

THE SIGNIFICANCE OF COMBINING FIRST-PERSON AND THIRD-PERSON DATA IN NEUROSCIENCES: AN EXAMPLE OF GREAT CLINICAL RELEVANCE

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ABSTRACT. Both perspectives, the one of the first and the one of the third person and their interrelation are necessary for the progress of consciousness research. This progress presupposes the systematic and productive collaboration between philosophy and neuroscience and cognitive science. While the philosophy of mind deals with working out clear conceptual implications and argumentative coherency in this area and critically follows the state of the art in this regard, the mission of neuro- and cognitive sciences is to develop and employ useful methods for the approach of the main problems of consciousness. I discuss this necessity by the example of research on implicit and explicit memory processes. Implicit and explicit memory processes are essential for the understanding and treating several psychological and neurological disorders. Among these, memory deficits play a crucial role in stress-related disorders, such as PTSD, dissociative disorders, and borderline personality disorders. Criticism has been exercised with regard to neglect of subjective experience in the research of memory processes, as well as the inadequate application of the concept of consciousness, usually leading to confusion. However, a step forward has already been taken in the research of memory processes. For example, the psychotraumatology research provided important advances in understanding the underlying distortions in implicit and explicit memory processes by employing combined assessments of both first-person and third-person data. Such multimodal research approaches delivered an exemplary model for the scientific investigation of mental processes and disorders and their neuronal substrates.

KEYWORDS: first-person data, third-person data, philosophy of mind, neurosciences, cognitive sciences, clinical psychology, implicit and explicit memory

1. An unsolved problem

How does consciousness arise in the physical world? This is a question that has preoccupied many scientists and philosophers for centuries. An important part of the problem, which corresponds to the project of empirical consciousness research,

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is to understand how a variety of subjective universes can constantly develop and fade away in our objective universe. The philosophical part of the problem is to understand how we ourselves can embody such subjective universes and, above all, what all that really means.²

The subdivision of the problem in the philosophy of consciousness

1. In philosophy, the main problem is the *ontological* one, which deals with *the nature of mental processes*.³ Main issues in this area are: Can mental phenomena be attributed to physical phenomena? Can mental states be realized physically?

2. *Epistemologically* there is a distinction between:

a. *the problem of knowledge about our own mental states* and

b. *the knowledge about the mental states of other*.⁴

The first problem is called the problem of *privileged access to one's own mental states* or the problem of *first-person perspective*. The second has been called the problem of *other minds*, or the *third-person perspective*.

3. Another important issue is *semantics*, which deals with the problem of the *meaning of mental concepts* and the *methodology* that tries to determine the *best methods for the study of consciousness phenomena*.⁵ In the area of methodology, the importance of the cooperation between philosophy and natural science is illustrated best.

2. The analysis of theories of consciousness

The analysis of philosophy has shown that positions represented for example by theses of *substance dualism*, *semantic physicalism*, *functionalism*, and *identity theory* have *many weaknesses*, so *they can impossibly demonstrate what they intend to*. Other theories, like those of Frank Jackson, Thomas Nagel, Joseph Levine have led to *philosophical progress* by contributing to a *better understanding* of the various and complex aspects of the problem of consciousness.⁶ They pointed out that it is conceivably *not possible to reduce phenomenal states to objective physical states* and that *they cannot be identical* with brain states. According to these authors, *there is no conceptual or analytical link between the concepts of*

² Thomas Metzinger, *Bewusstsein. Beiträge aus der Gegenwartsphilosophie* (Paderborn: mentis Verlag, 2005), 17-21.

³ Ansgar Beckermann, *Analytische Einführung in die Philosophie des Geistes* (Berlin: Walter de Gruyter, 2001), 1-2.

⁴ Beckermann, *Analytische Einführung*, 2.

⁵ Beckermann, *Analytische Einführung*, 2-3.

⁶ Beckermann, *Analytische Einführung*, 429-430.

consciousness and the physical, non-mental concepts, by which consciousness can be explained or reduced. However, the remaining question, regarding the *nature of this link*, remains open.

