging is the loss of energy of the instincts. There are several differences between the physiological and pathological aging, because no matter how much physical energy will decrease, the body can cope reserves by balancing complex shapes. With the loss of energy sleep also changes as a function of regeneration of the body. Sleeplessness occur, but not the disease, but a physiological or psychological disorder.

The arrears of changes are:

Cognitive changes; they occur because there is a decreased ability to acquire new information, but there is a remarkable ability to use existing knowledge. Intellectual capacities remaine relatively active between the ages of 65 and 75.

• in behavioral manifestations are observed discrete inflation of subjectivity – they are more concerned about themselves. What is most specific in intelligence in adulthood, is how elderly evaluates facts and chronology of events. Chronology related to self operates correctly, instead the chronology of events and external facts which becomes confused. Here are added and spatial confusion.

• in terms of memory, its performance decreases, particularly in the short term memory and long term memory becomes more resistant. Also speaking and attention are much slower and with very large breaks.

• the elderly often shows personality changes by tones of neuroticism and introversion gain. Emotions show obvious changes: the increasing of nervousness, irritability and recorded increases of strongest dominance trends.

Affection; emotions are primitive, depressed mood became common, which affects both internal balance and relationships with others. This depression is most often accompanied by the idea of death and appears in its most pronounced when the spouse dies.

• in the second stage of aging, most are concerned about their own person and easily irritated by unimportant situations. We say that there is a self - hypertrophy, dilatation of exeperienced events and personal rights. There has been registered the fact that suicide is more common in men aged over 55 years. True personality

structure disruption occurs after the age of 70- 75 years.

• the most common changes that occurs in a elderly's life, are adapting changes. Adaptation crises specified by retirement, death , spouse , institutionalization and even near death. These occur when major and profound changes occur on lifestyle, place of life, physical and psychological environment, stress of illness.

METHODOLOGY

The objective of this work is to observe the impact it has the institutionalization on integration of elderly people in society and how this contributes to the elderly's state change. In this way, I wanted to see which of the two groups of subjects, has a better quality of life, a better appreciation of self and which of them can be easily integrated in society.

Experimental research hypotheses

• Events during life contribute to institutionalization.

• Appreciation of aging is made in a negative way by institutionalized people.

• Institutionalizes third aged persons, in terms of self-esteem, are considered themselves more useless, isolated and marginalized by others.

• Uninstitutionalized third aged persons have a better social integration and a better quality of life.

The research was conducted on a total of 30 subjects aged between 65 and 89 years old. Total plot consisted of two groups of equal size institutionalized persons and unistitutionalized persons.

The plot of institutionalized elderly, with the average age of 77,66 was divided into elderly of the Center for Elderly "Acad. Nicolae Cajal "and the Centre" Sfanta Elena".

Table 1. Plot of institutionalized elderly

Nr. Crt.	Subiect	Varsta	Sex	Mediul de provenienta	Studii	Stare civila	Rezultate teste		
							B	C	D
1	T.A.	85	F	rural	medii	vaduva	6.5	1.3	0.5
2	M.A	68	F	rural	elementare	vaduva	5	1.5	0.75
3	V.I.	87	F	urban	elementare	casatorita	4.5	0.4	0.15
4	S.A.	82	F	urban	medii	vaduva	5.2	0.4	0.4
5	Z.S.	68	F	urban	superioare	vaduva	4.75	0.1	0.45
6	I.C.	72	M	rural	superioare	casatorit	6.75	1.2	0.9
7	R.B.	76	M	urban	superioare	casatorit	7.25	1.1	1
8	P.D.	82	M	rural	medii	casatorit	8	0.3	0.6
9	C.A.	65	F	urban	medii	necasatorita	7.25	1.1	0.8
10	P.A.	83	F	rural	medii	vaduva	5.5	0.6	0.35
11	P.V.	84	F	urban	elementare	vaduva	1.5	0.7	0.4
12	M.A.	88	F	urban	elementare	casatorita	5.75	1	0.7
13	C.G.	89	F	urban	medii	casatorita	3.75	0.7	0.4
14	F.M.	66	M	rural	medii	vaduv	1.5	0.5	0.4
15	S.L.	70	M	rural	superioare	casatorit	1.5	0.7	0.3

The group of uninstitutionalized elderly with the average age of 77,73 was questioned in various parks in the Capital.

Table 2. Plot of uninstitutionalized elderly

Nr. Crt.	Subiect	Varsta	Sex	Mediul de provenienta	Studii	Stare civila	Rezultate teste		
							B	C	D
1	T.A.	78	F	urban	superioare	casatorita	6.25	1.2	0.75
2	D.P.	75	F	urban	elementare	vaduva	6.25	0.7	0.65
3	G.C.	65	M	rural	medii	casatorit	8	1	0.55
4	M.I.	77	M	urban	medii	casatorit	6.75	1	0.75
5	D.M.	89	M	urban	medii	vaduv	7.5	1.2	0.85
6	I.G.	73	M	rural	medii	casatorit	6.25	1.1	0.4
7	L.S.	71	F	urban	medii	vaduva	7.25	0.8	0.8
8	R.V.	76	F	urban	medii	vaduva	6.25	1.3	0.65
9	A.C.	85	M	urban	superioare	casatorit	7.5	1.5	0.95
10	F.C.	81	F	urban	elementare	vaduva	7.25	1.4	0.9
11	C.V.	73	M	Urban	superioare	casatorit	6	1.3	0.75
12	M.N.	87	F	Rural	medii	vaduva	6	0.7	0.5
13	S.D.	87	M	Rural	elementare	vaduv	7.5	1	0.75
14	A.G.	70	F	Rural	superioare	casatorita	6.25	1.1	0.65
15	I.T.	79	F	urban	medii	casatorita	6.25	1.2	0.8

METHODS AND INSTRUMENTS

I used as instruments for research, interview and a questionnaire consisting of three tests, namely:

Visual analog scale assessment of appreciation of old age; with this scale, I watched how itmanages each person to assess their own current status, their age, and by default aging time.

