

**EFFECTS OF NEUROLINGUISTICS ON EVERYDAY
COMMUNICATION**

by

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Presented to the
Department of English & Communications
In Partial Fulfillment of the
Requirements for the Degree of Bachelor of Arts

American University of Armenia

Yerevan, Armenia

May 21, 2019

Table of Contents

Abstract.....	3
1. Introduction.....	4
2. Literature Review.....	5
2.1. Neurolinguistics and its scientific evolution till now.....	5
2.2. Alfred Korzybski and General semantics.....	10
2.3. Fritz Perls and Gestalt therapy.....	13
2.4. Virginia Satir, Family system's therapy and Milton H. Erickson, Ericksonian hypnosis.....	15
3. Research Questions and Methodology.....	17
4. Research Findings and Analysis.....	19
5. Limitations and Avenues for Future Research	25
References.....	26
List of Abbreviations.....	33
Appendix 1.....	34
Appendix 2.....	35
Appendix 3.....	36
Appendix 4.....	37

Abstract

Neurolinguistic programming is studying the positive experience of specialists in a sphere of psychology, Gestalt psychology, psychoanalysis, hypnosis with the aim of hereinafter developer tools for effective communication in everyday life bases. Basically, the NLP presents modeling techniques of successful people, for making these techniques publicly available. It is worth noting that NLP is not a science, it is knowledge and this knowledge can't be scientifically verified. Moreover, the science community is skeptical about NLP, but each day it becomes more serious and already it became one of the most useful spheres of psychology and 90% of a world used it in universities as psychology sphere.

On the other hand, Neurolinguistics is a fast developing sphere of science and communication, which could serve to the wide range of real-life situations both for understanding some specific conditions of local reality and improvement of the professional skills devoted to coping with a number of extreme nowadays challenges.

This present work is a try to recruit a scientific methodology of Neurolinguistics for everyday communication's problems.

1. Introduction

The term Neurolinguistic programming (NLP) has been given by John Grinder and Richard Bandler (USA) in the early 70s as an approach to psychotherapy, but more to everyday communication and personal development as a direct way to success. Their main idea based on a postulate, that between neurological processes (neuro-), language (linguistic) and behavioral patterns learned through experience (programming) is a tight connection, which can be developed to be able to achieve highest goals in life (Tosey and Mathison, 2006; Dilts et al. 1980). They also ensure that the NLP technique can "model" the skills of exceptionally successful people, allowing anyone to achieve such merit (Bandler & Grinder, 1975), as well as that NLP can heal pathological conditions like as depression, near-sightedness, phobias, tic disorders, psychosomatic illnesses, (Bandler, 1993), and also learning disorders (Grinder & Bostic St. Clair, 2001). Later, NLP became marketed product by some hypnotherapists and companies, producing a series of extremely popular workshops and seminars for businesses on management training (Dowlen, 1996). It was tricky, because there wasn't any scientific evidence supporting the idea, so in the next decade NLP has been discredited as a pseudoscience (Thyer and Pignotti, 2015): critics state that NLP's main objectives are based on outdated glances on the brain work, which are inconsistent with current neurological theory (Witkowski, 2010).

Scientific reviews also found that all the experimental research on NLP contained numerous factual errors and significant methodological flaws. So, the question is why this "extraordinary claims" made by Bandler, Grinder, and other NLP practitioners became such a popular successful practice for more than 35 years, while many studies of a much higher quality failed (Von Bergen et al., 1997)?! Until now, NLP is adopted by some companies as leadership training to businesses and government agencies (Bandler, 1993). After this entire contradictory

NLP theory base on the very solid scientific theories and practices, which have become quite popular during the 20th century. First, it was in a tight connection with the development of a new scientific sub-field of neurophysiology – neurolinguistics. As one could guess from its term, Neurolinguistics is the study of the “neural mechanisms in the human brain that control the comprehension, production, and acquisition of language” (<https://en.wikipedia.org/wiki/Neurolinguistics>). This science is in the crossover of the scientific fields such as neuroscience, neuropsychology, cognition, communication disorders, and linguistics so it could draw both the methodology and theories from all of them. The main question of neurolinguistics is how the brain can implement the processes in producing and comprehending language? The natural evolution of this field leads to the number of new approaches in psychophysiology and psychiatry: like as the theory of general semantics by Alfred Korzybski, Gestalt Therapy by Fritz Perls, family system's therapy by Virginia Satir and Ericksonian hypnosis by Milton Erickson. In general of their methodology, Bandler and Grinder drew upon these theories and practices, and a methodology termed modeling.

2. Literature Review

2.1. Neurolinguistics and its scientific evolution till now

The field of science concerning the development of models of the physiological mechanisms related to the language information processing by the human brain now called neurolinguistics. It serves to evaluate psychology and linguistic theories together, using aphasiology, brain imaging, electrophysiology, and computer modeling as tools (Nakai et al., 2017). The study of linguistic deficits (Aphasias) occurring as the result of brain damage, played a crucial role in neurolinguistics historical development (Phillips & Sakai, 2005). Hence,

aphasiology could correlate the structure to function relations in the brain by analyzing the injuries of the brain on language processing (Wisniewski, 2007).

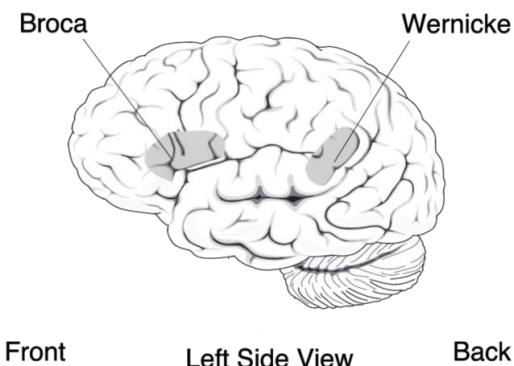


Fig 1. Broca's area and Wernicke's area in the brain.

Paul Broca, a French pathophysiohistologist, was almost the first person, who noticed a link between a certain brain area and language processing. He conducted numerous autopsies on individuals with speaking deficiencies and discovered that damage or lesions of the left frontal lobe of the brain has been the pathological specification of those patients. So, now the area of the brain responsible for speaking skills is called Broca's area (Dronkers et al., 2007), and his work has been described as "epoch-making" and "pivotal" (Teter, 2007) to the fields of neurolinguistics and cognitive science. Later, some other area of the brain was named after Carl Wernicke, who proposed which parts are specialized for different linguistic tasks (Wisnievski, 2007). It means that Broca's area is responsible for the simple motor production of speech, while Wernicke's area handling auditory speech comprehension (**Fig 1**). Another famous name in aphasiology - Korbinian Brodmann - "mapped" the whole surface of the brain based on the cytoarchitecture (cell structure) and function (McCaffrey, 2008) links. This map named also after him as Brodmann areas is in used up today in neuroscience (Garey, 2006). Contemporary new brain time-sensitive electrophysiological techniques (EEG and MEG) and new imaging technologies (such as PET and fMRI) pushed up the neurolinguistics from the narrow aphasiology field to

wider patterns of brain activation depending on the various language tasks (Brown & Hagoort, 1999).

