Parallel Presentiment Tests Can Verify the Effectiveness of Our Free-Choices[1]

Ephraim Y. Levin

Independent researcher

Abstract: Our inability to rewind time may cast some doubt about the genuineness of the effectiveness of our free choice capability. I suggest that the so-called presentiment anomalous experience can be used to verify this genuineness. The idea is to post stimulus compare averaged results from two apparently "similar" presentiment tests ("channels") carried out simultaneously on the same individual. Before the occurrence of the stimulus an experimenter decides, in real time, whether to observe the measurements in any channel or not and immediately performs this decision before the occurrence of the stimulus. A case in which a channel is observed during real time and a case in which it has not belong to different decoherent histories. This holds true because according to the "Orthodox Interpretation" of quantum mechanics the conscious observation collapses the multitude of possible pre stimulus measurements to just the perceived one. In such cases quantum mechanics imposes a disappearance of the retrospective presentiment effect. Thus, in such a parallel design one can compare what happens when an observation is carried out and is not carried out at the same time instance. The presentiment effect disappearance in the observed channel despite its appearance in the unobserved channel for the same moments is thus evidence for the effectiveness of the experimenter's willed observation.

Keywords: consciousness; quantum collapse; effective free choice; presentiment; decoherent histories

Highlights

- Our inability to rewind time and then repeat an experiment under counterfac-

1 Address correspondence to: Ephraim Y. Levin, Ph. D., Yoni Netanyahu 30, Givat Shmuel 5442504, Israel, ephraimlevin50@gmail.com

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tual conditions seems to rise suspicions about the genuineness of the effectiveness of our free-choice capability, rendering the issue a philosophical one.

- Using the reputed recent empirically supported Orthodox Interpretation of quantum mechanics, this paper argues that by comparing the results of two simultaneous naively "similar" presentiment tests on the same single individual one can empirically verify the genuineness of the effectiveness of our free-choice capability.

- The aforementioned two simultaneous naively "similar" tests actually differ by an executed autonomous decision of an experimenter to consciously observe the pre-stimulus measurements in real time (that is, before the presentation of the stimulus) in one of them.

Acquiring knowledge about the world through experiments, perceptions, induction, modeling and deducting checkable predictions defines the scientific method. This is an iterative process. The hope is that we can use our freedom in selecting experiments to disprove any wrong theory eventually. Hence, our capability to choose a question freely and pose it to nature at any moment we prefer is a fundamental presumption in advancing science. Were our apparently free decisions genuinely ineffective delusions, the effectiveness of the scientific method might become illusive. Its very status as a way to reject false theories and thus asymptotically discover the truth would be lost.

For the founders of Quantum Mechanics (QM) it was of utmost importance to allow this freedom in the quantum theory. Bohr (1935) claimed "our freedom of handling the measuring instruments [is] characteristic of the very idea of experiment." Indeed, in QM the choice of the question to be asked and the choice of the time to carry out this questioning experiment are free, in the sense that QM does not forbid different tests and timings. For example, it allows a test of a position or a test of a momentum. Likewise, it allows angular momentum measurement along one out of infinite possible directions. (In fact, due to the non-commutativity of various observables, to measure some observable property exactly the physicist *must* usually select a single definite observable to study at a specific moment. This happens because QM forbids exact measurement of several non-commuting observables at the same moment in principle. Hence, in order to get some exact information about the relevant system the physicist has to select *a specific* questioning aspect.) Another example is how many detectors to use in the experiment and how to distribute these detectors in space. QM supplies no rule whatsoever (neither deterministic nor probabilistic) for the pick. It leaves it completely free, up to the experimentalist. Nevertheless, it is undeniable that

somehow the scientist makes a decision. This means that not only physics happens in the context of an experiment. In the lack of any imposing physical law, it seems to be a psychological choice. Therefore, the quantum theory seems as a framework for an at least *psychophysical* theory.

Furthermore, QM dictates that the answer to a well-posed selected question will fit *that preferred question*. That is, QM claims that in such a case the observed system will be found in the ray (a whole class of normalized state vectors that differ from one another only by phase factors, i.e., by numerical factors with modulus unity) associated with a corresponding eigenvector (a nonzero vector that changes at most by a scalar factor when the observable is applied to it) of *that specific chosen observable* in Hilbert space (a vector space equipped with an inner product that defines a distance function for which the space is a complete metric space). In such a case the answer will be some eigenvalue (a factor by which an eigenvector is scaled when an observable is applied to it) of *that specific chosen observable*. This means that the theory clearly shows that although the experimenter does *not* completely determine the result, the experimenter's choice regarding the question to pose to nature *is efficacious*. The well-known Quantum Zeno Effect (Aharonov & Rohrlich, 2005), for example, clearly exhibits this effectiveness. It appears that in the quantum theory different posed questions will end up with different futures.