Self-assessment wellbeing test; in this test I used three possible answers, each response option showing if subject status is worse, better or the same.

The test for evaluating the quality of life; Based on this test it desires to find the conditions that should be met in order to have a better quality of life.

Operational criteria for selecting subjects:
• Age greater than 65 years;
• Auditory or visual acuity or appropriate correction;
• Adherence assessment and cooperation;
• Clinically able;
• Without psychiatric medical history;
Operational criteria for excluding subjects:
• Severe sensory impairments or language impairments;
• Non-compliance and non-cooperation;
• Clinically unfit.

Analysis, processing and interpretation of data

The two samples $n1 = n2$ have the same volume, means that the number of institutionalized persons $n1 = 15$ and the number of uninstitutionalized persons $n2 = 15$.

The average age in institutionalized elderly group is $m1 = 77.66$ years, with a standard deviation $SD1 = 8.69$, respectively average age in uninstitutionalized elderly group $m2 = 77.73$ years, with a standard deviation $SD2 = 7.00$.

The independent variable age in the two groups have the same amplitude min = 65, max = 89 years.

The coefficient of variation less than 15% of the value scales in the two groups check their homogeneity; scattering is small, so the average is representative.

Table 3. The average score of the scale B, the visual analog scale assessment
of appreciation of aging

Lot	Average age	n	Min	Max	m	SD	v
Institutionalized	77,66	15	0.1	1.5	0.8	0.43	0,18
Uninstitutionalized	77,73	15	0.7	1.5	1,12	0.23	0,05

Table 4. The average score to the C self-test of autoevaluation of wellbeing in the 2 groups

Lot	Average age	n	Min	Max	m	SD	v
Institutionalized	77,66	15	1,5	8,87	5,24	2.02	3.06
Uninstitutionalized	77,73	15	6	8	6,77	0,69	0.48

Table 5. The average score to the D test of quality of life in the 2 groups

Lot	Average age	n	Min	Max	m	SD	v
Institutionalized	77,66	15	0.15	1	0.56	0.24	0.06
Uninstitutionalized	77,73	15	0.4	0.95	0.72	0.15	0.02

Psychological interpretation

It should be noted that the number of women in the two groups was higher than that of men, this may have several explanations since life expectancy of women. They had life duration 6.97 years higher than men in Romania, according to the National Institute of Statistics.

Institutionalized third aged persons in terms of self-esteem, are considered more useless, isolated and marginalized by others. As the elderly are more at peace with themselves, with both their wellbeing is higher, and the aging appreciation is negative to those institutionalized.

Uninstitutionalized elderly have a better social integration and a better quality of life, and this helps to easily accept aging period.

CONCLUSIONS

Using questionnaires applied on subjects in the two groups, the assumptions were confirmed as follows:

According to the interview held to elderly of the two groups, we confirm the first hypothesis, namely that the events of the life contribute to institutionalization.

The second hypothesis that assessment of aging in those institutionalized is more negative, is confirmed by the results of the second test, namely Visual Analog Scale Assessment of Appreciation of age.

The third hypothesis is supported and confirmed by Self-assessment test of wellbeing. This hypothesis was that elderly institutionalized people, in terms of self-esteem, are considered more useless, isolated and marginalized by others.

The fourth hypothesis, and most important, namely the uninstitutionalized elderly have

a better social integration and a better quality of life, is confirmed using the Quality of Life Assessment Test.

Proposals and recommendations
I recommend that regardless of where they would learn, institutionalized or uninstitu-tionalized, they can even be integrated with occupational activities, which can motivate them and can make them to enjoy the life. Because the lots of subjects of the research were small, I leave space for a more detailed research on this topic.

REFERENCES

[1] Constantin Bogdan (1997), Geriatrie, Ed. Medicala, Bucuresti.
[2] Fontaine Roger (2008), Psihologia imbatranirii, Ed. Polirom, Iasi.
[3] Schiopu Ursula, Verza Emil (1995), Psihologia varstelor, Editura Didactica si Pedagogica Bucuresti, 112 - 140.

EEG EVALUATION OF NEURONAL FATIGUE IN ELDERLY PATIENTS

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Abstract. Neuronal fatigue or synaptic depression is the inability of neurons to activate and transmit signals in the neuronal network. Currently, there is no application of a cognitive task as a standard activation method in Electroencephalography (EEG), to evaluate the neuronal network activity, in order to integrate and apply the method for detecting possible conditions involving the damage of the nervous system. The present paper aims to assess elderly subjects with cognitive impairments, using Reverse Counting Task as an activation method in Computerized EEG analysis. This method aims at assessing the degree of the neuronal fatigue by establishing a link between the evolution stages of the pathologies involving the cognitive processes and the neuronal network activity. Reverse Counting Task requires a sustained mental effort for a short timespan, by performing a calculation with four difficulty levels, adapted to the patient's mental capacity (skip counting backwards from 100 by 7, from 40 by 4, from 20 by 2 or from 10 by 1). The study was conducted on a total of 82 patients hospitalized at "Ana Aslan" National Institute of Gerontology and Geriatrics (NIGG), divided into two groups: a normal group showing no neurological pathology and a pathological group with varying degrees of cognitive disorders. Reverse Counting Task was the prefinal activation in the EEG recording. For the normal group, Reverse Counting Task changed the EEG structure by decreasing the amplitude and increasing the frequency by 3-5 Hz. For the pathological group, the response to Reverse Counting Task was weak or nonexistent. Therefore, this method can be considered an indirect marker of neuronal fatigue or synaptic depression in various cognitive disorders, representing a new activation in EEG analysis. **Keywords**: EEG, neuronal fatigue, Reverse Counting Task, MMSE, cognitive impairment

INTRODUCTION

With the increasing average age of the population, there is a growing interest for understanding the neuronal and cognitive changes that accompany aging. Neuronal fatigue or synaptic depression is the neuron's inability to activate and send a signal to surrounding neurons in the neuronal network and it is common with old age nervous system pathologies, which cause aging of neuronal network. Due to high sensitivity to functional and metabolic changes, EEG parameters can indicate changes in the electrical activity of the cerebral cortex caused by cognitive tasks. In the absence of a pathology, electro-encephalographic record continues to have a normal appearance. Abnormal changes in the EEG recording have a high frequency when they are based on pathologies involving shrinkage of the brain, neural alterations, accumulation of senile plaques, neurofibrillary degenerations etc.