Hemodynamic. Hemodynamic techniques mainly could answer to two questions of neurolinguistics: which parts of the brain may be responsible for the specific language tasks (Embick et al., 2000; Friederici, 2001) and how change over time the distribution of language-related activation as a function of linguistic exposure (Wang et al., 2003; Sereno & Wang, 2007). This method based on the known fact that blood is mainly sent to supply with oxygen those areas of the brain which work hard (BOLD - Blood Oxygen Level-Dependent response, Ward, 2006). PET and fMRI techniques (**Fig 2**) give high spatial resolution, allowing investigators to fix the exact location of activity within the brain, while temporal resolution (timing brain activity), is not appropriate, because the BOLD response is not fast enough to figure out the language processing. Except for PET and fMRI, some other modern techniques are in use by researchers for deciphering these problems: DTI - diffusion tensor imaging and fNIRS - functional near-infrared spectroscopy to discover neural pathways between brain areas (Ansaldi et al., 2011).

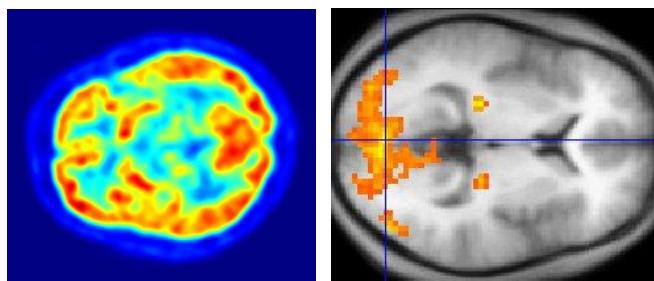


Fig 2: Images of the brain recorded with PET (left) and fMRI (right). The reddest areas are the most active, while the yellow areas show the greatest difference in activation between two tasks: watching a black screen vs watching a moving object.

Electrophysiological. While working simultaneously in the brain, a group of neurons creates an electric current, which could be measured by sensors on the scalp. This method (EEG – electroencephalography, **Fig 3**) allows measuring brain activity non-invasively with an excellent temporal resolution - from one msec to the next - to study language comprehension and production processes, which are very fast (Pylkkänen & Marantz, 2003).



Fig 3: Brain waves recorded using EEG.

However, this technique couldn't give the information concerning the precise location of the process, so it is used rather study *how* language processes are carried out, than *where* (event-related potentials – ERPs, **Fig 4**).

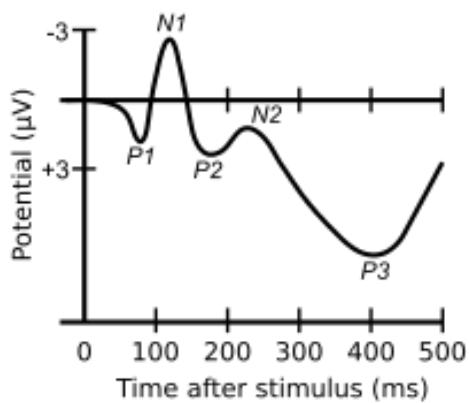


Fig 4: An event-related potential.

Neurolinguistics employed already numerous experimental design to figure out conclusions about how language is represented and processed in the brain.

Subtraction - while participants read syntactically complex sentences, brain activation may be compared to baseline activations when participants read simpler sentences or even strings of random letters instead of words (Grabowski & Domasio, 2000).

Mismatch negativity - when a person hears "deflecting" stimulus in a row of perceptually identical "norms" (like is s s s s s s d d s s s s d s s s s d), a certain electrophysiological response occurs in the brain (Shtyrov et al., 2004).

Violation-based – the analysis of a brain response on the anomalies of syntactic or semantic rules in experimental stimuli, when a subject encounters these errors (Frisch et al., 2004). This analysis could be done both by EEG and hemodynamic studies (fMRI and PET) approach (Osterhout & Holcomb, 1992; Embick et al., 2000).

Priming - when a subject can identify a word more quickly if he previously already has met a similar word (eighter similar in meaning or morphological composition) (Fiorentino & Poeppel, 2007).

Stimulation – the imitation of aphasia symptoms by exciting or interrupting brain activity in a specific and controlled brain location noninvasively using powerful magnetic fields applied the head (TMS - Transcranial magnetic stimulation) (Hagoort, 2005).

Lexical decision – this task involves subjects seeing or hearing an isolated word and answering whether it is a real word or not (could be used in priming studies) (Friederici et al., 1999; Fiorentino & Poeppel, 2007).

Grammaticality and acceptability judgment - request subjects to make a decision about the "acceptability" (grammatical or semantic) of stimuli (could be used as a particular task of

violating-based approach). It has been shown experimentally that brain responses to stimuli could be influenced by the instructions to subjects (Frisch et al., 2004; Ye et al., 2006).

Probe verification - subjects must answer whether the probe word had appeared in each experimental sentence or not (Friederici et al., 1999; Frisch et al., 2004)

Truth-value judgment - subjects are instructed not to judge whether or not the sentence is logical or acceptable grammatically, but whether the proposition expressed by the sentence is true or false (Gordon, 2008; Crain et al., 2008).

Active distraction and double-task - subjects used to implement some distracting exercise to check out a certain automatic computation and how much attention resources devoted to main stimuli, or subject must perform an extra task (such as sequential finger-tapping or articulating nonsense syllables) while responding to linguistic stimuli.

These experimental approaches are used to investigate the working memory in the course of language processing (Rogalski et al., 2008).

2.2. Alfred Korzybski and General semantics



Alfred Korzybski (1879 –1950) was a developer of a field called general semantics. The theory is based on the argument, that human knowledge of the world is limited both by the human nervous system and the languages, so there is no direct access to reality for human because everything should be filtered through the brain's responses to reality

(Korzybski, 1933). Following Korzybski's theory, humans can experience the world only through their "abstractions": through nonverbal impressions of the nervous system and derived

from languages verbal indicators. Hence, our understanding could lack the similarity of structure with what is happening and sometimes mislead us about what is the truth.