3. Phenomenal Consciousness and „Qualia“

Many philosophers improperly used the term ‘*consciousness*’ to mean the *inner spiritual world*, which is similar to the *physical inner world*, even if they differ fundamentally.⁷ Consciousness mainly implies *subjective experience*, so it has *phenomenal characteristics* or *qualities of experience*, also called ‘*qualia*’ in philosophy.

In *the subjective nature of mental states* the main concern is, according to Nagel’s famous essay,⁸ “*what it feels like*” (e.g. “*what it is like to be a bat*,” which has different sensory organs in comparison to other species). Another well-known example is that of Jackson⁹ about Mary, who is a specialist in the research field of perception, but does not have the ability of color perception. When Mary leaves her black-white-gray prison and for the first time sees a ripe tomato, she has acquired something new. These essays are far from being able to define the complex field of phenomenal consciousness, and generally *a non-circular definition of consciousness cannot be avoided*. One can only explain this aspect by using synonymous terms and referring to examples.¹⁰ However, they offer explanations that serve to avoid confusion with other applications of the concept of consciousness.¹¹

4. The necessity for the integration of two types of data for the study of consciousness

Metzinger¹² argues that ultimately a *good theory of consciousness* has to be accepted as a *theory of our own inner experience*. It needs to account for the *subtlety and phenomenological richness of experience* and to really *take seriously the internal perspective* of the experiencing subject. Moreover, it has to explain to us *how the*

⁷ Beckermann, *Analytische Einführung*, 13.

⁸ Thomas Nagel, “What is it like to be a bat?” *Philosophical Review* 83 (1974): 435-450.

⁹ Frank Jackson, “Epiphenomenal qualia,” *Philosophical Quarterly* 32 (1982): 127-136.

¹⁰ Beckermann, *Analytische Einführung*, 384.

¹¹ Ned Block, “Eine Verwirrung über eine Funktion des Bewusstseins“, in *Bewusstsein. Beiträge aus der Gegenwartsphilosophie*, Hrsg. Thomas Metzinger (Paderborn: Mentis Verlag, 2005), 523-581.

¹² Metzinger, *Bewusstsein*, 18.

first-person perspective is related to the third-person perspective of the externally operating science.

Chalmers¹³ approached these issues and demonstrated that the *research progress in the field of cognitive psychology and neuroscience requires consideration of both the first-person perspective and a third-person perspective.*

Third-person data present *neutral phenomena* by reflecting *behavioral data* and data *on brain processes*. They provide traditional material for *cognitive psychology and neuroscience* with the phenomenal aspect remaining unexplained.

First-person data are *subjective*, since they are concerned with *data about emotional experiences*. They provide a second perspective for the science of consciousness and allow *access to the phenomenal experience*. However they make no statement about cognitive and neural mechanisms.

Consequently, *first-person data cannot be reduced to third-person data and vice versa*. This means that third-person data alone provide an incomplete data catalog, since the phenomenal aspect remains unexplained. Only first-person data are also incomplete, since they make no statement about cognitive and neural mechanisms. This is the *explanatory gap*, which was discovered in the current state of the art regarding knowledge in the area of consciousness. One can therefore say that *the association between objective functions and a certain kind of subjective experience requires the integration of both kinds of data*. This would be the main objective of a satisfactory study of consciousness, which would allow building an explanatory bridge in a scientific context.¹⁴ Both data types require explanation and interpretation.

5. First-person data: the "difficult" problem of consciousness

In philosophy, the problem connected with *the explanation of the third-person data of consciousness* is also known as *the 'simple' problem of consciousness*, since *clear methods* of implementation for collecting such data are directly available among standard procedures of the *cognitive psychology and neurosciences*. In this way, the processes are discovered and specified in terms of *computational and neural mechanisms*. Chalmers¹⁵ indicates that third-person data explain how the system is objectively functioning. A *reductive explanation model* (e.g. higher-level phenomena can be explained by low-level processes i.e. molecular biology) can

¹³ David J. Chalmers, "How can we construct a science of consciousness?" in *The Cognitive Neurosciences III*, ed. Michael S. Gazzaniga, *The Cognitive Neurosciences III* (Cambridge: MIT Press, 2004), 1111-19.

¹⁴ Chalmers, "How can we construct."

¹⁵ Chalmers, "How can we construct."

only be useful for clarifying the *objective function of the cognitive system* in the form of neurophysiology.

