Aristotle's Fly - Remarks on Anomaly Research and a Review on the Relationship between Meditation and Psi

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Abstract

In the first part of this contribution the assertion is made that the perception and objectification of facts in science is not only determined by empirical data but also by social processes. This is illustrated by the case of an obvious error by Aristotle which was not recognized for more than two thousand years. Such a social influence can be explained by theories put forward by Ludwig Fleck, Thomas Kuhn and Harry Collins. This analysis has also a large impact on research into the paranormal because it can explain why many true anomalies are regarded as error on the side of the investigator. Furthermore it becomes clear how social processes within science lead to a suppression of knowledge not fitting the central paradigm. As a remedy to this distortion a procedure called mindful science is suggested.

In the second part one area within anomaly research is extensively reviewed, i.e. the relationship between meditation and psi. It can be shown that meditation demonstrated psi-conducive properties in many different experiments within the last 35 years but only one experimental paradigm followed up on such effects systematically. In this paradigm one meditator tries from a distance to assist another meditator in keeping his or her attention. A meta-analysis over these studies revealed a small but highly significant effect of $d = 0.11$ ($p = .009$). Finally a group of studies assessing the effects of group meditation on societal markers such as crime rates and quality of life are shortly reviewed.

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Aristotle's Fly – the longest lasting error in the history of science

Aristotle (384-322 BC) is often considered as the father of the modern natural sciences. He was the first philosopher to develop his ideas in a systematic and logical fashion and also the first to investigate all those phenomena which are transient and perishable such as plants, animals and the human species (Walach, 2005). His prominent role for the development of modern science lies in his rediscovery in the medieval age in central Europe.

When Europe at the beginning of the second millennium settled again after a long period of migration most of the antique writings were lost. A new science slowly developed out of monasteries and prospering towns. Scholars got in contact with the Arabic world through Spain, which was at that time occupied by the Islamic Moors, and through the crusades where besides the main battle fields also writings from the Antique were exchanged. By 1253 most of Aristotle's texts were translated from the Arabic into Latin and available to scholars. After some lively debate the predominant university in Paris declared these writings as the foundation of any study of philosophy and theology, and thus as the groundwork of modern science (Walach, 2005). From this time on Aristotle's writings were the indebatable authority for any scientific dispute.

Unfortunately Aristotle erred in a minor issue (Benz, 1986). In the description of the mayfly in the historia animalium he wrote: "....the day-fly as it is called uses four feet and four wings" (Aristotle, 1979, p. 31). The error was a simple one and every fly alive could display with its six legs Aristotle as wrong. Interestingly this did not happen for more than 2000 years. It was only in 1675 that the famous Dutch scholar Jan Swammerdam (1637-1680) wrote a detailed monograph about the mayfly where the six legs are correctly mentioned and also drawn in a copperplate engraving. But it lasted another 63 years until in 1738 this book was published which is now considered as the first scientific account of a fly with six legs. This date marks the end a period of 2060 years after the death of Aristotle where his error was not corrected but continuously copied from one text to another (Benz, 1986).

This is quite a surprising fact. Flies are not hard to observe, no microscopes or telescopes are needed. They are ubiquitous present and also stop regularly moving so it is not difficult to count the legs. But obviously this simple observation did not take place in the presence of a strong and authoritative statement telling that the fly has four legs. What we can observe here is that a dominating belief by a scientific community can for some time suppress divergent empirical facts observed by single individuals.

I would like to make the point that this is no process limited to the Antique or the Medieval but also present in todays since. The German Ludwig Fleck was a medical doctor and researcher into pathogens in the 1930s. But he was also a philosopher of science and published in 1935 a book entitled "Genesis and Development of a Scientific Fact" (Fleck, 1980) were he described the social processes within scientific communities. According to Fleck scientists have first to be trained to perceive in a particular way before they could start conducting empirical science. In his case this was how to look through a microscope, how to colour pathogens, or how to detect and classify them. An untrained person could not see and identify the same germs than a trained scientist. But what exactly was regarded as a proper observation and what was considered just as an erroneous perception was defined by group of dominant researchers in the field who had to power to decide and thus to define the phenomena to be observed (or not to be observed). Fleck called these implicit rules of observation and reasoning "thought styles" and the group dominating these styles a "thought collective".

