How long-term presentation of text stimuli affects production and perception of visual mental images

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Abstract:
The presented paper contains results of pilot study in the area of human computer interaction. The proposed design is based on a subject's stay of several days in purely symbolic (text) visual environment and subsequent analysis of one´s change in production and perception of visual mental images. The recordings were anylesed to identify the differences between the stay in normal visual and textual environment in terms of changes in mental imagery production As the subject fully accomodated to the textual environment

Keywords: mental imagery, null hypothesis, depictive theory, descriptive theory, environment simulation

1. Introduction

The present state of art in the field of mental imagery is very unclean.
We can identify origins in debate between Kosslyn and Pylyshyn (Kosslyn, 2005); (Pylyshyn, 2003), which is concerned to nature (form or coding) of mental imagery as well as mental representations. The gist of this extensive debate is challenge, whether exist depictive representations (images), or we can transform all perceptual information to the symbolic code (propositional representation), which is used in the process of thinking and reasoning then (Thomas, 1999). Even thought mental images are for its nonverbal character hardly accessible to classical psychological investigations, there had been proposed great number of experimental designs, which have had reveal indirectly nature and functional components of this subjectively perceived phenomenon. Seeing that difference between depictive and propositional format of images is good identifiable in visual sensory modality, researchers frequently exploit congenitally blinds as subjects.

Usage of blind subjects along experiments is potential method, how approve or disprove Kosslyn's quasi-pictorial and later depictive theory (Kosslyn, 1994). There is a presupposition as a basis of research design, that congenitally blinds people, which have not experience of visual information, would have manifest it in production, perception and operations along mental images.
In general terms it is possible to split results of studies with blind subjects into two groups. Former group of researches (Zimler,Keenan, 1983; De Beni,Cornoldi, 1988; Haber, Haber, Levin, Hollyfield,1993; Cornoldi,Bertuccelli, Rocchi, Sbrana, 1993) concludes same visual imagery during mental operations for blinds and sights, on the basis of similar results in experimental and control group. Further group (Heller,Calcaterra, Tyler, Burson, 1996;

Vecchi,1998; Aleman, van Lee,Mantione, Verkoijen, de Haan, 2001; Vanlierde, Wanet-Defalque, 2004)on the contrary found differences in favor of sighting subjects.

We can interpret diverseity of results subsequently. It is important to emphasis way of presentation task within experiment. Former group outbalances such task, when it is possible to process solution by transformation into language level and they don't need to employ potential of visual images. This can affect or change results. Another important factor is different way of operations on representations, due to blind subject's different sensorial modality. It means substitution of visual images by haptic. Subject makes use of tactile knowledge during experimental task. As evidence demonstrating insufficiency of blind subjects serve experiments focused to visualization of space e.g. shortenings, where it is impossible to use haptic imagery (Arditi, Holtzman, & Kosslyn, 1988).

Although research work with blind subjects unveiled many valuable details about nature of imagery, we still miss satisfactory evidence or refutation of descriptive theory and symbolic form mental images and representations.

The present state isn't much more clear. Kosslyn tries to confirm depictive theory using neuroscietical methods, by identification of topological organization of neural activations corresponding to shape of perceived object (Slotnick, Thompson, Kosslyn, 2005). He postulate "null hypothesis" as argument for computational processability of any cognitive domain. We can find background for its formulation already in theory of physical symbolic system (Simon, Newell, 1963) or in arguments of strong artificial intelligence (Searle, 1980).

They don't reach consensus possibly just for different starting points (empirical versus theoretical) and diverse methodologies.

It's necessary to emphasize, that empirical area is crucial for verification of theoretical standpoints and it would be desirable to seek for experimental design, enabling to empirically handle „null hypothesis". Let us concentrate to its details first.

Pylyshyn´s descriptive theory (relates also to propositional representation or tacit knowledge) used to be sometimes mistakenly called "propositional" and its gist forms statement, that the images are created of descriptions, stored in language similar to computational format (Thomas, 2003). Mentioned representational system is according to Pylyshyn so much fundamental, that it is possible to validate its relevance by "null hypotheses", believing mental images as result symbolic operations. In this conception there is fixed cognitive architecture under phenomenological experience , which is symbolical (Simonneti,2003).