This model is not appropriate for *first-person data* because such data deal with *subjective experience*. A complete report on the objective functions of consciousness cannot possibly answer questions on the association of these functions with a certain kind of subjective experience. This problem can *withstand these methods*. The *problem of explaining the first-person data of consciousness* is sometimes called *the 'difficult' problem of consciousness*. According to Chalmers, important questions, even after completing the picture of the objective functions of the brain and behavior, remain unanswered. In general, can one tackle this problem at all with the tools of neuroscience? Why are these functions associated with conscious experience? And why are they connected with a certain kind of experience?

The *obstacles in the collection of first-person data* are significant, e.g. the privacy of this kind of data; the *lack of inter-subjective perception* (there is no measure of consciousness); the *less advanced development of methods* for the investigation of first-person data in comparison with those for collecting third-person data, particularly with concern to more subtle phenomena; *lacking formal criteria and theory development* for collecting first-person data.

6. Integration modalities for both kinds of data

Chalmers¹⁶ made *methodological suggestions* for further research in this area. He proposed the following: *correlate detailed first-person features with third-person features, systematize the connection* with principles of increasing generality, and use preferably *simple, basic, and universal principles* that underlie and explain the higher-level connections.

He suggests that one can *solve these problems in a roundabout way*: e.g. *comparing conscious-unconscious, finding behavioral and neural correlates of subjective experiences, monitoring subjective verbal reports*, applying observational methods. The main types of first-person data are based on *visual perception* (e.g. the perception of color and depth), *other senses* (e.g. hearing and tactile sense), *bodily sensations* (e.g. pain and hunger), *imagination* (e.g. memory of visual images), *emotional experiences* (e.g. happiness and anger), and *thoughts* (e.g. deliberations and decisions). Nevertheless, the connection between these two types of data may require a theory based on *principles of structural coherence, organizational invariance, and double perspective*.

¹⁶ Chalmers, "How can we construct."

As for *verbal reports*, philosophers like Chalmers or Metzinger refuse to recognize them as first-person data. Metzinger has gone further and claimed that there are no first-person data. This is a very challenging position, which precludes the hope of a scientific approach to this data. Data are considered *objective* if they *proportionally correspond to the measured aspect of reality*. As a parenthesis, *all data are actually subjective*, but if the subjective estimation is confirmed in a variety of situations, then we can consider the measure as objective. The *example of temperature measurement* has been frequently used to illustrate the subjectivity of data: we measure the temperature not directly, but we assume that the highness of the mercury column is proportional with the temperature.

In the case of *verbal reports*, there are procedures in which one looks at many different subjective experiences for a *large number of persons and conditions* and *verifies this data by objective instrumental measures*, an option that allows *access to the first-person data*. If the received *verbal reports are proportional to the subjective experience*, they allow *access to valid first-person data*. Here I find the suggestion of Hobson¹⁷ constructive: he proposes a compromise by which verbal reports can be at least considered "*third person half-some-one*."

7. Implicit and explicit memory

So far I have presented views and suggestions coming from the field of the philosophy of mind. Using the *example of the memory research*, I will now show that *first-person data have been often less considered in the cognitive psychology and neuroscience*.

In the philosophy of mind, *memory* can be commonly referred to as an *information supplier* from which stored information can be retrieved. In psychology, memory is defined as the *brain's ability to receive, retain, organize, and retrieve information*. The memory content is set out in the *synaptic efficiency of neural networks* and the dominant metaphor for memory retrieval is the *association*. In this way, words, phrases, and also emotions are seen as part of a large network, with its adjacent areas being semantically related to each other.

