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# The challenges of consciousness research in light of the variations of conscious experience

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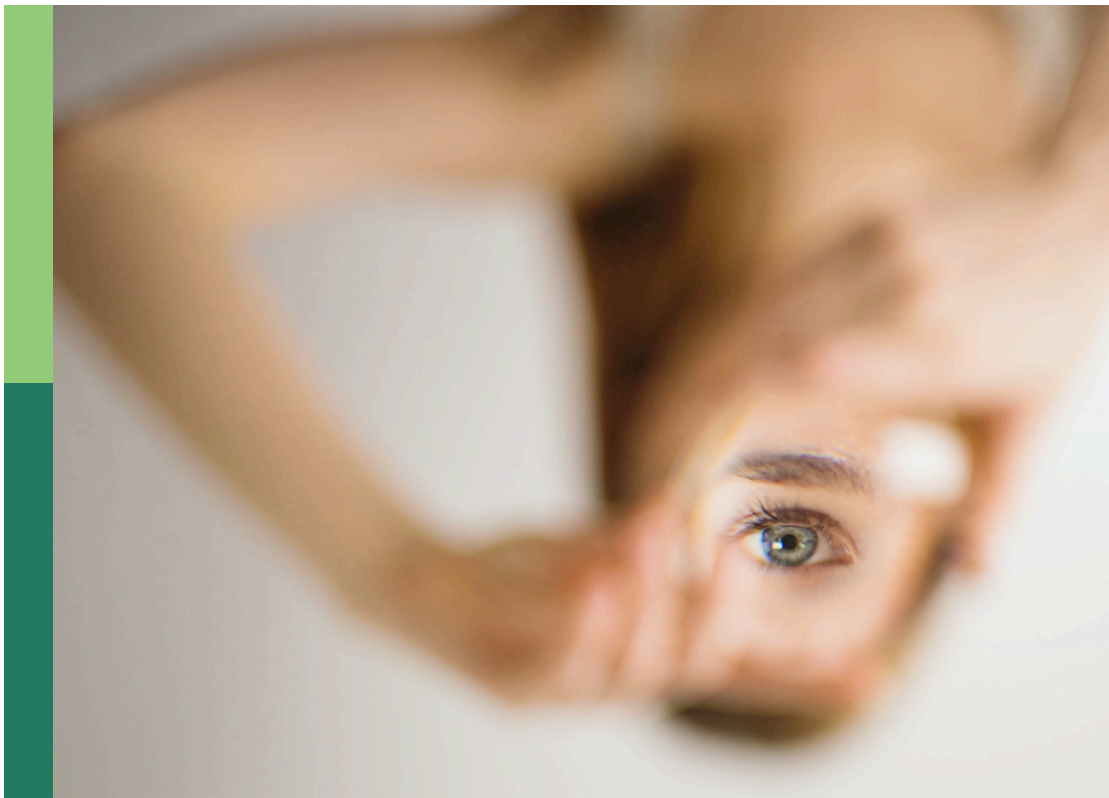

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# The challenges of consciousness research in light of the variations of conscious experience

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# Editorial: The challenges of consciousness research in light of the variations of conscious experience

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Editorial on the Research Topic
The challenges of consciousness research in light of the variations of conscious experience

Conscious experience undergoes considerable changes. Prominent examples are the transitions between dreaming, deep sleep, and the unfolding of consciousness in early childhood. However, the conscious experience of awake adults can change no less drastically. In adults, such changes can occur accompanied by more or less control. Examples of uncontrolled or even uncontrollable shifts are psychotic episodes, developing depression, schizophrenia, or mania. Arguably, examples of more controlled changes are those brought about by deeply immersing oneself in artworks or artistic performances, cultural rituals geared toward a state of trance, and even administering drugs like hallucinogens. The most controlled manner to bring about such changes is through meditative practices and philosophical methods of exploring the constitution of consciousness.

This situation creates challenges for consciousness research: After all, an objective or intersubjective investigation requires observer-independent statements about what conscious experience is like. The named changes, however, mean that the object of consciousness research, i.e., consciousness, is, in a sense, unstable. Conscious experience may vary considerably, even in adults. Three questions in need of answering thus emerge for consciousness research: First, can we identify parameters that help us understand and describe these changes? Second, can we identify aspects, elements, or structures of consciousness that remain constant even within such changes? Third, is it possible to determine an "average" in the sense of an everyday consious experience that could serve as a frame of reference for contrasting the possible changes?

Those are the main questions underlying the contributions to this volume. We limited the investigation to the conscious experience in adults, and we welcomed interdisciplinary contributions combining fields like psychology, psychiatry, philosophy, meditation research, and neuroscience. A single volume naturally cannot reach a conclusive and comprehensive scientific description of all the possible alterations and their mutual relations. However, we are hopeful that the contributions united here will incite awareness of the challenges

in describing the dynamics of conscious experience and provide means to tackle them scientifically. In the following brief summary of each article, we proceed in alphabetical order by last name of the author, and we focus on how each contribution relates to the overall goal of this volume.

Christoffersen et al. submit a literature review on the notion of tranquility, focusing on patterns of regional traditions. Providing a system of four experiential categories, the authors engage with the question of whether the localized traditions share phenomenological patterns. In general, most, if not all, experiences of tranquility share the structural character of detachment.

Dzwiza-Ohlsen and Kempermann explore the embodied mind in motion as a framework for understanding dementia from neuroscientific and philosophical perspectives. The authors discuss habits as embodied long-term memories and illustrate this with Marta Cinta González Saldaña, an ex-ballerina with Alzheimer's disease. The example shows that highly habitually embodied abilities are less prone to undergo the change of consciousness occuring in Alzheimer's disease.

Guardiola explores different distinctions within the ego drawn by Edmund Husserl and their explanatory value for depersonalization disorders. He first offers reflections on how Descartes's philosophy unduly suggested identifying the ego and the subject. After laying out three senses of the ego in Husserl—the ego pole, the substrate of habitualities, and the monadic ego—Guardiola then suggests that dislocated mereological relations between the first two senses can explain psychotic or schizophrenic experiences.

Gutland explores a change in conscious experience when transitioning from thinking quantitatively to thinking qualitatively. In the first part, he draws on Edmund Husserl to show how science historically and one-sidedly emphasized quantification and measurability while discarding the objectivity of experiential qualities. Drawing on Hegel, Gutland then portrays the shift in conscious experience when thinking qualitatively over and above quantitatively.

Masi revisits the current paradigm in consciousness research, i.e., the neurobiological approach that views conscious experience as an epiphenomenal byproduct of neural activity. This material monist theory of consciousness would imply changes in conscious experience if the underlying neurological structures change. Masi, however, reviewed literature on hydrocephalic individuals who have severely diminished neural tissue but preserved mental experience. He thus uses the absence of changes in consciousness to raise questions about the dominant interpretation of consciousness.

Ramminger et al. engage with the methodological and meta-theoretical discourse in neuropsychology. They are considered with the philosophical paradigms underlying research procedures, addressing the controversy between localizationism and holism. Developing a dialogue between these accounts can disclose new assessment methodology for the neuropsychological research on consciousness.

Schleim traces the so-called hard problem of consciousness back to historical precursors in Leibniz and Du Bois-Reymond. This allows him to connect explaining subjective conscious experience with the problem of introspection as Wundt saw it, i.e., that even paying attention to it already alters conscious experience. Schleim then suggests Varela's neurophenomenology and meditation research to conduct consciousness research with an encompassing method and to stabilize conscious experience.

Taguchi and Saigo use category theory to explain a puzzle of time-consciousness: Any given "now" in time is different from the last, yet simultaneously, "now" is always "now." The flowing and standing now, so they argue, can be captured by the notion of a monoid, while the cosclice category descriptively captures viewing time as consisting of distinct points. In the last part, the authors show how the monoid structure also prevails in meditative states of consciousness.

Wagemann et al. contribute an empirical investigation on the basis of a mixed-methods approach. The subject matter of their investigation is intersubjectivity under the constraint of wearing face masks in the context of the COVID-19 pandemic. Their results support theories of inter-corporeality as they suggest that I-Thou relations unfold in oscillating forms of mental activity that are impeded by social distancing regulations.

Wendler and Fuchs question schizophrenia as a pathological shift in consciousness that leads to utter incomprehensibility and bizarreness. The authors counter that this supposed incomprehensibility's experiential structure can be understood by drawing on phenomenology. They make their case by countering three different sources of confusion: overreliance on delusional beliefs, a false threat of irrationalism, and various equivocations.

Ziegler and Weger use a mathematical example and first-person phenomenology as a guideline to broaden one's attention to the pure thinking action that underlies our daily conscious experience, but that usually goes unnoticed. To stabilize the descriptive particulars of this thinking, the authors contrast its productive and performative nature with various other kinds of thinking, flashes of insight, and mere associating based on memory.

## Author contributions

CG: Conceptualization, Project administration, Validation, Writing—original draft, Writing—review & editing. SK: Conceptualization, Project administration, Validation, Writing—original draft, Writing—review & editing. KL: Conceptualization, Project administration, Validation, Writing—original draft, Writing—review & editing. MM: Conceptualization, Project administration, Validation, Writing—original draft, Writing—review & editing. AW: Investigation, Validation, Writing—original draft, Writing—review & editing, Conceptualization.