Kosslyn (2003) considers concept of "null hypothesis" as misleading. Suggested hypothesis is nihilistic, because it doesn't lead to testable predictions. This non-testability of "null hypotheses" would consider it as statement outside scientific framework.

Pylyshyn specified some disputable aspects on the basis of mistaken interpretations of hypotheses.

The purpose of introducing the "null hypothesis" is not primarily to claim that images must be symbolic, but that many phenomena that imagery theorists are concerned with can be accounted for by any theory adequate to carry out reasoning, including a symbolic one that implements a "language of thought" (Pylyshyn, 2002, p. 223)

Quoted statement is very vague and therefore he refine further that "*The null hypothesis is not a formal description of anything; it is a proposal ... about what form our representations might take when they are experienced as visual images. The reason why I treat this particular option as the "default" is that we know something about it (since it includes all the various formal languages and symbolic calculi for which we have a formal semantics to tell us how the meanings of complex structures are composed from the meanings of their parts) and because it*

meets certain minimal requirements that must be met by any system adequate for the representation of knowledge and for reasoning. In particular we know that a recursive system of symbols has properties such as productivity, compositionality, and systematicity and that these are essential for reasoning and knowledge representation" (Pylyshyn, 2002, p. 224) Summarizing, there are not ideal conditions for creation of experimental design, which would prove eventually uproot fundamentality of symbolic system in the area of images.

2. Experimental question

Considering nature of mental images hardly accessible, it is necessary to choose experimental design, susceptible to explore problems in a different way. Given that most of experiments used to work with people, who are congenitally blind, it is possible to attempt problem differently and prohibit sighted experimental person to perceive visual information. If we simultaneously want to know details about difference between symbolic and nonsymbolic format of representation, we have to "blindfold" subject only to one form perception. We are concerned about production and perception of mental images in simulated environment, when there are visual inputs only in symbolic (text) format.

Is there a relation between form of visual information from environment and resulting production and perception of visual mental images?

 Integrating aforementioned information into common ground, there is possibility to formulate hypothesis on the basis of following considerations. In case that subject perceives only text visual information and according to "null hypotheses" (claiming symbolic representational form as fundamental), it means very simple way of processing visual information for subject, because compared to classical perception of environment there is qualitative shift. Visual information doesn't need to be preprocessed, considering text input (by its nature) more closer to symbolical form of representation than classical visual information. Difference can manifest itself in reaction times of processing information, but it is hardly measurable variable in these conditions. Lets continue to consider further. According to ideas about similarities between text input and symbolic representational form we can conclude:
1. In case that subject will stay several days in such adjusted environment , he has to achieve decrease or fade away in production and perception of visual mental images.
2. Contrariwise in case that subject will achieve increase production and perception of visual mental images during stay, such findings are then inconsistent with "null hypothesis".
3. In case, that production and perception of images will stay at the same level, we can explain such results in the following way:
    a) Proposed experimental design is deficient for capture levels of mental images.
    b) Methods used in pilot research aren't enough sensitive to capture levels of production and perception of images and therefore it is necessary to record experiment by more accurate methods.

3. Hypothesis

 Before we start to formulate hypothesis, we have to accomplish certain restriction in suggested proposals. In pilot phase is main objective to prove, whether there are changes in the area of

production and perception of mental images. Full version of experiment would follow in case of changes evidence.

Because we can consider as change both increasing and decreasing of production and perception of images, we shall formulate hypothesis together for both alternatives. We do this because of mentioned type research and employed method of observation and analyses. Hypothesis is formulated as combination of points 1. and 2. and serves as identification of changes in the field of mental images.

If subject will perceive only text visual information on a long-term basis , it will manifest in change of production and perception of visual mental images.

Whereas on a long-term basis means several days subsequently, change means increase and decrease, and mental images are phenomenally perceived visual mental images. In final discussion we will introduce explanatory power of presented hypothesis, possibilities of alternative explanation and its relationship to Pylyshyn´s "null hypothesis".