"The silent level" and "Identification." The theory of General semantics postulates that what most people call "identification" is the inability to differentiate the "levels" of their neuro-evaluative process. As Korzybski said: "Most people identify in value levels I, II, III, and IV and react as if our verbalizations about the first three levels were 'it.' Whatever we may say something 'is' obviously is not the 'something' on the silent levels." (**Fig 5**) (Blake & Ramsey, 1951). Hence, the saliva production is a normal response on lemon juice onto the tongue, but the image of lemon, or the word "l-e-m-o-n" also could trigger a salivation response being inappropriately identified by a person, who knows it's taste. So, the general semantics sharpens the so-called "internal" orientation like a GPS device may sharpen an external orientation by training a 'mental' habit to find and keep one's bearings among the ordered stages. "Once we differentiate, differentiation becomes the denial of identity," Korzybski wrote in *Science and Sanity*. "Once we discriminate among the objective and verbal levels, we learn 'silence' on the unspeakable objective levels, and so introduce a most beneficial neurological 'delay'—engage the cortex to perform its natural function." (Korzybski, 1933) Arriving from the senses this "auto-associative memory" recuperates previously obtained characters that most closely match to any current incoming pattern (Level II in **Fig 5**). So, if the stored representations resolve the arriving patterns, in accordance with the memory-prediction model for intelligence, this constitutes "understanding," and brain activity shifts from evaluation to triggering motor responses. Therefore, it takes some more time required for signals to go up and down the cortical hierarchy, which is a so-called "beneficial neurological delay." (Visser, 2004)

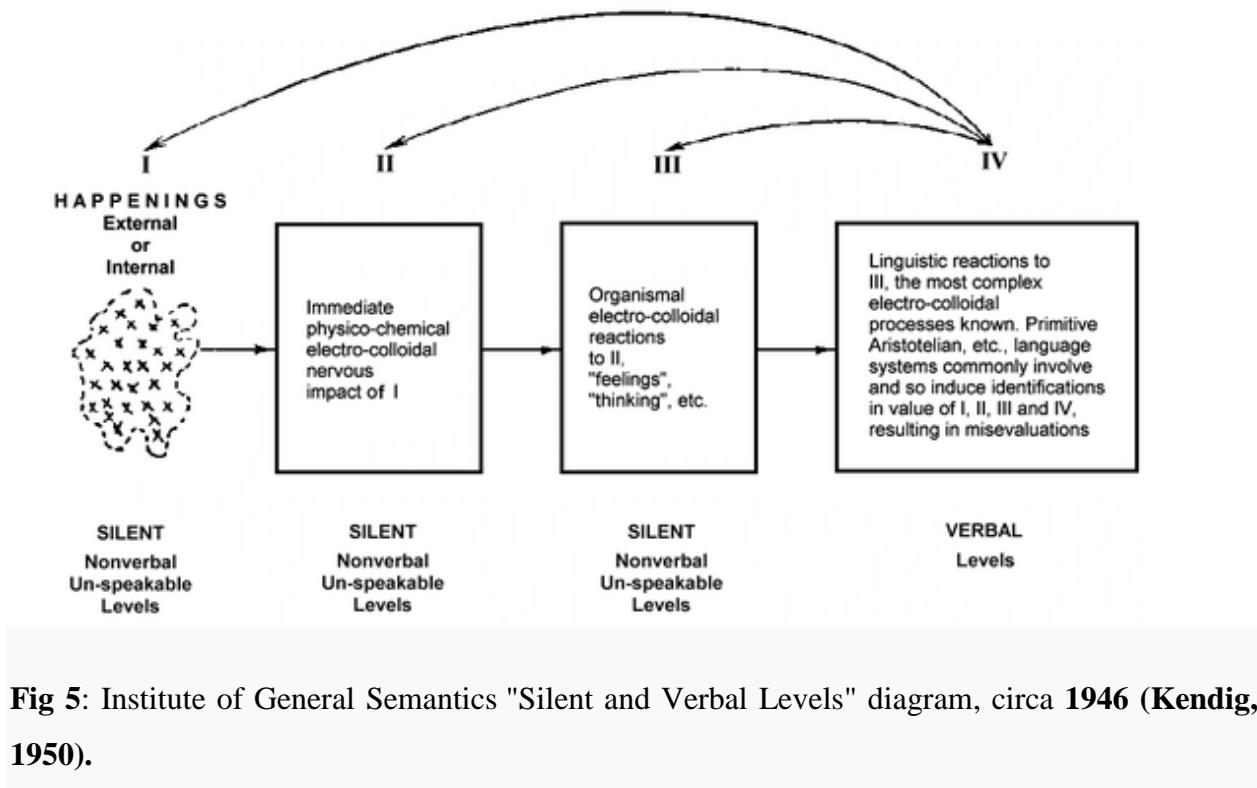


Fig 5: Institute of General Semantics "Silent and Verbal Levels" diagram, circa 1946 (Kendig, 1950).

Abstracting, it's consciousness and Extensional devices. General semantics' main goal is to promote the additional cortical processing experienced as a delay, which Korzybski called "consciousness of abstracting." Korzybski's use the term "abstracting" as somewhat usual, like as the problem of identification in "confusions of orders of abstractions" and "lack of consciousness of abstracting." By the General semantics diagram, levels II-IV are abstractions of level I, so all we get are abstractions, and Korzybski prescribed the technique to help a person develop the consciousness of abstracting, which he called "extensional devices" (Postman, 2003). For example, if you teach in the university, students come to your classroom on the first day, and you identify them to a memory association retrieved by your brain, you could under-engage your powers of observation and your cortex. If you assess new students and indexing explicitly differentiates student-1 from student-2 from student-3, etc., but you know one student from a prior course as either excellent or weak, then you could escape identification by your indexed awareness that «student-this term, this course» varies from the «student-that term, that course».

Thus, not identifying, you both expand and sharpen your apprehension of "students" with an awareness rooted in fresh silent-level observations (Hayakawa, 1979).

Language as a core concern, «To be». Auto-associative memory in the memory-prediction model describes neural operations in mammalian brains generally (Hawkins, 2004). A special circumstance for humans arises with the introduction of language components, both as fresh stimuli and as stored representations. The contention that Korzybski opposed the use of the verb "to be" would be a profound exaggeration. He thought that certain uses of the verb "to be," called the "is of identity" and the "is of predication," were faulty in structure, e.g., a statement such as, "Elizabeth is a fool" (said of a person named "Elizabeth" who has done something that we regard as foolish). In Korzybski's system, one's assessment of Elizabeth belongs to a higher order of abstraction than Elizabeth herself. Korzybski's remedy was to deny identity; in this example, to be aware continually that "Elizabeth" is not what we call her, so Elizabeth not in the verbal domain, but rather nonverbal. This was postulated by Korzybski's most famous dictum, "the map is not the territory".

2.3. Fritz Perls and Gestalt therapy



Fritz Perls (July 8, 1893 – March 14, 1970), German-born psychiatrist gave the term 'Gestalt therapy' which he developed with his wife, Laura Perls, in the 1940s. The basis of this therapy process is enhanced awareness of sensation, perception, bodily feelings, emotion, and behavior, in the present moment. Hence, Gestalt therapy focuses on the process (what is actually happening) over content (what is being talked about) (Sommers-Flanagan & Sommers-Flanagan, 2012). The patient learns to become aware of what he or she is doing by prioritizing his direct experiences over

indirect or secondary interpretation (Beisser, 1970). Its theoretical foundations mainly rest atop four pillars: phenomenological method, dialogical relationship, field-theoretical strategies, and experimental freedom (Brownell, 2008).

Phenomenological method. The achievement of this exploration is awareness, which could be comprised of three steps: the rule of epoché, the rule of description, and horizontalization. Through the first rule (*epoché*) one sets aside his initial biases and prejudices so as to arrest assumptions and expectations (Spinelli, 2005). With the rule of description, one could occupy himself with describing and not explaining. The rule of horizontalization help patient treats anyone described as having an equal significance and/or equal value to avoid prioritize and categorize data of experience by receiving. A Gestalt therapist, in the course of this analysis might say: “When I say that I’ve seen a slight tension at the corners of your lips, and I see you shifting on the chair and keep your arms across your chest … and now you’ve rolled eyes back” (Brownell, 2010).

