

EXPERIMENTS ON ANOMALOUS RETROACTIVE INFLUENCES IN THE CONTEXT OF THE THEORY OF GROWING BLOCK UNIVERSE

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Introduction

The study of the nature of time is at the edge of human understanding. In the physical sciences, the nature of time is deeply related to the most fundamental concepts of cosmology and quantum mechanics, unfortunately the present development of physics is not truly satisfactory in this regard, and the most comprehensive models of the nature of time are indeed due to philosophical studies [1].

The quest for further research should be initiated and supported by experiments, on the other hand the question is: which experiment? Our studies are very preliminary and we accept to follow a basic approach. We are immersed in our human nature and we all understand that physics is historically based on our senses. At some level of intensity and frequency all physical quantities can be sensed directly without instruments, that is how all physical research started in the past. Therefore if new effects related to time do exist, they should be sensed by a human subject at some level of intensity and frequency.

Measurements must be rigorous and the experiments repeatable. Models must be compatible with current knowledge.

Basic Information on D. Bem's experiment

The experiments of Daryl Bem from Cornell University [2] have become widely known. They are based on the experiments with priming effect. Standard priming research conducted approximately in a following way. The prime (word that have to change the reaction time) are presented to the participants. Than the stimuli words or images you want to identify or estimate according to the procedure are demonstrating. Evaluation of stimuli is faster if the stimulus is congruent to prime, and slower if it is discordant with it.

In experiments of D. Bem standard procedure of the experiment with prime was reversed in time. First the participant chose answer to the question about the image, then the prime was demonstrated. The hypothesis is similar to the standard priming research: picture stimuli are identified more quickly if the following word was congruent. In the experiments of D. Bem this mean that people could hear "a hint of the future."

Goals and tasks of the experiment

The general goal of our experiment was modeling D. Bem's experiment to test his results empirically.

The study involved 60 people, 31 men and 29 women. Balance of the gender, age and social status of the participants makes the sample homogeneous.

Information about the participants, each functions

The initiative of the research belongs to Dr. G. Fontana of the University of Trento. The experiment was conducted within the research program of the laboratory-chair of the Institute of the research of the nature of time at MSU [3]. We used the technical base of the psychology department of the Belarusian State University in Minsk. The software specifications are due to G. Fontana and the software was written by G. Fontana collaborator Michele Welponer using Java. In Minsk, the software was supplemented with stimuli material and adapted to the Russian-speaking users. The aim of the research group in Minsk was to organize the experiment, as well as to implement the mathematical processing of data and its interpretation. It is expected to continue research on a wider sample and more complicated program in the future.

Description of the computer program

Interface of the computer program is represented by a couple of empty gray squares. It incorporated a random number generator. The experimental results are exported in a text file.

The variable options of the program are:

Generation Period. This parameter specifies the generation period of random numbers. It is important to observe that generated random numbers belong to a pseudorandom sequence, and they are continuously generated, one every *Generation Period* time interval. Therefore the pseudo-randomness of the sequence is made truly random by the subject that takes a number out of the sequence at a random time. To make the study of time more detailed, the following options have been included.

Timeshift. This parameter indicates the time between the participant's selection action (click) and the selection of the random number from the continuously generated sequence. The positive value of this parameter allows you to select a random number (out from the continuously generated sequence) after the specified amount of time and after the selection of the participant. A negative value means that the random number was generated and saved before the direct choice of the image has been done. This option allows differentiating the alleged phenomenon of anticipation to the direct vision and "reading" of the computer's memory. The last means that the solution already exists in objective reality at the moment of choice.

Test tries means the quantity of test tries in the session.

The value of the option *stimuli* indicates whether the current session, use a neutral image, or affective.

The Role of random number generator (RNG)

It should be noted that the software RNG cannot be described in the full sense as the true RNG, because the mathematical algorithm underlying such programs involves a first preassigned number, from which comes the countdown. In fact it means the complete predestination. That's why this kind of generators are also called pseudo-random number generators.

In our experiment, we have not had an opportunity to use a different RNG, except the software, but the fact that the program allows to vary the period of generation combined with the random time of selection from the sequence lets us talk about true random result in the physical sense.

Period of relaxation.

After the participant took his place in front of a computer, he was given the following instruction: "This experiment allows you to test your ability to extrasensory perception. It takes about 15 minutes and it's performed completely with help of computer. To get started you will be asked to answer a few simple questions and fill in the information about yourself. Then the relaxation video will be started. Then the program which looks like two gray squares will be opened. Behind one of these squares is hidden image. Behind the second is nothing. Your task - click on that square, behind which you think the image is hidden. Then you will be notified about whether or not you choose the right one. There will be two sessions of 36 trials each. Please rely on feelings and intuition, and not try to logically predict the appearance of the image.

Some images are explicit and erotic. If such images is not acceptable for you, you should refuse to participate in the experiment. "

After reading the instructions the participant filled out information about themselves, then a three-minute period of relaxation started. The video was a fast-track sky shooting with relaxing music.

Priming was given in the instructions to the experiment as the prevention of the participants before the session about the character of the images.