4. Methods

Seeing that elimination of intervening variables in planned research is difficult, we select opposite style. External variables stay constant, similarly to method of difference, when are all variables, with the exception of independent variable, leave unchanged (Fejrencik, 2000). In a matter of fact it means to conduct experiment in normal conditions. Presence of equipment for production of text visual information (independent variable) is only exception.

On the other hand stay in such environment is for subject physically and mentally demanding. Hence, select group is reduced only to one person. Mentioned type of research is according to way of selection called self-experiment. Self-experiment is special instance of intrasubjective experiment, in which experimenter perform experiment onto himself. Famous pioneer of this method is H. Ebbinghaus by his researches on memory.

Independent variable was presence or absence nontextual visual information. Subject is during pilot research prohibited to perceive other than text visual stimuli, which could cause phenomenally significant change in production and perception of mental images. Production records serving as detector of changes are way of capture subject´s behavior, subsequently put through content analysis. Records come from three sources. These are diaries, text conversation from instant messengers and audio diary (converted into text form).

Since pilot phase of research does not contain control group, it was necessary to compare acquired records to records in control conditions. It was 7 days section of one year old diary administrated in control conditions without visual restrictions. Content analysis provides detection of frequency of records related to mental images and compare them in experimental and control conditions. Obtained results refer to production images. It is also necessary to put records through further content analysis focused to recognize changes in the area of image perception. Considerable factors for examination of images are intensity, adequacy, vivacity etc.

Since it is possible to record activity structure of subject during stay, statistics of these data serve as basis for comparison to data in normal (control) conditions. Comparison has provided absence of result´s distorsion due to possible inadequate frequency of activities in experimental conditions.

Crucial factor for compensating deficiencies in method of group selection and other used methods is duration of research. Several days stay can establish subject´s adaptation to novel environment and creation of ideal conditions for measuring changes in the area of mental images. In case of realization full version experiment, there are used more accurate method for capture changes (tests, questionnaires), whose results can describe more exactly anticipated phenomenon.

5. Design

Realization means creation of special environment. Experimental design has to induce and subsequently record supposed phenomenon, which is not possible to evoke under normal conditions due to nature of visual information. Surveyed person will stay 7 day in environment, prohibited to perceive nontext visual information. Technically it means restriction to see normal environment. It was obtained by using helmet for virtual reality (HMD), computer, OS Linux and its software applications, modem, microphone and keyboard. You can see it in Pic.1.
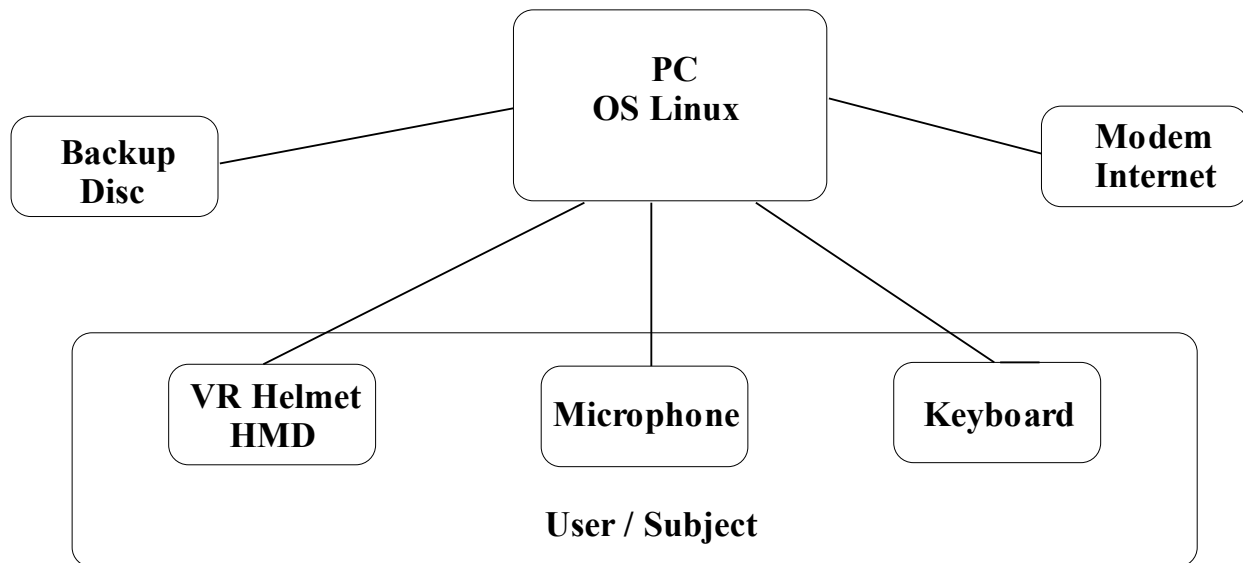
Pic.1 Interconnection