Thomas Kuhn continued with this observation in his famous book "The Structure of Scientific Revolutions" (Kuhn, 2004) which was first published in 1962. According to Kuhn science can be broken up in three different stages, 'prescience', 'normal science' and after a period of crisis 'revolutionary science'. In 'prescience' no central paradigm is available yet and different theoretical models run in parallel. In the next stage, called 'normal science' a dominant paradigm has evolved. This notion could be compared with Fleck's 'thought collective'. If many anomalies are building up which are in contradiction with such a central paradigm then the paradigm will be skipped. This results in a 'crisis' followed by a period of 'revo-

lutionary science' in which new frameworks are developed. The interesting point in this model is how science deals within the stage 'normal science' with anomalies or results which contradict the central paradigm. According to Kuhn these are considered as an error on the side of the researcher. If everybody knows that the Earth is at the centre of the Universe and Galileo's observations of alleged Jupiter moons with some dubious new tool are in contradiction with this widely accepted knowledge than something must be wrong with either this fellow from Pisa or the instrument he is using. But of course as can be seen from this example not all anomalies are errors on the side of the researcher, both options 'true anomaly' to the central paradigm or 'artifactual results' are always possible.

One possible solution to the puzzle of Aristotle's fly could be demonstrated here with the social processes outlined by Fleck and Kuhn. Nevertheless the picture is not complete yet. According to Kuhn the anomaly will be detected but considered an error. According to the work by the English sociologist of science H. Collins (Collins & Pinch, 1993; Collins, 1985; Collins & Pinch, 1982) the anomaly might not be even perceived. Collins extends the social processes described by Kuhn und Fleck also to the perceptual system of the individual. He assumes that there is less stability and regularity in the world than we perceive. According to Collins our perceptual system is designed in a way which ascribes actively regularity and order to the world. What we perceive is also influenced by social factors "...because any perception of irregularity in an institutionalized rule is translated by ourselves and others as fault in the perceiver or in some other part of the train of perception" (Collins, 1985, p. 147). Most of the time we are not aware of these processes and Collins compares them with ships in bottles:

Our common perceptions, ..., are like ships in bottles. The ships, our pieces of knowledge about the world, seems so firmly lodged in their bottles of validity, that it is hard to conceive that they could ever get out, or that an artful trick was required to get them in"(Collins, 1985, p. 5f)

So the four legged fly may be considered as such a ship in a bottle and it can be assumed that at that time people only did not dare to mention the six legs but they actually did not perceive them.

The impact of this analysis for the research into the anomalies is enormous. If we according to Collins suppress anomalies in order to find a world of stability and order than we do not have to be surprised that many results of research into the anomalies are not even considered by the mainstream. But if we change the perspective and *explicitly* look for anomalies (rather than to block them out), then, according to the model proposed by Collins, they should pop up much more often than expected.

Empirical Sciences - A Mindful Perspective

If these ideas are thought through consequently than every scientist has to take a careful look at the way s/he perceives his or her phenomena of investigation. The same is true for the dominant paradigm within the area of science she or he is working in. Even more fruitful would be also a reflection on the general presupposition of our modern science (see e.g. Walach & Schmidt, 2005).

In order to arrive at such an undistorted perception and observation of phenomena it will be necessary to step back from all learned and acquired concepts and just to *observe* as unbiased as possible. In terms of cognitive science this would read as an enforcement of data-driven bottom-up processes and a reduction of concept driven top-down processes. Philosophically this comes close to Husserl's concept of phenomenology. But there is also an approach from the East which points into the same direction. It is the Buddhist concept of *mindfulness* as it is described in the Satipatthána--Sutta (Analayo, 2004). 'Mindfulness' is a notion with multiple meanings. It can be a special form of meditation, a personality characteristic or a psychological concept. Here the concept is used as a special way to pay attention as it is described by Jon Kabat-Zinn (2005, p. 108):

Mindfulness can be thought of as moment-to-moment, non-judgmental awareness, cultivated by paying attention in a specific way, that is in the present moment, and as non-reactively and as non-judgmentally and openheartedly as possible.

