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# SCIENCE DYNAMICS REVIEW®

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ČASOPIS PRO ROZVOJ SYSTÉMOVÉ VZDĚLANOSTI



## *Science Dynamics Masterclass*

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V TOMTO ČÍSLE:**

**50** years ago, Philipp Zimbardo invented and carried out one of the most famous psychological experiments. The general conclusion is the starting point of a work called "The Conspiracy of the Inferiors," which you will see in one of the next issues of this journal.

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# The Stanford prison experiment

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*Abstract: The article deals with the context in which the Stanford Prison Experiment took place in 1971. Similar experiments are mentioned, about which information has been preserved, and then the starting points, course and conclusions of the Stanford prison experiment are described in detail. In the main part of the work, the causes of the observed behavior are investigated, a causal loop diagram is created and subsequently a simulation model, the results of which are compared with the preserved records of participants' statements. The original conclusions are extended by the key missing element.*

Let others examine whether a fifty-year-old event is a current or historical, with one tending to attribute the second label to stories that, when perceived as current, cause unpleasant feelings with a tendency to evoke **anxiety** and **fear**. I believe that all events need to be considered in all circumstances according to their "learning potential," whether or not we were direct participants. Informative **myths** or **legends** can have a high potential, and if they are presented as myths or legends and not as a pure truth, there is no need to examine the proportion of historical facts. The story and the "lessons learnt" will suffice. On the other hand, a necessary precondition for the enlightenment of a **real event** is that it actually happened at all, someone wrote it down or memorized it, and we learn about it from a credible source. If we know the situation from storytelling or literature, caution is necessary. Us, who call themselves scholars, know, that the question is not whether the description of the event does not contain **misleading** information and **whether** or not something is **missing** in it. We ask what the **proportion of lies**, half-truths, mistakes and empty spaces in the description actually is. If such a situation frightens you, and it occurs to you that in the defense against contaminated data, from now on, you will focus only

on things seen and experienced "with your own eyes," I have sad news for you. The situation will not be much better in terms of the facts and ballast ratio. *Quod erat demonstrandum*, an event received by senses is only partially perceived by the individual, most of the information does not pass through **perceptual filters**, let alone be properly evaluated and remembered. Even remembered event does not remain threatened by **our own brain**, it is gradually not only forgotten, but also modified to ultimately support our **ideologies**, **worldview**, **values** and self-concept [1-4]. The primary feeling of guilt is unpleasantly perceived by those who have a **working conscience**, but a cat-o'-nine-tails, suitable for self-beating, reducing perceived guilt, does not belong, especially today, to the common equipment of a home first aid kit. It is easy to test that an event in which we figured from the point of view of morality or ethics as thugs is gradually modified by our brain, "put into the right context" and twisted so that it becomes a logical consequence of **someone else's mistake**. Preferably someone or something that can't defend himself or herself. But the first problem in all the above is that it was *demonstrandum* by **someone else**. And our own experience teaches us, that it is not always wise to rely on information provided by someone else.

...continues on page 3...

Fifty long years ago ... sorry, I'll start again. Just fifty years ago, Philipp Zimbardo launched a series of events that entered the literature under the title "**Stanford Prison Experiment** [6, 7]." Perhaps more has been written about the experiment than is healthy, and the topic returns relatively regularly, especially in the silly season, when a mischievous journalist tries to wake readers out of summer lazing with an article proving what bastards people are. The Germans, as the theme is apparently close to their hearts, even made a film based on the motifs of the experiment [8]. And in order to go even further, the film's *schauspielgeist* are now eagerly applying in practice. *Ante tempora multa*, I had the opportunity to work with one of my late friends, Barry, on the development of a model not only for the author but for a broad audience, capturing the dynamics of the experiment. When reading this text you can judge for yourself how much educational potential actually is in that fifty-year-old event and draw conclusions for yourself. According to available data, the history of **psychological experiments** dates back almost to the beginning of time.