Dialogical relationship. During this method the therapist attends to his own presence, creates the space for the client to enter in (inclusion), and commits himself to the dialog, surrendering to what takes place beside attempting to control it (Yontef, 2005), and hence judiciously “shows up” as an authentic person and not a false role. For example, the therapist shouldn’t say a devout client that religion is a myth because it can’t be useful in the early stages of their relationship.

Field-theoretical strategies. Field theory is a concept (in physics) to describe people and events as parts of a larger mosaic, which composed from the past and the observation and consisting of the ontological dimensions and phenomenological dimensions. The former is all physical and mental dynamics that contribute to one’s sense of self (the memory of an uncle’s

inappropriate affection, one's color blindness, one's sense of something, and so forth). The ontological dimensions are one's subjective experience, like as all those environmental or physical contexts in which we live and move: the weather, the landscape, etc. (Brownell, 2010).

Experimental freedom. Gestalt therapy moves away from mere talk therapy toward action, and hence, could be considered an experiential approach (Crocker, 1999). The Gestalt therapist is working with a process rather than content, the *How* rather than the *What*, because through experiments instead of merely talking about the possibility of something new, the therapist supports the patient's direct experience of something new.

Due to this theory point of view, neurosis can be seen as fixed predictability (Gestalt) and healing can be seen as facilitating the unpredictability of the patient.

Originally, Gestalt technique was a form of psychotherapy, but now it is often used in counseling: for instance, by encouraging clients to act out their feelings helping them prepare for a new job. Perls has been widely cited outside the realm of psychotherapy for a quotation often described as the "Gestalt prayer": «I do my thing, and you do your thing. I am not in this world to live up to your expectations, and you are not in this world to live up to mine.» (Fritz Perls, Gestalt Therapy Verbatim, 1969)

2.4. Virginia Satir, Family system's therapy and Milton H. Erickson, Ericksonian hypnosis

Virginia Satir (1916 –1988) was known especially for her approach to family therapy and her pioneering work in the field of family reconstruction therapy. She is also known for creating the Virginia Satir Change Process Model, a psychological model developed through clinical studies. Change management and organizational gurus of the 1990s and 2000s embrace this

model to define how change impacts organizations (Banmen, 2002). One of Satir's most novel ideas then was that the "presenting issue" or "surface problem" itself was seldom the real problem; rather, how people coped with the issue created the problem." (Satir, 2015). The conceptual frameworks developed by family therapists, especially those of the family system's theorists, have been applied to a range of human behavior, including organizational dynamics and the study of greatness. Currently, there are many theories and techniques developed in a frame of the Family system therapy, but V. Satir herself was more devoted to the Communications approach summarized it as the following: «All people are born into a primary survival triad between themselves and their parents... Experiential therapists are interested in altering the overt and covert messages between family members that affect their body, mind, and feelings so as to promote congruencies and to validate each person's inherent self-worth.» One of her most well-known works, "I Am Me," was written by Satir in response to a question posed by an angry teenage girl (Satir V., 2015, see *Appendix I*).

Milton Erickson (1901 – 1980), an American psychologist, specialized in medical hypnosis and family therapy, was noted for his ability to "utilize" anything about a patient to help them change; including their beliefs, favorite words, cultural background, personal history, or even their neurotic habits. Through conceptualizing the unconscious as highly separate from the conscious mind, with its own awareness, interests, responses, and learnings, he taught that the unconscious mind was creative, solution-generating, and often positive. In this way, what seemed like a normal conversation might induce a hypnotic trance or a therapeutic change in the subject. According to Weitzenhoffer, "[Erickson's] conception of the *unconscious* is definitely not the one held by Freud." (1976)

Erickson also believed that it was even appropriate for the therapist also to go into trance.

Erickson maintained that trance is a common, everyday occurrence. For example, when waiting for buses and trains, reading or listening, or even being involved in strenuous physical exercise, it's quite normal to become immersed in the activity and go into a trance state, removed from any other irrelevant stimuli. These states are so common and familiar that most people do not consciously recognize them as hypnotic phenomena (Gorton, 2005).

3. Research Questions and Methodology

The term polygraph generally refers to a so-called lie-detector test conducted with a physiological device. For forensic purposes, a polygraph measures autonomic responses of the organism to crime-related questions. Autonomic responses, such as skin conductance and respiration, have high signal-to-noise ratios and can easily be measured outside controlled laboratory settings, unlike central measures such as electroencephalograms.

For the polygraph tests, several question techniques were evaluated. The most commonly used worldwide is the technique of control question test or comparison question test (CQT). In this test, an examiner asks crime-relevant questions (e.g., “Did you rob the Gevorg last night?”), some comparison questions (e.g., “Did you ever take something that did not belong to you?”), and also neutral questions (“Did you live in the Yerevan?”). The aim of this CQT-test is to reveal whether an examinee has lied about the crime by comparing the physiological responses of the crime-relevant with comparison questions.

The crime-irrelevant test (CIT), or the so-called guilty knowledge test, is another question technique for the polygraph, although it does not directly aim to detect deception. The CIT assesses the examinee's memory of a particular crime detail. The examiner infers that the examinee, in fact, recognizes the crime-relevant item, despite his or her statement to the contrary, when the responses to the crime-relevant item differ from those to the crime-irrelevant

items. Typically, for the relevant items greater skin conductance, suppressed respiration, slower heart rate, and smaller pulse volume are observed compared with the irrelevant items

In the present study, the application of the polygraph was paired with a novel questioning paradigm we constructed for detection of stress-resistance among students, who've been in the real 4-day war conflict *vs* those, who've just been in Mandatory military service. Several questioning paradigms have been used extensively in conjunction with the polygraph for stress-resistance detection, but the major novelty, that it was done from the neurolinguistics point of view, e.g. the subject groups was proposed by three language questionnaires (Armenian (native), Russian (fluent), and English (quite good, but still less familiar)). Each paradigm involves a set of questions to ask objects with the purpose of better extracting physiological responses that accurately represent psychological states relevant to the stress. The Relevant/Irrelevant (R/I; Furedy, J. J., & Heslegrave, R. J. 1991) paradigm was the first of these to be developed, asking objects relevant questions (i.e., those regarding the stress-resistance) and irrelevant questions (i.e., those regarding personal information). The Comparison Question Technique (CQT; Ben-Shakhar G., 2002) built on the R/I paradigm by adding a third type of questions: comparison questions regarding the moral character (Synnott et al., 2015). The comparison questions were meant to help differentiate stress-resistant subjects from non-stress-resistant ones whose physiological responses indicated high stress toward relevant questions, and how the language issue could influence the objectivity and the final analysis of the result.