Often this way of paying attention is also characterized as *pre-conceptual* in order to emphasize the non-intellectual, not-elaborative, i.e. data-driven mode of observation. Another term within the Buddhist teachings

is called *beginner's mind.* It is described as 'perceiving things for the first time' which is a good guideline on how to arrive at such an unbiased mode of observation. What is expressed here can be characterized as 'empirical' in the true sense of the word. But mindfulness can not only be applied to external phenomena but also to the own internal mental processes when practicing science. If these mental activities are considered in a mindful way then there is also a chance to identify at least some aspects of the own inner 'thought styles'. It is the merit of the Buddhist teachings that they stress repeatedly that such a specific way of paying attention, of turning towards a sensual and experience-based mode can be learned in a systematic fashion. In this case the according practice would be mindfulness meditation often also called *Vipassana* (see e.g. Goldstein, 1994; Hart, 1987; Kabat-Zinn, 1990; 1994; Schmidt, 2004; Solé-Leris, 1986).

I would like to propose such a practice of a mindful science as an integral part of conducting high-quality empirical research. I am quite sure that if this method is applied regularly and repeatedly more anomalies will be seen and more six-legged flies will be detected.

Meditation and Psi

After these initial comments on the process of anomaly research in general, I would now like to proceed to a specific topic. The question to be considered in the next sections is whether there is a relationship between *meditation* practice and psi effects. In order to understand the role of meditation for the research into the paranormal at first a closer look at the history of empirical parapsychology is necessary. Next I will outline a couple of typical experimental designs where different forms of meditation were applied followed by a closer look with meta-analytical techniques at one specific experimental protocol. Finally a group of studies assessing the effects of group meditation on societal markers such as crime rates and quality of life (Maharishi Effect) are shortly reviewed.

Historical Aspects

Parapsychological research as we understand it today started with the foundation of the Society for Psychical Research in England in the year 1882. From the 1930s on the research was dominated by what was called later the *Rhine's paradigm.* J.B. Rhine established at Duke University a tradition of looking for psi mainly in card and dice experiments (Pratt, Rhine, Smith, Stuart & Greenwood, 1966; Rhine, 1964). Characteristic features of these studies were that they (i) used forced-choice methods (i.e. the subject had to chose a target from a fixed set as e.g. in the Zener cards), (ii) had many identical trials (iii) applied statistical methods to look for deviations from the mean chance expectation within these data. For the participants this meant that they had repeatedly to guess the right target in many consecutive trials (guessing paradigm). Often they were bored by these procedures and lost their interest in the experiments. The 1960s brought many changes to the society with a lot of people searching for a new orientation, especially with new approaches towards consciousness (Alvarado, 1998). The new field of transpersonal psychology and also parapsychology gave important incentives to this movement. In 1964 Rhea White published a seminal paper which was the precursor to a radical change of the predominant experimental paradigm within the field (White, 1964). In sharp contrast to Rhine, White laid an explicit focus on introspection as a method to understand psi effects:

> *If we could be conscious of our inner states while producing significant results in an ESP test, this would indeed seen to be a step toward gaining control over the elusiveness of psi (White, 1964, p. 47).*

She presented many subjective reports from participants in earlier studies from the literature and outlined a system with four mental steps involved in an extra-sensory perception, with *relaxation* and *attending to the inner processes* being important parts. This was the starting signal for many experimental protocols which assessed psi within what was then termed *altered states of consciousness* (Tart, 1976) or *internal attention* states (Honorton, 1977). In these experiments participants were in hypnosis,

deep relaxation or their dreams were assessed. The idea was not only to enforce introspective techniques but also to reduce external 'noise' in order to better focus on internal processes. This turn was backed up by the many spontaneous cases reporting of psi events while e.g. dreaming (Rhine, 1962) or being close to sleep (hypnagogic experiences). Target and calls were not matched anymore by forced-choice methods but by free-response techniques where protocols or sketches were ranked by independent judges according to their similarity with the target. The most prominent experimental paradigm emerging from this period was the *Ganzfeld experiment* (Honorton & Harper, 1974; Storm & Ertel, 2002).

Studies on Meditation and Psi

But of course also meditation is such an internal attention state and the first experimental study on meditation and psi was published in 1970 by Gertrud Schmeidler. The design of this study was simple and straightforward. During a class six students performed a standard ESP test with Zener cards and then a Swami by the name of Madhavananda came to give a short lecture on meditation and relaxation before they performed a breathing exercise. Next the ESP test was repeated and this time students scored significant ($p = .01$) while the first test was at chance (Schmeidler, 1970).