OS Linux works in console mode, displaying only characters. It is possible to control one program in any of six concurrently running consoles, which provides possibility to communicate, write, browse, record, save etc. Basic software pack includes web browser, instant messenger, word processor, voice recorder and file explorer. Subject could install and use any other programs according to own desires. Activity isn't structured in advance and depends on actual requirements.
VR helmet is connected to computer. It consists of two miniature monitors, providing identical view for left and right eye. Subject cannot perceive other visual stimuli than monitor screens. Human-computer interaction proceeds through the use of standard keyboard, so system instructions and communication accomplishes in text form only.
Subject wear blackout glasses for movement out of helmet´s cable reach (toilet, hygiene, food, sleep), which prohibits reception of visual information. There is no special regime, subject can

determine, when he wants eat, go to toilet or sleep. He will spend 7 days in such environment, and data mentioned above will be record. Subsequent analysis will examine obtained text files representing subject's behavior (text output).

Because created conditions differ from normal environment and because there are no researches about long-term stay in simulated environment, it was necessary to determine criteria, leading to the interruption of research. In case of persisting physical or psychical discomfort of subject, it means immediate termination of whole project.

6. Results and analysis

If we are interested in subject´s introspectional perception during research, we have to focus on diary and communication analysis. Audio diary is recorded only first day, when subject cannot write on keyboard quickly enough. Next days he stopped to use this program, because it is possible to write text diary comfortably.

Technique of mentioned analysis is as follows. Texts from all three sources were sequenced according to timeline and divided into separate days. For subsequent analysis serve statements, which are relevant with respect to hypothesis and applied method. Practically it means, that we choose statement that refers to physical states, emotional states, mental images, self-perception, self-esteem and introspectional passages of problem solving and decision making. Such parts of text are emphasized, whereas they aren't taken out of context, but interpreted regarding to given event and overall progress of research.

Unfortunately it was wrong presupposition to believe in ability to compare records during research and control conditions ones. I resigned to compare them for theirs discrepant structure. Additional reason is small occurrence of records directly concerned to mental images (especially in control conditions).

Hence it's necessary to reformulate method of capturing changes in the area of production and perception of images. Instead of comparing two records it was necessary to introspectively capture changes of phenomenal perception of images and thinking processes. Important statements are now focused to subject´s perception of changes.

Mentioned shift divided analysis into two parts. In case of sensation´s changes subject has had possibility to record them as self-reflection. Records (including self-reflexive passages) are subsequently put through content analysis, which accomplishes possibility to interpret statements in wider context of research.

Proposed methodological shift arise from presupposition, that during stay will occur fundamental and intensive change in perception of visual images (corresponding to phenomenon), which will be recordable by mentioned method.

6.1 Analysis of the 1st day

Duration of stay in text environment		
3.5	Hours	Text environment
0.5	Hours	No visual information

Tab.1 Summarization of stay duration

Time	Source	Text

19:49	Audio	I feel good. Everything is OK.
20:11	ICQ	: it is for shxt / I can´t see anything
20:36	Audio	I can't control it at all. It is very hard to write. Operating is very difficult.
22.00	Text	Everything is so slow. I cannot write anything properly.
23.00	Text	It is very slow but improves.
23:37	Audio	It is perfect, when I have something to do. It is much more livable.