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# Stable Consciousness? The "Hard Problem" Historically Reconstructed and in Perspective of Neurophenomenological Research on Meditation

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Finding a scientific, third-person explanation of subjective experience or phenomenal content is commonly called the "hard problem" of consciousness. There has recently been a surge in neuropsychological research on meditation in general and long-term meditators in particular. These experimental subjects are allegedly capable of generating a stable state of consciousness over a prolonged period of time, which makes experimentation with them an interesting paradigm for consciousness research. This perspective article starts out with a historical reconstruction of the "hard problem," tracing it back to Gottfried Wilhelm Leibniz and Emil du Bois-Reymond in the 18th and 19th century, respectively, and the problem of introspection as already acknowledged by Wilhelm Wundt in the 19th century. It then discusses the prospects of research on long-term meditators from a contemporary perspective and with respect to the neurophenomenological research program already advocated by Francisco J. Varela.

**Keywords: consciousness, hard problem, neurophenomenology, meditation, introspection, Wilhelm Wundt, phenomenological psychology**

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## INTRODUCTION

Finding the biological basis of consciousness is sometimes considered as one of the major unsolved puzzles of contemporary science (Miller, 2005). However, philosophical arguments commonly subsumed as the "hard problem" of consciousness question the possibility of this endeavor, at least with respect to *subjective experience* (Chalmers, 1995). The issue is even more complicated by the lacking consensus in both psychology and neuroscience on what precisely is to be explained (the so-called *explanandum*) and what an explanation would look like (the *explanans*). For example, Northoff and Lamme (2020) distinguish eight different explanatory frameworks with different views on the *explanandum*, different experimental approaches, and different findings. Another recent review similarly distinguishes even nine modern models for explaining consciousness (Signorelli et al., 2021). That such distinctions matter empirically is illustrated by the example that researchers pursuing the Global Neural Workspace Theory commonly identify regions in the *prefrontal* cortex as candidates for the minimally sufficient neural correlate of consciousness, while

scientists following the Integrated Information Theory commonly find *posterior* brain areas to be more active in their experiments (Koch et al., 2016; Northoff and Lamme, 2020).

The aim of this perspective is not to propose yet another framework or to unify the already existing accounts (but see Wiese, 2020). Instead, I first summarize the historical precursors of the presently known "hard problem." It turns out that the core of the argument has already been formulated by Gottfried Wilhelm Leibniz (1646–1716) in the 18th and Emil du Bois-Reymond (1818–1896) in the 19th century (Leibniz, 1714/2014; Du Bois-Reymond, 1872).[1] This is then related to Wilhelm Wundt's (1832–1920) view of experimental psychology and the problem of introspection, particularly the lacking stability of consciousness and the impossibility to observe it without changing it (Wundt, 1888). Decades later, John B. Watson (1878–1958) and other behaviorists banned consciousness from scientific investigation because of its (alleged) vagueness and the unavailability of reliable instruments (Watson, 1913). The arguments gathered thus far will, secondly, be discussed with respect to Francisco J. Varela's (1946–2001) neurophenomenological research program (Varela, 1996). In particular, recent reviews of meditation research and one exemplary study will be discussed with respect to the possibility of overcoming the "hard problem" by stabilizing consciousness in deep meditation (Winter et al., 2020).

## THE "HARD PROBLEM" HISTORICALLY

The common reference for the "hard problem" of consciousness has become David Chalmers's article "Facing Up to the Problem of Consciousness" (Chalmers, 1995).[2] There he distinguished rather "easy" problems to scientifically explain *cognitive functions* (like the ability to discriminate, categorize, and react to environmental stimuli or the integration of information) from explaining *subjective experience*, the "something it is like" to be a conscious organism (see also Nagel, 1974). As described in the introduction, recent reviews of psychological and neuroscientific accounts of consciousness neither agree on the *explanandum* nor the *explanans* of consciousness. Signorelli et al. (2021) conclude in particular that before explaining consciousness, "one needs first to be precise about what it would mean to 'explain' something." Arguments of this kind are *negative*: We don't know precisely what has to be explained or what an explanation should look like. Can we also find a *positive* argument for why consciousness might be scientifically inexplicable–or at least so hard to explain?

A classic source to look for is Leibniz's *Monadology* (1714/2014). In § 17 of his major philosophical work, he proposed a thought experiment: Imagine that there were a machine that could think, feel, and perceive just like yourself. Now also imagine to increase it in size such that you could walk around in it like in a mill. If you did, you would see mechanical parts working on each other–like cogwheels and a millstone. But nothing of that mechanism, none of these activities and motions, would explain a perception. For Leibniz, perceptions and the like were properties of *the whole* which cannot be explained by properties of its parts; in modern terms we might say that he denied the possibility of a *reductive* explanation and considered consciousness an emergent phenomenon (Stephan, 2006). Transferred into our time, we might imagine a living human brain increased in size such that we could walk around in it like in a factory (Bieri, 1995). By looking at the neurons and other cells–their synapses, the molecules, and the like–we would see, in analogy to Leibniz's thought experiment, nothing to explain subjective experience. In a way, brain scanning and other techniques were developed to allow precisely this, to investigate activities of cells and neural networks in the microscopic world of the brain (Schleim and Roiser, 2009). But all we see are accompanying neurophysiological processes, not consciousness itself. Here we must be careful, though, to not beg the question: The argument is supposed to show that there is no reductive explanation for consciousness. One might say, though, that Leibniz's thought experiment is not a real argument, but an appeal to our imagination or intuition; Dennett might call it an "intuition pump" (Dennett, 1993; Brendel, 2004).

In the 19th century, some 160 years after Leibniz, physiologist du Bois-Reymond gave a couple of influential lectures on the limits of scientific knowledge. In one of them, he picked up Leibniz's thought experiment and developed it further: Imagine Laplace's Demon, an intelligence knowing all scientific facts of the world. That super-intelligence would know everything of the atoms moving while you are feeling pain, lust, taste something sweet, smell a rose, hear a tone, see a color, and the like. Du Bois-Reymond (1872) only saw two possibilities: Either the atoms themselves were already conscious, which would not provide an explanation; or their motions and activities wouldn't explain consciousness. The brain of a (dreamlessly) sleeping person wouldn't pose a riddle to the Demon, but as soon as the person woke up and became conscious that would change. Again, as with Leibniz, the thought experiment is intended to support the intuition that a full mechanistic explanation of the nervous system cannot explain consciousness. We thus must again be careful not to beg the question.

This situation is different on Wilhelm Wundt's account, the founder of the first laboratory for psychological experimentation. Wundt sharply distinguished psychology as an experimental science from a broader perceived cultural psychology (Wundt, 1888; de Freitas Araujo, 2016). The former would require *observation* and not just *perception*. To illustrate this difference, Wundt compared somebody's perception of a lightning with the case of a botanist accidentally discovering an interesting plant on a hike. Wundt was aware of what is commonly known as

[1] As is so often the case in philosophy, one could trace the origins of this argument even back to Greek antiquity: Plato described in *Phaido* how Socrates, shortly before executing his death sentence, discussed the materialistic philosophy of Anaxagoras. According to materialism, Socrates argued, a valid answer to the question why he is in prison would be that his bones and tendons moved such-and-such to transport his body there (*Phaido*, 98c–e; see also Polak, 1936). But this would miss the point of the question altogether (i.e., that he accepted the sentence of the Court of Athens instead of fleeing from the city). While this is obviously not exactly the same as the "hard problem" of consciousness, it already illustrates the competition between first- and third-person perspectives, intentional and naturalistic explanations, or the humanities and the natural sciences that will be central in the remainder of this article.

[2] The article has 4,686 Google Scholar citations as of May 1, 2022.

the problem of introspection, although he himself didn't use that term (de Freitas Araujo, 2016). That is, consciousness is changing all the time and paying attention to itself also changes it; furthermore, recalling a conscious experience from memory carries the risk of missing important features of the original process or of inventing some that weren't originally there. By contrast, the botanist's plant remains stable and can be observed in many different ways. This explains why Wundt preferred to use experienced subjects intensively trained to respond as fast as possible to simple stimuli in order to minimize the likelihood of any distortions (Danziger, 1980).[3] Scientific self-observation (German: *Selbstbeobachtung*) would only be possible under such strict and simplified experimental conditions; otherwise there were only inner perception (*innere Wahrnehmung*) beyond the purview of science generally and psychological science in particular (Wundt, 1888).

The problem of introspection and the idea of the trained subject will also play a major role in the next section, but first the opportunity should be taken to contrast the positions summarized thus far with the behavioristic research program that would dominate psychology for decades after Wundt. In his seminal programmatic paper, John B. Watson was very skeptical of both investigating consciousness in general and the introspective method in particular (Watson, 1913). He saw the latter as "mental gymnastics" and found that it had "something esoteric." Terms like "feeling" had no clear meaning–and therefore no place in science, just like consciousness at large. Psychology should, like other natural sciences, only deal with that which is objectively measurable. For Watson's psychology this was only *behavior*. Although Burrhus F. Skinner (1904–1990), another famous behaviorist, expressed a less radical view about consciousness, he was also very skeptical of the place of "mental vocabulary" in science, particularly psychological science (Skinner, 1971), anticipating the philosophical position of *eliminative materialism* that emerged a little later (Churchland, 1981).

We have seen in this section that the idea of the "hard problem" of consciousness can be traced back until at least the 18th century. However, the view that consciousness is impossible or at least hard to explain mechanistically or reductively rather seems to be based on an appeal to intuition or imagination than on strict scientific reasoning; the arguments thus amount to a negative/skeptical stance and fall short of providing a strong positive reason for why the problem should be impossible to solve. Wundt described experimental conditions under which at least some perceptions could be observed scientifically, while Watson wanted to restrict science to the study of behavior. Both the problem of introspection and the critique that the meaning of certain vocabulary is unclear are still relevant today, even though consciousness has now become an accepted and even quite successful research domain. However, recent scientific reviews introduced above show that there's still no agreement on either the *explanandum* or the *explanans* of consciousness research. We cannot ask Leibniz, Du Bois-Reymond, Wundt, Watson, or Skinner for their views on the present research; but we can discuss in the next section whether meditation research is a promising way to deal with the "hard problem."