However, conventional thinking holds that we have only a single world and time always "flows" forward. Whatever result one gets in an experiment, it is unique. So, once an experimenter makes a decision any other alternative prior possible decision become counterfactual. A counterfactual experiment cannot be carried out. Posing to nature *at the same moment* any alternative question using another similarly prepared system cannot absolutely convince a stubborn skeptic. After all, this new question is directed at another system. Even by repeating any experiment on a well-reprepared system, one cannot reach the goal. (That is because the very moment of execution will never be the same.) We absolutely cannot rewind time in order to pose another question about the very same system under exactly the same conditions (including the same time) in a hope of observing the appearance of a different result in a counterfactual test. Hence, our inability to rewind time casts some philosophical doubt about the agent's real freedom involved and the genuine effectiveness of these choices.

Indeed, Greene (2004), for example, claims that an inescapable consequence of the theory of relativity is that, at least theoretically, we should be able to find all past and future events queued up in the form of world lines, and these past and future events exist together, at once, in one eternal, frozen `static block universe`. They will forever remain so. It seems that this worldview leaves no place for genuine influenc-

es of agent's carried out free decisions. (Needless to say, this "inescapable consequence" is not unanimously accepted. For an example, Capek (1976, p. 521) shows that "The virtualities of our future history which our earthly "now" in the universe separates from our causal past remain potentialities for all contemporary observers. Something which did not yet happen for us [locally] could not have happened elsewhere in the universe."

The fundamental traditional scientific belief in the agent's freedom to choose a test and the aforementioned lack of QM's restrictions over the experimenter's decisions led Bell (1964) to predict the, by now empirically confirmed, violation by QM of his famous inequality. However, concerning this, Bell himself noted that there is a far-fetched way to escape the inference of superluminar speeds and spooky action at a distance by assuming superdeterminism in the universe. That is, by completely denying the apparent agents' free ability to choose to do one experiment at one moment rather than another at another moment. The replacing idea is that all choices were predetermined already earlier (say, at the Big Bang, where all backward light cones presumably overlapped). (If this idea is accepted there is no need for a faster than light signal to tell particle A what measurement has been carried out on particle B, because the universe, including particle A, already "knows" what that measurement, and its outcome, will be.) Were we able to rewind time in order to pose a counterfactual question about the very same system under exactly the same time and conditions we could have try to falsify superdeterminism (by showing that particle A is being told about what measurement has been carried out on the far particle B only during real time). Unfortunately, time always seems to advance forward. Therefore, we cannot act in this way and we are left with a philosophical doubt. Bell (1977, 104) phrased this difficulty by saying "In this matter of causality, it is a great inconvenience that the real world is given to us once only. We cannot know what would have happened if something had been different. We cannot repeat an experiment changing just one variable; the hands of the clock will have moved, and the moons of Jupiter". The superdeterminism idea is advocated nowadays as well by some scholars. For instance, by Hossenfelder & Palmer (2020). They rephrase the above Bell's citation (p. 4) as "'In summary, Statistical Independence is not something that can be directly tested by observation or by experiment because it implicitly draws on counterfactual situations, mathematical possibilities that we do not observe and that, depending on one's model or theory, may or may not exist."

In addition to the aforementioned gap concerning the experimenter's side, the quantum theory has a causal gap on nature's side. Though QM lacks an explanation of the selection process by which a particular result is obtained for a well-posed question, nature at least commits itself to the Born (1926) statistical rule. Inclusion of

the behavior on nature's side in the QM's worldwiew causes the quantum theory to look like a framework for a theo-psychophysical theory. That is, some immaterial Deus-ex-Machina obeys the Born's rule and decides about the final result in every test. Similar doubts may be raised concerning this gap as well. That is, a stubborn skeptic may ask how can one become convinced about the coexistence of the QM's tendencies (sometimes called propensities). After all, in each well-prepared test the experimenter gets a definite answer. Being unable to rewind time and exactly repeat the same test on the very same system to observe another result, one may remain skeptical about the real coexistence of these tendencies and suspect that the famous QM statistical fluctuation is epistemic. That is, that these tendencies are only "pretending to exist" *for us*. This "ontic or epistemic" question has bewildered physicists and philosophers ever since the formulation of QM. It amounts to the basic puzzle of whether one should regard QM as a *discovery* or as an *invention*. The unsettled debate reflects itself in the generation of a multitude of interpretations for the quantum theory.