The OIPH approved LX-5000, (Lafayette Instrument Company, USA) physiological measurement system was used to collect ECG and GSR data. Written informed consent was obtained from each participant and all studies were conducted under and in accordance with the Declaration of Helsinki. Subjects between the ages of 22 and 27 years old, without any history of

ischemic or coronary artery disease, hypertension, diabetes mellitus, were recruited by advertisements for this study. All studies were performed in a designated quiet, temperature controlled and uniformly lit room. Subjects were seated comfortably in a padded chair with armrests, with their feet flat on the floor. In order to construct the 10 questions for Modified-CQT frame, a questionnaire was used to obtain some basic personal information from each participant prior to the main three-lingual test. The 10 relevant questions were formed based on stress-resistance observations (*Appendix 2*).

Each participant's raw ECG and GSR data were processed using MATLAB (The MathWorks, Inc.) to extract features from ECG and GSR signals to detect significant physiological changes.

4. Research Findings and Analysis

The psychological irregularities, provoked by specific physiological and psychological stress, connected with neurolinguistic problems could be very crucial etiologies of military accidents, based on the human factor (HF), especially for peacekeepers. The violation of the psychological adaptation in combat border units in professional stressogenic situation develops as successive 4 stages of a psychological crisis: difficulty, slowness, incompleteness and stall adaptation of personality to rapidly changing the extreme situation, in the form of dis-adaptive behavior deviation manifested. The team of military cadets in educational, training and especially combat clash conditions has subjected the influence of psycho-physiological dangerous factors (PPhDF), as the manifestation of limited opportunities or violation of the operation of individual psycho-physiological systems of the organism. When the action of this factor reaches definite values, the soldier reacts either by incorrect actions or a decrease in the efficiency that leads sometimes to

the drastic incidents. Through such point of view, the possibility to avoid any stressful pressure from the lack of correct communication will be very valuable for negative manifestations of HF.

The positive motivation and normal psychological protective mechanisms and the negative impacts of emotional stress in course of the mandatory military service are counterbalanced, but during the real combat clash situation, any minor problems could become ultimately crucial. The assessment of peacekeeper's motivation in the military conflict zones is qualification, the relation of a soldier to possible dangers, his ability to cope with dangers, his psycho-physiological extremely exo- and endogenous stimuli is determined by the HF (Matte J., 2007). HF includes the physiological, psychological, social characteristics of organism define abilities, reserves, stable properties of personality in the process of military activity and the ability for a normal communication play surprisingly a very certain role for it (Harwell E., 2000). It is well known that some types of Aphasiology, like as stuttering could be a serious reason for obtaining a military deferment, hence the problems with a poor understanding of the language of commands also seem to be a stressful factor. Professional selection with study of individually-psychological features (IPF) of cadets on aptitude in armed forces of RA, systematical multilateral psycho-physiological testing, training and psychological post stressful rehabilitation using multifunctional computer polygraph are necessary assurance that cadet will have all the requested psycho-physiological and moral-psychological qualities of military pilots, peacekeepers, ordinary soldiers in the combat dangerous situations. Unfortunately, similar frontier situations are very relevant to our country and have a tendency to periodically repeat.

To approve our point of view concerning the role of language and communication for the military service recruits, we've tried to decipher the level of their stress-resistance in course of polygraphology testing depend on the language of the quiz. The study was carried out according

to international standards adapted to military specifics proved by experimental methods of investigation. The psycho-physiological status of individuals on correlation with their types of identity, character and temperament, psycho - informational and physiological components was defined. By systems of the integral technique of three-lingual (English, Russian, Armenian) psychological survey using computer polygraph the accuracy of verbal responses of studied persons on the nonspecific physiological, psycho-vegetative, mimic and psychomotor reactions of the organism was estimated. The group of 8 young men with different levels of foreign language knowledge from 22 to 27 years old has been divided into 2 sub-groups:

1. Students who completed mandatory military service;
2. Students who completed mandatory military service in combat border units during the so-called 4-Days War in April 2016.

All personal data was coded to avoid any ethical problems, and written informed consent was obtained from each participant.

The questionnaire for CQT was composed of the following questions:

- 1 Your Last name is ...?
- 2 Your future profession is ?
- 3 Are you ready to pass the computer test?

C4 Do you most often take the troubles hard?

R5 Do you most often take the troubles easy?

C6 In work/study you try to keep up with the rest?

R7 In work/study you try to be the first among equals?

8 Is it a problem for you to pass the computer test?

C9 Usually you try to avoid conflict situations?

R10 Usually you try to solve conflict situations?

Where 1,2,3 and 8 are the neutral (or personal) questions, 4,6 and 9 are the comparison questions; and 5, 7, and 10 are the relevant questions.

Figure 6 illustrates an example of raw ECG and GSR signals from both groups of participants. Heart rate and GSR amplitude were selected as physiological features to be analyzed for an indication of irregular signal («lie») because these features are one of the most commonly evaluated in lie detection research (Raskin, 1979; Lykken, 1998). Participants were assigned to either the stress-resistant condition or the non-stress-resistant. As such, those assigned to the first condition would have the answer to all questions, being less nervous from the situation and testing procedure, whereas those assigned to the second condition would have told a more «noisy» response to the question regarding whether they have more nervous psychotype. Thus, the binary classification including “sprinter” vs. “stayer” was used to differentiate “more resistant” from “less-stress-resistant”. But for the final analysis we've decided to figure out three different levels of stress-resistance - low, medium and high (LSR, MSR, and HSR respectively), which were quantitatively divided as the following (Ben-Shakhar G., 2002):

1. LSR – from <1 to 4%;
2. MSR – 5-90%;
3. HSR - <91%.

The average values of three experiments, when the test was performed on the same participant but with the different languages demonstrate the overall perfect fit with the differences of examinees: most resistant to the stress situation has been observed among those young men who've been already in the extreme conditions during the real combat situation. Almost all of them show HSR levels as are obvious from Figure 7. It is necessary to mention,

that all of them were not just in the Army during that April 2016 clash, but have been on the frontier within the combat units!