What followed until today is large set of different studies with great variations in design. Out of these approaches only one experimental paradigm evolved which was repeatedly conducted by different researcher. This is the attention focusing facilitation experiment first published by Braud, Shafer, McNeill & Guerra in 1995, which will be subject to a meta-analysis in one of the following sections. Most of the studies on meditation and psi were conducted in the 1970s with a decline in 1980s and almost no publication besides the one by Braud et al. in the 1990s. In the 2000s meditation research gained a growing popularity within mainstream research due to two circumstances. One is the increasing body of evidence for the relationship between mindfulness meditation and mental and physical health (Grossman, Niemann, Schmidt & Walach, 2004), the other is the growing interest in imaging studies of experienced meditators within neuroscience (e.g. Brefczynski-Lewis, Lutz, Schaefer, Levinson & Davidson, 2007; Lutz, Brefczynski-Lewis, Johnstone & Davidson, 2008; Lutz, Greischar, Rawlings, Ricard & Davidson, 2004). Here especially the capacity of meditators to reproduce and maintain reliably certain states of consciousness over time is of interest (Lutz, Dunne & Davidson, 2007). This second move towards meditation research after the 1970s is also reflected in parapsychology with several new studies on meditation and psi appearing in the last 5 years.

Experimental Designs in Studies on Meditation and Psi

In this section I would like to outline some designs in Parapsychological research involving meditation and I will describe a representative study for these designs. The most important distinction is whether meditation is treated as a state or a trait. In an experiment applying meditation as a state usually the ESP performance during or immediately after a period of meditation is assessed. If on the other hand meditation is treated as a trait then no meditation has to take place during the experiment. Here either experienced meditators are compared with non-meditators or novices (cross-sectional) or the changes associated with long-term meditation training are assessed over time (longitudinal).

An example of a *state study* can be found in Rao, Dukhan & Rao (1978). They conducted three experiments where they tested meditators immediately before and after a meditation session in an ESP Zener card test. All participants were students of an ashram in Bangalore, South India. The study took place during a period when they had intensive training in meditation. Students were classified as either 'juniors' or 'seniors' depending on their level of expertise in yoga and meditation and data were analyzed separately for each group. With two groups and three experiments six comparisons were made. In 5 out of 6 comparisons there was a significant improvement in hit rate from the pre-meditation to the post-meditation test ($p = .001$ - $.05$). Interestingly five of the six pre-meditation tests showed significant psi-missing while four of the six post-tests had significant psi-hitting results. They furthermore conducted a free-response test with the same participants. Here a sealed target had to be described in a written protocol before and after meditation. Protocols

were rated against the targets by independent judges. Again the participants scored significantly better (p = .05) after the meditation compared to before. There was no consistent pattern of the senior students scoring better than the junior students. Similar designs operationalizing meditation as a state were used by Roney-Dougal & Solfvin (2006; 2008) for a precognition task, by Palmer, Khamashta & Israelson (1979) in a Ganzfeld experiment, and by Osis & Bokert (1971), Rao & Puri (1978), and also Nash (1982) in an ESP tests.

A typical *trait study* was conducted by Schmidt & Schlitz (1989). They did a Psychokinesis (PK) study on pre-recorded targets. Based on a true random process melodic tones of different lengths were mixed with noise of different length and recorded on tape. 568 participants received these tapes with the task to extend the tones and to shorten the noise. Overall the experiment showed a significant PK effect of $p = .049$ or $p = .022$ depending on the method of analysis. Participants were asked in a questionnaire "...whether they had at some time practiced meditation" (p. 9). Meditators showed a significant PK effect ($p = .0005$) while non-meditators reached only chance results. The difference between the two groups was also significant ($p = .0007$). Later on many studies followed a similar approach when they asked their participants whether they practiced a mental discipline (e.g. meditation, martial arts, Tai Chi, hypnosis, relaxation exercises) and then analyzed the results for these two groups (yes/no) separately. But this approach is of course not specific enough to conclude anything regarding the effects of being a regular meditator on psi performance. Interestingly this procedure was initiated by a comment in Bem & Honorton (1994, p. 13) stating that involvement with meditation or mental disciplines in novices was a significant predictor for success in the autoganzfeld studies. But this is only true when this particular predictor was combined with other predictors (reported personal psi experience, prior psi testing). The classification according to "practicing a mental discipline" alone did not yield any significant differences (Honorton, 1997).