An Account of the Presentiment Effect, Its Explanation, and the Involved Premises

Despite the fact that according to orthodox physics one cannot sense an undetermined future event prior to the occurrence of the event, during several decades what seem to be successful presentiment experiments (PSEXs) have been carried out and replicated (Duggan & Tressoldi, 2018). In such experiments, physiological arousals of participants, such as skin conductance, heart rate, blood volume, respiration, EEG, pupil dilation, blink rate, and blood oxygenation level dependent responses, are monitored and recorded during several seconds by computers. The records are taken before (and usually also during and after) randomly presented stimuli designed to evoke either a significant or a nonsignificant psychological poststimulus response. As one may expect, this psychological response can objectively be inferred from *poststimulus* physiological measurements. However, after averaging the results for each specific *prestimulus* time over many trials, a statistically significant difference between the *prestimulus* response to stimuli that evoked a significant poststimulus response and the *prestimulus* response to stimuli that did not evoke a significant poststimulus response clearly emerges as well. Although the bare effect is small and imbedded in strong noise (i.e., an estimated effect size of 0.28 with 95% confidence interval of 0.18-0.38 (Duggan & Tressoldi [4])) the averaging improves the signal to noise ratio. This improvement allows the difference to become statistically significant; over six standard deviations.

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Various potential mechanisms to explain the surprising effect as an artifact were discussed and examined over the years but were rejected. The aforementioned meta-analysis (Duggan & Tressoldi, 2018) as well as Mossbridge & Radin (2018) concluded that the presentiment effect (PSE) seems to be confirmed and can be considered among the more reliable anomalous effects.

"Orthodox QM" is a term introduced by Eugene Wigner to describe von Neumann's formulation of QM (Stapp, 2017b, p. 19). (This does not necessarily mean that his Orthodox interpretation is currently supported by the wide cohort of physicists.) Utilizing orthodox QM Levin (2020) justified the existence of this effect by contemporary QM's ideas. He initially showed that an efficient real-time prediction of an unpredictable future sentiment is impossible. He then recalled the difference between an "actual-past" and an "effective-past" (Stapp, 2017a) in QM. By using this QM's idea of a difference between an actual-past and an effective-past (i.e., the historical-past) he suggested that the PSE is merely a "quantum delusion". I.e., it really appears, but in retrospect only. Levin (p. 193) describes the basic idea as follows.

> According to orthodox QM, there are *two* different pasts: The "actualpast" that was there before the collapse and included all the potentials, and the effective-past that, in principle, is defined as the backward-intime continuation via a relevant Schrödinger equation, of the immediate future that exists just after the collapse. The effective-past keeps changing even though the causal dynamical process is strictly forward in time. (…) this is a result of the fact that in a collapse event one of the possible classically described worlds survives, along with the actualization of the potentiality approximately represented by the classically described process that the actualization event selects. The collapse eradicates all the other possibilities. An evolution in time according to the Schrödinger equation is essentially continuous. Therefore, it is only reasonable to expect that the averaged record (…) *before* the mental event in the causal offshoot of what survived the collapse had been correlated to the value of it shortly *after* the mental event took place. The point is that when the experimenter is statistically recovering the PSE the subject already knows in every single specimen in the averaged poll whether he had a strong stimulus (…) or a weak stimulus (…). This question was settled already. It had already served as a final boundary condition for the evolution in time in that case. Poststimulus collecting of the survived prestimulus records and statistically averaging them over the cases thus recovers the effective-past instead of the actualpast.. Therefore, for real-time statistically averaging prestimulus collection of records

> orthodox QM predicts a negligible mean (…). Whereas by statistically averaging poststimulus collection of survived prestimulus records over the cases we get, in a way compatible with contemporary QM, an effective-past's PSE that is not negligible (…).

Levin (2023) went further and *mathematically* explained the way in which this effect retrospectively appears in the quantum theory. In his explanation he relied on the contentious claim of the Orthodox Interpretation of QM (OIQM), that the reduction of the quantum state occurs at the moment an agent's mind perceives the observation. Hence, although unobserved prestimulus records are decohered they retain their tentative nature (i.e., remain coexisting possibilities) until the moment the participant's mind consciously perceives the stimulus.