Regarding the relationship between memory organization, brain structures, and memory capacity, the fundamental idea in psychological literature is that *memory is not a single unit*. Apparently memory consists of *several separate and partially independent components that rely on different brain systems*. The most common types of distinctions are made between *long- and short-term memory* and between *implicit and explicit memory*. The explicit/*declarative* memory is the

¹⁷ Allan Hobson, "Finally Some One: Reflections on Thomas Metzinger's 'Being No One,'" *Psyche* 11, 5 (2005): 1-20.

capacity for *memory of facts/general-knowledge information (semantic memory)* and *events/situations (episodic memory)*, which can be *deliberately retrieved* and *verbally reported within a chronological context*.¹⁸ The processes of declarative memory appear to be based on the activity of the *hippocampus* and adjacent cortical structures, and of the frontal lobe.¹⁹

The *implicit memory* is conceived as a *heterogeneous collection of unconscious learning skills* (i.e. *non-declarative/procedural memory*) that are expressed through *performance* and for which *access to any conscious memory content* is mostly not available. It refers to *habits, skills, emotional reactions, reflexes and conditioned responses*. These processes are linked to different specific areas of the nervous system, e.g. *amygdala*.²⁰ Implicit memory contents are *activated by cues* and characterized by sensory, emotional, and physiological perception accompanied by feelings of *'here and now,'* and *could not be verbally reported in a coherent form or logically explained*.

The division between implicit and explicit memory was initially based on the evidence that such processes are *experimentally separable*. Studies showed that performance improvements in fulfilling tasks and the ability to learn are possible without conscious recollection of the learning episodes in amnesic patients. Thus, the processes and the relevant areas of implicit memory seem too heterogeneous to be included in a unitary memory system.²¹ Moreover, the subdivision of implicit memory seems to correspond rather to the types of tasks than to the criteria of consciousness.²² Brain studies have indicated that these memories are processed in *different brain areas*.²³ There is also evidence that *glucocorticoids* have an important role in the regulation of imprinting, consolidation and retrieval of *declarative memory*.²⁴ The *amygdala* modulates the strength of both declarative and procedural memory processes.

¹⁸ Martin A. Conway and Christopher W. Pleydell, "The construction of autobiographical memories in the self-memory system", *Psychological Review* 107, 2 (2000): 261-288.

¹⁹ Larry R. Squire, "Declarative and nondeclarative memory: multiple brain systems supporting learning and memory", in *Memory systems*, eds. Daniel L. Schacter and Endel Tulving (Cambridge: MIT Press, 1994), 203-232.

²⁰ Squire, "Declarative and nondeclarative memory," 215-224.

²¹ Daniel B. Willingham, Laura Preuss, "The death of implicit memory," *Psyche* 2, 15 (1995), <http://psyche.cs.monash.edu.au/v2/psyche-2-15-willingham.html>.

²² Willingham, Preuss, "The death of implicit memory."

²³ Squire, "Declarative and nondeclarative memory," 215-224.

²⁴ See C. Kirschbaum, O. T. Wolf, M. May, W. Wippich, D.H. Hellhammer, "Stress- and treatment-induced elevations of cortisol levels associated with impaired declarative memory in healthy adults," *Life Sciences* 58 (1996): 1475-1483; Dominique J.-F. de Quervain, Benno

8. The neglect of first-person data in memory research

A *key criterion* for distinguishing between explicit and implicit cognitive functions is the *presence / absence of conscious knowledge*. Implicit memory is demonstrated when performance by fulfilling a task is facilitated by the absence of conscious recollection. Explicit memory is demonstrated when performance requires conscious recollection of previous events/knowledge.

The *methods* used for testing implicit processes are *different* from those that assess explicit functions. For example, *declarative memory* is directly tested by asking participants to *consciously recall something*. On the other hand, *implicit memory* is usually studied by *evaluating performances* depending on indirect recall and expressing behavioral changes.

Gardiner²⁵ investigated the direction research on implicit memory leads into. A picture of the restrictions in this area is presented by *two main methods* preferred by many researchers: the *criterion of intentional retrieval*²⁶ and the *procedure of process dissociation*.²⁷ In the intentionality criterion of retrieval are reached conclusions about the nature of implicit versus explicit memory by experimental designs, in which the same stimuli for implicit and explicit tests are given to participants and only test instructions vary. The procedure of process dissociation investigates the cognitive control of the recall for the completion of word stems during two experimental conditions. In the first condition, participants are requested to complete the stems from a previously studied list of words. In the second condition, participants are asked to complete the word stems that were not on the list. Gardiner criticizes this approach, since it falls under the category of *third-person explanations of consciousness*. He proposes the use *experiential procedures* aiming at correlating this data with first-person data.