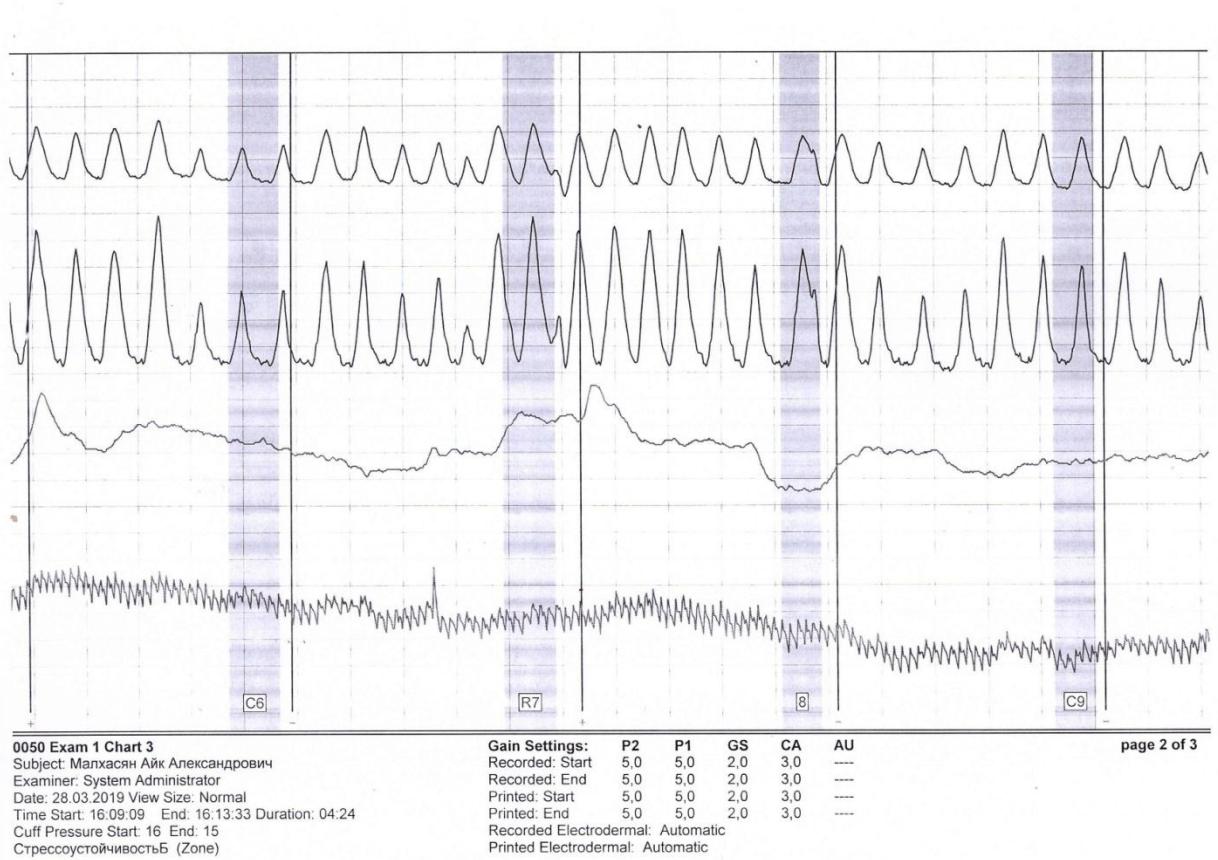


Fig 6: A typical example of raw ECG and GSR signals of the LX-5000 polygraph, (*Lafayette Instrument Company*, USA; approved by the Orbeli Institute of Physiology of the National Academy of Sciences of RA).

The picture became even more interesting if we'll try to classify their stress-resistance abilities in accordance with their skills for the native, quite familiar and more complicated (for some of them) languages (**Table 1**). To compare the differences between polygraph data for the same person in course of these three independent experiments, one could see the *Appendices 3 and 4*: the participant with LSR level and the one with HSR level, respectively.

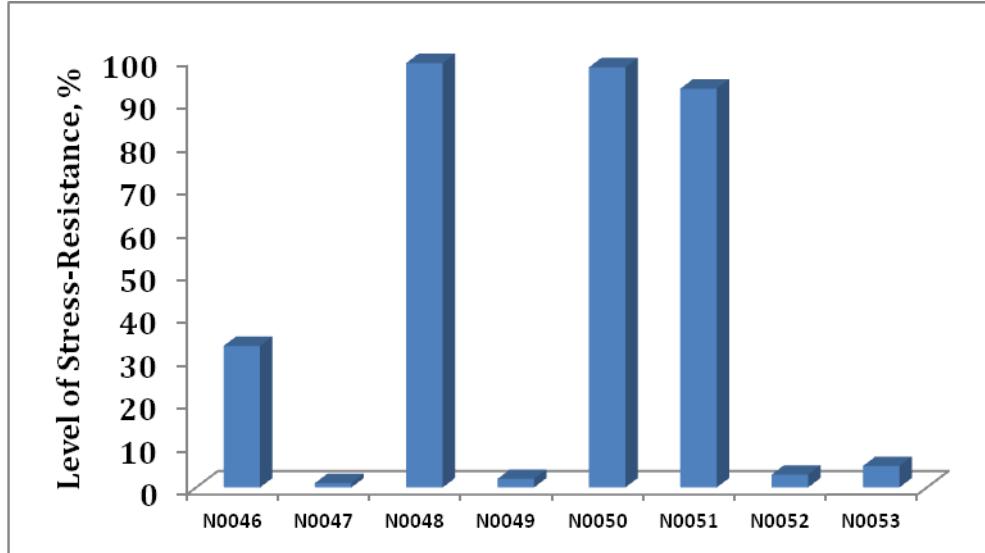


Fig 7: The level of stress-resistance of all 8 participants (in %) according to the polygraph CQT-test. Coding of their personal data has been done by the number of recording on the device.

Table 1. The level of stress-resistance of participants (in %) according to the three-lingual CQT-test (*P*- participant, *NP* – non-participant).

N	Code of the Participant	Participation in the April 2016 War	Year of Birth	ENG Level of stress-resistance (%)	RUS Level of stress-resistance (%)	ARM Level of stress-resistance (%)
1	0046	NP	1991	3, LSR	3, LSR	5, MSR
2	0047	NP	1992	<1, LSR	2, LSR	3, LSR
3	0048	P	1990	99, HSR	4, LSR	99, HSR
4	0049	NP	1984	1, LSR	1, LSR	<1, LSR
5	0050	P	1996	92, HSR	98, HSR	5, MSR
6	0051	P	1996	3, LSR	60, MSR	99, HSR
7	0052	P	1996	2, LSR	99, HSR	<1, LSR
8	0053	NP	1995	76, MSR	<1, LSR	3, LSR

As we could conclude from the data, especially in case of participants 51 and 52 language skills could change the results of test quite significantly, and, hence, in the military conditions could be crucial indeed!

5. Limitations and Avenues for Future Research

This present work is a try to recruit a scientific methodology of Neurolinguistics for everyday communication's problems. As it became clear from the Literature analysis the novelty of such kind of investigation is hard to overrate because there is almost not any paper concerning the topic! Starting from this observation, we should accept, that current research could be only the very first step in the direction of very serious studying in that field, but, on the same time it opens up a new wide horizon for the Neurolinguistics practical application in such a complicate actual sphere of human activity as is the Military service. Moreover, with all due respect to the humanistic and pacifistic point of view, our country is living in the condition of the permanent military tension last 25 years, is not to say its entire history! Today, when the conflicts became more and more international and wars exit to the new hybrid level, the problems of professional competency of the National Army and platoons of peacekeepers became more relevant.

In this current work the main problem of my investigation I see in the small sample of subjects and, hence, inability to divide them into more precise groups by their age, personal specifications and kind of troops.

I strongly believed that we just opened up new perspectives for the very interesting and exciting field of research and I'd like to express my acknowledgment to the very professional staff of the Laboratory of Psychophysiology of the OIPH for their kind support in the implementation of my experimental vision.

