

# MATHEMATICAL MODEL AND SOFTWARE USED TO IMPROVE COGNITIVE CHARACTERISTICS

*PROF.UNIV.DR.ING. PARASCHIV TITI*<sup>1</sup>

*PROF.UNIV.DR.ING. POSTOLEA DAN*<sup>2</sup>

*FIZ. NEDU CONSTANTIN*<sup>3</sup>

## **Abstract**

*The characteristics are measurable cognitive tests IQ (intellectual quotient), the affective measurable by EQ (emotional quotient) and the social are measurable by SQ (social factor). The first two types of measurements are validated psychometric tests defined and run time. The third type of measurement is less used due to divergent behavioral nature of giftedness.*

## **1. Process memory - cognitive process**

Learning is the process of acquiring information (us) about the world. Saving is the retention for a certain period of time such information. Memory is all functional and structural aspects related to learning and memorizing information, the retrieval of information stored in need, as well as partial or total oblivion of the information stored.

Classifications memory:

- Sensory - that retains data received through the sense organs;
- Motor - which refers to a certain behavior or a high degree of skill.

**Immediate memory** - lasts a matter of seconds. At its core lies the emergence **reverberant networks**. With time, the neurons involved in these networks will shape by structural and functional changes of synapses, the movement of preferential pathways of nerve impulses, which underlies **MSD** and **MLD**.

Short-term memory (STM) retain the information for minutes or hours.

Long Term Memory (MLD) acting days, weeks, months or years.

Short-term memory (STM) and long-term memory (MLD) involve durable changes of protein changes that need to be protected from the devastating impact metabolic bone turnover.

---

<sup>1</sup> Siemens SRL, România, titi.paraschiv@siemens.com

<sup>2</sup> Universitatea "Titu Maiorescu" Bucuresti, România, dan.postolea@utm.ro

<sup>3</sup> Universitatea "Titu Maiorescu" Bucuresti, România, constantinnedu@gmail.com

Short-term memory. (MSD) operates without the need for synthesis of proteins, limited to altering existing ones or their functional display where it would be masked by other molecules.

Long Term Memory (MLD) assumes, however, de novo synthesis of proteins. This becomes evident if administered during or immediately after learning a protein synthesis inhibitor, for example antibiotics puromycin, cicloheximin or anisomicin. The result is nereținerea such information. If such inhibitors (either transcriptional or translational) is administered after more than an hour of trying learning, memory impairment does not appear.

There is therefore a narrow time interval in which protein synthesis takes place memory and this interval coincides with the act of memorizing.

There are three types of memory:

- sensory;
- short-term (working);
- long lasting.

Sensory memory is a buffer zone to receive stimuli from the senses.

There is one area of sensory memory for each channel: iconic memory, tactile memory and memory ecoică. It is continuously overwritten with the new information received. The information in sensory memory is transferred in short-term memory by carefully (important stimuli are filtered only) - influenced by the presentation of information and our goals (if clear).

**Short-term memory** is used to retain information for a short time (eg 35 x 6 =?) Or read, to retain the beginning of a sentence. Access to MSD's really fast - 70 ms. Information may be retained max. 200 ms.

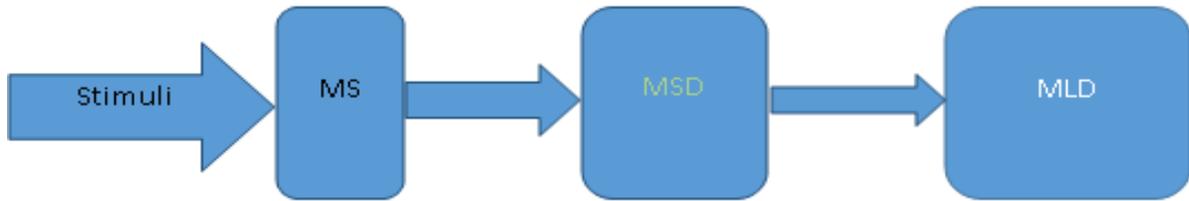
Capacity limited -  $7 \pm 2$  pieces of information (George Miller, 1956).