MATERIALS AND METHODS

Patients

The study was conducted in the Neurophysiological Explorations Laboratory of the "Ana Aslan" NIGG between March and May 2014, with a total of 82 subjects (62 females and 20 males).

Diagnostic criteria

Patients in each group were tested using the Mini Mental State Evaluation (MMSE) before the EEG recording and were consulted and diagnosed by their doctor. MMSE test checks the level of cognitive impairment, assessing functions such as memory and orientation. Score between 27 − 30 points (max) represents the normal cognitive function. A lower score may indicate mild (19 − 26), moderate (10 − 18), or severe (≤ 9) cognitive impairments. EEG analyses were linked to the MMSE score obtained by the patient. Thereby, the patients were divided into two groups:

• The control group includes 20 normal subjects (15 females, 5 males, aged between

50 and 84 years, mean age 61.5 years, MMSE > 28), showing no neurological pathology (recent stroke onset in the last 6 months, Parkinson's disease, Alzheimer's disease, cerebral arteriosclerosis, psychosis, anxiety disorders, major depressive syndrome, hypo- or hyperthyroidism, metabolic syndrome etc. all of which can cause changes in the EEG). It is also necessary that the patient is not an alcohol or drug consumer and doesn't smoke. In this group we integrated patients complaining of subjective memory impairment, loss of balance

• The pathology group is represented by a total of 62 patients (47 women, 15 men, aged between 50 and 88 years, the mean age is 70.8 years, MMSE score between 6 – 18. In this group we integrated patients showing discrete to moderate degree of cognitive impairments, such as mixed dementia, Alzheimer's disease, Parkinson's Disease, stroke, depression, all of which are diagnosed by the doctor.

EEG Recordings

Recording the electrical activity of the brain was performed using a Nihon – Kohden EEG 9200 Made in Japan, 2007. The signal was picked up by 23 silver electrodes (21 electrodes placed on the scalp, 2 auricular electrodes placed on the earlobes) using Jasper's 10 – 20 International system of electrodes placing. Monopolar and bipolar EEG recordings were used.

Reverse Counting Task

This method implies a continuous mental task for a short timespan (maximum 45 seconds). Advantages of the method are the ease of completing the task regardless of age or intelligence, causing activation of complex mental functions. The level of difficulty is adapted to the patient's mental capacity, involving four levels:
• Level I: skip counting backwards from 100 by 7;
• Level II: skip counting backwards from 40 by 4;

• Level III: skip counting backwards from 20 by 2;
• Level IV: Regular counting backwards from 10.
The difficulty level is set before the start of the computerized EEG recording. The patient should start counting from the highest level of difficulty. If the patient exceeds 5 mistakes during the countdown, the difficulty level is adjusted. The patient is not interrupted during counting, regardless of the occurrence of a mistake.

EEG Registration Protocol

The registration starts with a spontaneous resting EEG of 2 – min duration. Then a 20 – s section follows with eyes open for the stabilization of the vigilance level. Another 2 – min section of resting EEG with eyes closed, followed by a 3 – min hyperventilation. Then a 2 – min section of resting EEG with eyes closed. This is followed by the Reverse Counting Task (45 – s). Another 1 – min section of resting EEG with eyes closed. The final part of the recording consists of the photic stimulation (with a strobe light) and the last 2 – min section of EEG with eyes closed.

RESULTS

EEG was performed using the following frequency bands: Delta: 0,5 – 3 Hz, Theta: 4 – 7 Hz, Alpha1: 8 – 11 Hz, Alpha 2: 12 – 14 Hz, Beta: 15 – 30 Hz. In the resting state with eyes closed, control group patients presented an EEG recording characterized by a normal amplitude of 50 – 80 μV, a frequency of 8 – 12 Hz, Alpha rhythm dominant and well expressed, Theta and Beta waves not exceeding 10% (Fig. 7). In contrast, Reverse Counting Task changed the EEG rhythmic activity, decreasing the amplitude with 30 – 50% and increasing the frequency by 3 – 5 Hz, reaching Alpha2 and Beta (Fig. 8). This result was found in 90% of the patients from the control group (Fig.1).
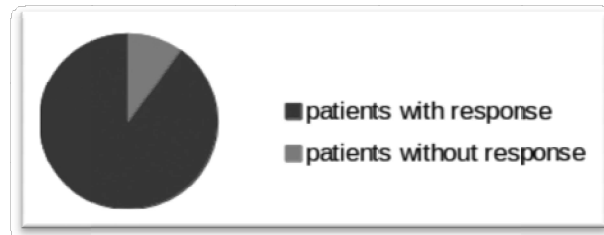
Fig. 1 Proportional representation of pacient' s reactivity in control group during Reverse Counting Task EEG

The EEG recording in patients with mild to moderate cognitive impairments is characterized by slowed Alpha rhythm and discrete to moderate level of Theta rhythm in the resting state (Fig. 9). Reverse Counting Task increased the frequency rate by 2 – 5 Hz (Fig. 10) in 54% of the patients (Fig. 2).