Roozendaal, James L. McGaugh, "Stress and glucocorticoids impair retrieval of long-term spatial memory," *Nature* 394 (1998): 787-790; J. W. Newcomer, G. Selke, A. K. Melson, T. Hershey, S. Craft, K. Richards, A. L. Alderson, "Decreased memory performance in healthy humans induced by stress-level cortisol treatment," *Archives of General Psychiatry* 56 (1999): 527-533; Werner Plihal, Jan Born, "Memory consolidation in human sleep depends on inhibition of glucocorticoid release," *Neuroreport* 10 (1999): 2741-7; Benno Roozendaal, "Glucocorticoids and the regulation of memory consolidation," *Psychoneuroendocrinology*, 25 (2000): 213-238.

²⁵ John M. Gardiner, "Functional aspects of recollective experience," *Memory and Cognition* 16 (1988): 309-313.

²⁶ Daniel L. Schacter, Jeffrey Bowers, Jill Booker, "Intention, awareness, and implicit memory: The retrieval intentionality criterion," in *Implicit memory: Theoretical issues*, eds. Stephan Lewandowsky, John C. Dunn, and Kim Kirsner (Hillsdale: Erlbaum, 1989), 47-65.

²⁷ Larry L. Jacoby, "A process dissociation framework: Separating automatic and intentional uses of memory," *Journal of Memory and Language* 30 (1991): 513-541.

Kihlstrom adds more criticism by showing that *such experiments do not really investigate what they intend to investigate*. Although the tasks involve complex rules that are unknown and unpredictable for the participants, *volunteers gain explicit knowledge* during the experiment, which helps them fulfill the tasks and can explain their performance. Kihlstrom et al.²⁸ propose a different approach in the investigation of unconscious memory processes.

9. Interactions between the implicit and explicit memory processes

However, it seems *oversimplified* to divide memory into two precise mental entities. The *interaction between implicit and explicit processes* and mechanisms has been *demonstrated experimentally*. For example, in the case of *perceptual-motor skill learning*²⁹: This is a test in which 4 lines continuously appear on the lower part of a screen to indicate sites where asterisks may appear. At each appearance of an asterisk, participants must press the corresponding button (A, B, C or D). Participants were naive with respect to the existence of sequence of appearance sites, which is repeated again and again. Results showed improved response times for both amnesic patients and in healthy controls. However, healthy participants acquired a certain degree of declarative knowledge during the tests. Similar findings also came from other tests for implicit memory and *partially overlapping brain activation patterns during implicit and explicit processing have been recently demonstrated*. The *earlier view* that completely different brain areas are responsible for implicit and explicit memory processes became *invalidated*. This shows that *these processes work simultaneously and harmoniously, and it is difficult to distinguish between them*.³⁰

Hence the question arises: Is the distinction valid and useful? Are there qualitative / quantitative differences? Related conceptual criticism questioned the categorical division between implicit and explicit cognitive processes, proposing that apparently intact implicit processing in the presence of apparently disturbed explicit processing may solely reflect “*a more degraded modus operandi of the cognitive system as a whole, i.e. with ‘explicit’ and ‘implicit’ processes in fact lying*

²⁸ John F. Kihlstrom, Terrence M. Barnhardt, Douglas J. Tataryn, “The psychological unconscious. Found, lost, and regained,” *American Psychologist* 47 (1992): 788-91.

²⁹ Paul J. Reber, Larry R. Squire, “Parallel brain systems for learning with and without awareness,” *Learning & Memory* 1 (1994): 217-229.

³⁰ Deborah Faulkner, Jonathan K. Foster, “The decoupling of ‘explicit’ and ‘implicit’ processing in neuropsychological disorders: insights into the neural basis of consciousness?” *Psyche* 8, 2 (2002), <http://psyche.cs.monash.edu.au/v8/psyche-8-02-faulkner.html>.

*on a functional continuum.*³¹ Consequently, the apparent *preservation of qualitatively separate implicit / non-conscious brain units* in amnesic patients *may embody the preservation of simpler and less resource-consuming processing patterns*. In this way, the question about the nature of conscious knowledge remains open.

