

Abstract

Decades in parapsychology (psi) research have shown that identifying effects in this very particular field requires an inherently new approach for experimental designs that cater to the demand for reduced objectivity in measurement while maintaining the scientific standards attached to it. What is more, micro-psychokinesis (micro-PK) effects seem to flee observation time and again when one aims to measure and observe them directly. The study described in this paper was designed with these special methodical prerequisites in mind. The first research goal was to identify a positive impact of reduced objectivity in measurement on willpower as operationalized by vitality by means of partially deleting the obtained data in an experiment employing positive visual stimuli given out by a quantum random number generator (qRNG). The assumption was that a found effect on vitality could identify a person's willpower and thereby hint at an underlying micro-PK effect. Furthermore, we wanted to investigate whether positive affect would correlate with a higher number of positive pictures received as well as remembered by the participants, thereby allowing to deduce an objective and a subjective micro-PK effect respectively. Unfortunately, no convincing evidence could be found to support our first prediction, since vitality did not show itself to be higher in the condition where the objective data had been deleted. Also, our investigation about the impact of affect on the emergence of micro-PK effects did not yield the anticipated outcome. In all cases, however, there was also no substantial evidence against the assumptions, which means that there might still be room for the effects to stabilize towards the predicted direction if a larger sample is obtained. It would thus be feasible to continue this line of research and not discard vitality as well as affect as a possible bridge to identify micro-PK just yet.

Introduction

It is widely agreed that experience arises from a physical basis, but we have no good explanation of why and how it so arises. Why should physical processing give rise to a rich inner life at all? It seems objectively unreasonable that it should, and yet it does.

(Chalmers, 1995, p. 201)

Chalmers's words in his work on the hard problem of consciousness sum up well the centuries long mysticism as to how the physically tangible brain relates to the subjective inner world of consciousness and how both interact with each other. Modern science will mostly reduce the relationship to a purely biological one, pointing to the mere fact that conscious experience goes along with information processing in the brain. But it thereby fails to close the explanatory gap as to why and how consciousness arises and comes into existence in the first place. The same holds true for the lack of knowledge as to how the mental can affect the physical and whether the mind is free in its choices or largely determined by its material biological basis. This has been discussed extensively by Shariff et al. (2008) in terms of the problem of free will. How the authors put into words both fittingly and candidly, "[p]rogress into the hard problem would require a discussion of the mechanisms by which the subjective power [...] actually affects the physical neurons of the brain, how it actually moves the meat" (p. 187).

What contributes even further to the dilemma is the question of whether the will of the mind only has an effect when our neurons translate it into actions – by means of a conscious decision – or whether it is in and of itself capable of shaping what happens in the world – hinting at the power of the subconscious. A theoretical framework that provides a basis for answering this question is the Unus Mundus Theory developed by physicist Wolfgang Pauli and psychiatrist Carl Gustav Jung (Atmanspacher & Fach, 2013). In their dual-aspect monist

perspective, the mental and physical aspects of our existence are not to be viewed as entities that are separated from one another right from the beginning. Rather they are to be understood as two elements that stand in a complementary relationship to each other and spring from the same neutral reality underlying everything. From this common ground of possible realities, there are two ways that they can manifest themselves. The first way is the structural correlation, where no particular meaning is attributed to the consequence of an action by its performer. An example of this would be “neural correlates of conscious mental states” (Atmanspacher & Rickles, 2022, p. 53). They are persistent and reproducible. The other is the induced correlation, whereby individuals can impact reality insofar as certain outcomes hold a specific relevance for them. This type of correlation is far more occasional in that it occurs only under certain circumstances and is thus evasive.

Based on this framework, micro-PK research now aims at finding out more about how and when these induced correlations come into play, despite the substantial challenges caused by their elusive nature and the fact that to this day, we do not yet know how the interface between the mental and the material works in detail. When wanting to identify instances where deviations from chance can be provoked mentally and registered, one has first to find an experimental setting that allows to test against chance successfully and at the same time provides a space where psi phenomena can occur. While earlier research had to contend itself with simple dice or coin throws, modern qRNGs can be seen as a breakthrough for operationalizing micro-PK research (Bösch et al., 2006; Varvoglis & Bancel, 2016). Micro-PK effects here are understood as involving intentional observer effects on quantum-based stochastic outcomes (Maier et al., 2022). Quantum theory in general opened up an until then largely deterministic world view of the scientific community in physics to incorporate realities where particles with a wave-function

do not have a fixed position initially (Born, 1926; Schrödinger, 1935). These small building blocks of the universe exist in superposition, i.e. probabilities of being in one place or another, until they are observed and measured. One can easily see the parallels to the understanding of the world proposed by the Unus Mundus Theory, where realities can equally exist side by side in an indecisive state until one of them enters awareness as becoming actual observable reality. In this way, one can say that Pauli and Jung with their theory in a way extended quantum theory to outcomes that hold meaningfulness to human observers (Dechamps et al., 2021).

Yet in operationalizing the observation already lies one of the biggest challenges for investigating micro-PK effects. The effects do not show themselves easily, and if so then they do it with rather small effect sizes, tend to decline over time and are generally difficult to replicate (Bem et al., 2016; Bierman, 2001; Bösch et al., 2006; Dechamps et al., 2021; Jahn et al., 2000; Maier et al., 2022). An interesting theory around the Model of Pragmatic Information as initially proposed by von Weizsäcker (1974) and elaborated on by von Lucadou (1995) hints at the fact, that the culprit for the difficulties in identifying micro-PK effects could actually be the general way that empirical science aims at achieving the highest possible degree of objectiveness as a sign of quality for research. The model assumes that pragmatic information (PI) for the recipient contains two components – novelty and confirmation which stand in a multiplicative relationship to each other. Novelty is the part of the information that holds the intent of the sender and is thus new to the recipient. Its confirmation part in turn is seen as that which is generally agreed upon and thus constitutes common communicative ground for both the sender and the recipient. This holds an important conclusion for the research in micro-PK. Because if confirmation is at its highest when information is objectivized to a maximum as heralded by scientific convention, then there is no more novelty and thus no more transfer of PI is possible. And if novelty, i.e. the

subjective component of PI is at its highest, then objective and scientifically analyzable data can no longer be obtained.

To solve this problem, Maier proposes that the maximum of PI is transferred, when both novelty and confirmation are at a medium level (2023a). Because if we understand reality as proposed by the Unus Mundus Theory, then in the research of psi phenomena we are not dealing with something purely subjective, but rather something that stands in between the subjective and the objective. To further clarify this concept, Maier et al. (2022) infer the existence of a reality that they coin as “sobjective”. In this understanding, the objective and the subjective are not extremes that stand in stark contrast to each other but rather move fluidly on a continuum that allows for both to coexist complementarily. What directly follows from this is that any experiment in the psi domain needs to take this into account and cater to it in its design in terms of a reduced objectivity in measurement as compared to the generally empirically scientific approach (see also Jahn & Dunne, 1997; von Lucadou & Zahradnik, 2004).