Although they were not always presented as an experiment, it is clear from the context that, for example, the ancient text that talks about the situation, when "*the proband was led by the Spirit into the wilderness to be tempted*" describes a psychological experiment. Similarly, a several hundred years before, in the case of a certain Job, when the task of the experiment was: "*Ecce in manu tua est*" with a limitation of the repertoire of applicable methods, expressed by the addition: "... *verumtamen animam illius serva.*"

This way, we can get to the very beginning of the Universe and ask ourselves whether the whole creation is not indeed the experiment...

Let's stop metaphysical considerations for now and turn our attention to a number of much younger experiments, from Milgram's somewhat frightening **experiment with conformity**, where probands collected from the street punished subjects with electric shocks for "ignorance," pretended by actors behind a glass. Wast majority of probands, when given the chance, responded to the "ignorance" by increasing the current up to the life threatening levels. The experiment was repeated, this time with puppies. No wonder, some of them died. It is hard to forget the experiment with **mercy** from the year nineteen seventy-first, in which seminary students who were to preach the Good Samaritan **did not help the needy**, lying on the way to the auditorium, with the same probability as students who were to lecture on job offers, to (again to Stanford - perhaps someone should take a closer look at that institution ...) **experiment with marshmallows**, examining the impact of a child's ability to postpone the benefit of his or her success in adulthood. Then we can, without shame, fall into nihilism, or demand the speedy fulfillment of the promise from the seventeenth verse of the sixty-fifth chapter in the prophecy of Isaiah. Zimbardo had a "prison" built in the basement of one of the dormitories on the university campus and placed an advertisement in the newspaper in which he was looking for male students for an **interesting psychological experiment**.

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From the group of applicants, those who did not suffer from serious psychological or psychiatric disorders were selected. According to the author, the selected ones were randomly (really???) divided into two groups. To the "prisoners" and the "wardens." The author appointed himself the director of the prison, and they were all to spend a pleasant two or three weeks in prison, according to predetermined rules. However, the experiment **had to be stopped** on about the fifth day\*. Violence from guards broke out in the "prison", the "prisoners" were preparing to escape, and instead of maintaining balance and calm, the director himself went to the local police station to report that the prisoners are planning the escape. He didn't understand why the sheriff and deputy looked at him like a fool, and without the intervention of one of the outsiders \*\* who had managed to keep her sanity, it was possible that there would be serious damage to health and possibly to life. Both the participants themselves and the educated and uneducated public eventually refused to believe that it only took a few days for "normal" people to become what were captured by secretly installed cameras. And so it was known "what" happened. **Why** this happened remained a question. As with all complex behavioral manifestations, the resulting behavior can hardly be reduced to a function of a single variable. No matter how much we wish. Tracing the cause of today's failure to forty years ago denied ice cream on the third visit to the amusement park requires weeks, months and years spent on a psychoanalyst sofa, a lot of money and a dose of self-hatred.

\* The reports differ somewhat in the exact determination of the end, and the director himself did not make the problem clear.

\*\* her identity is known not only to the editors but also to the editor; for moral reasons, no one intends to divulge her under any circumstances.

The reward will be a simple equation of no unknowns, which will probably clearly demonstrate the monstrosity of the fifth commandment. For the rest of us, opponents of the *reductio ad absurdum* method, there is another way. In accordance with what has been presented and learned so far, we will create a **causal loop diagram** with parameters that play an important role in the imprisonment of so far free people, and we will add parameters for the behavior of those who are supposed to supervise the prisoners. When constructing the diagram, we will follow the principle of the minimum required number of variables, at which the diagram will still make sense. But don't wait for me and try to find the variables yourself in the empty space for Figure 1, which you think play a role in modulating the behavior of the freshly imprisoned people and their wardens.

Fig.1 Place for your variables

If you struggle, think about the position of a man devoured by hatred towards people devoured by hatred, for example. In such a situation, it is not difficult to conclude that after a while no longer is clear who is who. If the powerful ones decide that this or that hatred comes with a forbidden adjective, then so far law-abiding citizen will end up in a dungeon. Until now, he had been allowed to hate at will, anyone and anything, but now, to his horror, he learns that it is allowed to hate only hatred free of all adjectives. How to behave in such a situation? Even in situations where "we have no choice", **we choose**. We can get acquainted with the rules of the new place of residence and unconditionally obey them. Or throw a paper with a list of rules demonstratively on the ground, spit on it and kick the nearest warden in the shin to emphasize the attitude.