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LIST OF ABBREVIATIONS

- BOLD - Blood Oxygen Level-Dependent response
- CIT- Crime-Irrelevant Test
- CQT- Comparison Question Technique
- DTI - diffusion tensor imaging
- ECG - electrocardiogram
- EEG - electroencephalography
- EPR - event-related potential
- fMRI - functional magnetic resonance imaging
- fNIRS - functional near-infrared spectroscopy
- GSR- galvanic skin responses
- HF – human factor
- HSR - high stress-resistance
- IPF - individually-psychological features
- LSR – low stress-resistance
- MEG - magnetoencephalography
- MSR - medium stress-resistance
- NLP – Neurolinguistic programming
- OIPH – Orbeli Institute of Physiology
- PET - Positron Emission Tomography
- PPhDF - psycho-physiological dangerous factors
- TMS - Transcranial magnetic stimulation

Appendices

Appendix 1

«I am Me» poster by Virginia Satir (2015)

MY DECLARATION OF SELF-ESTEEM

I AM ME

IN ALL THE WORLD, THERE IS NO ONE ELSE EXACTLY LIKE ME
EVERYTHING THAT COMES OUT OF ME IS AUTHENTICALLY MINE
BECAUSE I ALONE CHOSE IT — I OWN EVERYTHING ABOUT ME
MY BODY, MY FEELINGS, MY MOUTH, MY VOICE, ALL MY ACTIONS,
WHETHER THEY BE TO OTHERS OR TO MYSELF — I OWN MY FANTASIES,
MY DREAMS, MY HOPES, MY FEARS — I OWN ALL MY TRIUMPHS AND
SUCCESSSES, ALL MY FAILURES AND MISTAKES BECAUSE I OWN ALL OF
ME, I CAN BECOME INTIMATELY ACQUAINTED WITH ME — BY SO DOING
I CAN LOVE ME AND BE FRIENDLY WITH ME IN ALL MY PARTS — I KNOW
THERE ARE ASPECTS ABOUT MYSELF THAT PUZZLE ME, AND OTHER
ASPECTS THAT I DO NOT FRIENDLY AND LOVING TO AND HOPEFULLY LOOK FOR
AND FOR WAYS TO FIND OUT LOOK AND SOUND, WHATEVER



KNOW — BUT AS LONG AS I AM
MYSELF, I CAN COURAGEOUSLY
SOLUTIONS TO THE PUZZLES
MORE ABOUT ME — HOWEVER I
I SAY AND DO, AND WHATEVER

I THINK AND FEEL AT A GIVEN MOMENT IN TIME IS AUTHENTICALLY
ME — IF LATER SOME PARTS OF HOW I LOOKED, SOUNDED, THOUGHT
AND FELT TURNED OUT TO BE UNFITTING, I CAN DISCARD THAT WHICH IS
UNFITTING, KEEP THE REST, AND INVENT SOMETHING NEW FOR THAT
WHICH I DISCARDED — I CAN SEE, HEAR, FEEL, THINK, SAY, AND DO
I HAVE THE TOOLS TO SURVIVE, TO BE CLOSE TO OTHERS, TO BE PRO-
DUCTIVE, AND TO MAKE SENSE AND ORDER OUT OF THE WORLD OF
PEOPLE AND THINGS OUTSIDE OF ME — I OWN ME, AND THEREFORE
I CAN ENGINEER ME — I AM ME AND

I AM OKAY

Virginia Satir

Appendix 2

The example of a quantitative analysis of physiological information of the one of the examinees by Polygraph LX Software V.8.1.1. calculated by POLYSCORE® algorithm

0047 Scoring Report 28.03.2019 page 1 of 1

POLYSCORE™
Version 4.0

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All rights reserved. (301) 953-5000: Dale E. Olsen and John C. Harris.

For assistance call technical support: (800) 428-7545

Eng	NDI--Probability of Deception is Less Than .01
-----	--

0047 charts scored: Exam Type: Zone

Chart	Exam	Date	Time	Examiner	QuestionSet
2	1	27.03.2019	17:54	admin	StressResistance

Spot/Vertical Scores

Prob	ID	Question
0.11	R10	Usually you try to solve conflict situations?
0.07	R7	In work you try to be the first among equals?
0.06	R5	Do you most often take the troubles easy?

Channel Contributions

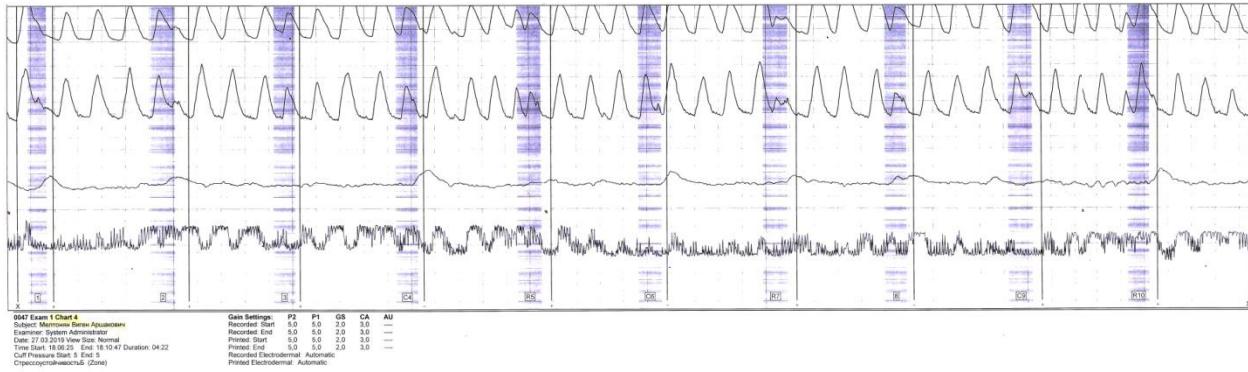
Weight	Channel
+0.52	Electrodermal
+0.09	Pulse
+0.34	Respiration
+0.05	Blood Volume

Chart 2 Exam 1 StressResistance

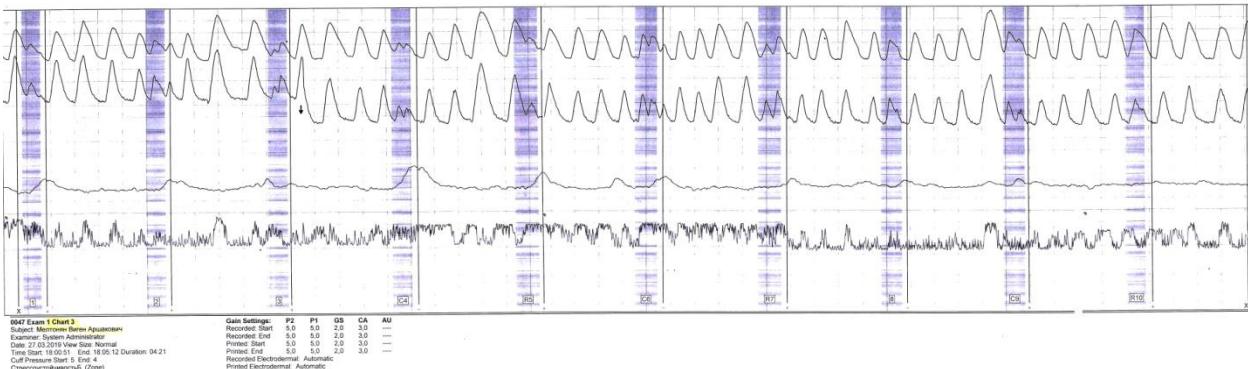
React	Type	ID	Question
		1	Your last name is Meltonyan?
		2	Your ... profession is programmer?
		3	Are you ready to pass computer test?
0.75	C	C4	Do you most often take the troubles hard?
0.06	R	R5	Do you most often take the troubles easy?
0.53	C	C6	In work you try to keep up with the rest?
0.07	R	R7	In work you try to be the first among equals?
		8	Is it problem to pass computer test?
0.25	C	C9	Usually you try to avoid conflict situations?
0.11	R	R10	Usually you try to solve conflict situations?