10. The improper use of the concept of ‘consciousness’ in memory research

Another problem is that phenomenal consciousness (*P-consciousness*) is often *confounded with other types of consciousness, usually with access-consciousness.*³² So speaks, for example, Baars³³ about the nature of experience (P-consciousness), but his theory is a *"global workspace" model of access-consciousness*. Also, Jacoby et al.³⁴ argued that studying the processes of access-consciousness may say a lot about P-consciousness.

Baars³⁵ argues that while Nagel's criterion is a too demanding criterion for an empirical science of consciousness, behavioral denial of the phenomenal aspects of consciousness research is too restrictive and this endless debate is fruitless. He proposes a *compromise for consciousness research by specifying comparable pairs of psychological phenomena*, which differ in only one point. One part is aware and the other is not (e.g. conscious / unconscious memory). He calls this method a *"method of contrastive analysis."*

11. Examples of knowledge advance on memory processes coming from the field of clinical psychology

The field of *clinical psychology necessarily relies* much more than other psychology domains *on subjective, first-person data*. The research of emotion is devoted to *studying the behavior and physiology of human emotion* by means of which we are able to observe and understand humans. For this kind of research, it is important to *scan, consciously integrate and probe information from three levels: subjective* (verbal expression, prosody), *behavioral* (motor, facial expression, etc.), *physiological*

³¹ Faulkner, Foster, "The decoupling of 'explicit' and 'implicit' processing in neuropsychological disorders," 4.

³² Block, "Eine Verwirrung."

³³ Bernard J. Baars, "A Thoroughly Empirical Approach to Consciousness," *Psyche* 1, 6 (1994), <http://psyche.cs.monash.edu.au/v2/psyche-1-6-baars.html>.

³⁴ Larry L. Jacoby, D. Stephen Lindsay, Jeffrey P. Toth, "Unconscious influences revealed. Attention, awareness, and control", *American Psychologist*, 47 (1992): 802-809.

³⁵ Baars, "A Thoroughly Empirical Approach."

(trembling, sweating, and crying). Lang³⁶ emphasized that *assessments that leave out one or more of these three modes of emotional expression can be highly misleading*. Contrasting research in other areas, particularly *psychotraumatology research*, has employed *multimodal assessment strategies*: first-person data (e.g. data coming from the observation of behavior, self-report measures, and clinical interviews) and third-person data (neuropsychological tests, learning experiments, psychophysiological and brain investigations). This approach of clinical psychology combining both types of data led to significant advances of knowledge in the area of consciousness. Here I will exemplify such important *advances in the area of implicit and explicit memory processes* with important implications for research, clinical practice, and psychotherapy.

Memory processes are of great relevance in the area of stress-related disorders (e.g. posttraumatic stress disorder/PTSD, dissociative disorders, and borderline personality disorder). The *response to stress* appears to be mediated by specific *neurochemical and neuroanatomical dysfunctions*³⁷: When stress increases, both the *hippocampus and the amygdala increase their activity* and *stress hormones* (e.g. adrenalin, noradrenalin, and glucocorticoids) are being released into the circulatory system. From a certain point onward, when the level of stress is very high, the *hippocampus becomes less functional* and the *amygdala reaches a plateau level*. It has been showed that *elevated doses of glucocorticoids* impair hippocampal activity and *have damaging effects on the hippocampus on the long-term*: atrophy and loss of pyramidal neurons, reduction of the ramifications of the hippocampal dendrites and that adrenalin and noradrenalin in high concentrations increase the activity of the amygdala (particularly in case of chronic/prolonged trauma³⁸). *Hippocampal dysfunctions* are thought to impair the *encoding of explicit information* and, subsequently, the *access to the elements of the trauma-related explicit memory*. It is assumed that this *dysfunctional encoding of distressing/traumatic events* is the way in which the *posttraumatic symptoms are generated*.

The “*fear network*” model of trauma-related memories originating in the work of Lang³⁹ states that a *sensory-perceptual representation* including elements of

³⁶ Peter J. Lang, “What are the data of emotion?” in *Cognitive Perspectives on Emotion and Motivation*, eds. V. Hamilton, G. H. Bower, and N. Frijda (Boston: Martinus Nijhoff, 1988).

³⁷ Bessel A. van der Kolk, “The psychobiology of posttraumatic stress disorder,” *Journal of Clinical Psychology* 58 (1997): 16-24.