The study outlined in this paper is based on the insights described above. In this sense, the first hypothesis wants to identify if the positive impact that reduced objectivity in measurement achieved by means of a partial deletion of objective data has on vitality, as measured by a questionnaire designed by Buchner et al. (2022). Vitality here is perceived as a state in which the individual feels energetic both mentally and physically so that it can motivate them to actions with purpose. It is used as a proxy for bringing to light a person’s willpower. Because, if we recognize induced correlations and micro-PK effects as stemming from an unconscious that affects outcomes in the material world intentionally, then it follows that the unconscious mind of the observer needs to be in a favorable state to produce them (Dechamps et al., 2021; Varvoglis & Bancel, 2015). This favorable state of mind can be induced by employing

for instance a meditative session fostering relaxation and optimism ahead of a micro-PK experiment as was done for instance by Maier et al. (2018). Or one can make use of variables such as willpower operationalized by vitality to derive the respective emotional and unconscious state a person is already in. This assumption is based on a further development of the formula of pragmatic information by Maier (2023b). In this new conceptualization of the formula, free will assumes the original position of pragmatic information and is the product of willpower and objectification. In the current study, the willpower that a person already possesses is then primed further by instigating them to believe in it. It can thus be said to employ a combination of already existing personal factors together with an experimental induction.

What needs to be added here is that using vitality to operationalize willpower as the dependent variable in and of itself favorably adds to further reducing objectivity, since it serves as a substitute for measuring a micro-PK effect directly. According to the same line of reasoning, the second and third hypotheses include affect as an additional indicator of a person's emotional and unconscious state. In this way Hypothesis 2 wants to analyze whether affect correlates positively with the number of positive pictures received via a qRNG as visual stimuli, while the Hypothesis 3 analyzed its correlation with the number of subjectively remembered images. Affect here is understood as the general mood that participants are in, when starting to complete the study. It is thus measured by obtaining a sentence about their current emotional state, that they write themselves and which is later coded on a scale.

For consistency purposes, we included Hypotheses 4 and 5 as the first of four additional hypotheses to investigate possible direct subjective and objective micro-PK effects. In this way we investigated if people would remember more positive images in the condition where the objective data had been deleted than in the condition where it was saved, and if people would be

objectively shown more positive images as could be expected by mere chance respectively. The sixth and seventh hypotheses then aimed at identifying the relationship between implicit theory of willpower and ego depletion on the one hand and vitality on the other hand. Implicit theory of willpower refers to a person's belief on whether willpower is a resource that can be drained or rather that it stands unlimitedly at their disposal (Bernecker, 2015). It was measured according to a questionnaire elaborated by Job et al. (2010). Ego depletion entails how people describe their current capacity for self-control as assessed by a questionnaire introduced by Lindner et al. (2019). Checking the correlations of vitality with the aforementioned variables was included because the results are important for future research making use of vitality as a way to unveil micro-PK effects. In this sense, it might be very helpful to include them in analyses or they could each or both together even turn out to serve as a good substitute for vitality depending on the experimental setup.

Methods

Participants

Recruitment for participants consisted in obtaining a community sample among the personal contacts of the student experimenters collaborating for the study to complete a university course. The community sample slightly exceeded the predefined minimum size of 500 to reach a sample size of $N = 505$. The previously determined exclusion criterion would mean that those participants entering an impossible number greater than 20, when asked how many positive images they had seen, would be eliminated from the data set. Only one person had entered a minus before the number 10, and it was agreed among experimenters, that this had to have been by accident, since 10 constitutes a possible number. As a consequence, no participant data had to be excluded from the analysis. The recruiting period was from December 6, 2023 to

January 28, 2024. The age range of the sample was from 13 to 84 years resulting in a mean age of $M = 34.27$ ($SD = 14.71$) years with a median at 28 years. We had informed participants prior to completing the study, that the minimum age for participation was 18 years old. Unfortunately, data showed a minimum age of 13 years, which is however to be expected and cannot be entirely avoided when conducting an online experiment. In total, only 12 participants entered an age younger than 18 years old. Due to the very neutral and unproblematic stimuli and material used in the study, a negative effect on then psychological wellbeing of minors can be ruled out with confidence. Furthermore, one participant had entered an age of 500 years and another one of -56 years. As a joint decision among the experimenters, these data sets were not excluded, since both 50 and 56 are possible ages and it was deemed obvious that both the additional zero as well as the minus must have had been entered by mistake. The age entries for these two participants were thus changed to 50 and 56 respectively. Regarding the distribution of sexes, 337 participants were women, 166 men and 2 people entered “diverse” as their sexual identification. 88.90 % completed the study in German and 11.10 % in English.

Ethical Guidelines

The study is in line with the requirements of the American Psychological Association (APA). Written consent was obtained online from all participants prior to the study and they participated by their own free will. The study purpose and research objective was not revealed to the participants, but they were informed that their data would be collected anonymously and that they had the right to quit at any moment. Finally, the Ethical Commission of the Department of Psychology of the LMU also had given their consent prior to the study.

Materials

Hardware and Software

The study was programmed and stored on a webserver located and owned by the university. It was designed as an online survey and experiment and thus access was possible via any computer, tablet or cellphone equipped with an internet connection.

Images in each trial were selected by means of a true qRNG developed by the company ID Quantique SA in Geneva (ID Quantique SA, 2024), with excellent credentials (Turiel, 2007). The device operates according to the content of the double slit experiment well-known in quantum mechanics and conducts photons through a semiconductor mirror-like prism (Maier et al., 2018). This allows for each photon to take both directions with equal chance and having it remain in superposition in both possible states until the point of measurement. The qRNG is directly attached to the USB port of the computer and its output is integrated to perform the selection process with a software developed specifically for the device.

Stimuli

The image pool that the qRNG would access consisted of 100 pictures with a positive motive and 15 images belonging to a neutral category. The images originated from the Open Affective Standardized Image Set (OASIS) database (Kurdi et al., 2017). The idea behind this was to select images for the positive category that would have a high probability to touch participants emotionally and thus hold value and meaningfulness for them, since they would cater to their basic psychological needs. For the neutral category such images were chosen, which were rated as stimulating low arousal and holding medium valence (5 on a scale from 1-7). The visual stimuli appeared on the screen against a white background. Examples of the pictures used from both the positive as well as the neutral category along with the display of the

invitation to participants to focus on their willpower preceding each trial can be found in Appendix A.