Fig. 2 Proportional representation of pathology group pacient's reactivity with moderate cognitive impairment, during Reverse Counting Task EEG

EEG in patients with major cognitive dysfunction is characterized by a slow rhythm, with reduced Alpha wave, Theta increased quantitatively, Delta rhythm being present as well (Fig. 11). Reverse Counting Task only resulted in an increase in frequency of 1 – 3 Hz (Fig. 12) in a low percentage of patients (23%) (Fig.3). The absence of reactivity after the stimulation may be an indicative for the atrophy of the neural networks.

Fig. 3 Proportional representation of pathology group pacients reactivity with major cognitive impairment, during Reverse Counting Task EEG

Using brain mapping, there is an obvious difference between the two groups, during the Reverse Counting Task: when resting with eyes closed, the control group presents posterior dominant rhythm with a frequency of 8 – 10 Hz, compared to the pathology group, which has visible Alpha activity (moderate pathology) and Delta and Theta rhythms diffusely distributed on frontal, parietal and central derivations (major pathology). The Reverse Counting Task activates Alpha2 and Beta waves in the control group, while the pathology group presents slow waves such as Theta and Delta, and absent Beta wave (Fig. 4, 5, 6).
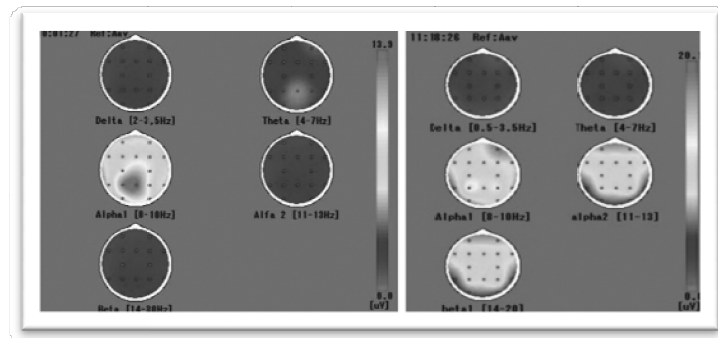
Fig. 4 Example of brain mapping of control group patient. When resting with eyes closed (left), posterior dominant rhythm is present, with a frequency of 8 – 10 Hz. During Reverse counting task (right), rapid Alpha and Beta waves are activated, distributed on frontal and central derivations.
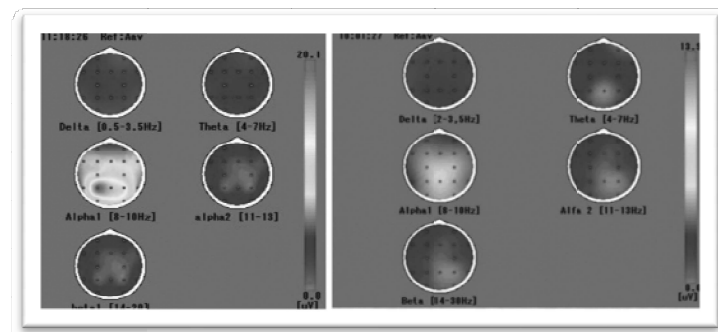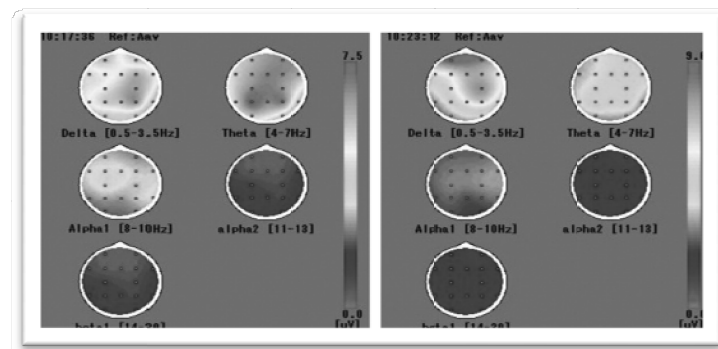

Fig. 5 Example of brain mapping from a pathology group patient with moderate cognitive impairments. In the resting state (left), posterior Alpha rhythm is dominant. During Reverse Counting Task (right), there is no remarkable reactivity, Beta rhythm reveals little activation.

Fig. 6 Example of brain mapping from a pathology group patient with major cognitive impairments. in the resting state (left), Theta and Delta waves are dominant in the frontal, parietal and central derivations. The Reverse Counting Task, the slow waves are still present, and Beta rhythm is absent.

DISCUSSION

A common feature for the pathology group is the low voltage amplitude during resting state with eyes closed, which doesn't allow differentiation between the EEG resting state and the EEG during Reverse Counting Task, which in the control group was characterized by a low voltage amplitude. Usually this situation is found in patients who are nervous, agitated or have hearing problems, therefore they are in a continuous alert state. In this case hyperventilation plays an important role as it amplifies the structure of the EEG recording, allowing to

highlight the changes due to the reverse counting.

There were patients who refused to respond to the Reverse Cognitive Task. This is correlated with depression, diagnosed by the doctor, which explains the lack of collaboration.