## NEUROPHENOMENOLOGY AND MEDITATION RESEARCH

Neuropsychological research on meditation has become so common that some actually already warn us to "mind the hype" (Komjathy, 2017; Van Dam et al., 2018) or its possible negative effects (Cebolla et al., 2017; Schlosser et al., 2019). However, for the purpose of this article we need not address whether meditation or its "mindfulness" component really has the health benefits so many now have come to believe. Our interest here is twofold: First, can experienced meditators produce conscious states with sufficient stability to solve the problem of introspection; and second, could subsequent research overcome the "hard problem" of consciousness?

Traditionally, an explanation of conscious experience was attempted by *phenomenological psychologists*. In particular Edmund Husserl (1859–1938) already distinguished first-person descriptions of lived experience from investigating consciousness within an empirical science (Husserl, 1911/1965).[4] We addressed the problem of introspection in the previous section, particularly that consciousness is constantly changing. Discussing the neurophenomenological program originally developed by Varela from a present perspective, Berkovich-Ohana et al. (2020) recently acknowledged this very problem: "As lived experience is a constantly changing, multi-layered and highly complex flux, its exploration is challenging". Similar to Wundt, Varela also emphasized the importance of developing certain skills for the experimental subject in consciousness research (Varela, 1996). As will be shown in the remainder of this section, meditation seems to be a promising technique to achieve precisely that.

While there are too many ways of practicing meditation to address here, recent and influential reviews generally distinguish three major kinds: attentional, constructive, and deconstructive (Dahl et al., 2015; Lutz et al., 2015). The first aims at sustaining attention on a certain object or process; the second at achieving a certain psychological state (e.g., compassion); and the third at getting rid of certain features of psychological processes that may be disturbing.[5] The first and the third are most relevant for the purpose of this paper. There's now a general consensus that sustained attention facilitates not only meditation, but also introspectively investigating consciousness (Dahl et al., 2015; Lutz et al., 2015; Berkovich-Ohana et al., 2020). For example, Lutz et al. (2015) described how practicing

[3]In Danziger's useful history of introspection in psychology, other approaches–like that of the Würzburg School–are discussed as well. Doing justice to these or contemporary approaches like micro-phenomenology (e.g., Petitmengin et al., 2019) goes beyond the scope of this perspective.

[4]It is a matter of debate whether and to what extent Husserl's method can be described as *introspection*. The answer is not central for my analysis. In line with Berkovich-Ohana et al.' (2020) discussion which I rely on in what follows, Gutland discussed this in detail and answered the question affirmatively, applying Schwitzgebel's criteria for introspection (Schwitzgebel, 2016; Gutland, 2018).

[5]Constructive kinds of meditation not further addressed in this article are often exercised in the context of healthcare, wellness, or the ethics of particular spiritual traditions such as Buddhism (Wallace, 2007; Federman, 2021; Schmalzl et al., 2021).

continuous attention on one's psychological processes can lead to *dereification* (sometimes also called *cognitive defusion*), a state where one perceives emotions and thoughts without identifying with them as *my thoughts* or one realizes that there is anger without interpreting that *I am angry*. The latter also exemplify the deconstructive aspect of meditation.[6] In that sense, (experienced) meditators would become more neutral observers of their own psychological processes. Sustained attention and a decrease of distractions (e.g., mind-wandering, rumination) would facilitate stable consciousness of a certain object or process–or perhaps even a state of *pure consciousness* without any identification or *consciousness of* something (Lutz et al., 2015; see also Metzinger, 2020). This skill of (very) experienced meditators seems, at least partially, to overcome the problem of introspection and meet Wundt's (1888) requirements of scientific observation. Here we should distinguish two aspects of meditation which are independently, but complementarily related to introspection: The first is the attentional/mindfulness component that simply allows subjects to attend better to their psychological processes; the second are particular states of consciousness (arguably) only occurring in deep meditation, such as the example of pure consciousness addressed below. Regarding the former, this perspective aims at encouraging such approaches in phenomenological psychology; with respect to the latter, it serves as an example for how to solve the problem of introspection.

Many studies and reviews already described brain processes and areas related to meditation (e.g., Fox et al., 2016). With respect to the "hard problem," however, it is more informative for the present purpose to look at one such particular study in more detail. Winter et al. (2020) used neuroimaging (EEG and fMRI) to investigate a (very) experienced meditator with more than 50,000 h of practice, sometimes up to 12 h of formal meditation per day. This subject was allegedly able to get into a state of pure consciousness–or content-free awareness–as described above. The meditator reported having achieved a state with "no awareness of any mental content or any sensory event, including the noise of the MRI scanner" and "no experience of self, time, or space of any kind whatsoever" under experimental conditions while being awake the whole time (Winter et al., 2020: 4).[7] Summarized briefly, the authors report that this state was correlated with a sharp decrease in EEG alpha power and a decoupling between the dorsal attention network and the sensory cortex in the brain. This would be consistent with neural markers of sensory disconnection and a state of disconnected consciousness as reported in previous literature.

What does this mean with respect to the "hard problem"? We may recall that Leibniz invited us to imagine walking around in the meditator's brain as if it were a mill and that du Bois-Reymond suggested that we may have all scientific knowledge of the meditator's neural processes. Even though Winter et al. (2020) combined different neuroscientific methods to investigate a subject allegedly successful in producing a very stable conscious state, we still seem far away from the preconditions of Leibniz's or du Bois-Reymond's thought experiment. However, the present situation lets us draw at least some preliminary conclusion: First, investigating advanced meditators appears to be a promising experimental paradigm for empirical consciousness research going beyond what deemed Wundt possible (and even more so Watson or Skinner); second, even under such controlled conditions, first-person knowledge about the meditator's phenomenology seems to be a prerequisite for interpreting the neuroscientific data; third, this interpretation requires background knowledge of how the brain works more generally; fourth, when these conditions are met, a plausibility check becomes possible to evaluate the first-person account in the light of third-person data–or the other way around. This could also mean that, in the long run, when meditation becomes understood better neuroscientifically, this knowledge might be used to guide meditators. Theoretically interesting cases would occur when, unlike in the study presently discussed, the first- and third-person accounts were *incongruent* (e.g., when a meditator's alleged state of pure awareness looked neurally like a state of rumination, or *vice versa*; see also Schleim and Roiser, 2009; Schleim, 2018). But for the time being it seems justified to conclude that it is not possible, on the basis of what was discussed above, to assess how hard the "hard problem" really is. Instead, in line with the neurophenomenological research program (Varela, 1996; Berkovich-Ohana et al., 2020) the first- and third-person perspectives have the potential to inform each other. In particular, knowledge gained in such investigation could be used to design follow-up studies, which has been coined phenomenological "front-loading" before (Gallagher, 2003; Gallagher and Sørensen, 2006). Finally, assuming that meditators discuss previously unknown experiences with their teachers or with researchers employing specialized questionnaires (e.g., Wallace, 2007; Gamma and Metzinger, 2021), neurophenomenology could also include the second-person perspective.

## SUMMARY AND OUTLOOK

Both consciousness and its "hard problem" have a long tradition in philosophy and science. The behaviorists' views turned out to be too extreme and pessimistic, partially thanks to advances in psychology and neuroscience allowing researchers to look into the "black box" of the nervous system and the brain; but also Wundt's views on what is experimentally possible seem too limited from a present perspective. His idea to use trained subjects undergoes a revival in the form of investigating long-term meditators presently.[8] This kind of research also promises to combine first-, second-, and third-person approaches to

[6]While this perspective does not specifically address Husserl's phenomenological approach, the striking similarity between attentional meditation (or mindfulness, to use the popular term) as described above and Husserl's *epoché* should not be neglected; further similarities between deconstruction/dereification and Husserl's noema or phenomenological reduction (Gutland, 2018) should be pursued in more detail elsewhere.

[7]Some question the possibility of content-free awareness (consciousness without content) or pure consciousness. Here I would like to refer the interested reader to the discussion by Metzinger (2020) and Winter et al. (2020), with further references mentioned therein.

[8]Not pursued here are transcultural perspectives related to meditation, such as the perception of classic Asian texts, the reinterpretation, or decontextualization of meditative practices by scholars in the West (Komjathy, 2017; Metzinger, 2020).

study consciousness, without any of them making the others obsolete. Disagreement on the *explanandum* and *explanans* of consciousness research also illustrates, though, unresolved foundational issues. In line with Leibniz's and du Bois-Reymond's train of thought one can still question what the total knowledge of the mechanism underlying consciousness in general or meditative experiences in particular would be knowledge *of*. Therefore, finding minimally sufficient neural correlates of consciousness may primarily answer neuroscientific questions, without solving the "hard problem" as a whole. But is this actually important in general–or only interesting from a naturalistic point of view concerned with the completeness of natural science? New research on mechanisms also illustrates how scientific explanations can be *integrative* and combine different levels of description without automatically replacing or reducing them (Machamer et al., 2000; Craver, 2007). This perspective article suggested a few preliminary answers and tried to illustrate the diversity of available methods and paradigms to study consciousness as well as the continuation of phenomenological psychology in neurophenomenology. The present situation of consciousness research thus promises many more interesting findings, with research on long-term meditators (allegedly) producing stable states of consciousness being a particularly interesting path to follow.

## DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

## AUTHOR CONTRIBUTIONS

SS conceived and wrote the whole manuscript, contributed to the article, and approved the submitted version.

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# Exploring tranquility: Eastern and Western perspectives

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Although tranquility is a fundamental aspect of human life, the experiential nature of tranquility remains elusive. Traditionally, many philosophical, religious, spiritual, or mystical traditions in East and West have strived to reach tranquil experiences and produced texts serving as manuals to reach them. Yet, no attempt has been made to compare experiences of tranquility and explore what they may have in common. The purpose of this theoretical study is to explore the experiential nature of tranquility. First, we present examples of what we consider some of the most central experiences of tranquility in Eastern and Western traditions. For the sake of simplicity, we sort these examples into four categories based on their experiential focus: the body, emotions, the mind, and mysticism. Second, we offer an exploratory account of tranquility, arguing that the different examples of tranquility seem to share certain experiential features. More specifically, we propose that the shared features pertain both to the content or quality of the tranquil experiences, which involves a sense of presence and inner peace, and to the structure of these experiences, which seems to involve some degree of detachment and absorption.

KEYWORDS

**consciousness, stoicism, yoga, Buddhism, meditation, mysticism, absorption, detachment**

## Introduction

From time immemorial, human beings have longed and strived for tranquility. Testimonies of this are widespread in sacred, philosophical, and medical texts, literature, and art. Throughout history and across cultures, contemplative, philosophical, spiritual, religious, and mystical traditions have developed their own practices to reach certain experiences of tranquility. Still, the nature of the various experiences of tranquility, the very purpose of reaching them, and their interpretation vary substantially, depending on the traditions' cultural or religious configurations. From the perspective of everyday life, tranquility is not unknown to us. Occasionally we all feel tranquil, and we thus have an intuitive grasp of what tranquility means. Asked to define it, though, it tends to slip through our fingers, and we struggle to qualify the experience. Indeed, there is

something puzzling about the experience of tranquility. On the one hand, it seems like a trivial phenomenon that everyone already is familiar with. On the other hand, it appears to be a complex phenomenon, requiring dedicated and enduring practice to reach.

In many Eastern traditions and practices (e.g., the six Brahmanic or orthodox schools such as Yoga, the non-orthodox or Shramanic schools of Indian philosophy such as Buddhism, Chinese traditions such as Daoism, etc.), tranquility has been a key focus for several thousand years. A few examples may illustrate this point. The first example is the introductory and *key* sutra (aphorism) of the Yoga Sutras (YS) of Patanjali, which reads "Yoga (is) bringing to complete cessation the functional modifications of citta [the mind]" (Karambelkar, 2012).[1] In other words, the very purpose of Yoga is to still the mind. Another example is a famous verse of the Bhagavad Gita: "To the disunited (one not established in the Self) does not belong wisdom, nor has he meditation. To the unmeditative there is no tranquility. To the peaceless how comes happiness?" (2.66; Yogananda, 2013, p. 313). Yet another example is from the Soto Zen master, Shunryu Suzuki, who elaborating on calmness in zazen (i.e., the seated meditative practice of Zen) states, "When you are doing zazen, you are within the complete calmness of your mind; you do not feel anything. You just sit. But the calmness of your sitting will encourage you in your everyday life" (Suzuki, 2020, pp. 112–113). Finally, the work of the late Thich Nhat Hanh, a world-renowned Vietnamese Buddhist monk, is a powerful example of a dedicated, lifelong commitment to tranquility and peace [see, e.g., Hanh (2005)].

In Greek and Roman philosophy, tranquility was considered central to happiness (*eudaimonia*) by skeptics (e.g., Pyrrho of Elis and Sextus Empiricus), epicureans (e.g., Epicurus and Lucretius), and stoics (e.g., Chrysippus, Seneca, Epictetus, and Marcus Aurelius). Tranquility was the core experiential aspect of notions such as *ataraxia*, *apatheia*, and *euthymia*, which were important notions in these philosophical schools. These notions all describe a calm state of mind in which one is not disturbed or overwhelmed by strong emotions or passions, impulses or wishes. The term tranquility comes from the Latin *tranquillitas* (from *tranquillus*, quiet, calm, still), which, as Striker pointed out, is the term Cicero and Seneca used to translate Democritus' *euthymia*—although the meaning of *tranquilllitas* is, in fact, closer to that of *ataraxia* (Striker, 1990, p. 98). In a seminal book, Sorabji (2000) illuminated how Greek and Roman ideas on tranquility found their way into early Christian thought through the works of Evagrius Ponticus and St. Augustine—ideas that also appear in the hesychast (gr. *hesychia*, inner peace or silence) tradition of the Eastern Orthodox Church, collected in *Philokalia*, and in the work of Christian mystics such as Eckhart (2009).

In contemporary philosophy and psychology, tranquility is sometimes regarded as an aspect of mental well-being (Soysa et al., 2021), considered a mood by some (e.g., Gallegos, 2017; Kriegel, 2019) and an emotion by others (e.g., Ellsworth and Smith, 1988; Berenbaum et al., 2019). Tranquility has also become an important topic in the growing literature on mindfulness (Bishop et al., 2004; Coleman and Coleman, 2019), metacognition (e.g., Schraw and Moshman, 1995; Jankowski and Holas, 2014; Dorjee, 2016), and equanimity (e.g., Juneau et al., 2020; Analayo, 2021). For example, tranquility has here been described in the context of emotional calmness or in relation to a state of mind, where, e.g., thoughts or sensations are noticed entering and leaving the field of awareness without engaging with them. Jon Kabat-Zinn, the founder of the Mindfulness-Based Stress Reduction approach and an ambassador of mindfulness in the West, has emphasized that Western mindfulness is strongly inspired by traditional meditative practices found in Buddhism (Kabat-Zinn, 2011).

Collectively, these examples illustrate that tranquility is a central concept in key texts of Yoga, Buddhism, and Christianity, in classical and contemporary philosophy, and in current psychological research. Still, we suggest that the phenomenon of tranquility has not yet come into full focus: Is tranquility an emotion or a mood? Is it an emotionless state or a state in which one's emotions are balanced? Is tranquility always related to happiness? Is a relaxed body, emotional calmness, or a peaceful state of mind a prerequisite for experiencing tranquility? Is tranquility an ephemeral or enduring experience? Is the tranquility at stake in mystical states like that found in non-mystical states, etc.? Is there only one kind of tranquility or are there many kinds of tranquility and, if so, what do they have in common? If we are to answer such questions, a more comprehensive grasp of the experiential nature of tranquility is needed. The question therefore remains: What is tranquility?

## Exploring tranquility

Despite a remarkably rich and multifaceted history of tranquility across traditions and cultures, no comprehensive attempt has to the best of our knowledge been made to compare and map different forms of tranquil experiences and explore what they may have in common. Such a comparative analysis faces many challenges, including an appreciation of the different practices that seek to cultivate tranquil experiences and of the different natures, roles, and interpretations of these experiences in their respective philosophical, spiritual, or religious traditions. With this article, we hope to provide one key piece of the puzzle of what tranquility is.

Initially, however, we want to emphasize that we are not offering an exhaustive historical mapping of all kinds of tranquil states nor offering a definitive account of tranquility. Instead, we first offer examples of what we take to be some

1 Our reading of Patanjali's Yoga Sutras is based on translations and commentaries by Karambelkar (2012) and Satchidananda (2019).

of the most central experiences of tranquility in Eastern and Western traditions. For the sake of textual simplicity, we sort these examples into four categories based on their primary experiential focus: the body, emotions, the mind, and mysticism. While this categorization provides a simple structure for this article, it also comes with certain limitations—e.g., the range or depth of some of the discussed examples of tranquility extends beyond the category in which they are placed. The categories should therefore only be considered as a preliminary way of mapping and grouping together different examples of tranquil experiences in the hope of achieving some overview of this complex literature. Finally, we propose an exploratory account of tranquility, emphasizing what seems to be shared features among the different experiences of tranquility.

## The body

This category covers experiences wherein the body is calm or tranquil. Noticeable states of bodily tranquility can be found in Indian traditions, e.g., *pratyahara, pranayama*, and *asana* of the Yogis and *passaddhi* of the Buddhists. Here, we focus on one of the most famous examples of bodily tranquility, namely one attained through the yogic posture *shavasana*, i.e., the corpse pose.

In the Yoga Sutras of Patanjali, we are introduced to *ashtanga*, i.e., the "eight limbs of Yoga": *yama, niyama, asana, pranayama, pratyahara, dharana, dhyana*, and *samadhi* (see Section "The mind" for details). The third limb, *asana*, designates a steady, comfortable position, allowing meditative practice (Satchidananda, 2019, p. 117; YS 2.46). While many today, perhaps especially in Western countries, recognize Yoga as a system of often challenging gymnastic postures, the aim of traditional Yoga was, as already noted, to still the mind, i.e., *nirodha* (YS 1.2, 2.29; Satchidananda, 2019, p. xi). Therefore, some basic seated postures were meant to calm and stabilize the body for meditative purposes in the traditional Yoga of Patanjali. *Padmasana* (the lotus pose) is the most famous meditation pose in Yoga. In medieval times, the Hatha Yoga tradition bloomed with a further exploration of *asanas* [Feuerstein, 2008, pp. 29–31; see Hatha Yoga Pradipika (Akers, 2002)], and since then new postures have been introduced to the world of Yoga (Mallinson, 2017).