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But there is still a **golden mean**. I almost wants to say, the Czech way. Apparently, we can accept all the rules that dictate the wearing of nonsensical clothing components, the consumption of inedible substances and the wake-up call, but **sabotage** them to a barely noticeable extent. By drilling a hole in a garment and making an excuse for faulty product, hiding food and then disposing of it by throwing it in the waste, silent overnight stays and daily napping, thereby slowly, but step by step, increasing our feeling by imprisoning lost self-control, in other words sovereign control of our life. In my experience, Czechs are experts in similar behavior, many see its perfect expression in the most famous Czech novel the Good Soldier Švejk.

Self-control

Degree of resistance  
to the rules

Wardens brutality

Prisoners' fear

Fig. 2 Variables of the basic diagram of a prison experiment

Currently, it is possible to mention the otherwise quite well-behaved Mark, who has been addressing members of the judicial caste for years with the term "mourn honor..." Activities that bring pleasure, receive the highest priority and are repeated and intensified, until the (often bitter) end. And so the hole in the garment is replaced by the throwing the part away, disgusting food scattered on the furniture and floor and the tongue switched to call-to-call mode.

May sound a little childish, but nothing that could not be forgiven to a **free individual**. However, not to prisoners, especially if, by the will of providence itself, you are their warden. At first you will look stern, if that doesn't help, you can start spinning your baton. If it doesn't work, all you have to do is force the person to do pushups, then isolate, then beat, then starve, deprive them of sleep, and if it doesn't work either, then you have no chance but! You only try to do your job after all...

Now you know enough to derive variables that will form the basis of a causal loop diagram. Try connecting them yourself first, if you don't succeed, a short summary follows. The lower the sense of freedom, or if you want self-control, the higher the tendency to rebel. The more rebellion, the higher the feeling of freedom. From the point of view of supervisors, it is simple. The more rebellion, the more delayed, the more brutal. The more brutality, the less rebels.

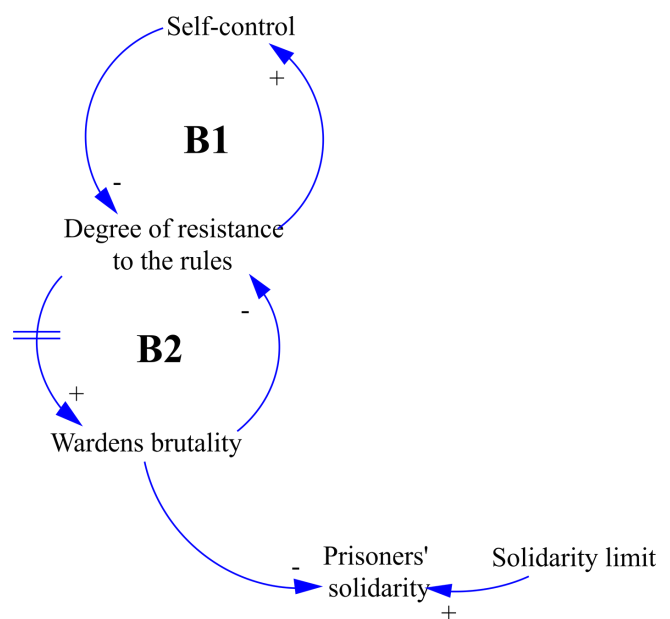


Fig.3 Basic loops of a prison experiment diagram

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I have added **solidarity** to the original list in Figure 2. It is known that the brutality of guards evokes solidarity among prisoners, but this is only true to a **certain extent**. If brutality exceeds a **certain limit**, solidarity between prisoners will disappear. We now have the diagram in Figure 3. However, examining the testimonies of students-prisoners and students-wardens, we conclude that our diagram does not explain **two phenomena**. All the prisoners jointly claimed (and camera recordings confirm their statements) that the brutality of the guards **continued to grow**, despite the fact that the prisoners **no longer put up any resistance**. The initial solidarity had long since disappeared, and with prisoners' fear of further violence grew with brutality. It was in such a situation that the experiment was stopped. A relatively easy solution lies in the role of **memory**. Two other elements of the diagram can be formulated - "prisoners' fear" and something like a "memory of resistance" in the guards, reinforcing the