Questionnaires and Free Text Field

The variables vitality, theory of willpower, ego depletion and autonomy were measured by means of different questionnaires. Vitality was assessed with 3 items taken from the modified German Subjective Vitality Scale (SVS-GM) (Buchner et al., 2022), which could be rated on a 10-point scale ranging from 1 = “does not apply at all” to 10 = “fully applies”. A sample item is “I feel alive and vital”. The 6 items to measure implicit theory of willpower were taken from a questionnaire created by Job et al. (2010). The rating scheme here was a 6-point scale ranging from 1 = “I strongly disagree” to 6 = “I strongly agree”. An example for a questionnaire item is “After a strenuous mental activity, I feel energized for further challenging activities”. The questionnaire used to measure ego depletion was the 5-item scale to measure the current self-control capacity (SMS-5) in a learning and performance context (5-Item-Skala zur Messung der momentan verfügbaren Selbstkontrollkapazität (SMS-5) im Lern- und Leistungskontext; Lindner et al., 2019). This short questionnaire was designed with a 7-point scale spanning from 1 to 7. Apart from this, the study also contained three items apt to assess autonomy, which came from a questionnaire developed by Janke & Glöckner-Rist (2012). The items could be answered in a 5-point scale ranging from 1 to 5 with 1 equaling “does not apply at all” and 5 being “fully applies”. Autonomy, however, is not in the scope of this paper and will thus not be integrated in the further analysis. Finally, the variable affect was not assessed through a questionnaire, but participants could freely describe their emotional state and enter it in a text field. This qualitative contribution would later be coded on a 5-point scale ranging from -2 for low to +2 for high affect

with the middle at 0 equaling neutral affect, in order to be able to consider it in the statistical analyses.

Data Collection and Analysis

For testing the first, fourth and fifth hypothesis, we used a Bayesian sequential analysis (Sedlmeier & Renkewitz, 2018; Wagenmakers et al., 2011). This approach reveals the likelihoods for the H_1 (alternative hypothesis) and its corresponding H_0 (null hypothesis) to operationalize an assessment for evidence for each of the two at the same time. Another advantage is that this line of statistical testing allows for adding more data to the sample until a predefined stopping threshold is reached. The analysis in this paper thus serves to capture the current sequential development of the effect, given the sample size at hand of $N = 505$. A priori a value for the Bayes Factor (BF) for the H_1 of $BF_{10} = 10$ was determined as target criterion for the analysis, since this would point to a strong evidence for a postulated hypothesis. There was no predefined stopping point. We used an uninformed prior with a Cauchy distribution centered around 0 with an $r = 0.1$, i.e. $\delta \sim \text{Cauchy}(0; 0.1)$ as applied previously in micro-PK research (Maier et al., 2014; Dechamps et al., 2021). This was done taking into consideration that psi effect sizes in general tend to be rather small and thus an effect size of Cohen's Delta $d = .1$ was estimated (Bem et al., 2016; Maier et al., 2018). In line with the Bayesian approach, the second, third, sixth and seventh hypotheses were each tested with the help of a Bayesian Pearson correlation, where the stretched beta prior width was set at .1. In addition to the Bayesian analyses for several hypotheses we also used classical t -tests to calculate effect sizes for Cohen's d (significance level $\alpha = .05$). For all Bayesian and classical analyses, the statistical software tool JASP (JASP, 2023) was used.

Interrater reliability for coding the affect variable was checked between every combination of the 5 raters with a sample of the texts obtained from the same thirty participants. The mean weighed Cohen's Kappa resulted in $k = .89$, which exceeds the threshold for a high interrater reliability at .70 and thus translates to a high interrater reliability.

Procedure

The study could be accessed online by clicking on a link provided by the student experimenters. There was a different link for completing the study in English vs. in German. The first display showed a short introduction to the study informing participants that they would be shown neutral and positive images and that they should use their willpower in order to see as many positive images as possible (see Appendix A). After the introduction, participants were informed about the privacy policy for the study and asked for their consent to participate. They could then proceed to starting the study by clicking on "Start experiment". The next screen thanked participants for their participation and asked them to describe their current emotional state in a free-text field, which would later be used to code the variable affect. After clicking on "Continue", participants were then shown a screen outlining that they would subsequently see 20 pictures one after the other with either a positive or a neutral motive, preceded by four examples for both picture categories. They could then click on "Next". The next display informed participants that after clicking on "Next" again they would start viewing the images, and reminded them once more that they should use their willpower to see more positive images. The experiment would then switch to full screen mode and participants would see the sentence "Believe in your willpower!" for 2 seconds. This mantra was followed by the display of a black screen for the duration of 500 milliseconds, before being shown a picture provided by the qRNG on the next screen for 2 seconds. The picture display was then followed by a black screen

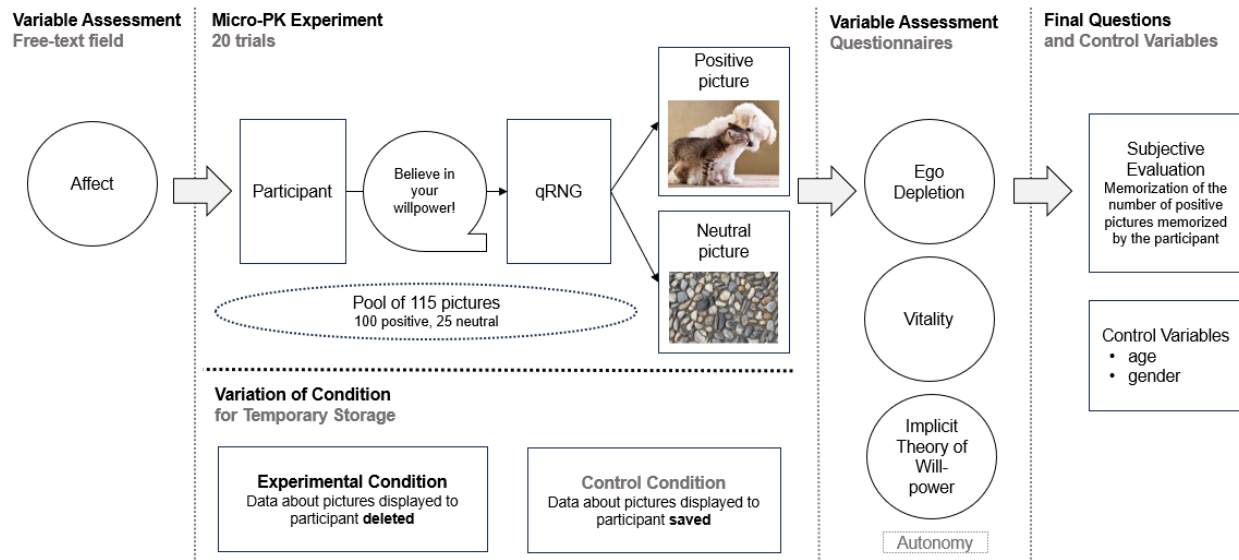
interval of 1 second, before the next mantra display would appear. This cycle would repeat itself for 20 trials. After the trial phase was finished, participants were asked to complete items measuring the variable ego depletion. Clicking on “Next” lead participants to the short questionnaire measuring vitality, which was followed by asking participants to complete the items assessing the variable theory of willpower. After the three questionnaires, participants were asked to insert the number of positive images that they believed they had received during the trial phase. This was followed by 3 items included for measuring autonomy that needed to be answered. The study procedure then concluded with collecting the biographical data about age and gender and thanking participants again for their participation.