This OIQM claim for the participation of the mind in a step of the von Neumann's Process 1 is sometimes hastily and a little carelessly called Consciousness *Causes* Collapse (CCC). A more careful wording should probably say that mind initiates the Process 1's step by posing a question and then consciously perceives Deus-ex-Machina's selected answer, where the term Deus-ex-Machina stands for a non-psychophysical abstract entity needed in the QM machinery. Whereas during the sixties Wigner (1961) suggested that Consciousnesses (i.e., *minds'* features) *Causes* Collapses and wrote (1961, p. 173) "It is the entering of an impression into our consciousness which alters the wave function because it modifies our appraisal of the probabilities for different impressions which we expect to receive in the future. It is at this point that the consciousness enters the theory unavoidably and unalterably.", Pauli (1954) preferred to endow a non-psychophysical abstract entity with such an astonishing ability. For Pauli the determinate mental state of an observer only *statistically supervenes* on the observer's physical state. On page 223 Pauli wrote that the appearance of the collapse of a system to a definite position during an observation is "a 'creation' existing outside the laws of nature." (Indeed, given the facts that we have no intuitive feeling that we are actually carrying out this task and no idea how our minds can perform such a task in the first place, and what we nowadays empirically and theoretically know about the QM's non-local nature (Stapp, 2014), such an omnipotent Deus-ex-Machina presumably is better equipped for this marvelous task than our restricted minds.)

Assuming that whether an emotionally significant experience would occur can be considered a "Yes" or "No" question posed to nature, Levin (2023) assumed that the initial state of this qubit of information represents total ignorance. He then used the formula to calculate from this initial ignorance state's density matrix the probability of a history composed of a sequence of decoherent alternatives and the usual rules of the classical probability theory to calculate the conditional probabilities to get "Yes" or

"No" records at any prestimulus moment given any poststimulus record. Throughout these calculations the most general 2X2 time evolution matrix has been used. Eventually, he used these conditional probabilities to calculate the retrospective difference between the average at a prestimulus moment due to an emotionally significant stimulus and the average at the same prestimulus moment due to an emotionally insignificant stimulus. This retrospective difference turned out to fluctuate as a function of the involved prestimulus time resembling the empirical PSE. He argued, therefore, that the shown OIQM's success to explain the statistically well-established empirical existence of the PSE is clear evidence that this interpretation is the correct one.

The physiological arousals in which the PSE is detected, such as skin conductance using electrodermal activity (EDA), have poor resolution as for identifying the influential sentiment. The activities measured by it at any moment are apparently a combined weighted response to several, sometimes temporally shifted relative to one another and even conflicting, sentiments. Therefore, usually one should not expect that just a single sentiment will determine the EDA signal over a long period. Over time, other sentiments may usually contribute their influence to modify the effective EDA signal. That is, it is not only that the value of Levin (2023)'s n_3^2 may depend on the experimental case, even with a plausible Levin's $n_3^2 = 1$ value it is more reasonable than not to expect the PSE to be of finite duration only. Simply because most probably some earlier, different, sentiment prevailed at that earlier moment. Nevertheless, sentiments are a slippery thing and unless being masked by such other hypothetical earlier sentiments, the aforementioned fluctuation of the retrospective difference as a function of the involved prestimulus time that Levin (2023) obtained in his model has a constant amplitude. Levin (2023) suggested to associate this constancy with the results of an experiment on prediction with planarian worms described by Alvarez (2016), who found an apparent predictive behavior even one whole minute before the stimulus. In this respect, it is also relevant to mention the results of Radin (2023), who analyzed 13 years of daily Twitter sentiment data in 10 languages. The sentiment data was examined *two weeks* prior to events assessed as significantly negative and unpredictable (including acts of terrorism, mass shootings, unexpected deaths of celebrities, etc.). Results of the analysis were statistically significant ($p = .001$), suggesting the existence of a form of a long-time collective presentiment.

According to Schlosshauer et al. (2013), it appears as if the majority of researchers in the foundations of physics have left behind the relationship between physics and psychology and in particular the aforementioned hypothesis that the observer's consciousness plays a distinguished physical role (i.e., CCC). However, this fact, by no means, implies that somebody *proved* that the Orthodox Interpretation is wrong and untenable. One should not judge scientific quality by popularity alone (recall that

Newton's classical physics enjoyed very high popularity during the beginning of the nineteenth century, yet in the twentieth century it lost popularity drastically and better theories replaced it).

Bierman (2006) pointed out that for a PSE to occur, the mind has to *consciously* perceive the Deus-ex-Machina's selected answer. While describing a successful re-examination of published data (originally collected in 1993 by Murphy and Zajonc for other purposes than showing a PSE), Bierman realized that although a previously unnoticed PSE was indeed buried in the data when the pictures` exposure time was long enough, no PSE was present in the data when the pictures` exposure time was less than about 100msec. Since less than about 100msec is too short for a full comprehension of the contents and meaning of a picture, he suggested that for the PSE to appear conscious observation is apparently a requirement.