Neutral images had no emotional coloring. For this purpose, were chosen rather trite images of nature in muted tones.

Description of the experiment.

The empirical study consisted of two sessions of 36 trials. In most cases first appeared neutral images, and then the affective image. This separation is due to the need to standardize procedures, as well as the need to ensure that the excitement of erotic images did not influence the selection of neutrals.

We sought the most accurate replication of the original experiment.

Results of the statistics

The data were processed by methods of mathematical statistics using SPSS software package version 16 [4]. The hypothesis: among the participants was significantly more those who guesses the most affective stimuli than those who guesses the most neutral stimuli, or those who guessed equally. The sample included 60 subjects - 31 men and 29 women. According to the results 15 people guessed more neutral stimuli, 34 guessed more affective and 11 guessed equally. Considering the fact that the sample is small and its associated (two measurement for each participant), Wilcoxon test was used. The result for the guessed affective images was 0.002; $p \leq 0,05$. This suggests that the choice of the affective images is not accidental.

In further analysis the sample was divided according to gender. We are Obtained the following result: men guessed neutral images at the average 17.16 times, women - 16.17; men guessed affective images at the average - 19.42 times, women - 17.34. In general we can conclude that men are more often guessed affective images than women, probably because of the specific of the images. With the help of the Mann-Whitney test we found the significance level of the sample: $p \leq 0,05$. Using the Wilcoxon test gave 0.301 for the neutral images, and for the affective - 0,005. The first of these two values is too large, the second is much less acceptable. This means that the men in the study were significantly more guesses these affective- images than women.

In the next stage of analysis, we attempted to find a correlation between age and the type of image. We used the Kendall's coefficient. Such a correlation was not detected.

Further Wilcoxon test was used to determine the significance of the results by gender. For men, the results were as follows:

These are significant at the .014 level at an acceptable value of $p \leq 0,05$.

The main hypothesis was confirmed for men. We could say that men guessed the position of the erotic images statistically more frequently than images of neutral position.

The same procedure was done for women. The result of Wilcoxon test - .056. This means that hypothesis was not confirmed for women.

The difference in depending on the sequence of the presentation affective or neutral images was not found.

In this way we obtained results indicating the possibility of obtaining information from the near future if the test subject is properly motivated.

Interpretation

The Block Universe approach for understanding the nature of time may be adopted to develop a philosophical and physical interpretation of our experimental data.

According to our experiment, that indeed confirms Bem's results, properly stimulated human subjects have the ability to access information from near future events with anomalous probability. It means that future events are already in existence and can be sensed. We do not know how they can be sensed, but we have measured that this phenomenon is possible.

We also measured that perfect prediction is not possible. It means that the human subject has a very rough capability of reading the events in the near future, or that those events are not immutable, but they do indeed change. We assume that both effects are present.

Philosophical approaches based on the Block Universe concept consider a static Block Universe, in which we merely experience a predetermined story, and an Evolving Block Universe, in which our actions create the story, therefore the Block Universe evolves. The present experiment seems to validate the Block Universe concept, but it remains to be determined why, if the future "already exists", it is not possible to read it more accurately than how our experiment shows.

A new concept of Block Universe emerges in which the overall story already exists and we merely "edit" it. The present experiment shows that we can sense future events by accessing the full Block Universe structure. This structure is obviously changed by us in "our" present time. If "other realities" can change the same structure outside "our" present time, our capability of reading accurately will be compromised in part by these additional "editors".

Surprisingly a rigorous physical model can be written in agreement with our philosophical concept.

In Einstein Special Relativity, the absolute distance τ between two events can be measured by the metric [5]:

$$(d\tau)^2 = c^2(dt)^2 - (dx)^2 - (dy)^2 - (dz)^2, \quad (1)$$

We rewrite it as:

$$c^2(dt)^2 = (d\tau)^2 + (dx)^2 + (dy)^2 + (dz)^2. \quad (2)$$

At the left we have the element of time t and the speed of light. At the right we have elements of the *four* space coordinates of our Block Universe. Being τ absolute

we extend its property to τ, x, y, z . All coordinates of the Block Universe are absolute and are space coordinates. Physically the four dimensional Block Universe is a *memory*, that is edited by space-times (1):

Space-times sweep the Block Universe at a speed that can be determined by simply rewriting again eq (1).

The speed clearly is the speed of light.

$$\left(\frac{d\tau}{dt}\right)^2 + \left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2 + \left(\frac{dz}{dt}\right)^2 = c^2. \quad (3)$$

This approach is known as Euclidean relativity [6]. Because photons travel at the speed of light in x, y, z , they are at rest in τ .

Matter belonging to a space-time is nearly at rest along x, y, z , and it travels at nearly the speed of light along τ . Therefore photons are orthogonal to matter, and a photon detected in a specific space-time (like the one we live in) is indeed emitted in a “very near” space-time located at some distance along τ , and co-traveling with the observer. According to Fontana [7] infinite space-times exist along τ , to make the model consistent.