The study was set up as a between-subjects design with two conditions. The overall procedure of the experiment with 20 trials including the questionnaires and free text field to assess the variables vitality, theory of willpower, ego depletion and affect was the same for all of the participants as outlined above and visualized in Figure 1. The experimental condition was that the data for the images objectively received by the qRNG were deleted for half of the participants after they had been saved in a temporary file, but never looked at before deletion (delete condition). In the control condition (save condition) the objective data was transferred from the temporary storage to a permanent data file. The time to complete the study was set at around 10 minutes. There were no specific incentives to foster participation in the study and participants were not informed about the research purpose neither in advance nor at the end of the study in order to avoid any bias in approaching participation. In this sense, in a sensitive field such as micro-PK, where the attitude and current state of a participant might directly interfere with the effect to be measured, any confounding influences of this sort should be avoided. The

experiment was conducted under the leadership of Prof. Dr. Markus Maier and Dr. Moritz Dechamps.

Figure 1

Overview of the Study Design (20 trials)



Results

Confirmatory Analysis

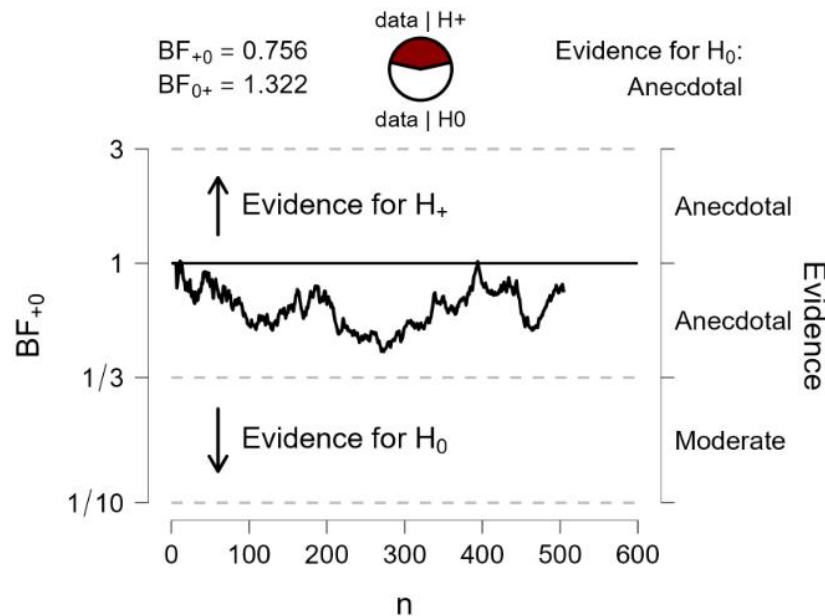
Main Hypotheses

The first hypothesis of this study assumed that the mean vitality would be higher in the delete condition than in the save condition. When looking at the descriptive data, the results for the means in vitality between the two conditions seem to support the hypothesis, with a slightly higher mean of $M = 5.64$ ($SD = 2.52$) in the delete condition than in the save condition ($M = 5.50$; $SD = 2.35$), as is shown in Table 1. The difference between the means in the two conditions is however not very substantial.

Table 1*Descriptive Analysis of Mean Vitality in the Two Conditions*

Condition	N	M	SD
delete	248	5.64	2.52
save	257	5.50	2.35

A Bayesian independent samples *t*-test (one-tailed; uninformed prior $r = 0.1$, i.e., $\delta \sim \text{Cauchy}[0, .1]$) showed a Bayes Factor of $BF_{10} = .76$ for the H_1 and a $BF_{01} = 1.32$ for the H_0 , which is slightly higher anecdotal evidence for the H_0 . The sequential Bayes factor is shown in Figure 2.

Figure 2*One-tailed Sequential Bayesian Independent-samples *t*-Test Analysis for Vitality*

Note. $N = 505$.

In light of these indecisive findings, we proceeded to calculate Cohen's Delta at $d = .06$ ($p = .26$; $SD = .09$) with a classical independent-samples *t*-test to add more clarity. The effect

size found is below the threshold for a small effect size, starting at .2, and the p-value of .26 is also higher than the predetermined common significance level of $\alpha = .05$. The test was thus not significant.

The second hypothesis was that affect would correlate positively with the objectively obtained number of positive pictures. Since the objective data had been deleted on purpose for half of the participants, this hypothesis could of course only be checked for the save condition comprising a sample size of $N = 257$ participants. Prior to proceeding to the hypothesis check, both a Q-Q plot and a distribution plot were created and assessed, in order to verify if the further analyses could be conducted parametrically. The distribution plot approximated a standard distribution and the Q-Q plot showed only few values with a greater deviation from the line. These findings together with the considerable sample size of the study justified proceeding with the parametric analysis. The latter showed a very small Bayesian Pearson's correlation of $r = .07$, a $BF_{10} = 0.77$ and a $BF_{01} = 1.31$ (stretched beta prior width .1), the latter constituting anecdotal evidence for the H_0 .

The third hypothesis postulated that there would be a positive correlation between affect and the subjectively remembered number of positive images. The Bayesian Pearson correlation also in this case can be considered very small at $r = .08$ and a BF_{10} of 1.45 ($BF_{01} = 0.69$; stretched beta prior width .1), which means anecdotal evidence for the H_1 .