Tab.2 Sample of Recordings

Category	Visits	Percent
Search engines and Mails	0	0,00
Personal	0	0,00
School and Work	1	11,11
Entertainment and Relax	2	22,22
Technical Setting	6	66,67
Shopping	0	0,00
Sum	9,00	100,00

Tab.3 Activity statistics

6.1.1 General

1st day stay served as introductory adaptation to novel environment (only 3,5 hours). It is important to become familiar with helmet and alternative ways of interaction and communication with environment.
First hours I register feelings of pressure in the area of eyes, which soon disappeared. It was necessary to set proper font size, as well as learn write without look to keyboard. It is evident from samples of records that everything proceeds very slowly and personal pace is perceived negatively. After introductory settings I started to pay more attention to normal operations within possibilities of text environment. As table of activities shows, there dominate setting-up and entertainment activities.

6.1.2 Mental images

After such short period it has not been supposed perception of phenomenally inadequate or nonstandard visual mental images on the basis of presented text, eventually changes in production or perception of images. Major factor influencing first hours of stay is adaptation to change due to different style of sensation. There are self-reflexive passages in the diary about identical quality and quantity of perceived mental images as in normal conditions.

6.2 Analysis of 2nd day

Duration of stay in text environment		
9.5	Hours	Text environment
4.5	Hours	No visual information
9	Hours	Sleeping

Tab.4 Summarization of stay duration

Time	Source	Text

9:00	Text	I can write a little bit better. I try to accommodate to VR helmet and I slept good. I had normal crazy dreams and I had two short anxiety attacks about my present status. I have some strange ideas during stay. I think, it is because I feel uncomfortable about absence of seeing space and having chance to change something.
10:30	Text	Writing is getting better
12:50	Text	I feel good and everything is normal. I cannot do anything special but there are no difficulties or complications. Working pace is still slow.
13:30	Text	I have to habituate to slow pace. Everything is new and I have to figure out every step in my activities. On the other hand it is strangely comfortable, that I am in the room, but practically I am only in helmet.
13:56	ICQ	: It is OK. Just short anxieties sometimes. So far it is cool.
16:20	Text	I am watching Czech-Russia hockey game as an updating web page commentary. I do not imagine anything but I am appreciating it. I feel good watching game. I am fully concentrated to game and am not disturbed by surrounding. It is similar to watching TV.
17:00	Text	When I realize that I have VR helmet on, I start to panic and feel that something strange displays only nonsense to me. Then I wish to wear it out immediately.
17:30	Text	I feel good because I identified cause of my fear. Now I feel much more better.
17:40	Text	I am still watching game. It is dramatic and I like it.
21:00	Text	It looks I accommodate to environment, I feel pretty normal, in the matter of fact I am able to work here although I am very limited. I do not perceive any strange feeling. Self-perception is as usual, normal thinking processes and images, same emotions and no inadequate phenomena.
0:10	Text	- I am going to bed. I am OK, feel good.

Tab.5 Sample of Recordings

Category	Visits	Percent
Search engines and Mails	2	3,51
Personal	0	0,00
School and work	6	10,53
Entertainment and Relax	18	31,58
Technical Setting	17	29,82
Shopping	14	24,56
Sum	57,00	100,00

Tab.6 Activity statistics

6.2.1 General
Waking up and morning activities were common and without differences. Since I wanted to minimize stay in blackout glasses, I have been using them only in urgent cases and only along activities out of helmets cable reach – toilet, food, hygiene, rest. During morning period I

detected unwelcome physiological appearances (full nose due to helmet pads), but I fix it quickly. As major activity prevail entertainment pages browsing, whereas 30 percent of activities is still dedicated to setting-up system for comfortable work in text environment. General ratio among activities is already more equal (stable). During noon I perceive uncomfortable reaction in form anxiety. In the following time I successfully identify anxiety as fear of disability to orient in the neighborhood and to focus my eyes. Unpleasant feelings vanish after reconsideration. General emotional level was very unstable and it distinguishes to common day. There was oscillation of emotional states, from euphoria (possibilities of concentration just to text), flow-phenomenon (along pages browsing) to resentment and discomfort related to mentioned anxiety. In my opinion is variation of moods more attributed to restrictions due to experimental conditions, than influences of text stimuli affecting perception of mental images.