Concerning this issue, it is interesting to note the CCC assumption recently got an additional empirical support from other psychological experiments. Lucido (2023) used true random number generators, and an experimenter's early conscious observation of the coexisting possibilities for subliminal stimulus to reduce these possibilities to a definite stimulus, in the process reproducing the empirically well-established subliminal priming. After confirming that a usual subliminal priming effect had indeed appeared, he skipped the experimenter's early conscious observation of the coexisting possibilities for subliminal stimulus and repeated the test. He discovered that the subliminal priming effect disappeared. Recalling that the priming paradigm is a well-established one, one can consider the vanish of it an anomalous cognition effect. Lucido (p. 193) concluded, therefore, that his findings support the CCC interpretation; "The outcome suggests that the act of conscious observation may play a critical role in quantum mechanics, and, by extension, physical reality." Lucido (2023, p. 193) then first cautiously suggested that "replications of this investigation will be necessary to establish more confidence in the outcome obtained". Later on, in a so far unpublished paper, he successfully replicated that investigation.

Given that OIQM appears to provide a context in which the well verified existence of the anomalous PSE and the disappearance of the subliminal priming effect due to the avoidance of the experimenter's early observation of the coexisting subliminal stimulus possibilities can be explained, we now describe a design of a parallel PSEXs and the way in which such an experiment circumvents the time rewinding inability obstacle for verifying the genuineness of our free choices.

How Can Parallel PSEXs Circumvent the Time Rewinding Inability Obstacle?

To avoid the aforementioned time rewinding inability obstacle for proving the experimenter's genuinely effective freedom to pose questions to nature, one has to carry out two experiments of different types on the same system during exactly the same time. One must collect records from these two tests and show differences between these two groups of records. To avoid the time rewinding inability obstacle to proving the coexistence of various ontological tendencies, one has to show that the answer to any posed question can result in two different coincident results. Common wisdom seems to say that we can never satisfy such demands.

To satisfy these demands we suggest here a use of a modified (in the sense of Levin (2020)) PSEX and a non-modified (that is, a usual) PSEX in parallel. In principle, any physiological arousal that usually uses one out of an organs pair to exhibit the PSE may be used. Obvious candidates are skin conductance and pupil dilation.

In line with OIQM, we assume that an appropriate projection of the current world-representing ray represents in the Hilbert space the agent's conscious mental event by itself. The projection is onto the ray that describes the new situation consciously felt by the agent.

Suppose that we are talking about skin conductance measurements using electrodermal activity (EDA). According to OIQM, one may consider an agent as a whole individual with a single united consciousness. In principle, the conscious mental events of the participant are what really matter. However, the physiological EDA signal witnesses these mental events through some transfer function. Since distant organs may use different transfer function (that is, may be operated by distant centers in the brain, may have different neuronal length etc.), and we want the two channels of the parallel PSEX to measure systems that are as similar as possible, we shall farther connect the two pairs of electrodes to the same (non-active, say left) hand. The experimenter can minimize worries about possible harming interference between the two pairs by using relatively far locations on the same palm. For example, one can attach a first pair of electrodes on the distal pads of the first (index) and second (middle) fingers and attach a second pair of electrodes to the distal pads of the third (ring) and fourth (pinky) fingers (Fig. 1a). Alternatively, the experimenter can attach one pair of electrodes to the volar distal phalange and the volar proximal phalange of the index finger and attach the second pair of electrodes to the volar distal phalange and the volar proximal phalange of the pinky finger (Fig. 1b).

Figure 1

Electrode Configurations

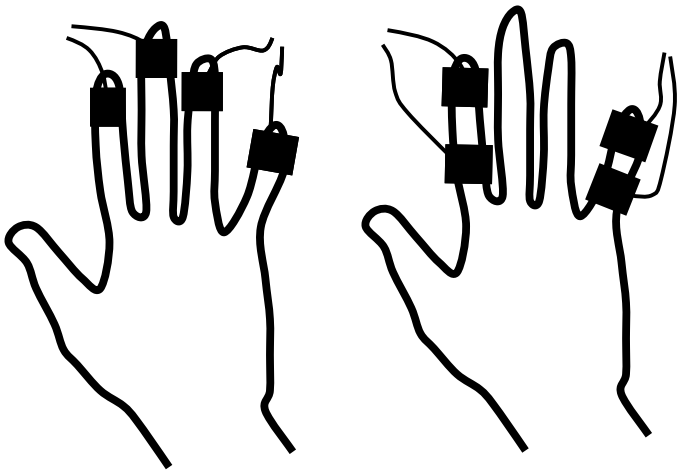

Fig. 1: a) *One pair of electrodes attached on pads of the first and second fingers and another pair attached to the pads of the third and fourth fingers*.