**Long Term Memory** retain knowledge acquired from experience, procedural rules, everything that we "know". It has high capacity and access is quite slow 1 / 10s, but the information they look harder.

There is a possibility of reminder is the same after 5 minutes / 1 hour / days. Information passes from short-term memory in long-term memory through repetition. If the information does not have meaning - unmemorable. They are easier to remember words that represent objects, than those representing concepts.

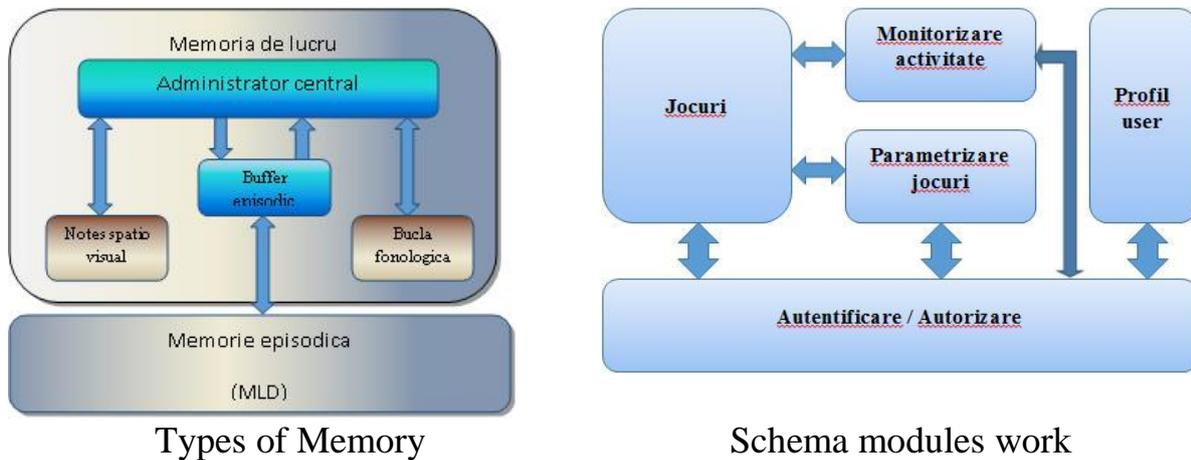
## **2. Cognitive behavioral skills improvement through training of working memory**

In 1968, Atkinson and Shiffrin propose a model in which sensory information stored in memory (MS) is forwarded to short-term memory (STM) characterized by short duration and limited volume storage. From short-term memory, some of the information is sent to long-term memory (MDL) which has unlimited storage capacity, compared to MSD and long storage (Aniței, 2010).



**Figure 1.** Schematic representation of the model memory (Atkinson and Shiffrin)

Episodic buffer (episodic buffer) was recently introduced in the model, as evidenced by the name; buffer contains embedded sequences or sequences coded multidimensional pieces. Thus acting as a deposit, not only between working memory components, but also between working memory and long-term memory. It can perform these functions because it can hold multidimensional representations, but as the other modules buffer has a limited capacity.



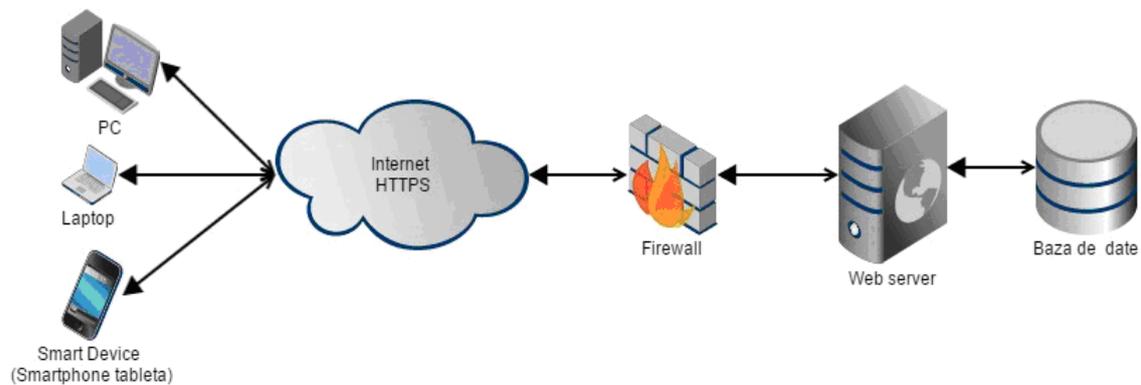
We propose steps platform brain "brain.stepsforward.eu", a platform with the main objective cognitive behavioral skills training. The abilities of their platform envisages training are: working memory, numerical memory, visual memory, attention. Due Desing this platform can support activities and research studies.