Among the cases of patients with major pathology, there were 2 subjects with high cognitive impairments, but with a MMSE score of 18 points, who completed the

Level II reverse counting without mistakes. However, during the Reverse Counting Task frequency and amplitude remained the same. These patients have a professional background in economics, so we assumed that the action of counting and calculating became automatic, without activating complex mental functions. Further research is necessary to confirm and better understand the results.
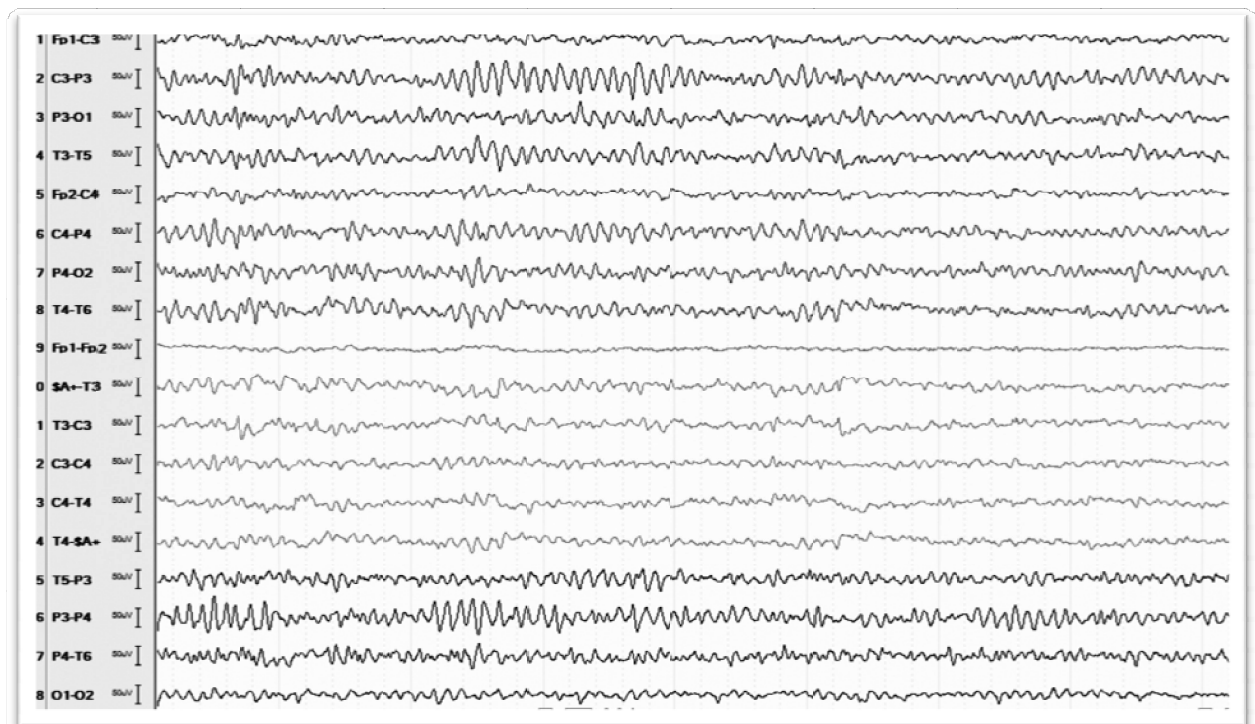
Fig. 7 Example of a control group patient's EEG during resting state. The amplitude reaches 50 – 80 μV (nrmal voltage), a frequency of 8 – 12 Hz. Alpha rhythm is dominant, Theta and Beta waves don' t exceed 10%
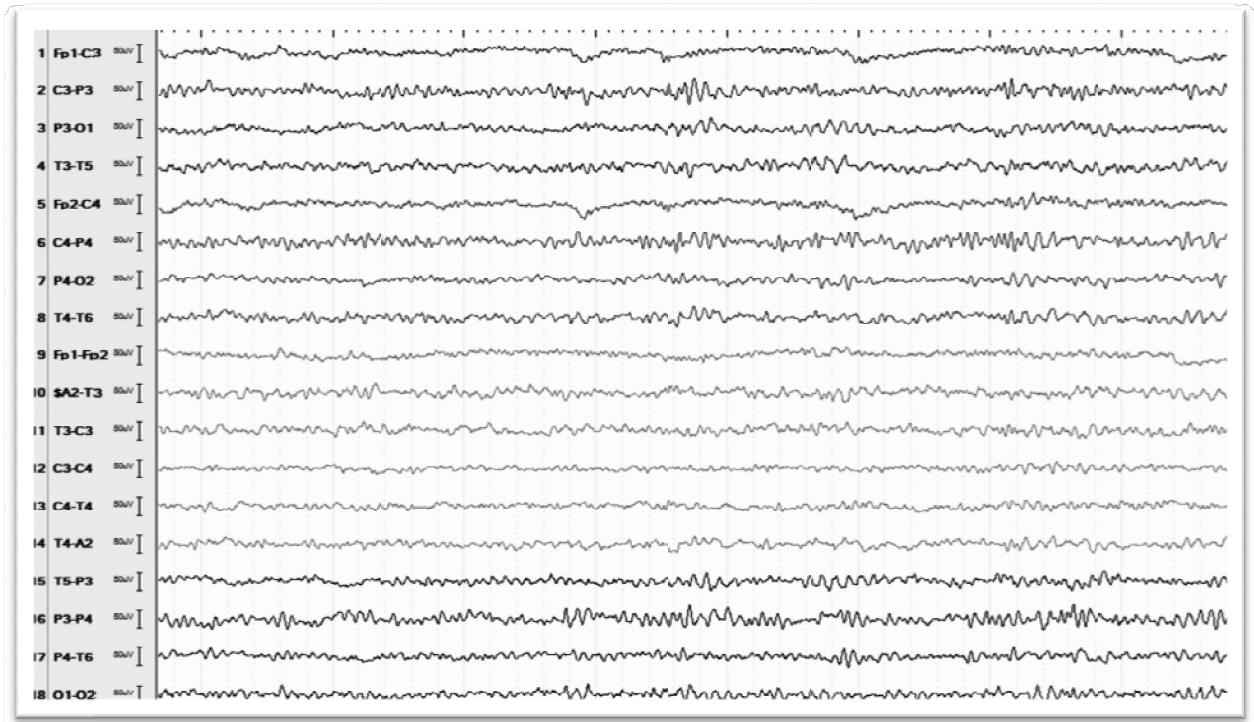
Fig. 8 Example of control group patient's during the Reverse Counting Task. The task changed the EEG rhythmic activity, decreasing the amplitude with 30 – 50% and increasing the frequency by 3 – 5 Hz, reaching Alpha2 and Beta.
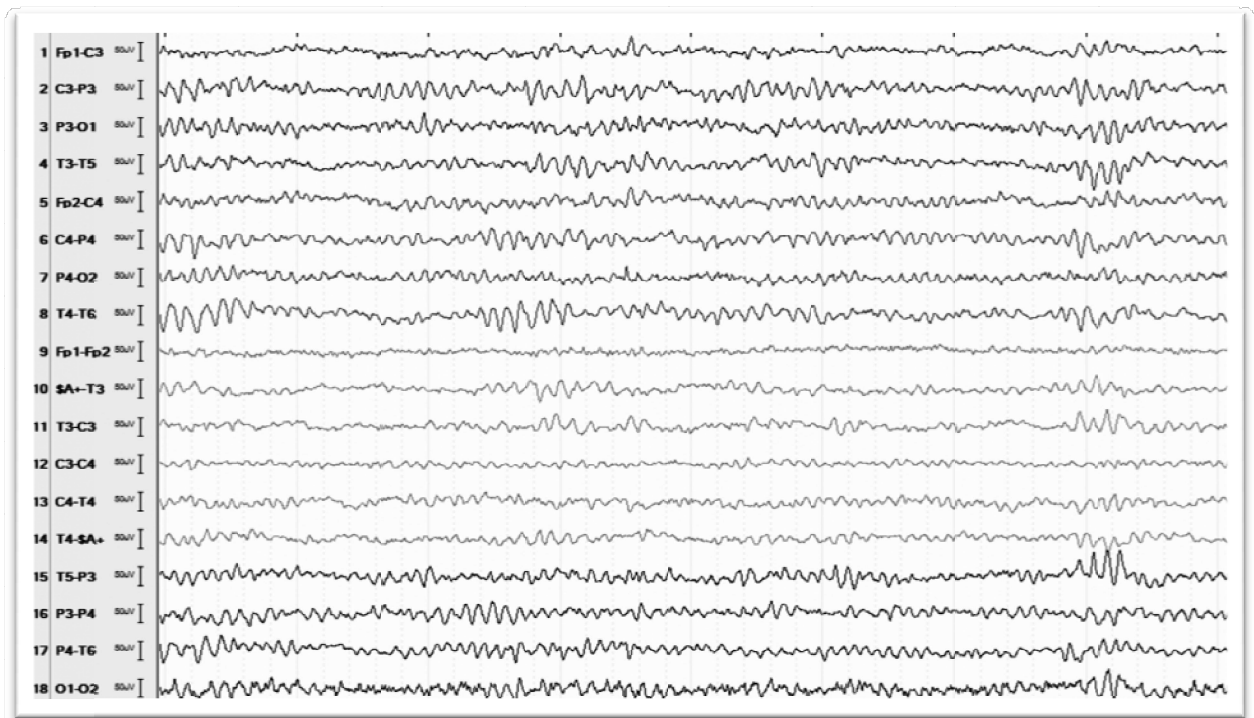