The motion of photons combined with the orthogonal motion of matter in space-times makes photon/matter interaction causal and time-ordered. Information bearing physical quantities that can propagate in the four dimensional Block Universe but in unconstrained ways may be responsible of the phenomenology observed by us.

Two kinds of time emerge from our analysis. Time t is an evolution parameter that is used to determine the universal and invariant speed c , and time τ , that is the fourth “space coordinate” of the Block Universe. Being τ a full fledged coordinate, at any τ the Block Universe is defined and its content can be observed. At any τ, x, y, z , a historical event is recorded and continuously edited by sweeping space-times, like a movie director that continuously edits all the scenes.

Conclusion

We experimentally confirmed an unexpected anomalous retroactive influence on human behavior, first discovered by D. Bem.

In the context of the philosophical approach to the nature of time and the physical models derived from the reinterpretation (without changes in the mathematics) of

Special relativity, a new model of the nature of time is proposed that is compatible with the experiment.

Application A

Frequencies

Statistics

пол

N	Valid	60
	Missing	0

пол

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	man	31	51,7	51,7	51,7
	woman	29	48,3	48,3	100,0
	Total	60	100,0	100,0	

NPar Tests

Wilcoxon Signed Ranks Test

Ranks

		N	Mean Rank	Sum of Ranks
affective - neutral	Negative Ranks	15 ^a	20,37	305,50
	Positive Ranks	34 ^b	27,04	919,50
	Ties	11 ^c		
	Total	60		

a. affective < neutral

b. affective > neutral

c. affective = neutral

	affective - neutral
Z	-3,063 ^a
Asymp. Sig. (2-tailed)	,002

- a. Based on negative ranks.
- b. Wilcoxon Signed Ranks Test

NPar Tests

Mann-Whitney Test

		Ranks		
пол		N	Mean Rank	Sum of Ranks
neutral	man	31	32,74	1015,00
	woman	29	28,10	815,00
	Total	60		
affective	man	31	36,56	1133,50
	woman	29	24,02	696,50
	Total	60		

Test Statistics ^a		
	neutral	affective
Mann-Whitney U	380,000	261,500
Wilcoxon W	815,000	696,500
Z	-1,035	-2,807
Asymp. Sig. (2-tailed)	,301	,005

a. Grouping Variable: пол

Nonparametric Correlations

Correlations

			age	neutral	affective
Kendall's tau_b	age	Correlation Coefficient	1,000	,043	-,018
		Sig. (2-tailed)		,673	,862
		N	59	59	59
	neutral	Correlation Coefficient	,043	1,000	,154
		Sig. (2-tailed)	,673		,110
		N	59	60	60
	affective	Correlation Coefficient	-,018	,154	1,000
		Sig. (2-tailed)	,862	,110	
		N	59	60	60

NPar Tests

Wilcoxon Signed Ranks Test

		Ranks		
		N	Mean Rank	Sum of Ranks
affective - neutral	Negative Ranks	9 ^a	8,78	79,00
	Positive Ranks	17 ^b	16,00	272,00
	Ties	5 ^c		
	Total	31		

a. affective < neutral

b. affective > neutral

c. affective = neutral

```
USE ALL.
COMPUTE filter_$=(пол=1).
VARIABLE LABEL filter_$ 'пол=1 (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMAT filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
NPAR TEST
  /WILCOXON=neutral WITH affective (PAIRED)

  /MISSING ANALYSIS.
```

NPar Tests

Wilcoxon Signed Ranks Test

		Ranks		
		N	Mean Rank	Sum of Ranks
affective - neutral	Negative Ranks	6 ^a	12,58	75,50
	Positive Ranks	17 ^b	11,79	200,50
	Ties	6 ^c		
	Total	29		

a. affective < neutral

b. affective > neutral

c. affective = neutral

Test Statistics ^b	
	affective - neutral
Z	-1,914 ^a
Asymp. Sig. (2-tailed)	,056

a. Based on negative ranks.

b. Wilcoxon Signed Ranks Test

```

FILTER OFF.
USE ALL.
EXECUTE.
NPAR TESTS
  /M-W= neutral affective BY пол(0 1)

  /MISSING ANALYSIS.

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- [1] http://en.wikipedia.org/wiki/Block_universe and “General Philosophy of Science: Focal Issues”, edited Theo A. F. Kuipers, North Holland, Amsterdam First edition, 2007, page 326. available on Google Books.
- [2] D.Bem, <http://dbem.ws/FeelingFuture.pdf> and Journal of Personality and Social Psychology, 100, 407-425. 2011 American Psychological Association
- [3] <http://www.chronos.msu.ru/lab-kaf/Polikarpov/pol-issl.html>
- [4] <http://www-01.ibm.com/software/analytics/spss/>
- [5] http://en.wikipedia.org/wiki/Special_relativity
- [6] [http://en.wikipedia.org/wiki/Special_relativity_\(alternative_formulations\)](http://en.wikipedia.org/wiki/Special_relativity_(alternative_formulations))
- [7] G. Fontana “The Four Space-times Model of Reality”, AIP Conf. Proc. 746, pp. 1403-1410, 2005 and <http://arxiv.org/abs/physics/0410054>