b) *One pair of electrodes attached to the distal and the proximal phalanges of the index finger and another pair attached to the distal and the proximal phalanges of the pinky finger.*

One can further reduce worries about possible influence of the different underlying sources of arousal in different places on the body. To this end the experimenter may exchange (alternatively or randomly) the position of the pair of electrodes that functions in a certain way (say, continuously stays connected and without consciously observing any recorded physiological measurement along the whole PSE experiment) with the position of the other pair that functions differently (correspondingly say, with consciously observing the prestimulus physiological measurements during real time (or maybe with disconnecting the organs from the recording computer a very short period before the presentation of the stimulus)). Use of such procedures would presumably bring him closer to the understanding that treats EDA as if it represents one homogeneous change in arousal across the body.

It may be worthwhile mentioning that supplementary evidence that the different locations of the pairs of electrodes with their different sources of arousal do not matter may be supplied, of course, by performing PSEXs in the serial design of Levin (2020) as well. This holds true because in that serial design one uses the same unique location in a time-sharing way; the experimenter uses the same location both for the usual PSEX (in which he or she leaves the electrodes connected to the organ and the recording

computer during the whole PSEX experiment and no agent consciously observes the results in real time) and for the modified PSEX (in which the experimenter consciously observes the prestimulus physiological measurements during real time (or maybe one disconnects the measuring equipment from the recording computer just before the stimulus presentation)). Notice, however, that the execution in the serial design is naturally twice as long. It may suffer from unknown changes in environmental conditions between its two parts as well.

In a basic suggested parallel design, a first pair of electrodes continuously measures the EDA from several seconds before the instants at which the computer presents random stimuli to several seconds after these instants. The computer continuously collects unobserved records from this pair of electrodes and stores it. Simultaneously, the other pair of electrodes measures the EDA along the same duration. However, this other pair's prestimulus results are consciously inspected by an agent in real time. Since only a few hundreds of milliseconds of inspection is usually considered long enough for the conscious agent to consciously perceive a sight, whereas the PSE endures at least seconds, the agent can easily consciously observe almost all of the prestimulus records in real time.

[Alternatively, this last pair of electrodes simultaneously measures the EDA from the same several seconds before the computer presents random stimuli until a fraction of a second before these presentations. These measurements are recorded and during real time remain uninspected. However, unlike the first pair of electrodes, at these fractions of a second before the moments of stimuli presentations somebody intentionally disconnects the second measuring pair from the recording computer. One inspects the records from both channels only after the stimuli presentations. This protocol creates two parallel sequences of records from the few seconds before any prestimulus disconnection instant. It seems that one can predict that the records from the first pair of electrodes will contain the usual low signal to noise ratio PSE. After appropriately averaging it for specific times before the presentations of the emotional stimuli and comparing to the averaging at the same specific times over the non-emotional stimuli these records will significantly reveal a PSE. However, one can also argue that due to the lost connection to the coming stimulus the records from the second pair of electrodes, when averaged at those specific times before the emotional stimuli, are (according to Levin, 2020, 2023) predicted to show no PSE compared to the averages at the same times before presentations over the non-emotional stimuli.]

Since the measuring devices and the computer are macroscopic and are not isolated from their environments one can expect that the records are almost immediately decohered. This turns quantum tendencies which are vulnerable to interfer-

ence into pseudo classical possibilities. It can therefore be argued that any quantum entanglement that might have correlated the tentative records from the first pair to those of the second pair should quickly vanish. However, according to the OIQM unless any conscious agent consciously observed a record, this decoherence by itself does not yet select a single definite result for that record. All various pseudo classical possibilities for the value of the record still coexist as tentative abstract entities. The formation of a conscious perception takes a few hundreds of milliseconds during which the possible pseudo classical possibilities still coexist. It is only at the times that the conscious experimenter perceives the measurements of the second pair of electrodes, once the experimenter indeed freely decided to observe it, that the various pseudo classical possibilities are being reduced to just the realized ones. Once reduced to just the realized ones these realized records cannot be changed anymore by the participant's later observation of the presented stimulus. This disability to be changed prevents a formation of a retrospective PSE in these second pair's measurements. According to Levin (2020), could one base an efficient real time prediction on these prestimulus measurements he would violate QM that prohibites such a real time prediction. As Levin (2023, p. 184) states for such conditions, at any presimulus t_1 moment QM dictates that the average of the $\alpha_1(t_1)$ measurements should be $\langle\alpha_1(t_1)\rangle = 0$.