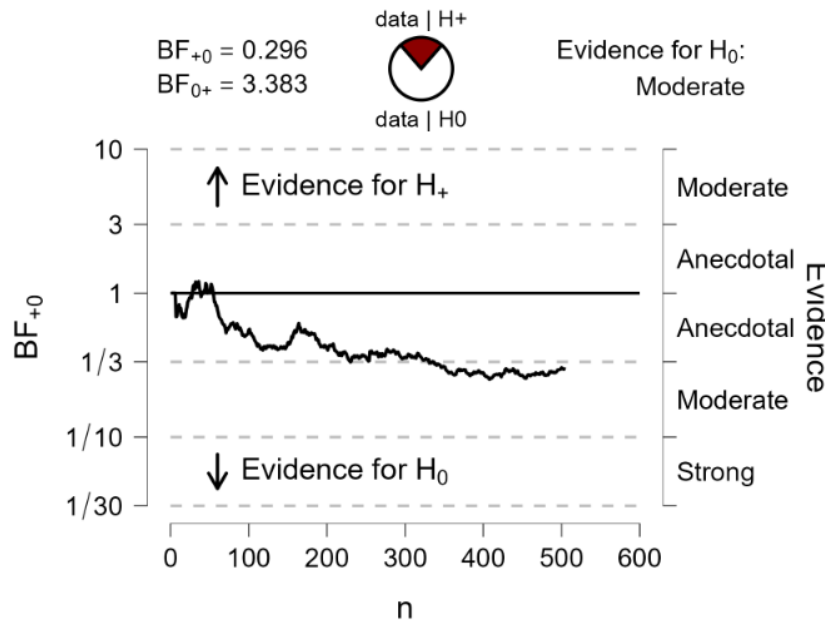
Supplementary Hypotheses

The fourth hypothesis was that the mean of subjectively remembered images would be higher in the delete condition than in the save condition, hinting at a subjective micro-PK effect. In contrast to this assumption, the descriptive data shows a slightly higher mean of $M = 11.06$ ($SD = 3.78$) in the save condition than in the delete condition ($M = 10.73$; $SD = 3.40$). The result of a Bayesian independent-samples t -test (one-tailed; uninformed prior $r = 0.1$, i.e., $\delta \sim \text{Cauchy}$

[0, .1]) showed a $BF_{10} = 0.30$ ($BF_{01} = 3.38$), which translates to moderate evidence for the H_0 , as is displayed in Figure 3.

Figure 3

One-tailed Sequential Independent-samples Bayesian t-Test Analysis for Subjectively Remembered Images

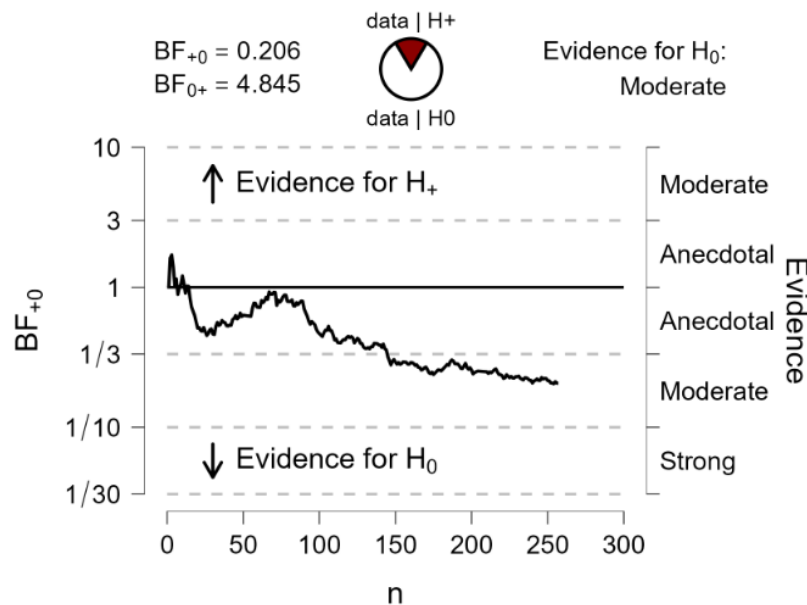


Note. $N = 505$.

The fifth hypothesis assumed that the mean objective images would be higher than could be expected due to chance, hinting at an objective micro-PK effect. Chance is defined here as a value of 10, since there is a total number of 20 trials for each participant in the experiment and 10 is situated at 50/50 chance. A descriptive analysis showed a mean of $M = 9.83$ ($SD = 2.26$), which is not higher than can be expected by chance. A one-sample Bayesian t -test (one-tailed; uninformed prior $r = 0.1$, i.e., $\delta \sim \text{Cauchy}[0, .1]$) yielded a $BF_{10} = 0.21$ ($BF_{01} = 4.85$), which culminates in moderate evidence for the H_0 with even a downward trend, as can be seen in Figure 4.

Figure 4

One-tailed Sequential One-sample Bayesian t-Test Analysis for Positive Images Received



Note. N = 257.

The sixth and seventh hypotheses were that the variables theory of willpower and ego depletion would each correlate with vitality. To assess this, we used Bayesian Pearson correlations with a stretched beta prior width of .1. The calculation for hypothesis 6 showed a small to moderate negative correlation of Pearson's Rho $r = -.21$ between theory of willpower and vitality and a $BF_{10} = 7575.7$ ($BF_{01} = 1.32 \times 10^{-4}$). For hypothesis 7 there was a strong negative correlation of Pearson's Rho $r = -.60$ between ego depletion and vitality and a $BF_{10} = 5.85 \times 10^{+46}$ ($BF_{01} = 1.71 \times 10^{-47}$). In each of the two cases, this means strong evidence for the H₁.

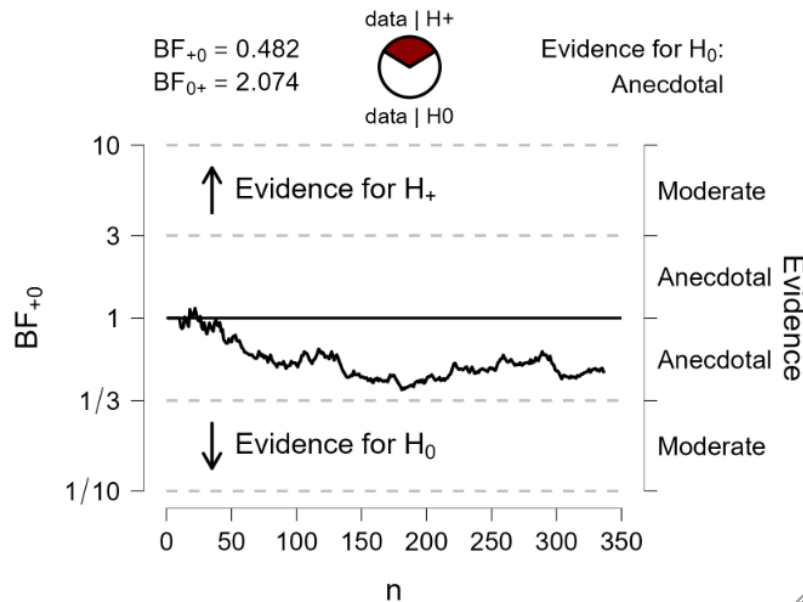
Exploratory Analysis

Our first exploratory analysis was conducted to see whether mean vitality per condition would differ according to gender. i.e. a variant of our main first hypothesis, where we would now test for a higher mean in the delete condition separately for the two sexes. The descriptive results

for the female participants showed no considerable difference in means of vitality between the conditions, with $M = 5.63$ ($SD = 2.52$) even being lower in the delete than in the save condition with $M = 5.70$ ($SD = 2.31$). A Bayesian independent-samples t -test (one-tailed; uninformed prior $r = 0.1$, i.e., $\delta \sim \text{Cauchy}[0, .1]$) yielded a $BF_{10} = 0.48$ ($BF_{01} = 2.07$), which is anecdotal evidence for the H_0 (see Figure 5).