A mix of these two approaches, state and trait studies, can be seen in the experiment by Braud & Hartgrove (1976). They recruited ten experienced meditators practicing Transcendental Meditation™ and a matched

control group of non-meditators. Participants had to influence a random number generator (PK-test) and to get impressions about a target in a sealed envelope (clairvoyance test) while meditating (meditators) or being at rest (control group). None of the two groups reached any significant result in any of the tests. But meditators scored significantly better (p = .02) than non-meditators in the clairvoyance experiment.

Other designs used in research on psi and meditation have operationalized whether the EEG characteristics of a meditation session immediately before an ESP test can be related to the outcome in the ESP test (Stanford & Palmer, 1973); or whether participants trained in a special Tibetan meditation technique for taking-up the suffering and sending-out positive feelings can influence the electrodermal activity of a remote person (Radin et al., 2006).

A narrative review regarding meditation and psi up to 1976 can be found in Honorton (1977), Schmeidler (1994) shortly summarizes the research from 1978-1992, an overview on studies applying meditation in PK-research is available from Braud (1990) and from Gissurarson (1992). More recent studies besides the ones already mentioned above, are by Kozak et al. (2003), Radin (2008) and Bierman (2008). In Kozak et al. (2003) participants were trained for 30 days in Primordial Sound Meditation before EEG correlations between them were measured. In the study by Radin (2008) trained meditators performed better than non-meditators in a psi-task that requested continuous attention. Dick Bierman conducted an fMRI study on a presentiment effects (see e.g. May, Paulinyi & Vassy, 2005) where he also compared in mixed design trained meditators with non-mediators, with meditators tested twice, once while meditating and once while resting (Bierman, 2008).

Overall it can be concluded that although meditation was often applied and yielded many significant results in psi research it did for some reason not have the same success than the Ganzfeld, dream telepathy (Ullman, Krippner & Vaughan, 1989) or *remote viewing* (Utts, 1996) experiments. None of the experiments mentioned here were replicated by another researcher, no standard paradigm evolved. Although meditation in many state-based experiments demonstrated psi-conducive properties

this effect was not followed up systematically. From the results of these single studies described here it is difficult to draw a general conclusion, especially if the claim is controversial. It can be concluded that the field was so far studied systemically enough. Current and future studies may close this gap and provide deeper insight on the relationship between meditative states or meditation as a trait and psi effects.

The attention focusing facilitation paradigm

The attention focusing facilitation experiment was first conducted in 1993 by Braud, Shafer, McNeill & Guerra and published in 1995. It was created within a larger program on so called DMILS studies which stands for direct mental interaction in living systems. In these experiments one participants tries to activate or calm another participant from a distance (Braud & Schlitz, 1989; 1991; Schmidt, 2003; Schmidt, Schneider, Utts & Walach, 2004) and usually a physiological parameter was applied as a dependent variable. But when William Braud and colleagues designed this specific study they were in search for a behavioral measure. In this design one participant had to focus his or her attention on a candle. Whenever s/he noticed that his or her mind was wandering s/he returned with his or her attention to the candle and pressed a button. Thus the frequency of button presses within a certain time interval is an indicator of mental distraction from the focus. A second participant was located in a distant and isolated room. No normal means of communication were possible between the two participants. This second person acted as a 'remote helper'. The helper had a monitor which displayed either one of the two experimental conditions, 'Control' or 'Help'. During 'Help' periods "the helper focused her own attention on a similar object and concurrently maintained an intention for the distant participant to focus well on his or her object and remain free from mental distractions and thus be better equipped to succeed in the attentional task" (Braud, Shafer, McNeill & Guerra, 1995, p. 104). During control periods the helper occupied her mind with other matters and tried not to think about the experiment. Overall 16 1-minute periods (8 Help and 8 Control) took place in random and balanced sequence (Schlitz et al., 2003). Sixty participants

had on average 13.6 button presses during Control and 12.4 during Help periods respectively and the difference was just significant ($p = .049$).