³⁸ James L. McGaugh, “Significance and remembrance: The role of neuromodulatory systems,” *Psychological Science*, 1 (1990): 15-25.

³⁹ Peter J. Lang, “A bio-informational theory of emotional imagery,” *Psychophysiology* 16 (1979): 495-512.

implicit memory (i.e. peritraumatic strong bodily sensations, intensive emotions, thoughts, and behavioral reactions) is formed, but these elements are *not well integrated in the autobiographical/explicit memory* at the same time. This fear network is *highly consistent, very large, and long-lasting*, has particularly *strong links* and can be *easily activated*. By contrast, there are fewer activation pathways going from the implicit memory system to the elements of explicit memory (i.e. knowledge of general, specific events and lifetime periods). Consequently, the *autobiographical representation* (explicit memory) is highly fragmented, inconsistent, includes partial amnesia, contradictory information.

For the psychophysiological and neurobiological research (third-person data), paradigms including first-person data have been employed: the paradigm of *emotional imagery*, the paradigm of *exposure to trauma-related stimuli, subjective ratings* of emotional experiences during event. In the paradigm of emotional imagery (*script-driven imagery*), during the reading of a personalized report of a traumatic event (*script*), participants are asked to vividly imagine this situation including actions, persons and emotions present during the real situation (imaginative procedure). The paradigm of exposure to trauma-related stimuli employed various material (auditive, visual, and combinations of auditive and visual stimuli).

Several results emphasize the importance of this multimodal approach. Findings of experiments using imagery and exposure to trauma-related stimuli indicated a higher physiological reactivity (e.g. heart rate, skin conductance, blood pressure, muscular activity, activation of certain brain areas, amplitude of the blink reflex) of PTSD patients as compared to traumatized persons without PTSD and to controls. Other studies proved that physiological reactivity to stimuli related to trauma may predict the development and persistence of PTSD.⁴⁰ The physiological reactivity to stimuli related to trauma may allow for the evaluation of treatment efficiency.⁴¹ Hippocampal Magnetic Resonance Imaging studies indicated lower hippocampal volumes in PTSD patients.⁴² The meta-analysis of clinical and

⁴⁰ See E.B. Blanchard, E.J. Hickling, A.E.Taylor, W.R. Loos, C.A. Forneris, J. Jaccard, "Who develops PTSD from motor vehicle accidents?" *Behaviour Research and Therapy* 34 (1996): 1-10; A.Y. Shalev, T. Sahar, S. Freedman, T. Peri, N. Glick, D. Brandes, S.P. Orr, R.K. Pitman, "A prospective study of heart rate response following trauma and the subsequent development of posttraumatic stress disorder," *Archives of General Psychiatry* 55 (1998): 553-559.

⁴¹ Scott P. Orr, Walton T. Roth, "Psychophysiological assessment: clinical applications for PTSD," *Journal of Affective Disorders* 61 (2000): 225-240.

⁴² J.D. Bremner, P. Randall, E. Vermetten, L. Staib, R.A. Bronen, C. Mazure, S. Capelli, G. McCarthy, R.B. Innis, D.S. Charney, "Magnetic resonance imaging-based measurement of hippocampal volume in posttraumatic stress disorder related to childhood physical and sexual abuse—a preliminary report," *Biological Psychiatry* 41 (1997): 23-32.

neurobiological indicators for PTSD⁴³ demonstrated the existence of mainly *two brain activation patterns* corresponding to *two pathological PTSD subtypes*: (1) the dissociative subtype of PTSD characterized by emotional inhibition and by an inhibition of the limbic system through the activation of the medial prefrontal cortex; (2) the PTSD subtype characterized by emotional activation (predominant re-experiencing/hyperarousal symptoms), mediated by the failure of prefrontal inhibition of the same limbic regions.