The situation just described should be contrasted against the first pair's unobserved prestimulus measurements which retain their coexisting pseudo classical possibilities nature until the conscious participant eventually perceives (at the t_2 moment) the presented stimulus. Due to this tentative nature of them they can be reduced upon the later participant's perception of the presented stimulus. This participant's perception serves as an end condition for the prestimulus time evolution of the possibilities leading to a retrospective PSE in the idealized model of Levin (2023, p. 184)

$$\langle\alpha_1(t_1) \mid \alpha_2(t_2)=1\rangle - \langle\alpha_1(t_1) \mid \alpha_2(t_2)=-1\rangle = 2 - 4\,(1- n_3^2)\,\sin^2[\omega\,(t_2 - t_1)]$$

with some $n_3^2 \leq 1$ and angular frequency ω.

Both pairs measure the *same* kind of arousal due to the *same* stimulus. The appearance of the PSE in the records from the first pair of electrodes and the lack of a PSE *for the same instances of time* in the records from the second pair of electrodes is obviously a result of the experimenter's free decisions to consciously observe the prestimulus records during their collection times in his favorite channel rather than in the other channel. This clearly shows that the experimenter's carried out decisions indirectly have real influence on the known evolving physical history. After all, the results obtained under his executed decisions can be *directly contrasted* against the results obtained when at the *same* moments the alternative decision has been taken.

Conclusions

The suspected hypothesis that an agent's free choice ability is genuinely effective can be empirically verified. This paper points at our inability to rewind time in order to actually perform counterfactual measurements as the source of certain current suspicions that our free choice ability is not genuinely effective. The paper argues that somewhat different parallel PSEXs carried out on the same individual can bypass the time rewinding incapability obstacle in proving that our free choice ability is genuinely effective.

The described experiment seems to be a feasible one. Utilizing current QM's understanding, an understanding supported by recent empirical results, the paper supplies and substantiates QM's predictions for the experiment's expected results as well. In line with the scientific method, one can empirically check the predictions. The experimenter can then either prove or disprove the hypothesis that an agent's free choice ability is genuinely effective.

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Des Tests Parallèles Peuvent Vérifier l'effectivité de nos Libres Choix

Ephraim Y. Levin

Résumé. Notre incapacité à remonter le temps peut jeter un doute sur le caractère véritable de notre capacité à faire des libres-choix. Je propose d'utiliser ce que l'on appelle le pressentiment pour vérifier cette réalité. L'idée est de comparer, en post-stimulus, les résultats moyens obtenus à deux tests de pressentiment (nommés "canaux") en principe "similaires", effectués simultanément sur le même individu. Avant que le stimulus ne se produise, un expérimentateur décide, en temps réel, d'observer ou non les mesures d'un des canaux et prend immédiatement cette décision avant que le stimulus ne se produise. Le cas où un canal est observé en temps réel et le cas où il ne l'est pas appartiennent à des événements différents et décohérents. Cela est vrai parce que, selon l'« interprétation orthodoxe » de la mécanique quantique, l'observation consciente réduit la multitude de mesures possibles avant le stimulus à la seule mesure perçue. Dans ce cas, la mécanique quantique impose la disparition de l'effet de pressentiment rétrospectif. Ainsi, dans un tel modèle de parallèle, il est possible de comparer ce qui se passe lorsqu'une observation est effectuée et n'est pas effectuée au même moment. La disparition de l'effet de pressentiment dans le canal observé malgré son apparition dans le canal non observé pour les mêmes instants est donc une preuve de l'efficacité de l'observation voulue par l'expérimentateur.

French translation by Antoine Biouy, Ph. D.