6.2.2 Mental images

There are only records relating to self-reflection of images perception again. Most interesting passage is watching of ice-hockey match by reading online record of game, updated every minute. Such activities should have cause introspectional visualization of game relevant to text information. This expectation was not prove. Generally I appreciated positively watching game in text form and perceived emotional background as under normal (control) conditions.

At the end of the day I realized, that there are neither any kinds mental images different to common, nor complements or interferences to text input information. I am already adapted to environment and I am able to behave there. Also activities in environment , which approximately correspond to activities during common day (control conditions), are followed by habitual perception of mental images.

6.3 Analysis of third day

Duration of stay in text environment		
10.75	Hours	Text environment
3	Hours	No visual information
11	Hours	Sleeping

Tab.7   Summarization of stay duration

Time	Source	Text
11:30	Text	Sleeping was OK. I dreamt beautiful long stories, no day rests, but it is normal. I feel still the same. I realized that it is not problem to not see surrounding. I feel comfortable in VR helmet.
14:10	Text	I have nothing to write about perception and self-perception again. I feel very common.
14:30	ICQ	: Yeah, cool, I work as in normal environment.
16:00	Text	Everything is OK
19:00	Text	It runs quickly.
20:30	Text	I wear blindfold glasses when I go to toilet or bathroom. I see such chiaroscuro, nothing particular. Sometimes I have feeling to see space around me, but after haptic control I realize it is illusion. It makes me unsecured in my movement around apartment. I have no mental map of that

		space. I feel still same, nothing new or extraordinary. I probably fully adapted to text environment. Yesterdays anxieties disappeared.
22:23	ICQ	: Oh, it is OK. There are no changes; I perceive normally, no hallucinations.
22:30	ICQ	: I afraid end of experiment and wearing off helmet.
23:00	Text	There is a change. I stop to appreciate it. It irritates me to perceive text all the time. It is not satisfied. My body says it is uncomfortable. So there is crisis. I feel so limited in my behavior. I have nobody to communicate. And I do not know, whether it is day or night outside. I can at least guess light in blackout glasses.
0:00	Text	I am calmer now. I browsed some stupid pages and changed my mind. I can just detour my way of thinking from self-perception and I feel better.

Tab.8 Sample of Recordings

Category	Visits	Percent
Search engines and Mails	7	4,22
Personal	75	45,18
School and work	57	34,34
Entertainment and Relax	26	15,66
Technical Setting	0	0,00
Shopping	1	0,60
Sum	166,00	100,00

Tab.9 Activity statistics

6.3.1 General

This day's structure of activities is comparable to normal working day. But there are still graduating feeling of frustration due to experimental environment, which escalates at 11 p.m. I feel resentment and want to terminate experiment. Seeing that there are neither changes in introspectional perception of mental images nor other phenomena, it is easy to understand such desires and moods. Stay in environment is available, but for narrow choice of activities as well as footling possibility of movement I did not find such environment sufficient.

6.3.2 Mental images

This day is ideal for staying in text environment investigation, since I spent approximately 11 hours in helmet. But I fail to evide introspectional changes or inadequate forms of mental images this day again. On this basis is originally planned 7 days stay reduced to 4 days.
I detect paradoxically only phenomenon of inadequate mental images during stay in blackout glasses. I have some sensation or image of space, but it is not identical to position of objects verified by touch. It is impossible to interpret these results more precisely, since glasses were blackout that way, to prohibit light deprivation of subject. They let through diffuse light, but it does not allow orienting in space. I can not prove that light did not induce image of space and objects.