These findings *inspired the development of effective treatment strategies*, suggesting that the *trauma-related fear network (implicit memory) should be activated and durably modified by adding new elements* that are incompatible with the original pathological memory representation. Consequently, most successful therapies operate an *integration of explicit/declarative memories within a coherent autobiographic report* (through repeated exposure to traumatic memories) and *correct dysfunctional old trauma-related beliefs by means of cognitive restructuring*. In this way, the pathological fear response is inhibited. Findings demonstrating that these *old fear responses can be reactivated in certain situations* even after successful therapy⁴⁴ *document the real neurobiological substrate of treatment effects*. This is not about a new memory restructuring (deletion of the old neural synapses of the fear network), but about a *memory restructuring through the learning of new elements*. On a neuroanatomical level, the extinction of fear response is mediated by the inhibitory influences of the medial prefrontal cortex on the amygdala, which has been confirmed by the research of brain activation patterns. Accordingly, one could say the following: (a) trauma-focused therapy leads to the inclusion of neutral, declarative contents into the memory system to form a new trauma-associated memory representation; (b) the new memory contents are parallel to the original ones and inhibit, depending on the context, the activation of the still intact old fear structure during the confrontation with trauma-associated stimuli/situations.

Multimodal assessments proved their *utility* in several ways. This approach demonstrated its *high efficacy for knowledge advance* as well as *clinical diagnostic and therapeutic value* by furnishing an *in-depth understanding of neurobiological substrates and mechanisms of psychological disturbances and their treatment*.

⁴³ R.A. Lanius, E. Vermetten, R.J. Loewenstein, B. Brand, C. Schmahl, J.D. Bremner, D. Spiegel, "Emotion modulation in PTSD: Clinical and neurobiological evidence for a dissociative subtype," *American Journal of Psychiatry* 67 (2010): 640-647.

⁴⁴ See S. Rachman, M. Whittal, "The effect of an aversive event on the return of fear", *Behaviour Research and Therapy* 27 (1989): 513-520; S. Rachman, M. Whittal, "Fast, slow and sudden reductions in fear," *Behaviour Research and Therapy* 27 (1989): 613-620.

12. Explanatory gaps in memory research

Research in the field of implicit and explicit memory has led to *insights about the objective functions* in terms of *cognitive processes and responsible brain areas*. Due to the *preference for third-person methods* by cognitive researchers and neuroscientists, most frequently *accounts of subjective experience (first-person data) have been left aside*. Although scientists in the field of memory research aim at investigating phenomenal consciousness, they have used *no solid principles for the collection of first-person data*. Most frequently, the aspects of phenomenal consciousness have been confounded with other types of consciousness. Previous findings in this area say little about the phenomenal aspects of consciousness accompanying memory processes. They provide even less evidence on how these functions are associated with subjective experiences. Some areas of *clinical psychology research have overcome some of these deficits* by using multimodal data collection that led to *significant knowledge advances in the area of explicit and implicit memory*. However, since *clinical research significantly relies on fundamental research* by approving and integrating concepts and findings coming from the cognitive psychology and neurosciences, many questions about the validity of implicit-explicit distinction and about the nature of conscious knowledge still remain unanswered.

Despite the advances in cognitive psychology and neurosciences, the problem remains unsolved. One reason for the strong increase in the current interest in the exploration of consciousness lies in the development of new technologies for brain research. This has led to a widespread optimism among neuroscientists in terms of access to a theory of consciousness. Many philosophers who have been following and have praised this progress of the neural correlates of consciousness, however, have realized that the explanatory gap remains unsolved. The question is what kind of theory and what types of methods are needed for building a bridge between the neural correlates and phenomenal elements of experience?

13. Proposals for a memory research that emanates from the unitary existence of phenomenal consciousness

Following *constructive philosophical recommendations* and *positive examples coming from areas of clinical psychology research*, I suggest that cognitive and neuro-physiological fundamental research should make more intensively and systematically use of first-person data, which should be combined with third-person data. I propose the following:

- It should *distinguish more strictly between working concepts*, develop *theories about the function of consciousness* and related, testable research hypotheses. This should be achieved through *more rigorous*

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classification criteria and the operationalization of memory and learning concepts.

- It should develop more *sensitive methods* for the investigation of first-person data (e.g. sensitive scales and formal and content data analysis of verbal self-reports and benchmarks for observation that should be collected additionally to third-person data).
- It should develop *valid procedures for the correlations* between the two types of data (e.g. isomorphism between aspects of phenomenological consciousness and changes in brain activity that occur simultaneously). An *interpretation of the associations as neuronal correlates* of certain aspects of consciousness should be *subsequently tested* on persons with neurological and psychological disturbances.