In *shavasana*, the practitioner performs a set of postures in a specific routine, which varies depending on the school of Yoga, and then lies down on the floor, relaxing all muscles from head to toes, feet slightly apart, and palms facing upward. The initial set of postures represents the cycle of life, and the final posture, lying down flat on the floor, resembles a corpse. In this symbolic death, the body is relaxed, and this helps to calm the mind [Hatha Yoga Pradipika 1.32 (Akers, 2002, p. 14)]. In the words of the famous Yogi Iyengar (2015, p. 351):

> In this asana the object is to imitate a corpse. Once life has departed, the body remains still and no movements are possible. By remaining motionless for some time and keeping the mind still while you are fully conscious, you learn to relax. This conscious relaxation invigorates and refreshes both body and mind. But it is much harder to keep the mind than the body still. Therefore, this apparently easy posture is one of the most difficult to master.

The experience of tranquility is here anchored in the body, which is stilled, relaxing on the floor. Thus, in *shavasana*, one may experience bodily tranquility without experiencing a calm observance of emotions or mind. As emphasized in the quote above, *shavasana* is a practice, whose goal extends beyond calming merely the body.

## Emotions

This broad category covers many concepts for experiences in which emotions are regulated, balanced, or stilled. Most experiences of this category can be subsumed under the notions of emotional equilibrium or equanimity. Some examples of historical concepts of emotional tranquilities are *apatheia* of the stoics, *ataraxia* of the stoics, skeptics, and epicureans, *metriopatheia* by Aristotle, Crantor, and Augustine, *vairagya* and *pratyahara* in Yoga, and *passaddhi* and *upekkha* in Buddhism. Here, we describe *upekkha* (often translated "equanimity" or "even-mindedness") as found in the Pali-Canon and its role in Theravada Buddhism, and we briefly compare *upekkha* to *apatheia* and *ataraxia* from stoicism.

The first and central teaching of the Buddha was *The Four Noble Truths*. Here, we are told that suffering (*dukkha*) exists, the cause of suffering, the end of suffering, and the path that leads to the end of suffering (i.e., *The Noble Eightfold Path*) [Samyutta Nikaya 56.11 (Bodhi, 2000); Majjhima Nikaya 141 (Nyanamoli and Bodhi, 1995)]. When one follows the *dhamma* (the teachings of the Buddha) through *The Noble Eightfold Path*, one will eventually reach enlightenment (*nibbana*), releasing one from the rebirth of suffering (*samsara*) [Samyutta Nikaya II.15 (Bodhi, 2000)]. According to Buddhist teaching, all phenomena are impermanent (*anicca*), imbued with suffering (*dukkha*), and no-self (*anatta*) (Humphreys, 1969, p. 33; Harvey, 2004, p. 50). From this perspective, we live in ignorance (*avijja*), and our way of being stems from an intuitive, yet illusory feeling of being a self, arising from immediate identification or attachment to our thoughts, emotions (e.g., pleasure or shame), and objects, etc. Since, on this view, no substantial self exists (*anatta*) and everything from emotions to mountains is impermanent (*anicca*), all self-identifications will eventually cause suffering (*dukkha*) and keep the wheels of *samsara* turning.

*Upekkha* is one of the four *brahmaviharas*, i.e., the virtues or meditation practices "which are to be extended boundlessly to all sentient beings" (Bodhi, 2005, p. 154). The other three are: loving-kindness (*metta*), compassion (*karuna*), and altruistic joy (*mudita*) (e.g., Harvey, 2004, p. 209). *Upekkha* is practiced to obtain a calm and balanced state of mind, i.e., a sort of equanimity characterized by emotional detachment, enabling the practitioner to remain neutral and not to react with craving or aversion to whatever occurs (Gowans, 2013, p. 439). Following the Buddhist teaching, the person mastering *upekkha* resists self-identification (i.e., any attachment to self-image, emotions, possessions, etc.) and responds emotionally neutrally to fortune as well as misfortune, thereby preventing suffering [Majjhima Nikaya 54 (Nyanamoli and Bodhi, 1995); see also Anguttara Nikaya 3.65 (Bodhi, 2005, pp. 88–91)]. According to the renowned Buddhist scholar Bhikkhu Bodhi, *upekkha* is perfected through the practice of the other three *brahmaviharas*, and therefore *upekkha* should not be regarded as a disconnection from or disinterest in other people. *Upekkha* is related to the yogic concept of *vairagya* (often translated "detachment," "dispassion," or "renunciation"), which designates stages of states in which one is increasingly free from any attachment. In the *Yoga Sutras* of Patanjali, *vairagya* is key to stilling the mind (YS 1.12).

We turn now to the Greek concepts of *apatheia* and *ataraxia*, which, in our view, designate experiences of emotional tranquility that resemble *upekkha*. The meaning of *apatheia* and *ataraxia* differs among the Hellenistic schools (Sorabji, 2000, p. 195f.), and our description of these concepts concerns their role in stoicism only. According to the stoics, virtue is the only good (e.g., Inwood, 2017, p. 78), and living a virtuous life amounts to living a life in agreement with one's true nature and the universal nature, which, in stoic philosophy, is one and the same. In this context, they emphasize the importance of *apatheia* [Graver, 2007, p. 81; see also Seneca's *De Tranquillitate Animi*, 2.1–6 (Anderson, 2015)], which designates a calm state of mind where one is not subjugated to one's passions or prone to acting without deliberation (*propeteia*) (Salles, 2007, p. 249). Dating back to antiquity, views differ as to whether *apatheia* should be understood narrowly as an emotionless state (*apatheia* literally means "absence of passions") or more broadly as a state of equanimity in which one's emotions are rational and appropriate to their object—see also the stoic concept of *eupatheiai*, i.e., "good passions" (Frede, 1986; Long, 2002, p. 244; Graver, 2007).

*Ataraxia*, a related concept also used by stoics, literally means "absence of disturbance," and the stoics conceived *ataraxia* as an imperturbable state related to *apatheia* (Striker, 1990, p. 100f.). In the Hellenistic schools, *ataraxia* was neither a goal in itself nor a constituent of the highest good (i.e., a virtuous life) but rather a consequence of it [Seneca's *De Vita Beata* 15.2 (Anderson, 2015)]. Although there are obvious similarities between *upekkha*, *apatheia*, and *ataraxia*, there are also differences, e.g., in terms of these tranquil experiences' relation to the overall goal: *upekkha* is a *constituent* part of the path to prevent suffering, whereas *apatheia* and *ataraxia* are *consequences* of living a virtuous life. In our view, *upekkha*, *apatheia*, and *ataraxia* all designate experiences of tranquility in which emotions are stilled but without necessarily involving a stilled body (as in, e.g., *shavasana*) or a calm observation of the mind.

## The mind

In this category, we explore tranquility of the mind. Here, we describe two kinds of tranquility of the mind, which can be categorized as "focused awareness" and "open awareness," respectively. To illustrate, we describe *dhyana* meditation of the yogis (exemplifying focused awareness)—*dhyana* is also important in Buddhism (in Mahayana traditions known as *chan* and *zen*, and as *jhana* in Theravada)—and *sati* ("mindfulness") of the Theravada Buddhist tradition (exemplifying open awareness).[2]

Recall *ashtanga*, i.e., the eight limbs of Yoga. Only after the yogi has learned to obey the ethical rules (*yama*), internalized these ethical rules as habits (*niyama*), mastered steady and comfortable positions of the body (*asana*), learned to control the breath and energy of the body (*pranayama*), and withdrawn from the senses (*pratyahara*) is the yogi ready for the three final limbs (*samyama*): *dharana, dhyana*, and *samadhi*. These can be regarded as a progressive, three-step meditation practice, leading to enlightenment. *Dharana* (YS 3.1) is a concentration practice in which one binds the attention to one specific object (e.g., the breath, a mantra, or chakra). When the yogi notices that the mind has wandered off (e.g., started thinking), the practice of *dharana* consists in continuously redirecting the attention back to the chosen object. Mastering this, the yogi may slide into *dhyana* (YS 3.2). In this meditative state, the mind completely ceases to wander off, allowing the object of mediation—whatever it may be—to clearly and steadily stand forth. Finally, the yogi is ready to enter the different levels of the absorptive meditative state of *samadhi* (see Section "Mysticism" for details). *Dhyana* is an example of perfected focused awareness, which represents one kind of tranquility of the mind. The Buddhist *samatha* (calm meditation) is like *dharana* with its one-pointed focus. In Theravada Buddhism, both *samatha* and *vipassana* (insight meditation) is needed to achieve true understanding of the nature of reality, i.e., wisdom (*prajna*) and liberation (*nirvana/nibbana*).

2 Since Western mindfulness is strongly based upon Buddhist meditative practices (Kabat-Zinn, 2011), we do not explore potential differences between Western concepts of mindfulness, and say, *sati* of Theravada Buddhism.

Open awareness represents another kind of tranquility of the mind. Contrary to the controlled meditative practice of *dhyana*, *sati* is a matter of a balanced, non-identifying observation. In the *Satipatthana Sutta* of the Pali-Canon, we are told that the person practicing *sati* contemplates the body as body, feeling as feeling, mind as mind, mind-objects as mind-objects in their appearing or vanishing states [Majjhima Nikaya 10 (Nyanamoli and Bodhi, 1995, pp. 145–155)]. Basically, this means that whatever appears in meditation (e.g., thoughts, emotions, or external sounds) is experienced without reaction, i.e., without grabbing on to them due to craving or pushing them away due to aversion. Thus, *sati*, contrary to *dharana*, does not involve binding and redirecting one's attention to a chosen object but instead in fostering an alert and attentive (mindful) state. By practicing *sati*, one cultivates, as Analayo (2006, pp. 263–264) put it, "bare and equanimous receptivity, combined with an alert, broad, and open state of mind." Although the body may not be stilled (as in *shavasana*), and emotions and thoughts may not be quieted, the practitioner in *sati* notices everything from within a calm and tranquil state of receptive presence or equanimity, which is characterized by an open, balanced, non-identifying attitude toward whatever appears in consciousness. *Sati* differs from *upekkha* or *ataraxia*, which are focused on emotional imperturbability, whereas *sati* rests on a meta-cognitive capacity of noticing and letting-be of every—pleasant or unpleasant—event.