further growth of brutality, as seen in the diagram in Figure 4. I omitted one important parameter in the diagram. Although it has a significant effect on both the behavior of the participants in the experiment and the behavior of the prisoners in a real prison. Can you figure out which one it is? It has been discussed several times in the previous text. If not, I'll give you a little hint. Is resistance the only possible response to loss of freedom? Is that enough? The diagram seems to make sense, draw your estimate of the behavior of the individual variables on a free sheet of paper. As you already know, mental simulation is usually treacherous even with relatively simple systems. So all that remains is to start creating a flow diagram - a simulation model. The model is not complicated at all, I will not describe the individual steps of creation, equations or graph functions. This time you have to make it alone with help in the form of a structure. As with all models of human behavior, we cannot do without a number of graph functions describing the influence of one parameter on another.

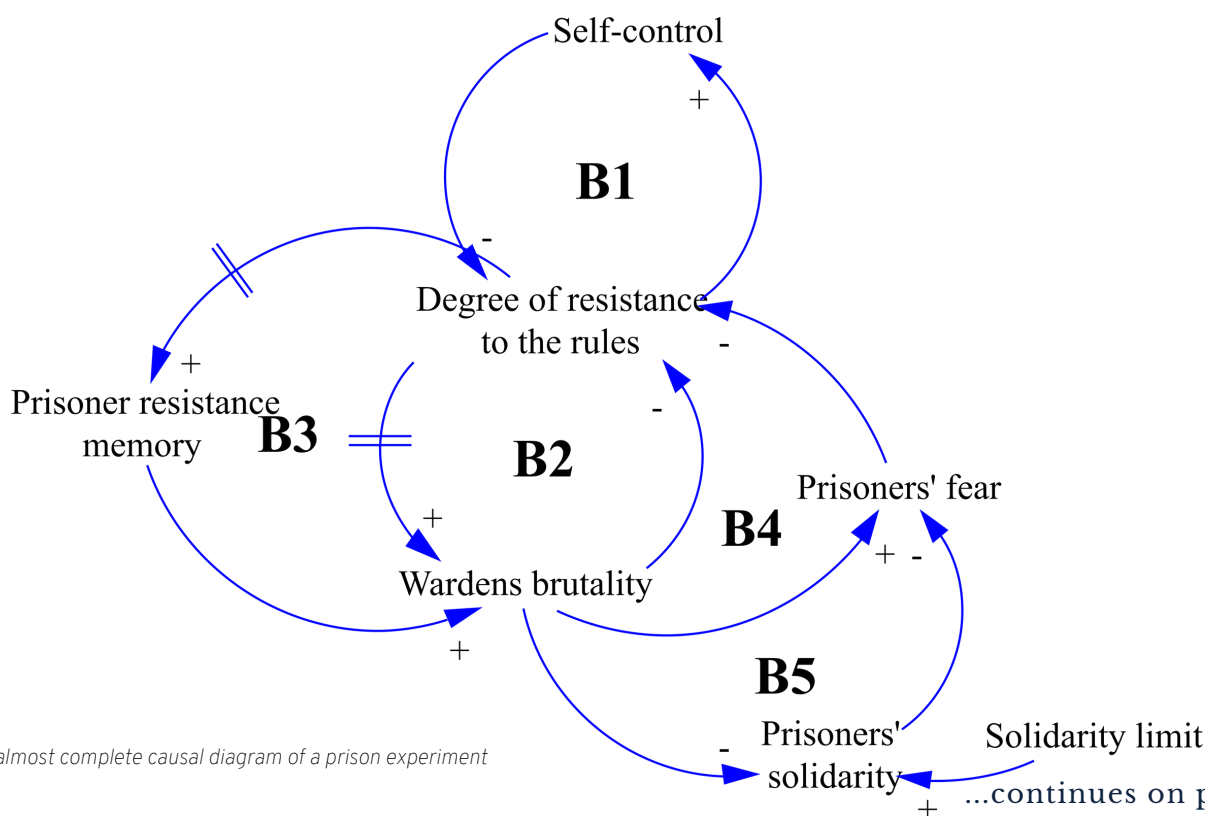


Fig. 4 An almost complete causal diagram of a prison experiment

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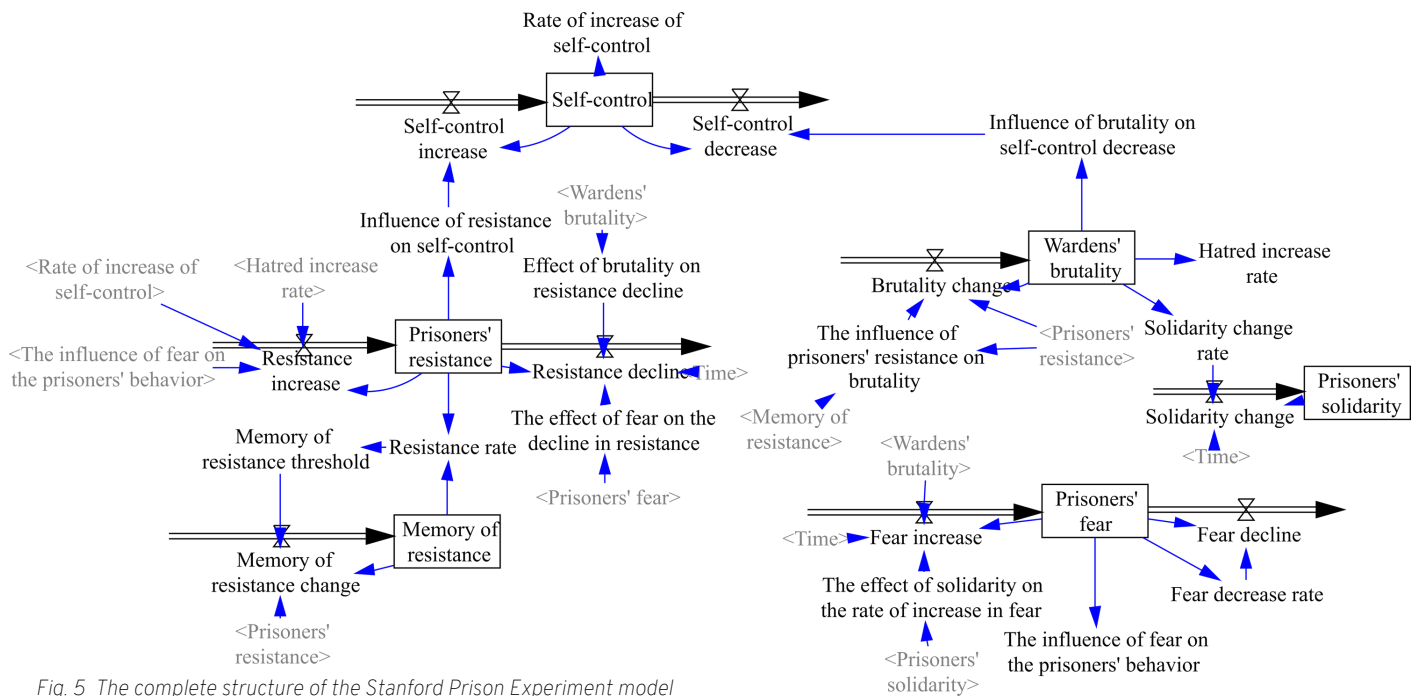