In the description of this experiment the word meditation was not mentioned. But the task to maintain the attention on one object and to return to it whenever the mind wandered away is one of the most basic processes practiced in many different types of meditation. Learning to maintain attention for some time to a focus is a necessary condition for many other meditation techniques such e.g. for mindfulness meditation. Narrowing the attention to a single pointed focus and to keep it there is known to result in inner calm and quiescence after so me period of regular practice. Braud et al. conclude in their study:

If the attention-focusing or concentration exercises of the present study are viewed as protomeditational in nature, then the present findings suggest that one person's meditation process may be directly influenced by the concurrent meditation of another person (p. 114).

The question if meditators can support each other through their practice has often been raised. Many people experienced with meditation report that it is much easier to maintain a specific way of paying attention in group with other meditators compared to their single practice at home. Such an effect could be described as a *sangha effect*. Sangha is in the Buddhist tradition the word for the disciples following the teachings of the Buddha, thus a group of meditators are often termed sangha. Although the experiment described above had a somewhat different intention its results may be also interpreted as a support for a paranormal mediated *sangha effect*.

Meta-analysis of Attention Focus Facilitation Studies

From all experiments reported so far this is the only one which was subject to direct replication. Altogether eleven replications were conducted with more or less the same design (Brady & Morris, 1997; Edge, Suryani & Morris, 2007; Edge, Suryani, Tiliopoulos, Bikker & James,

2008; Edge, Suryani, Tiliopoulos & Morris, 2004; Watt & Baker, 2002; Watt & Brady, 2002; Watt & Ramakers, 2003), four of these studies are not published yet.

	Year	*N sessions*	*p*
Braud et al.	1995	60	.05
Brady & Morris	1997	40	.08
Watt & Brady	2002/1	60	-
Watt & Brady	2002/2	60	.41
Watt & Baker	2002	80	.30
Watt & Ramakers	2003	36	.04
Edge et al.	2001	35	.04
Edge et al.	2002	53	.03
Edge et al.*	2003	40	.66
Edge et al.*	2004	69	.54
Edge et al.*	2005	60	.21
Edge et al.*	2006	43	.27

Table 1. Attention focusing facilitation experiments, with year of publication or year the experiment took place if unpublished. All p-values are two-tailed and may thus be different from the original report. * Not published.

Table 1 lists the number of sessions and p-values of these 12 studies. The essential experimental features are the same for all these studies. In every study the task was operationalized in keeping the attention to a candle for a helpee and a helper. The dependent variable was also the same for all experiments. Helpees had to press a button whenever they noticed that their minds wandered away from the candle. All sessions consisted out of 16 one-minute periods in a randomized sequence of 8 control and 8 help periods each, only the 2004 and the 2006 study by Hoyt Edge and colleagues applied 8 2-min periods (4 control and 4 help). Furthermore all investigators applied the same statistics. Thus the studies are similar enough to assume that they test the same effects and they can now be combined using meta-analytical techniques.

Eligible are only $k = 11$ of the 12 studies with overall $N = 576$ session as in one of the two studies published in Watt and Brady (2002) an artifact prevented the evaluation of the experiment. For each study an effect-size d was calculated by the formula

$$ES(d) = \frac{t}{\sqrt{df}} \text{ with } df = N\text{-}1 \text{ (Rosenthal, 1994, p. 233).}$$

This is a d-type effect size which means that d = 1.0 stands for a difference of one standard deviation between experimental and control condition. For each effect size an according variance has to be estimated in order to calculate a standard error for the effect size. This variance is here estimated by $\sigma_i^2 = \frac{1}{N}$

In order to combine studies they have to be weighted according to the inverse of their variance which is in this case just N. Next it has to be determined whether it is likely that the database forms a homogeneous data set where all single studies are an estimate of the same true effect size. This can be determined by comparing the variance expected to be found as a consequence of the sampling error with the empirical variance found in the dataset. Homogeneity can be determined by the Q-statistic. For the dataset of the eleven attention focus facilitation studies Q = 15.6 is obtained. Q is χ^2 distributed with $df = k\text{-}1 = 10$ resulting in $p = .11$. With $\sigma^2 = 0.01$ there remains some variance unexplained by sampling error. But the database is still homogenous enough in order to combine effect sizes by a fixed effect model. Effect sizes are thus integrated according to the formula provided by Shadish & Haddock . For the attention focus facilitation dataset this results in an overall $d = 0.11$ which is significant at $p = .009$ (two-tailed).