Figure 5

One-tailed Sequential Bayesian Independent-samples t -Test Analysis of Vitality for Female Sample



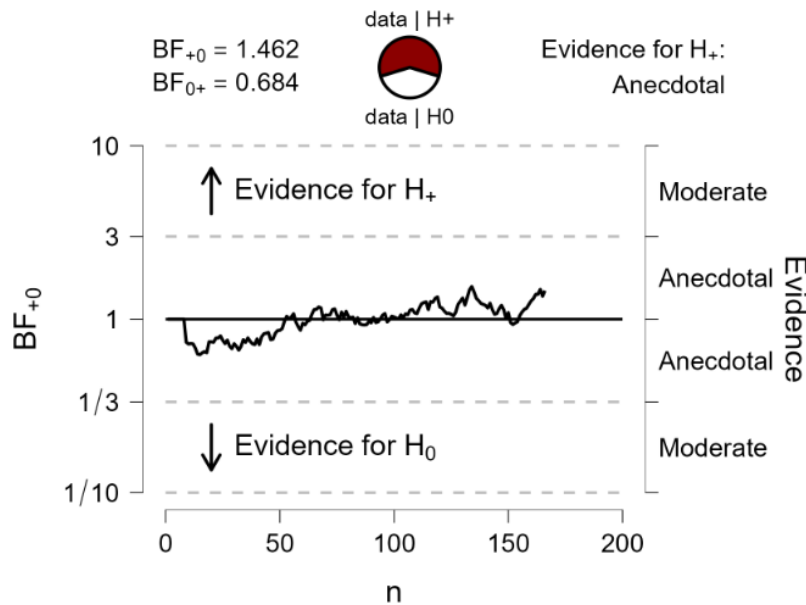
Note. $N = 337$.

Next, we performed the same analysis for the male participants in the sample and compared the means in the two conditions with the assumption that mean vitality would be higher in the delete condition. The analysis of the descriptives already showed a more substantial difference in the means than was the case when looking at the female sample, with $M = 5.63$ ($SD = 2.54$) in the delete condition and $M = 5.12$ ($SD = 2.39$) in the save condition. The results of a Bayesian independent-samples t -test (one-tailed; uninformed prior $r = 0.1$, i.e., $\delta \sim \text{Cauchy}[0,$

.1]) showed a $BF_{10} = 1.46$ ($BF_{01} = 0.68$), which translates to anecdotal evidence for the H_1 (see Figure 6). To gain more clarity in light of this, we performed a one-tailed classical independent-samples t -test resulting in a Cohen's Delta of $d = .21$ ($p = .09$; $SD = 0.16$). This translates to a small effect size, but at same time the test is not significant, since the p -value is above the predefined significance level of $\alpha = .05$.

Figure 6

One-tailed Sequential Bayesian Independent-samples t -Test Analysis of Vitality for Male Sample



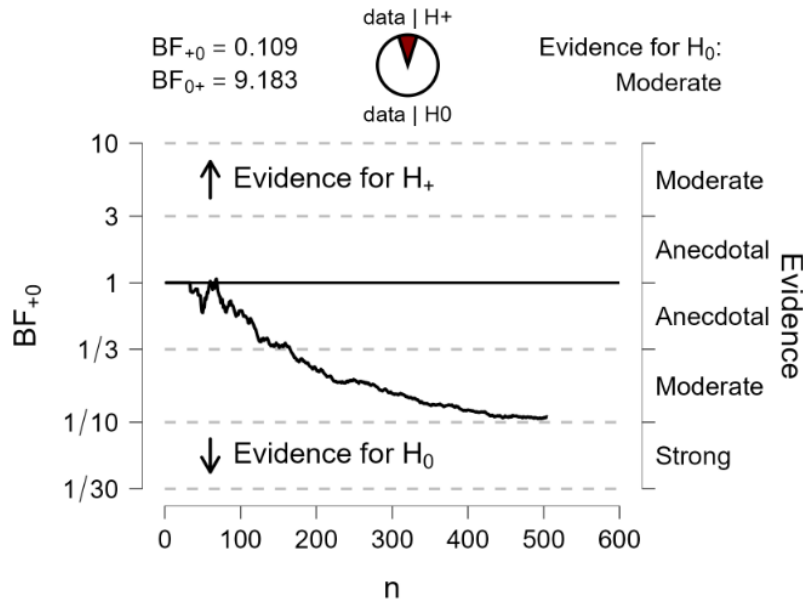
Note. $N = 166$.

In our exploratory analysis we furthermore wanted to know, if mean vitality would be lower in the upper age group than in the lower age group. With calculating the median age at 28 years we could divide the sample into two age groups. Using the median for this the sample sizes were nearly equal with $N_{low_age} = 269$ and $N_{high_age} = 236$. The descriptive data showed a higher mean vitality in the higher age group with $M = 6.12$ ($SD = 2.51$) and $M = 5.08$ ($SD = 2.26$) in the lower age group. A Bayesian independent-samples t -test (one-tailed; uninformed prior $r = 0.1$,

i.e., $\delta \sim \text{Cauchy}[0, .1]$) resulted in a $\text{BF}_{10} = 0.11$ ($\text{BF}_{01} = 9.18$), thus yielding moderate, but very near strong, evidence for the H_0 (see Figure 7).

Figure 7

One-tailed Sequential Bayesian Independent-samples t-Test Analysis for High- vs. Low-age Group



Note. $N = 505$.

Discussion

In this study we aimed at identifying a possible effect of deleting objective data on vitality in the sense that it would be higher than in the condition where objective data had not been deleted. This was based on the assumption that there is a complementary relationship between willpower operationalized through the variable vitality and objectification through the deletion or saving of objective data. In addition to that we wanted to show that a more positive affect would go along with a greater number of positive images shown, wherefrom an objective micro-PK effect might be inferred. Furthermore, it was assumed that the same would hold true

for the correlation between affect and the subjectively remembered number of positive images, a result hinting at an underlying subjective micro-PK effect. In a supplementary part to the research, we made the prediction that for the part of the data set, where objective data had been deleted, there would be both more subjectively remembered positive images as well as more objectively registered positive images, allowing to infer a subjective and an objective micro-PK effect respectively. Lastly, we also checked for a possible close relationship between the values of participants in terms of implicit theory of willpower and ego depletion and their vitality. This was performed in order to derive conclusions about the significance of these variables as possible antagonists of vitality holding useful implications for further research in the field. The confirmatory statistical analysis, however, unfortunately could not provide convincing evidence for neither of the seven hypotheses. In the following, these results will be discussed in more detail.