## Mysticism

Mystical experiences cover a wide range of states (including visions, trances, and ruptures), but here we focus solely on what often is considered the most significant type of mystical experience (e.g., Otto, 1931; Stace, 1961), namely *unio mystica*.[3] The interpretation of *unio mystica* varies, depending on the context in which it occurs [e.g., the One (Plotinus), the Godhead/divinitas (Eckhart), *shunyata*, *nirvana*/*nibbana* (Buddhism), and *moksha*/*mukti*/*kaivalya* (Indian philosophy, Hinduism, etc.)], but its experiential nucleus has by some authors been proposed to be the same, i.e., an ineffable, boundless sense of undifferentiated oneness or unity with the Absolute (Stace, 1961; Parnas and Henriksen, 2016).[4] Otto (1931, p. 39) famously distinguished between two types of mystical union: the inward way ("mysticism of *introspection*") and the outward way ("mysticism of *unifying vision*"). In the first, "The secret way leads *inward*" (Otto, 1931, p. 40), i.e., it implies a complete withdrawal from everything outward and a retreat into the depths of the mind, culminating in a non-sensuous, mystical experience of union. The outward way, by contrast, "knows nothing of "inwardness" (. . .) It looks upon the world of things in its multiplicity" (Otto, 1931, p. 42), culminating in seeing unity or oneness shine through everything in the sensory field. Otto's distinction was later echoed in Stace's (1961, p. 61f.) division between introvertive ("looks inward into the mind") and extrovertive ("looks outward through the senses") mysticism. Using this classic distinction, we describe two kinds of mystical experience: *samadhi* in Indian philosophy (exemplifying the inward way) and the *One Mind* of Huang Po, a ninth-century Chinese master of Chan (Zen) Buddhism (exemplifying the outward way).

The practices that lead to *samadhi* and its interpretation vary among the Indian schools. We focus here on the final and highest stage of *samadhi*, i.e., *asamprajnata samadhi*, as described in the Yoga Sutras of Patanjali. As noted above (see Section "The mind"), *samadhi* is the eighth and final limb of Yoga, expressing progressively deep meditative stages of absorption, ecstasy, and bliss [YS 2.28–29; see Feuerstein (2008, pp. 208, 216, 398)]. After enduring and dedicated practice, following *ashtanga*, the yogi may eventually reach *asamprajnata samadhi*. In this final stage of *samadhi*, which is devoid of any object of meditation, the yogi realizes his or her true self (YS 1.16, 1.18), which means that the yogi's consciousness is unified with the absolute or cosmic consciousness. In this ultimate stage of *samadhi*, all duality has ceased, and only pure consciousness remains. Satchidananda describes it as a state "where even the ego feeling is not present and the seeds of past impressions are rendered harmless. In that state, only consciousness is there and nothing else. Once that is achieved, the individual is completely liberated and there is no more coming into the world and getting tossed" (Satchidananda, 2019, p. 33). And further, "in Samadhi, you don't even know (that you are in meditation). You are not there to know it because you are that (. . .) there is neither the object nor the meditator. There is no feeling of "I am meditating on that" (. . .) you and God become one. That's Samadhi" (Satchidananda, 2019, p. 165).[5] *Asamprajnata samadhi* exemplifies a state of mystical tranquility, reached by "the inward way." Contrary to the tranquilities of the body, emotions, and the mind, which we presented in the previous sections, everything external is shut off and all bodily, emotional, and mind-related dynamics are completely stilled or quieted in *asamprajnata samadhi*, leaving

3 Other mystical experiences include *kaivalya* of various Indian traditions, *moksha* of Hinduism, *nibbana* of Buddhism, Meister Eckhart's *Godhead*, *hesychia* of Eastern Orthodox Hesychasm, the *bardo*-state of Tibetan Buddhism, *bitul ha-yesh* of Jewish Chabad philosophy, the Daoist state of *miejin ding*, the Zen Buddhist states of *kenshô* and *satori*, and *wagd* of Sufism.

4 Later, we address the role of culture in mystical experiences as we discuss the so-called perennials and constructivist views on the interpretation of experiences of unio mystica.

5 The sentence "You are not there to know it because you are that" might seem unfinished. It is not. The phrase "you are that" refers to a core thought of Vedantic philosophy, based on the Sanskrit mantra *Tat Tvam Asi* ("thou art that") from the famous Chandogya Upanishad (e.g., Myers, 1993). The phrase refers to the unity of the individual self (*Atman*) and God (*Brahman* or the Absolute).

nothing but a tranquil experience of pure consciousness. It is an experience of absolute emptiness and fullness at once. Notably, experiences of mystical union, reached through the inward way, are also described in other mystical texts and traditions (e.g., in Vedantic texts as opposed to the Yogic one, we cited before, but also in, e.g., Jewish, Christian, and Islamic mysticism).

Finally, we consider Huang Po's description of the *One Mind* as an example of "the outward way." Huang Po distinguishes between what he calls the conceptual mind and the *One Mind*, which is the Buddha nature of all sentient beings, i.e., everything is one. According to Huang Po, one cannot grasp the true Buddha nature through conceptualization. If one reaches for the truth, using the conceptual mind, one will, as he put, be "cut off and (. . .) find nowhere to enter" [1.9 (Blofeld, 1958)]. He continues, "there is only one reality, neither to be realized nor attained. To say "I am able to realize something" or "I am able to attain something" is to place yourself among the arrogant (. . .) there is just a mysterious tacit understanding and no more" [1.17 (Blofeld, 1958)]. Huang Po described the experience of the Buddha nature as a state of being detached from conceptualization and form [1.5–6 (Blofeld, 1958)], where speech is silenced, and all mental movement is stilled [2.17; see also 2.42 (Blofeld, 1958)]. He sums it up as follows, "our original Buddha-Nature (. . .) is void, omnipresent, silent, pure; it is glorious and mysterious peaceful joy—and that is all" [1.8 (Blofeld, 1958)].[6]

Like *asamprajnata samadhi,* Huang Po's *One Mind* exemplifies a state of mystical tranquility. Contrary to *asamprajnata samadhi*, however, Huang Po's *One Mind* requires neither a detachment from one's immersion in the world [1.6; see also 2.42 (Blofeld, 1958)] nor a progressive, inward search through still deeper stages of meditation through which all bodily, emotional, and mind-related phenomena eventually are stilled, leaving the mind completely empty and receptive of the mystical union. Rather Huang Po, whose teaching today is followed by the Rinzai-Zen community, believed in a sudden realization, sometimes within a second, perhaps provoked by hearing the teaching [1.6 (Blofeld, 1958)] or by receiving a blow to the head from one's teacher [2.28 (Blofeld, 1958)]. This is of course not to overlook or underestimate the importance of training and preparing the mind through meditation about which Huang Po, however, did not offer much detail (Blofeld, 1958, p. 19). Huang Po's *One Mind* articulates an experience of mystical union, i.e., seeing one in all. In *One Mind*, only the conceptual mind is stilled, leaving nothing but a tranquil, peaceful joy.

6 Notably, similar reports of sudden realization of oneness shining through all diversity can also be found in other traditions, e.g., in Christian mystics such as Meister Eckhart or Jakob Boehme. In a famous passage from *The Aurora*, Boehme stated, "In this Light my Spirit suddenly saw through all, and *in* and *by* all the Creatures, even in Herbs and Grass, it knew God" (Boehme, 1764, p. 184).

## An exploratory account of tranquility

The described tranquil experiences include a broad selection of experiences that in many ways differ from each other, and we can clearly see their respective cultural or religious imprints. Despite their differences, they seem to share some intriguing experiential features. To varying degrees, they all entail a sense of presence and inner peace, sometimes associated with pleromatic sensations such as warmth, bliss, flow, and release of tension. Apart from these features, which mainly concern the *content* or *quality* of tranquility, experiences of tranquility seem also to share, again in varying degrees, a two-sided *structural* feature of detachment and absorption.