6.4 Analysis of 4th day

Duration of stay in text environment

3	Hours	Text environment
1.33	Hours	No visual information
9	Hours	Sleeping

Tab.10 Summarization of stay duration

Time	Source	Text
11:20	Text	I could not fall asleep yesterday. I feel still the same and I am in good mood. Generally speak, I perceive stay in this environment as normal way of working or relaxing, but everything is very slow and complicated.
13:20	Text	I feel pretty uncomfortable in this helmet. 4 days in strange device on my face is enough. I am going to quit it in half of an hour
14:33	ICQ	: Yeah, I just finished. Space was like sphere, everything was deformed and very sharp and plastic. I could not adapt to it. Now it starts to calm down.
14:38	ICQ	: Everything was like in sphere and unrealistic to head movement.

Tab.11 Sample of Recordings

Category	Visits	Percent
Search engines and Mails	3	9,38
Personal	1	3,13
School and work	6	18,75
Entertainment and Relax	17	53,13
Technical Setting	5	15,63
Shopping	0	0,00
Sum	32,00	100,00

Tab.12 Activity statistics

6.4.1 General

Last day I spent in text environment only 3 hours. Dominating activity was relaxation and entertainment (more than 50 percent). During the day I perceive similar feelings as previous days. I am more and more confident about uselessness and complicatness of stay in such environment. Main argument is absence of anticipated phenomenon.

6.4.2 Mental images

As we can see in selected diary passages, this day is similar to previous ones. I do not reflect any abnormality, change, or other evidence about variance in the area production and perception of visual mental images. It's main argument for earlier termination of research.

6.5 Summarization

Total duration		
24.75	Hour	Text environment
9.33	Hour	No visual information

29	Hour	Sleeping

Tab.13 Summarization of stay duration

Category	Visits	Percent
Search engines and Mails	12	4,55
Personal	76	28,79
School and work	70	26,52
Entertainment and Relax	63	23,86
Technical Setting	28	10,61
Shopping	15	5,68
Sum	264,00	100,00

Tab.14 Activity statistics

Because experiment was divided into 4 days, whereas first and the last day mean only partial stay in text environment, there is more sleeping time than staying in text environment in overall result. If experiment should start already in morning on the first day, we obtain values corresponding to normal sleep-vigilance ratio.

Statistics of general activities shows dominance of personal arrangements followed by school and working activities and entertainment, corresponding to average distribution during normal day. It is possible to claim that structure of activities was similar to control conditions and had small impact on distortion of result.

6.6 Return to the normal environment

Even thought return to the normal visual environment was in terms of perception very intensive, we can attribute these changes rather to physiological reaction of organism. As an illustration there is Tab.15 showing selected passages of audio records after taking out helmet. Intensity of experience had declining tendency and after 10 minutes was visual sensation quite normal. During next days there were no unpleasant experiences caused by presented research.

Selected passages of audio recording after return to normal visual environment
(0:30) very intensive
(0:35) space is absolutely extraordinary
(0:50) I can just look down
(0:58) I am not able to look up
(1:04) I feel like in sphere
(1:20) everything is very round
Intensive colors
Now it is more stable, but the movement, like in helmet
I feel like in virtual reality
I can see very clearly and sharply
I cannot adopt to it
It is better to gaze to long distances
I can see very plastically

It looks that space is made of layers, and I can see very good dimensions of objects
But the movement is very uncomfortable
Sharp, everything is so sharp
(5:20) It is going to stabilize ...
(6:02) Yes, it is stabilizing
(Space) is moving much more faster than it used to.
If I turn my head slightly then the object I am looking at moves twice more faster than it has to.

Tab.15 Sample of records after taking out helmet.

7. Discussion

Presented results and analysis of given research tend to conclusion that during long-term stay in environment, containing visual information only in text form, perception of visual mental images is not distinguishable from perception of mental images in normal visual environment. Before more detailed analysis results, it is necessary to emphasize neglected or reduced aspects in current research.

I do not take into account other theories of mental imagery or representation, e.g. combination of two codes or forms supporting one another and working in parallel (Paivio, 1986). In case of taking them into account, which is for mutual incompatibility of theoretical foundations misleading, we can lose our original intention of empirical testability of "null hypothesis".