Fig. 5 The complete structure of the Stanford Prison Experiment model

In our case, it will be the *Influence of Resistance on Self-Control*, *The Effect of Brutality on Resistance Decline*, *The Influence of Fear on prisoners' behavior*, *The Influence of Prisoners' Resistance on Brutality*. In situations where two (often conflicting) feelings or emotions collide, or an accelerating or delaying effect of time is applied, create variables expressing the **degree of change**. In the model, these are the *Fear Decrease Rate*, the *Solidarity Change Rate*, the *Resistance Rate*, the *Rate of Increase of Self-Control*, and the *Hatred Increase Rate*. Human behavior derives from a highly nonlinear system, and whether a given influence is applied in the result does not have to be and is not given by the value of the **initial parameter**, but precisely by the **rate of its change over time**. The resulting structure of the model can be found in Figure 5. We will simulate only five days, this time set the integration method to Runge-Kutta of the fourth order and the time step to 0.015625; the output graphs will not look jerky.

The result of the simulation of the parameters that interest us the most, i.e. *Prisoners' Solidarity*, *Prisoners' Resistance*, *Wardens' Brutality* and *Prisoners' Fear*, can be found in Figure 6. In response to the brutality, a wave of solidarity arose among the prisoners, but with increasing brutality it began to disappear rapidly. When the brutality reached a certain limit, the resistance began to decline exponentially, but the brutality continued, hand in hand with the fear of the prisoners. It grew as guards remembered prisoners' resistance, and fear grew as a result of growing brutality. By comparing the output with the records of the participants' statements, we find that the model shows exactly the same behavior as described by the participants in the experiment. It remains to be asked whether things would have turned out differently if someone merciful in the middle of the experiment or a real prison had banned the brutality in enforcing the rules.

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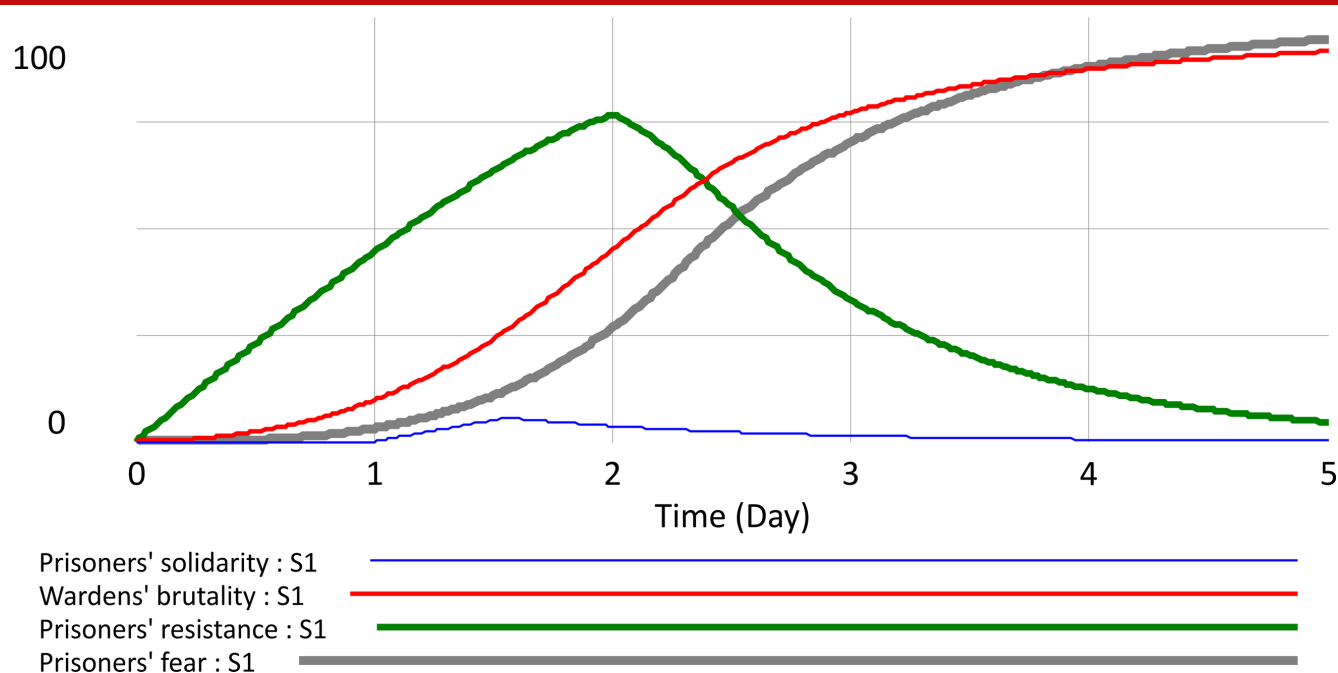