Fig. 9 Example of an EEG from a patient with moderate cognitive impairments characterized by slow Alpha rhythm in the resting state.
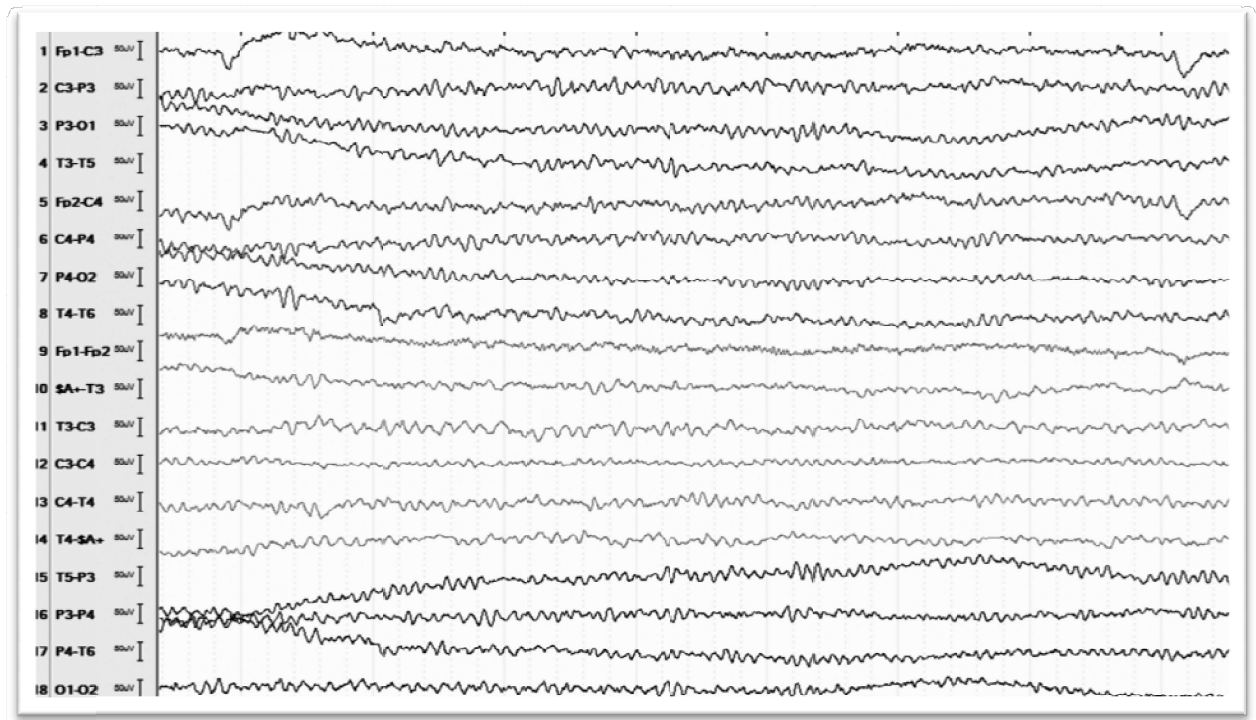
Fig. 10 EEG example of a patient with moderate cognitive impairments. The Reverse Counting Task increased the frequency rate by 2 – 5 Hz.
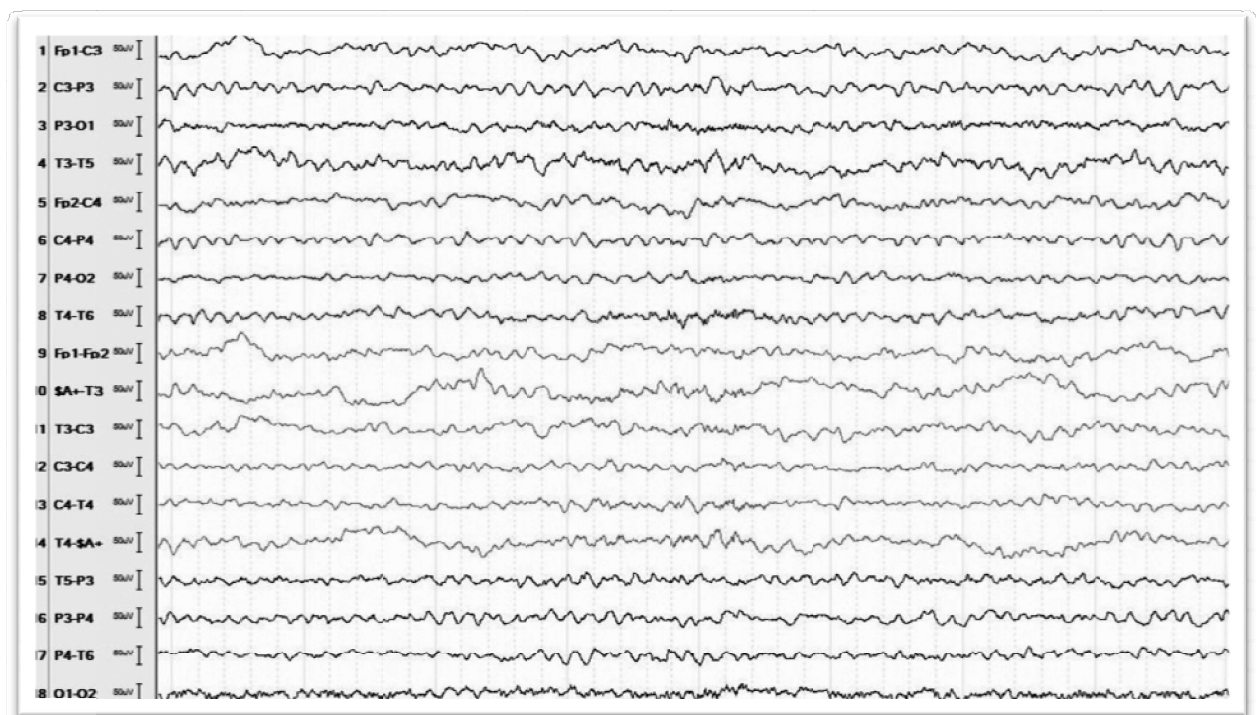