I do not also differentiate distinction between spatial and visual mental image, although current researches identify differences between these types of representation and attribute them significance in the process of production and perception of images. Particullary there are neuroscience researches about two cortical visual systems (Ungerleider, Mishkin, 1982), whose results were applied in experiments testing mental images on blind subjects (Knauff, May, 2006). Reasons for neglect these results are duration of preparation of pilot research and novelty of these experiments. In next phase will be mentioned studies take into account and experimental design will be adjusted.

If we step toward discussion of research results, we can do it from several points of view. It is possible to appreciate usage of helmet for virtual reality for artificial conditions simulation. Since I did not find studies using similar experimental design, I can judge it only on basis of obtained experiences. In the face of doubts related to ethical aspects, as well as doubts about subjects abilities to stay in such conditions without psychical troubles, research prove possibility to stay in simulated symbolic environment. That is why I advise to use presented experimental design for research in other areas.

It is possible to appreciate also method of long-term stay in environment. I cannot consider ideal longitude of stay on the basis of one trial, but as follows from records, 2nd and 3rd day are optimal for observation, because subject is already adapted to environment and there are not yet symptoms of discomfort. Another optimistic fact is quick fade-out of physiological problems after switching to the normal environment. Generally spoken, application simulation method is recommendable to next research, since expectations about impossibility of stay in experimental conditions were not prove.

We can consider as less satisfactory usage of method of text records and theirs further analysis. I presupposed that during research will be change of perception sufficiently intensive, so mentioned method can capture it. Unfortunately result shows necessity to record level of mental

images by more proper methods, as is planned full version experiment.

Considering hypothesis itself, we can interpret obtained results consequently. Since we withdraw investigation of frequency (production) of mental images in experimental and control conditions due to insufficient potentialities of comparation, it is possible to qualify only second part of hypothesis (perception of images). Analysis of records proved that during experimental conditions there is no change in perception of images capturable by given method. At the pilot phase of research we can reject hypothesis claiming that subject perceiving only text visual information on long term basis, will manifest changes in perception of visual mental images. But let us turn back to possible explanation of attained results, presented above.

In case, that production and perception of images will stay at the same level, we can explain such results in the following way:

a) Proposed experimental design is deficient for capture levels of mental images.

b) Methods used in pilot research aren't enough sensitive to capture levels of production and perception of images and therefore it is necessary to record experiment results by the help of more accurate methods.

Legitimacy of proposed explanations on the basis presented results is verifiable only by performing full version of experiment. In case of confirmation variant a) we would prove absence of changes in experimental results and affirm results of pilot research about nonvalidity of hypothesis. In opposite case is valid option b), we verify hypothesis and identify improper selection of methods for obtaining results within pilot phase. Performance of full version experiment leading to capture changes would subsequently allow us to interpret results on the basis of theoretic resource and considerations mentioned abov .

Evidence of increased production and perception of mental images originate doubts about validity of "null hypotheses". Nevertheless explanational power of relation between format of input information and resulting level of visual mental images is to a great extent disputable. On the chance of change confirmation, we can begin to polemize validity of "null hypotheses" in empirical level. And it means disputation about applicability of formal symbolic system or computational theory, on which basis is "null hypothesis" built. Final result is impeachment of cognitive plausibility of symbolic representational format. Even thought we can find similar ideas in studies of contemporary authors (e.g. Barsalou, 1999; 2003), it would be premature to make conclusion about these topics without performing full version of experiment, hence I'm leaving possibly explanation to subsequent research.

8. Conclusion

Result itself is fact that pilot research did not demonstrate capability to reveal new facts about nature of mental images. Potential of full experiment is foreshadowed in previous paragraph. On the basis of pilot research results it is possible to claim that we cannot expect intensive change in the area visual mental images.

Since it was self-experiment, whose disadvantage is also experimenters small distance from results, I would like to keep possibility of realization open for further discussion. From technical standpoint is evident, that planned experiment will demand better research conditions than pilot phase, which was carried without adequate financial and material background.

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