Detachment has been a key concept in several schools of thought in East and West, reflected in concepts such as *vairagya* in Yoga and *Abgeschiedenheit* in the works of Meister Eckhart. Etymologically, "to detach" (from old French, *destachier*; *des* "apart" and *attachier* "attach or connect") means "to untie" or "to disconnect." Detachment comes in different degrees, ranging from a limited kind that concerns only one domain (e.g., the disconnection from passions in *apatheia*) to an unlimited kind in which everything eventually is obliterated from consciousness (e.g., in *asamprajnata samadhi*). In the Eastern schools, detachment is regarded as a disconnection from or discontinuation of the ongoing self-identification with bodily sensations, emotions, or thoughts, etc. Indeed, the eight limbs of Yoga (*ashtanga*) or the Buddhist meditative practices can all be interpreted as gradually intensifying practices to soften, loosen, and eventually to let go of any self-identification, which is considered the central obstacle for spiritual enlightenment in these traditions. For example, dedicating the fruits of one's labor to God instead of taking pride in it (YS 3.1; cf. *bhakti yoga* of the Bhagavad Gita) or, in meditation, redirecting one's attention to the chosen object (*dharana*) instead of being immersed and invested in whatever thoughts or emotions pop up is basically to practice this kind of detachment (*vairagya*). The more absolute this detachment is, the more the meditator is emptied of all self-bound phenomena. Finally, letting go of any self-identification amounts to breaking through the self-illusion in *samadhi* or *nirvana/nibbana*. The basic idea that the self must be destroyed for the practitioner to become receptive of the mystical union is also found in other traditions. In Sufism, the concept of *fana* (Arab *faniya*, "to pass away," "to perish") designates the annihilation of the self (*nafs*) that separates the human being from God—as Wilcox (2011, p. 95) put it, "the passing away of the self is thus the essential pre-requisite to the survival (*baqa*) of the selfless divine qualities placed in man by God." In Christian theology, the concept of *kenosis* denotes the emptying of the self. In Christian mysticism, this theme was particularly emphasized in the works of Meister Eckhart, who devoted a thesis to the subject of detachment. Here, Eckhart (2009, pp. 556–575) "quotes" St. Augustine—though the quote is not actually found

in St. Augustine's works—for stating, "The soul has a secret entrance to the divine nature, when all things become nothing for it" (Eckhart, 2009, p. 573). According to Eckhart, "this entrance is nothing but pure detachment" (Eckhart, 2009), i.e., only by liberating oneself from all needs, strivings, and desires can the mind become completely empty, unmoved by whatever occurs, "rest on absolutely nothing" (Eckhart, 2009, p. 572), and thus be "receptive of nothing but God" (Eckhart, 2009, p. 567f.).

In sum, the experiences of tranquility exhibit, to varying degrees, the structural character of detachment—from the disconnection of the incessant self-involvement with our bodily sensations, emotions, or thoughts to the complete self-annihilation in experiences of mystical union. These different degrees and perhaps even different kinds of detachment may bring about various experiences on both the so-called "self-pole" and "world-pole" of experience—e.g., on the "self-pole," we find descriptions of "pure experience" (Zen), "witness consciousness" [Advaita Vedanta (Gupta, 1998) and Buddhism (Albahari, 2009)], and "the white light of the self" [Ramana Maharshi (Mudaliar, 1965)], whereas, on the world-pole, we find descriptions of experiencing objects as instantiations of oneness in the unifying vision.

Yet, the experiences of tranquility are, in our view, not adequately described as only involving detachment, which, briefly put, refers to an inhibition, discontinuation, or disconnection from something that usually is present. By contrast, the detachment that characterizes tranquil experiences seems simultaneously to imply some degree of absorption into another kind of awareness. Etymologically, "absorption" (Latin *absorbere*, from *ab* "off, away from" and *sorbere* "suck in") means to be "swallowed up" or "taking in by" something. In research on hypnosis, absorption has been defined both as a personality *trait*, designating a propensity or readiness for experiences of profound involvement in something (e.g., Tellegen and Atkinson, 1974), and as an experiential *state* in which one is totally immersed and directing all of one's resources to a specific attentional object (Kumar et al., 1996). Interestingly, absorptive states have here been described as involving "a heightened sense of reality of the attentional object, imperviousness to distracting events, and an altered sense of reality in general, including an empathically altered sense of self" (Kumar et al., 1996, p. 232). Our use of the concept of absorption bears similarity to this description of absorptive states. Yet, where absorptive states in hypnosis are said to involve an altered sense of reality *in general*, we suggest that this is not the case for *all* the forms of absorption that are at stake in experiences of tranquility. For example, detaching from emotions in *upekkha* or passions in *apatheia* involves absorption into a calm state of equanimity. In meditational practices such as *dharana* and *dhyana*, the meditator detaches from the ordinary and immediate self-identification and self-involvement with bodily sensations, emotions, and thoughts as they ceaselessly appear, disappear, and reappear in consciousness. The constant redirection of awareness to the chosen object in *dharana* or the undisturbed awareness of the chosen object in *dhyana* involves absorption into a kind of focused awareness. In *sati*, the meditator notices whatever pops up in the mind but without doing anything about it, except noticing it. Here, too, the meditator detaches herself from the usually incessant self-involvement and preoccupation with bodily sensations, emotions, and thoughts and is instead absorbed into a kind of open awareness. In *sati*, we may say, using Fasching's description, that the meditator becomes aware of "the self-presence of experiencing itself (. . .) become conscious of consciousness itself (which usually remains "hidden" behind what it is conscious of)" (Fasching, 2008, p. 464). Finally, at the level of mysticism, the experience of *One Mind* involves detachment from our ordinary mode of being and sensing (i.e., detachment from the "conceptual mind" in Huang Po's terms) and, simultaneously, absorption into the experience of oneness (the Buddha nature) as it unfolds in the unifying vision. The most absolute kind of absorption co-occurs with the most absolute kind of detachment. It is found in experiences of mystical union that are reached through the inward way. Here, everything is obliterated from the mind, and only the experience of mystical union is present. In our view, it is only at the level of mysticism that the absorptive states genuinely involve an altered sense of reality, including an altered sense of self.

Finally, our description of tranquility would be incomplete if we failed to mention that to reach most of the described tranquil experiences, it is, across traditions such as stoicism or yoga, Buddhism or Christianity, considered a prerequisite to live an ethical-spiritual life in accordance with the culturally or spiritually defined virtues and rules; or, as bluntly stated in the Book of Isaiah, "there is no peace for the wicked" (48:22). Although living an ethical life usually is considered a prerequisite for experiencing tranquility, ethical living is not itself a tranquil experience. Therefore, an exploration of the ethical dimension of tranquility, though important, is beyond the scope of our study.

## Concluding remarks

In this study, we have shown that experiences of tranquility come in many different shapes and colors, attesting to the complexity of the phenomenon. By exploring experiences of tranquility across Eastern and Western traditions, we argued that these experiences share certain core features both in terms of their experiential content or quality (i.e., a sense of presence and inner peace) and structure (i.e., detachment and absorption). However, even if one concedes that these core experiential features indeed characterize tranquility, one cannot conclude that they necessarily define it. A definition, specifying the essence of tranquility, requires drawing a conceptual boundary between tranquility and seemingly related

phenomena, which also involve some degree of presence, peace, absorption, or detachment. Exploring certain absorptive states of artistic (Høffding, 2019), esthetic (Legrand and Ravn, 2009), or athletic peak performance (Privette, 1983) could be relevant candidates for such a comparative endeavor. If a clear boundary cannot be drawn between tranquility and other related phenomena, then the definition would either fall short or, alternatively, one must grant that these phenomena too entail an element of tranquility. Such analyses, however, lie beyond the scope of our study. Consequently, we do not propose a definition of tranquility but point instead to shared experiential features that may be useful for further research on tranquility.

When exploring experiences of tranquility across different cultures and searching for core features of such experiences, one is inevitably confronted by the question of whether such experiences possess a universal nature or if they instead are socially or culturally constructed. This debate is prominent in mysticism research, where the controversy boils down to a distinction between two positions, i.e., the perennials view and the constructivist view. The perennials view argues for a universal nature of mystical experiences that is discernable across cultures and traditions. This view has been advocated by scholars like William James, Aldous Huxley, and Walter T. Stace (Stace, 1961). The constructivist view, however, criticizes the perennials view for being epistemologically naïve, ignoring constitutive aspects of sociocultural, religious, and historical contexts on mystical experiences. Steven T. Katz, one of the most influential advocates of the constructivist view, argues that mystical experiences are radically different, and consequently he emphasizes the need for epistemological pluralism (Katz, 1978). However, with new insights and hermeneutic rigor, which was introduced in the wake of the constructivist's criticism of the early perennialists, we have witnessed something like a rehabilitation of the perennials view (Forman, 1999). Research on shared core features of mystical experiences has been juxtaposed with analyses of sociocultural, religious, and historical contexts in determining the mystical experiences' variability (Smith, 1987). In our view, such an approach of what could be labeled "moderate perennialism" seems appropriate for studying experiences of tranquility, which, in our view, both share certain experiential features and remain influenced by the culture and tradition in which they are embedded.

In the absence of reviews on experiences of tranquility and lack of consensus about the concept's meaning, we considered a theoretical, explorative study adequate for the purpose of keying in on the experiential nature of tranquility. This approach allowed us to explore and synthesize insights into experiences of tranquility from many influential traditions, spanning continents and millennia. Yet, our analyses are constrained by our knowledge of such traditions and language barriers, and we may have overlooked nuances between the concepts. These limitations notwithstanding, the study has provided insights into the experiential nature of tranquility, its content and structure, and these insights may serve as a vehicle for further research, not only narrowly on tranquility, but also more broadly on other disciplines and research areas on human subjectivity such as consciousness studies, mysticism and religious studies, meditation, mental health, mental disorders, psychotherapy, and rehabilitation, etc. In a time of global health crisis, it is important to remember that experiential tranquility in many cases can be reached within, and that tapping into its deep well may not only have benefits for ourselves but also for those around us.

## Author contributions

VRC wrote the first draft of the manuscript, which was revised by MGH and BŠ. All authors jointly formulated the study's purpose and approved the final version of the manuscript.