The Bayesian analysis for Hypothesis 1 showed a 1.32 times higher probability for the H_0 ($BF_{10} = .76$, $BF_{01} = 1.32$), namely that vitality is not higher when objective positive images are deleted than where they are saved. Looking at the sequential analysis (see Figure 1), one can see that the Bayes Factor still oscillates around the value 1 and can thus be deemed indecisive. This means that it neither presents strong evidence in either direction of the hypothesis or its contrast. This result could be caused by the fact that the sample size of the study with $N = 505$ did not yield sufficient power to show a final trend for the effect. In this sense, one can postulate that, at least for the current analysis, there is no clear trend towards 0. On the other hand, a minimum $BF_{10} = 10$ was set a priori as a criterion for accepting the hypothesis and could not be reached by far. Calculating the effect size with a classical frequentist analysis showed results which can be interpreted accordingly. Because even though we already expected a small effect size around $d =$

.1 as derived from previous experiments in micro-PK research, this result did not even reach this cautious threshold. However, since it is greater than 0, one can conclude that it might go into the right direction and thereby reveal itself further if the data from more participants is obtained. The results of the descriptives further underscore this perspective, since they show a slightly higher mean vitality in the group where objective data had been deleted – as predicted. As a final conclusion for this point the research, however, one has to concede that there was no sufficient evidence found to support Hypothesis 1.

The analysis for Hypothesis 2 identified a very small positive Bayesian correlation below .1 and the BF_{10} was below 1 ($BF_{10} = .77$), both yielding no convincing evidence that positive affect goes along with a higher number of objectively obtained positive images. Almost the same holds true when testing for Hypothesis 3, since it also only yielded a very small positive correlation below .1 of affect and the number of subjectively remembered positive images. The BF_{10} for this hypothesis, however, was almost at 1.50 ($BF_{10} = 1.45$), which means anecdotal evidence for the H_1 . This small Bayes Factor for the H_1 has to be interpreted with caution but could point into the right direction. Since testing for this hypothesis could be done for the whole sample size of $N = 505$, in contrast to Hypothesis 2, where only half the sample provided objective data by design, it was expected that the effect sizes would grow accordingly. In any case, it did not reach our predefined criterion of $BF_{10} = 10$, so there was not enough supporting evidence for Hypothesis 3. Same as with Hypothesis 1, where the Bayes Factor equally showed itself to oscillate around 1 indecisively with no clear trend, obtaining an additional participant's sample might bring more clarity, and evidence for the alternative hypotheses might reveal itself still.

The supplementary hypotheses 4 and 5 also failed to meet our predictions, since both yielded moderate evidence for the H_0 ($BF_{10} = 0.30$, $BF_{01} = 3.38$ for Hypothesis 4; $BF_{10} = 0.21$, $BF_{01} = 4.85$ for Hypothesis 5). Consequently, neither the existence of a subjective nor an objective micro-PK effect could be supported, and the evidence rather points in the direction of their non-existence. This is in line with replication problems for identifying either subjective or objective micro-PK effects directly by means of a higher number of personally relevant visual stimuli as memorized by the participants or given out to them directly via a qRNG respectively in an erasure condition as encountered by Dechamps et al. (2021) and Maier et al. (2024). Maier et al. (2018) in a similar micro-PK study that equally made use of visual stimuli could also not bring a micro-PK effect out of hiding. So maybe problems could not solely lie in the fact that this type of experimental design aims at observing psi phenomena in a direct manner, but also that such a design may not to induce or at least enhance micro-PK effects reliably enough and in most situations. In this sense, one can never be sure as to how strong and which themes and motives illustrated by visual stimuli such as pictures actually reach the individual viewer sufficiently emotionally and in their subconscious in any given situation. If one decides to employ a similar design in the future, it might be advisable to check for personal preferences first, in order to be able to provide such stimuli that actually work according to the desired purpose. In the same way, pilot studies could help to further narrow the field of impact of visual stimuli addressing emotion and subconscious states. In this respect, a post-hoc feedback of a male participant revealed that those pictures deemed to be neutral, in many instances actually resembled walls. In a study wanting to prime willpower, it can be grasped easily how detrimental to the desired outcome a simple unexpected influence like this can be. Checking how the actual

impact of stimuli plays itself out when integrated into the rest of the study design might thus prove very useful – all the more so given the sensitivity of the effects to be observed.

When looking at the assumed correlations of implicit theory of willpower and ego depletion with vitality in the supplementary hypotheses 6 and 7, our predictions could be confirmed. Both cases showed considerable negative correlations, bringing to light that both variables could have a strong impact on vitality. This was also reflected in the respective Bayesian analyses, yielding very high Bayes Factors of $BF_{10} = 7575.7$ in the case of Hypothesis 6 and of $BF_{10} = 5.85 * 10^{+46}$ in the case of Hypothesis 7, both exceeding the predefined threshold of $BF_{10} = 10$ for strong evidence. While ego depletion shares the commonality with vitality that it is a reflection of the current situation that a person is in and could thus possibly serve as a substitute for the latter, implicit theory of willpower brings another interesting factor to the table. Here we are dealing with a more or less persistent conviction about the nature of willpower and it might thus be very interesting to include it in future analysis side by side with vitality. A Bayesian ANCOVA included in Appendix A yielded further interesting insights, the most prominent lying in underlining the importance of ego depletion for explaining the variance in vitality and placing the model incorporating it at the top of the hierarchy.

In addition to the confirmatory analysis for the 3 main and 4 supplementary hypotheses, two exploratory analyses were performed, the results of which will now be analyzed in more detail. The first finding was that there was indeed a higher mean vitality between the condition where data was deleted and where it was saved, as predicted by main Hypothesis 1 for the whole sample regardless of gender, when looking at the male sample separately. The results showed anecdotal evidence for the H_1 ($BF_{10} = 1.46$) and a correspondingly higher mean vitality in the delete condition than in the save condition. This outcome is interesting, since it might hint at the

fact that micro-PK effects could be stronger in men than in women. Mossbridge & Radin (2021) had found in their research that there was a high correlation between high psi believers and men. Maier et al. (2022) also note that gender effects might have played a role in the results of some of their micro-PK experiments. Further research should take this into account and perform analyses for the two sexes separately and see whether similar results might support the assumption that micro-PK effects could differ according to gender.