Fig. 11 Example of EEG in patients during resting state, with major cognitive dysfunction is characterized by a slow rhythm, with reduced Alpha wave, Theta increased quantitatively, Delta rhythm being present as well.
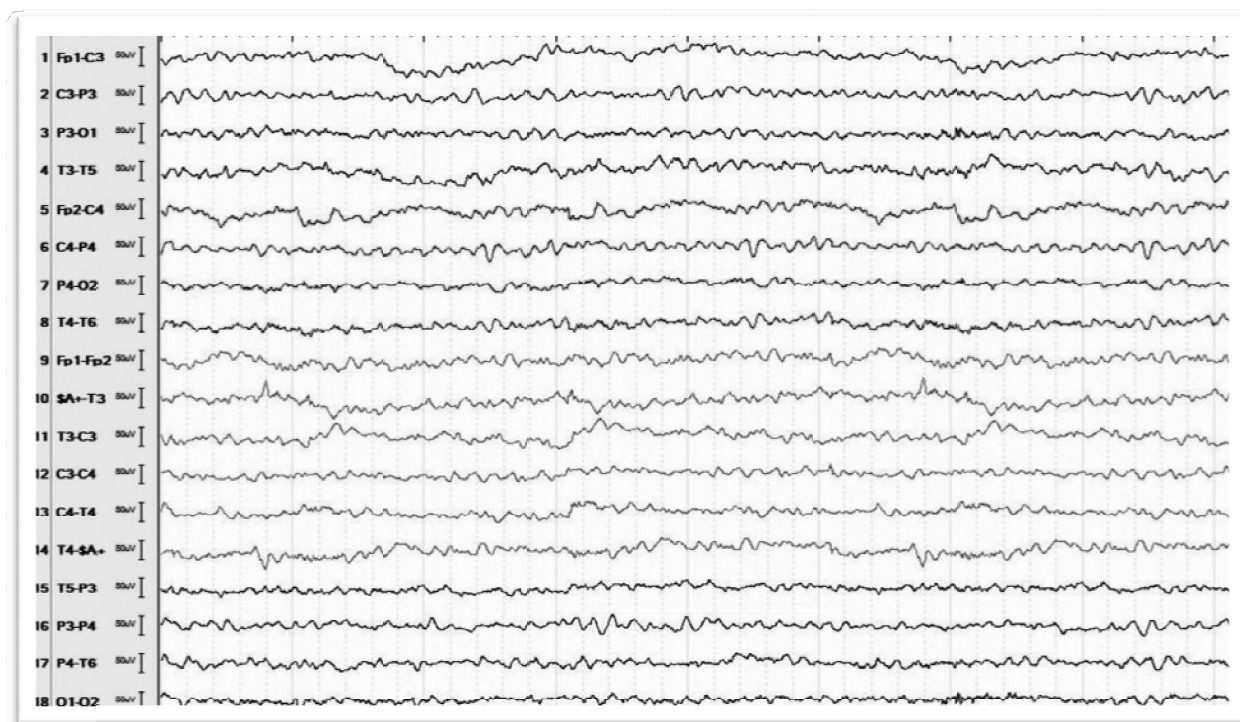
Fig. 12 Example of EEG in major cognitive impairments patient during Reverse Counting Task.
There are no changes in the frequency or amplitude during the task.