Thus it can be clearly demonstrated that there is a small but significant overall effect in all these 11 studies. The small effect size may explain why some of the single studies reached significance and others not. This is a question of statistical power with small effects needing large samples in order to find significant effects.

In two earlier meta-analyses we have combined studies from two experimental paradigms . These are DMILS studies with electrodermal activity (EDA) as dependent variable and so called Remote Staring studies also with EDA as physiological outcome measure. These studies were similar in design to the experiments meta-analyzed here and all three designs are testing the effects of a distant intention, operationalized either as helping (attention focus facilitation) gazing (remote staring) or activating and calming (EDA-DMILS). All three meta-analyses yield almost the same effect size as can be seen in table 2:

Experiment	*k*	*N*	*d*	*p*	*95% CI*
DMILS	36	1015	0.106	.001	0.043 — 0.169
Remote Staring	15	379	0.128	.013	0.027 — 0.229
Attention focus facilitation	11	576	0.109	.009	0.027 — 0.191

Table 2. Results from three meta-analyses on distant intention effects, k = number of studies, N = number of sessions, d = mean effect size, p = according p-value, 95% CI = 95% confidence interval of mean effect size.

The close similarity of these results can be regarded as mutual independent confirmation of each of the single meta-analyses. Therefore it can be concluded that the three experimental designs are likely to test the same effect. As in two datasets the dependent variable is a physiological one and in the third a behavioural one it can be furthermore assumed that the effect is independent of the measures applied.

Overall it can be concluded from this meta-analysis that there is a small but very significant effect of distant intentionality or to put it more specifically of remote support in keeping focused during meditation which cannot be explained in conventional terms.

The Maharishi Effect

Finally to complete this review I would like to mention a group of studies from a special context which is also relevant to the relationship between meditation and psi. These are studies which are assessing the so called *Maharishi Effect*, named after Maharishi Mahesh Yogi (1917-2008)

the founder of the Transcendental Meditation ™ movement. TM is based on the Vedic traditions of India and promotes an idealistic philosophy where consciousness is primary (Orme-Johnson, Zimmerman & Hawkins, 1997). According to this philosophy the basic field of our universe is a cosmic psyche which is eternal and unbounded. It can be accessed by the individual (transcendence aspect) through practicing transcendental meditation. Maharishi also promoted a theory of collective consciousness existing at different levels (family, community, nation etc.). He predicted based on the so called 'coherence principle' that 1% of a population practicing TM would result in a reduction of crime and other negative tendencies in the respective society (Orme-Johnson, Zimmerman & Hawkins, 1997).

This hypothesis has been tested in many empirical studies on meditators trying to reduce crime rates, to improve quality of life indicators or to lower armed conflicts and wars. A comprehensive overview including critics and rebuttal can be found at *http://www.truthabouttm.org/truth/Societal Effects/Rationale-Research/index.cfm.* I would like to report two examples from this collection, both published in Dillbeck, Banus, Polanzi & Landrith (1988).

The first example is a time series analysis with the two time series "weekly totals of violent crimes for the District of Columbia" and "weekly averages of participants in the group practice of the Transcendental Meditation ... program" (p. 475) for 105 consecutive weeks. Analysis were performed for lag -7 to lag +7 and only lag +1 reached a significant effect (p = .02). The according transfer function states that for each increase of one more meditator the crime rate decreases by 0.13 in the following week. One has to take into account that this statement is only correlational but not causal in its nature.

In order to overcome this limitation the authors applied in a second study a *cross legged panel correlation* (CLPC) design which is able to draw also causal conclusions. In this design correlations are followed up in a longitudinal design in order to determine their causal direction. The authors collected crime rates from 160 randomly chosen cities in the US for the years 1964-1978. They also had figures on the percentage of TM

trained population in these cities from 1972 to 1978. Crime rate changes were calculated and the data were controlled for social variables which had a significant influence on crime rate. Out of 7 years assessed (1972-1978) five showed a significant negative correlation in the range from r = -.143 to r = -. 216 between crime rate change and population practicing TM. Even more interesting is the causal CLPC analysis where the data from 1972 were contrasted with those of later years. Out of six analyses two showed a significant effect (p < .05) supporting the Maharishi effect. These are interesting and challenging reports with sound methodology and they deserve similar like the results of the meta-analysis reported above a critical discussion and of course independent replications.

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