The other exploratory analysis performed was to look at the higher and lower age group in the sample separately when it comes to vitality. In contrast to our assumption, the lower age group did not score higher in vitality than the lower age group. What is more, there was moderate and near strong evidence for the H_0 ($BF_{01} = 9.18$), thus even identifying a contrary trend. Same as for the analysis for gender, this finding might yield interesting implications for future research. In any case, as a possible explanation for why our prediction could not be confirmed, we could find that our sample in general did not have many participants with very high ages, as is demonstrated by the median being at 28 years. Not being able to divide participants into two groups that differ sufficiently in their ages to justify assuming that one represents a truly younger and the other an older age group might have confounded the results. In addition to that, taking into account that many of the participants were students and the time interval for data collection was at a time when many of those had exams or other deadlines in their courses of study, vitality might have been lower among these young participants that would normally be the case.

When wanting to find further explanations for why many of our hypotheses in this study did not yield sufficient supporting evidence, one has to consider the possibility that the theory they are based upon and the worldview they propose could simply be wrong. *Unus Mundus* and

the model of Pragmatic Transfer of Information are complex constructs that in and of themselves are not wholly situated in the objective and thus scientifically provable realm. Furthermore, research into micro-PK effects generally has faced the challenge, that effects do not show themselves easily, are difficult and often even impossible to replicate and in many instances do not operate in the way that one would initially expect them to (Bösch et al., 2006; Maier et al., 2018). Consequently, researchers in the field have always had to face quite a bit of skepticism and at times outward rejection towards the existence of psi phenomena (Cardena, 2015; Reber & Alcock, 2020; Wiseman, 2010). What stands against this is that, despite small effect sizes, psi phenomena do not always elude observation and their existence has been confirmed across various instances and settings (e.g. Bem et al., 2016; Cardena, 2018). So rather than being held up by the constant pressure of having to question whether research in psi is justified it seems much more feasible to concentrate on continuing to identify and refine the special requirements that unveiling micro-PK effects pose for researchers.

In this sense one factor that might have influenced the outcome of our study lies in its design as an online experiment. On the one hand it possesses a very huge benefit of being able to reach many participants simultaneously and with considerably less effort than would occur when having to invite people to a laboratory, gaining more power statistically. On the other hand, it has the disadvantage that experimenters can only admonish participants beforehand to complete the experiment in a quiet and undistracting environment but have not actual control if the advice is heeded or not (Sedlmeier, 2002). When wanting to bring to light sensitive and elusive micro-PK effects, this might have an even bigger impact, since the unconscious that lies at their roots could be influenced gravely by situational as well as personal circumstances (von Lucadou, 1987).

The latter is another factor that can only be controlled to a very limited degree in online experiments by means of a few hard exclusion criteria for participants. As we have just seen with the exclusion criterion age in this study, however, when left to the judgement of participants, not even clearly and explicitly stated prerequisites that should clearly prevent participation necessarily prove to do so. In any case, for micro-PK experiments in general, many more factors will need to be understood about which types of persons possess more potential for micro-PK, before a useful selection process can refine recruitment (Cardena, 2018; Varvoglis & Bancel, 2016). As we have seen in the exploratory analysis of this paper, for instance gender as a personal factor does seem to play a role, but research in the field has been somewhat inconclusive as to how and under which circumstances (Jahn & Dunne, 1997).

Micro-PK research is as important and interesting as it is challenging. Atmanspacher summarized the problem well in addressing the particular inherent characteristic of mind-matter correlations that renders them so difficult and cumbersome for classical scientific methods to discern and bring to light, namely, that they “inevitably necessitate a subjective element that challenges reproducibility” (2022, p. 49). Thus, while it can be frustrating to be confronted with the elusiveness of micro-PK time and again, researchers need to stick to their quest of making their research methods more “objective” to better fit their research “subjects”, as has long been requested by leading researchers in the field (e.g. Bierman, 2001; Maier et al., 2022). Similarly, efforts also need to focus on learning more on in whom, to what purpose and under which circumstances micro-PK effects are most prone to show themselves (Kennedy, 2003). In this way, as should be the case in research always, failures to identify an effect for the moment according to set criteria and used methods should only bring us closer to a better understanding of it. Or in Albert Einstein’s words (n.d., cited after Miller, 1955):

The important thing is not to stop questioning. Curiosity has its own reason for existing.

One cannot help but be in awe when one contemplates the mysteries of eternity, of life, of the marvelous structure of reality. It is enough if one tries to comprehend only a little of this mystery every day.

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Appendix A

Overview of Study Content and Stimuli Examples

Figure A1

Study Introduction

Study "Will Power"

Welcome to the study.

In this study, you will be shown positive or neutral images one after another. Although the selection is random, studies have shown that under certain circumstances it is possible to willfully influence which image is displayed.

We ask you to try to see as many positive images as possible through willpower.

Please click Next to participate.

< Previous

Next >

Figure A2

Free-text Field for Affect

Great that you are joining in!

Please describe in one sentence how you feel at the moment.

ca. 50-100 characters

Continue

Figure A3

Invitation to show focus on Willpower before each trial

Believe in your
will power!

Figure A4

Examples of Positive and Neutral Pictures shown in the Study



Examples positive picture.

Examples neutral picture.

< Previous

Next >

Additional Analyses

Figure A5

Bayesian ANCOVA for Implicit Theory of Willpower (ITW) and Ego Depletion (SMS5) as Covariates of Vitality and Condition as a Fixed Factor

Model Comparison

Models	P(M)	P(M data)	BF _M	BF ₁₀	error %
SMS5	0.125	0.493	6.797	1.000	
condition + SMS5	0.125	0.224	2.016	0.454	0.979
SMS5 + ITW	0.125	0.193	1.675	0.392	0.006
condition + SMS5 + ITW	0.125	0.091	0.698	0.184	4.977
ITW	0.125	4.080×10^{-45}	2.856×10^{-44}	8.282×10^{-45}	0.007
condition + ITW	0.125	1.668×10^{-45}	1.168×10^{-44}	3.387×10^{-45}	1.015
Null model	0.125	9.038×10^{-49}	6.327×10^{-48}	1.835×10^{-48}	0.006
condition	0.125	4.130×10^{-49}	2.891×10^{-48}	8.383×10^{-49}	0.006

Analysis of Effects – SVS

Effects	P(incl)	P(excl)	P(incl data)	P(excl data)	BF _{incl}
condition	0.500	0.500	0.314	0.686	0.458
SMS5	0.500	0.500	1.000	0.000	∞
ITW	0.500	0.500	0.284	0.716	0.396

Model Averaged Posterior Summary

Variable	Level	Mean	SD	95% Credible Interval	
				Lower	Upper
Intercept		5.565	0.087	5.391	5.734
condition	del	0.038	0.072	-0.104	0.187
	save	-0.038	0.072	-0.189	0.103
SMS5		-1.123	0.070	-1.265	-0.984
ITW		-0.177	0.094	-0.363	0.009

Note: Analysis performed adhering to an uninformed prior relying on a Cauchy distribution centered around 0 with an $r = 0.1$, i.e. $\delta \sim \text{Cauchy}(0; 0.1)$.