Parallele Presentiment-Tests Können die Wirksamkeit Unserer Freien Entscheidungen Überprüfen

Ephraim Y. Levin

Zusammenfassung. Die Tatsache, dass wir nicht in der Lage sind, die Zeit zurückzudrehen, kann Zweifel an der Echtheit der Wirksamkeit unserer Fähigkeit zur freien Entscheidung aufkommen lassen. Ich schlage vor, dass das sogenannte Presentiment genutzt werden kann, um diese Echtheit zu überprüfen. Die Idee besteht darin, nach dem Stimulus die gemittelten Ergebnisse zweier scheinbar "ähnlicher" Presentiment-Tests ("Kanäle") zu vergleichen, die gleichzeitig bei derselben Person durchgeführt wurden. Vor dem Auftreten des Stimulus entscheidet ein Experimentator in Echtzeit, ob die Messungen in einem Kanal beobachtet werden sollen oder nicht, und trifft diese Entscheidung unmittelbar vor dem Auftreten des Stimulus. Der Fall, in dem ein Kanal in Echtzeit beobachtet wird, und der Fall, in dem er nicht beobachtet wird, gehört zu unterschiedlichen dekohärenten Geschichten. Dies gilt, weil nach der "orthodoxen Interpretation" der Quantenmechanik die bewusste Beobachtung die Vielzahl der möglichen Prä-Stimulus-Messungen auf die tatsächlich wahrgenommene reduziert. In solchen Fällen erzwingt die Quantenmechanik ein Verschwinden des retrospektiven Presentiment-Effekts. In einem solchen parallelen Design kann man also vergleichen, was passiert, wenn eine Beobachtung zum gleichen Zeitpunkt durchgeführt wird und was nicht. Das Verschwinden des

Presentiment-Effekts im beobachteten Kanal trotz seines Auftretens im unbeobachteten Kanal zu denselben Zeitpunkten ist somit ein Beweis für die Wirksamkeit der vom Experimentator gewollten Beobachtung.

German translation by Eberhard Bauer, Ph. D.

Testes Paralelos de Pressentimento Podem Verificar a E fetividade de Nossas Livres-Escolhas

Ephraim Y. Levin

Resumo. Nossa impossibilidade de retroceder o tempo pode lançar dúvidas quanto à autenticidade da eficácia de nossa capacidade para realizar livres-escolhas. Proponho que o chamado pressentimento possa ser utilizado para se verificar tal autenticidade. A ideia é, após estímulo, comparar os resultados ponderados de dois testes de pressentimento aparentemente "semelhantes" ("canais") realizados, simultaneamente, com o mesmo indivíduo. Antes da ocorrência do estímulo um experimentador decide, em tempo real, se observa ou não as medições em qualquer canal e, imediatamente, executa tal decisão antes da ocorrência do estímulo. Um caso em que um canal é observado em tempo real, e um caso em que não, pertencem a diferentes histórias descoerentes. Isso é verdade porque, de acordo com a "interpretação ortodoxa" da mecânica quântica, a observação consciente colapsa as múltiplas medições possíveis, pré-estímulo, apenas para a que é percebida. Nesses casos, a mecânica quântica impõe um desaparecimento do efeito de pressentimento retrospectivo. Assim, em tal design paralelo, pode-se comparar o que acontece quando uma observação é realizada e não é realizada ao mesmo tempo. O desaparecimento do efeito de pressentimento no canal observado, apesar de sua aparição no canal não observado no mesmo momento é, portanto, evidência da efetividade da observação desejada pelo experimentador.

Portuguese translaiton by Antônio Lima, Ph. D.

Las Pruebas Paralelas de Presentimiento Pueden Verificar la Eficacia de Nuestras Opciones de Libre Albedrío

Ephraim Y. Levin

Resumen. Nuestra incapacidad de rebobinar el tiempo puede poner en duda la validez de nuestra capacidad de libre albedrío. Sugiero que el llamado presentimiento puede utilizarse para verificar tal validez. La idea consiste en comparar después del estímulo los resultados promediados de dos pruebas de presentimiento aparentemente "similares»"(canales) realizadas simultáneamente en el mismo individuo. Antes del estímulo, un experimentador decide, en tiempo real, si observa o no las medidas en algún canal y pone

en marcha inmediatamente tal decisión antes de la ocurrencia del estímulo. Un caso en el que se observa un canal en tiempo real y un caso en el que no se observa pertenecen a historias decoherentes diferentes. Así sucede porque, según la "Interpretación ortodoxa" de la mecánica cuántica, la observación consciente colapsa la multitud de posibles mediciones previas al estímulo a sólo la percibida. En tales casos, la mecánica cuántica hace desaparecer el efecto retrospectivo del presentimiento. En un diseño paralelo de este tipo se puede comparar lo que ocurre cuando se realiza o no una observación en la misma instancia temporal. La desaparición del efecto de presentimiento en el canal observado a pesar de su aparición en el canal no observado en los mismos momentos sería, por tanto, evidencia de la eficacia de la observación voluntaria del experimentador.

Spanish translation by Etzel Cardeña, Ph. D.