Appendix 3

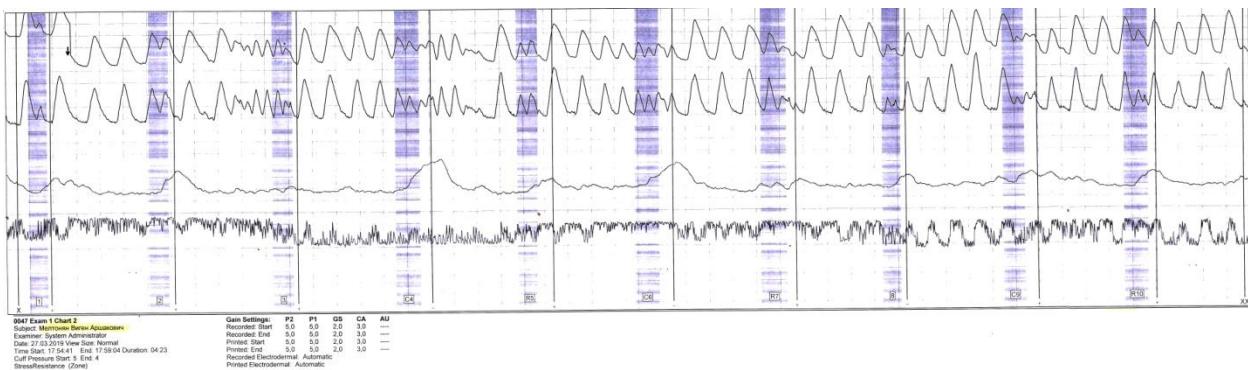
Polygraph data recording for the LSR person in course of three independent experiments with questionnaires in Armenian (A), Russian (B), and English (C); the examinee skills in Armenian is fluent, in Russian - advanced, in English - poor



A



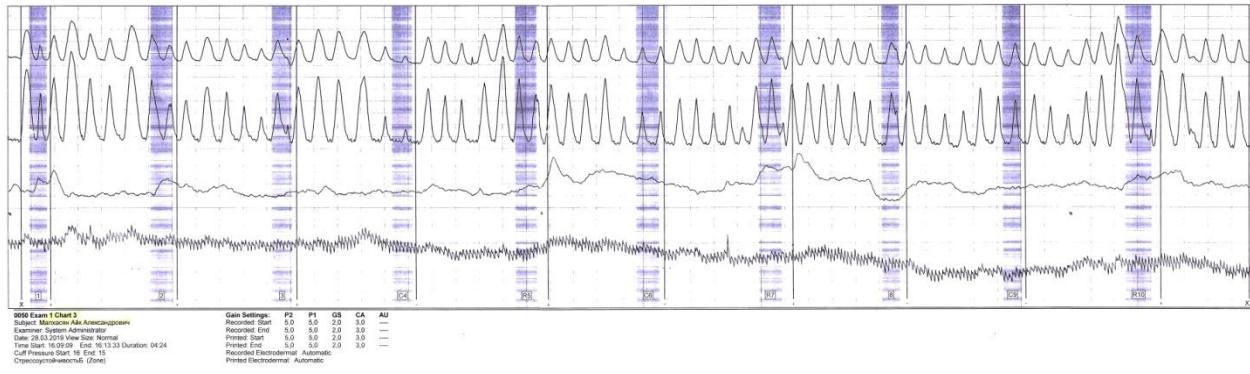
B



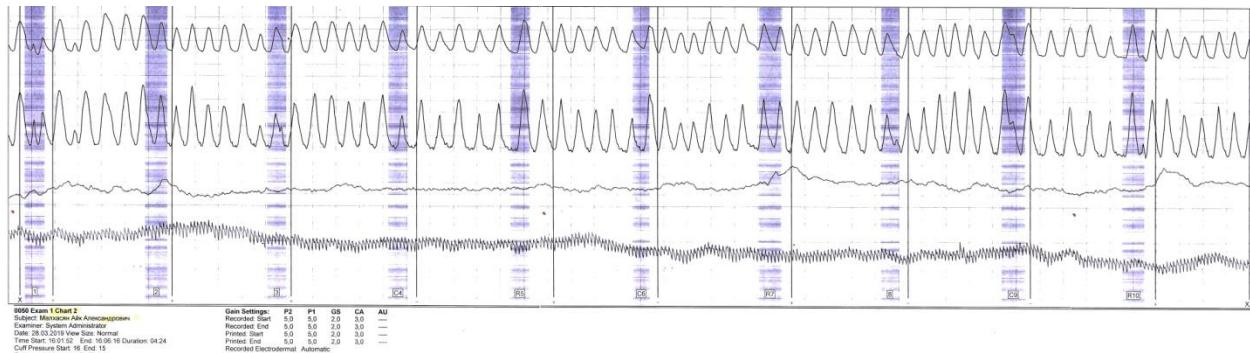
C

Appendix 4

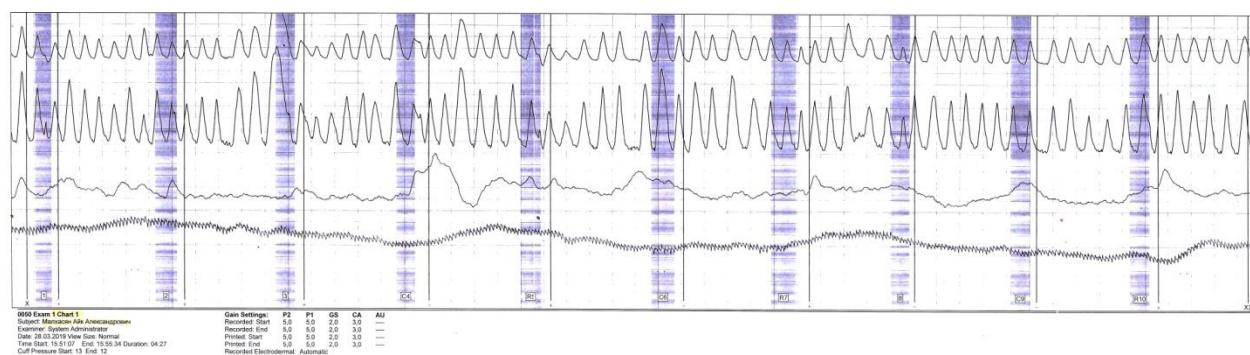
Polygraph data recording for the HSR person in course of three independent experiments with questionnaires in Armenian (A), Russian (B), and English (C); the examinee skills in all three languages are advanced.



A



B



C