The platform is client-server type from the use of data generated in the platform are stored in a database (SQL server) can be easily processed and analyzed later. Access to the platform is made online using a web browser. The platform provides access to all visitors however to benefit from all the facilities platform users must log in with user name and password platform. Only in this way can the platform to provide access to its own area. Authenticated users can view their own activity in the platform, configure profile (age, sex, education, field of activity), and customize the games.

For each game played the user receives a score in the degree of difficulty of the game and how to complete the task. Sor is presented individually to each user. The scoreboard shows the user its date and the points and a score of

evaluation agencies, it is displayed in descending order of scores being presented the 10 best scores. Ratings are generated for each game in hand, they are: the best score achieved (compared to all users), personal best score, best score today (game day), the best personal score today.

Rating and scoreboard were introduced to motivate users to play games from the platform. The platform was designed by the way they put the main emphasis on cognitive behavioral skills training is made a record this pin allowing the user to change certain parameters games. By changing the parameters of the user adapts his game training possibilities and needs. This avoids the feeling of frustration that a user may have due to the high degree of difficulty of the game and reduce the possibility of abandoning training on the ground "too hard", "takes too long" or "I'm bored".



*Figure 2. IT & C infrastructure required application*

### 3. Results and conclusions

Target group: People aged over 8 years

Skills covered: Working memory; Attention

Objectives: Training Vizio-spatial memory function stimululi -in; Phonological loop depending on the stimululi -in; The Executive (central manager)

Parameterization: Initial number of items - 15

The duration of an item display, default value: 1500 ms

The time between two items, default value: 500 ms

The score for each pair of cards indicated correctly be received 10 points, 10 points are subtracted if it was given wrong a couple of books, is also deducted 10 points if a pair of books has not been identified. The final score is multiplied by the difference between the number of books and 15 (the default).

Data stored: father-final; Configuration game played; The number of cards played; The number of correct indication; The number of wrong indication; The number of pairs in the deck.

Through exercise, people will play the game will jog your memory and after 10 total hours of play on several occasions, the results will be significant. It is recommended for children, timer, adults, and people with specialties requiring memory.

## **REFERENCES**

- [1] Boucsein, W., *Electrodermal Activity*, Second edition, © Springer Science + Business Media, LLC 2012;
- [2] Cacioppo, John T.; Tassinary, Louis G., *Inferring Psychological Significance From Physiological Signals*, American Psychological Association, Inc. 0003-066X Vol. 45, No. I, 16-28, January 1990;
- [3] Edelberg R ., In: *Biopotentials from the skin surface: The hydration effect*, Annals of the New York Academy of Sciences, Volume 148, *Bioelectrodes* pages 252–262, February 1968;
- [4] Kaniusas, E., *Biomedical Signals and Sensors I*, Biological and Medical Physics, Biomedical Engineering, DOI 10.1007/978-3-642-24843-6 1, © Springer-Verlag Berlin Heidelberg 2012;
- [5] Margaret, E., J., Christie, PhD, *Electrodermal activity in the 1980s: a review*, Journal of the Royal Society of Medicine Volume 74, August 1981;
- [6] Mânzat, I., "Psihologia sinergetică", Editura Univers Enciclopedia Gold, Bucuresti, 2010
- [7] Turpin, G., Clements, K., *Electrodermal activity and psychopatology. The development of the palmar sweat index (psi) as an applied measure for use in clinical settings. Progres in electrodermal research*, Edited by J.-C. Roy et al. Plenum Press, New York, 1993;
- [8] \*\*\*Marele dicționar al psihologiei, LAROUSSE, Editura Trei, București, 2006;
- [9] \*\*\*US3841316; US6067468; US6746397; US5720619 – patents.