Fig. 6 Result of simulation of selected parameters of the Stanford prison experiment model, all parameters are a dimensionless index with an interval  $<0;100>$

I received this question many years ago from the then highest representative of the prison guards of a certain country. In a similar model, it was not difficult to prove that in such a case the roles would switch very quickly and the original prisoners would become wardens. Would it be different if the author of the experiment made the group that became a prisoner a warden and vice versa? We know from countless sources that it would turn out the same way [9, 10]. The most important conclusion of the Stanford Prison Experiment was the rule that the **structure of the system determines the behavior of the entities that operate within the system**. Nevertheless, its wording is **very incomplete**. Ask yourself what caused the behavior described above. Yes, it was undoubtedly a system, but it did not do without the **willing participation of entities**. The greatest successes and tragedies are always due to the interaction of the system and the **person** who cannot get rid of their share in the resulting guilt in any way, even if they try their best. **It is not a system that kills and destroys. The system does not determine the behavior, but enables ...**

So could prisoners or guards behave differently? Over the course of our lives, we find that finding the **external culprit** is a well-functioning method in "developed" countries, so it's no wonder that in a situation that requires embarrassed whispering "*Mea maxima culpa!*" the position of a **poor victim** who couldn't help it but become a **parasite, drug addict or criminal**. If you're beginning to understand that the system and behavior rule applies to you, writing this article wasn't a waste of time. According to the original conclusion, to change the behavior is to change the system, but we already know that those who play this game and decide on the outcome are in fact **two**.

#### Reference

1. Barber, P.J.a., Applied cognitive psychology : an information-processing framework.
2. Denes, G.e., C.e. Semenza, and P.e. Bisiacchi, Perspectives on Cognitive Neuropsychology. 1st ed.
3. DePascalis, V. and W.J. Ray, Effects of memory load on event-related patterns of 40-Hz EEG during cognitive and motor tasks. International Journal of Psychophysiology, 1998(28): p. 301-315.
4. Susta, M., Systems Thinking Guide. 2. ed. 2016, Praha: Proverbs. 136.
5. Smoljak, L., Z. Sverak, and J. Sebanek, Akt. 1967, Supraphon: Prague.
6. Zimbardo, P.G., The Lucifer effect : how good people turn evil. 2007, London: Rider.
7. Zimbardo, P.G., E.B. Ebbesen, and C. Maslach, Influencing attitudes and changing behavior : an introduction to method, theory, and applications of social control and personal power. 2nd ed. ed. 1977, Reading, Mass. ; London: Addison-Wesley.
8. Hirschbiegel, O., Das Experiment. 2001: Kleindeutschland. p. 120.
9. Maynard, K.K., J. Kearney, and J. Guimond, Revenge versus legality : wild justice from Balzac to Clint Eastwood and Abu Ghraib. 2010, Abingdon: Birkbeck Law.
10. Mitchell, N.J., Democracy's blameless leaders : from Dresden to Abu Ghraib, how leaders evade accountability for abuse, atrocity, and killing. 2012, New York: New York University.





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- o Simple model production-sales
  - o Management game "Production lines," creating a simulator step by step
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  - o Market growth
    - o Project management model, demonstration of subscripts
  - o Epidemics - a paralell to Word of Mouths (models SI, SIR)
  - o CASH-FLOW model
  - o MS Excel as a model data source
  - o Demonstration of the Sable software (SD-SAB1)

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