CONCLUSIONS

• In patients without cognitive impairments, the response due to Reverse Counting Task reflects good functionality and better condition of neuronal networks.

• Reverse Counting Task in patients with moderate cognitive impairment triggered an increase in frequency of 2 – 5 Hz.

• In patients with major cognitive impairment, Reverse Counting Task resulted in an increase in frequency of only 1 – 3 Hz.

• No reactivity during mental stimulation may be a marker for neuronal fatigue.

• In the future, the type of response obtained after Reverse Counting Task in computerized EEG recording may indicate the presence of cognitive disorders.

REFERENCES

[1] Albert ML, Knoefel JE. 2011. Clinical Neurology of Aging. Editura Oxford University Inc. (pag 115).

[2] Benes FM, Lange N. Two-dimensional versus three-dimensional cell counting: a practical perspective. Trends in Neuroscience. 2001 Jan;24(1):11-7.

[3] Cabeza R, Anderson ND, Locantore JK, McIntosh AR. Aging gracefully: compensatory brain activity in high-performing older adults. Neuroimage. 2002 Nov;17(3):1394-402.

[4] Constantin D, Craiu D, Sîrbu CA, Butoianu N, Lupescu T, Popescu CD. 2008 Electroencefalograma clasică şi modernă la adult şi copil, Editura Medicală (pag. 9 – 13, 19 - 29).

[5] David R Riddle. 2007 Brain aging. Editura Taylor & Francis Group

[6] Esiri MM. Ageing and the brain. J Pathol. 2007 Jan;211(2):181-7.

[7] Flonta M – L, Ristoiu V, Deftu A – F. 2013 Neurobiologia cogniţiei, Editura Universităţii din Bucureşti (pag. 12, 88, 89, 98, 102, 111).

[8] Galluzzi S, Beltramello A, Filippi M, Frisoni GB. Aging. Neurol Sci. 2008 Oct;29 Suppl 3:296-300.

[9] Ge Y, Grossman RI, Babb JS, Rabin ML, Mannon LJ, Kolson DL. Age-related total gray matter and white matter changes in normal adult brain. Part I: volumetric MR imaging analysis. AJNR American Journal of Neuroradiology. 2002 Sep;23(8):1327-33.

[10] Grady CL, Bernstein LJ, Beig S, Siegenthaler AL. The effects of encoding task on age-related differences in the functional neuroanatomy of face memory. Psychology of Aging. 2002 Mar;17(1):7-23.

[11] Greenfield LJ. 2009 Reading EEGs: A Practical Approach. Editura Wolters Kluwer pag. 7 – 10, 47 – 51, 55, 56).

[12] Hughes SW, Crunelli V. Thalamic mechanisms of EEG alpha rhythms and their pathological implications. Neuroscientist. 2005 Aug;11(4):357- 72.

[13] Kropotov J. 2008 Quantitative EEG, Event – Related Potentials and Neurotherapy. Editura Elsevier (pag. 13 – 19, 59, 71) .

[14] Jensen O, Mazaheri A. Shaping functional architecture by oscillatory alpha activity: gating by inhibition. Frontiers in Human Neuroscience. 2010 Nov 4;4:186.

[15] Klimesch W. α-band oscillations, attention, and controlled access to stored information. Trends in Cognitive Sciences. 2012 Dec;16(12):606-17.

[16] Kropotov J. 2008 Quantitative EEG, Event – Related Potentials and Neurotherapy. Editura Elsevier.

[17] Lopes da Silva F. Neural mechanisms underlying brain waves: from neural membranes to networks. Electroencephalogr Clinical Neurophysiology. 1991 Aug;79(2):81-93.

[18] Lu T., Pan Y., Kao SY., Li C., Kohane I., Chan J., Yankner BA. Gene regulation and DNA damage in the ageing human brain. Nature. 2004 Iunie 24;429(6994):883-91.

[19] MA. Brandimonte, N.Bruno, S. Collina, Cognition. Psychological Concepts: An International Historical Perspective. Hove, UK: Psychology Press, 2006.

[20] Misra UK, Kalita J. 2005 Clinical Electroencephalography, Editura Elsevier (pag. 13, 41, 42, 60, 79).

[21] Saalmann YB, Pinsk MA, Wang L, Li X, Kastner S. The pulvinar regulates information transmission between cortical areas based on attention demands. Science. 2012 Aug 10;337(6095):753-6.

[22] Sigala R, Haufe S, Roy D, Dinse HR, Ritter P. The role of alpha-rhythm states in perceptual learning: insights from experiments and computational models. Frontiers in Computational Neuroscience. 2014 Apr 4;8:36.

[23] Smith CD, Chebrolu H, Wekstein DR, Schmitt FA, Markesbery WR. Age and gender effects on human brain anatomy: a voxel-based morphometric study in healthy elderly. Neurobiology of Aging. 2007 Jul;28(7):1075-87.

[24] Teză Doctorat: Dinca E, 2010 Realizarea unei scale de evaluare electroencealografică a tulburărilor cognitive la vârstnici, Universitatea București.

[25] https://www2.bc.edu/elizabethkensinger/ Kensinger_EncycloNeurosci.pdf