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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# From transcendental egology to orientation theory: Toward a mereological foundation for the different senses of the "self" in conscious experience

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In the present work, we aim to make a contribution to the origins of the notion of "minimum self" in Husserl's phenomenology. Starting from the difference between the philosophy of the subject and the philosophy of the self, the aim of this research is to show that the Cartesian association between both philosophies would not exactly correspond to the conception of the self, as we find it in Edmund Husserl's works. With this, we intend to nuance Heidegger's accusation of Husserl's "Cartesianism," At the same time, we show how a detailed analysis of the "senses of the self" in Husserl's phenomenology allows extracting the notion of "minimal self" as it has been introduced in the current and lively debate between psychiatry and phenomenology. In our research, we also show that in order to move the theory of the transcendental ego toward the theory of the orientation of the life of consciousness, it is necessary to consider the foundation of the concepts of ego in the technical vocabulary of the formal mereology of the Husserl's third "Logical Investigation."

KEYWORDS

**conscience, self, orientation theory, Edmund Husserl, phenomenology**

## Introduction

Many modern approaches to subjectivity, especially since Descartes's theory, share the perception that subject and ego are intimately linked, as if they were the same problem formulated in two different ways. Nonetheless, the history of metaphysics has shown that it would be wise not to simply accept this assumption, which can lead to automatically associate reflections on the ego and the subject: first, both are differently articulated within the framework of the structure of predication[1]. The process that produces a progressive substantivization of the "I" pronoun in the history of metaphysics,

1 In the structure of predication, "subject" (*subiectum*) is a noun while "I" is a pronoun. The fact that in terms of grammar, pronouns are a subcategory of nouns, which does not evade the need to clearly differentiate between the nouns as subjects of predication and the specific functions granted to pronouns, especially if they are personal pronouns.

with it being absorbed in the enunciative proposition as what lies beneath all enunciation, has been described (to a greater or lesser degree of success) by M. Heidegger[2]. However, even Heidegger warns that in principle, nothing of "I-hood" (*Ichheit*) would necessarily be found in the formal apophantic category of the *subiectum*. The *subiectum*, a Latin translation of the Greek term *ὑποκείμενον* in Aristotle's logical treatises, fails to retain any trace of "I-hood"; it simply and formally indicates the position in the enunciation of that which is predicated. In Aristotle's treatises, tracing back from the "what" is predicated to the "of that which" is predicated does not culminate in the *ψυχή* (and even less so in the *νους*), but rather in the category of the *οὐσία*[3]. The area of problems with the *οὐσία* is not particularly concerned with the specific case of the "living thing" (*ζωή*), the treatment of which is confined, for Aristotle, to interrogating the soul (*Περί ψυχής*). It would seem that no fundamental crossover occurs in Aristotle's treatises between the theory of being (being as being) and the specific case of the theory of "living things," to which specific investigations into the soul are dedicated. Indeed, it appears that for Aristotle, the soul (*ψυχή*) being the *οὐσία* of life simply means that everything predicated about a living thing ultimately finds its logical "subject" in the soul[4]. The implacable nature of the *πρώτη ουσία* with regard to predication is linked, according to Aristotle, and not so much with *ψυχή*, but rather with the ineffable nature of the individual (whether this individual has life or not), since the "something of something" (*τί κατά τινος*) structure inherent to all demonstrations collapses in the predication of individuals. Heidegger would use this ineffable and impredicative nature of individuals, as per Aristotle, to link the concept of *πρώτη ουσία* to the "existence" of being and to the idea of life as facticity (*Dasein*), more than with any idea relating to understanding life as "self-consciousness[5]." Descartes proposed linking the soul to the idea of self-consciousness, by discerning an apodeictic relationship between ego and *cogitatio*. Through the Cartesian establishment of the ego as "I think," and the position of this "I think" as a substance (*res cogitans*), it is possible to constitute it as "*subiectum*" of all possible predication. The fusion process between the I and the subject could be defined in three steps: (1) I is always "I think,[6]" (2) "I think" is interpreted as "*substantia*,[7]" and (3) the thinking substance is the "subject" of all possible predication. Not only this, as the thinking substance is the condition of possibility of the coherent unit of representation for all predicates, the "I" becomes a guarantee for the coherence of the synthesis processes of sensitive multiplicities in their respective conceptual units[8].

Heidegger also includes the concept of consciousness from his professor, E. Husserl, in this hermeneutic reconstruction of the process by which the "I" and "subject" converge in the history of metaphysics. In Heidegger's assessment, while setting out certain fundamental differences between Husserl and Descartes, "Husserl completely moves in the direction of Descartes"[9]. In the winter term of 1923/24 and the summer term of 1925, Heidegger gave critical presentations on the phenomenology of his professor, where he declared excessive tethering to Descartes' premises and intentions in Husserl's initial phenomenology project. Heidegger proposed moving away from these premises and intentions through "radicalizing" the phenomenological method, in a shift toward ontology[10]. After the publication of "Being and Time" in 1927, for both Heidegger and Husserl, the name "Descartes" became the symbol of a barely disguised confrontation between two ideations of phenomenology (viz., transcendental

2 Heidegger, 1975, GA 24, p. 178. Heidegger finds in Kant the classic sentence in substantivization of the "I" pronoun, interpreted as self-consciousness: "The 'I think' must be able to accompany all my representations" (*KrV*, § [13], B132).

3 The *ψυχή* is only the *οὐσία* for those beings with life (*ζωή*). We prefer to remain dissatisfied and leave *οὐσία* untranslated, since this automatically underscores the dissatisfaction with any of the classical translations.

4 Aristotle, "Metaphysics," 1017b16. In *Περί ψυχής*, Aristotle would go beyond the logical determination of the soul as *ὑποκείμενον* of life and directly use the expression "principle" (*ἀρχή*): "for the soul is in some sense the principle of living beings" (De Anima, 402a6ff).

5 Heidegger, 2002, GA 18, § [7], p. 33ff. Not in vain is the privileged place Aristotle reserves for his observations on self-consciousness (*νόησις νοήσεως*, as thinking of thinking) found within the framework of "Metaphysics" and not of "De Anima"; specifically, within the context of the last elucidation of eternal motion ("Metaphysics," 1074b34). Analyses of the *Περί ψυχής* ("De Anima," 429a10–430a10) are limited to framing comprehension of a general theory of sense knowledge.

6 Descartes, *Oeuvres*, A&T, Vol. VII, Med. II, p. 27.

7 Descartes, *Oeuvres*, A&T, Vol. VIII, par. LIII, p. 25. The Cartesian distinction between a single and plural meaning of the term "*substantia*," according to which in a restricted use (substance is what does not need anything else to exist), could only apply to god; meanwhile, in a less strict use, it is applied to those substances that only depend on god to exist, that is those substances that have a relative and not absolute independence; see *Oeuvres*, A&T, Vol. VIII, LI, p. 24.

8 Heidegger does not explicitly find this third step in Descartes but, rather, in Kant's expansion (Heidegger, GA 24, p. 177): The content of the *cogito* (*cogitationes*) in Kant becomes *determinationes* which are *praedicata* of things. The fact that the "I" must be able to accompany all my representations (now understood as *praedicata*) means that the "I" becomes "subiectum" in the formal apophantic sense, and this is the basis on which Kant's project is able to open up to a reframing of Aristotelian categories—a step that Descartes' ontology (embedded in the fundamental distinction between *res extensa* and *res cogitans*) did not need to even elaborate on.

9 Heidegger, 1994, GA 17, § [46], p. 254.

10 Heidegger, 1979, GA 20, § [11], p. 147.

phenomenology and hermeneutic phenomenology), whose paths would remain separate to the present day.

Nonetheless, the purpose of this article is not to review Heidegger's criticism of Husserl's concept of phenomenology from his lectures in the 1920s[11], but rather to directly show how Husserl's phenomenological approach to the notion of the "I" contains many nuances, so much so that it enables us to go beyond the strict limitation of the "I" to the topic of subjectivity. In this way, it will also attempt to show how the many nuances in Husserl's notion of the "I" provide ways to describe the many experiences of altered consciousness, with the basis of the debate on the existence of the "minimal self" offering an explanation for many phenomena of interest to psychiatry and neuroscience[12].

## The three senses of "ego" in "Cartesian Meditations"

Much of Heidegger's criticism is based on the idea that at no point does Husserl determine the "conscious being." However, Husserl does indeed determine the "conscious being" from the start, through Brentano's concept of "intentionality": the conscious being is characterized by intentionality; "being" conscious means being composed of intentional experiences. For Heidegger, this does not suffice to characterize the conscious being since according to his interpretation, Husserl's concept of intentionality remains directly focused on "theoretical behavior" (*theoretisches Sichverhalten*)[13]: intentionality would be limited to providing representations when judging, wanting, loving, etc. This is a highly limited concept of intentionality based in large part on Husserl's presentation of it in "Ideas I," which does not include the presentation and explanation in later works, such as "Cartesian Meditations."

In sections [31]–[33] in "Cartesian Meditations," Husserl meditates on the meanings of the "I" in the field of transcendental egology[14]. In section [30], he sets the mereological inseparability of the ego and processes constituting life. This mereological inseparability is always fundamental to Husserl's phenomenology: on the basis of this mereological inseparability of the ego and life experiences, intentionality must always be interpreted as correlation[15]. Section [30] thus provides the immediate context for interpreting the meanings of the ego in the subsequent three sections: intentionality is understood as the vehicle that traverses the correlation between the object of experience and its different manners of givenness. In this sense, the transcendental ego is inseparable from the processes making up life: both (ego and experiences) lie solely in the ambit of correlation. It should be noted that when Husserl uses the word "separable/inseparable," one needs to draw on the meaning of these concepts from his sole operational use of the expression "ontology" which, far from being a mystery or grandiloquence, is always posited as formal mereology[16]. Therefore, intentionality defines and delineates the "how" of *a priori* correlation, although it loses all interest in phenomenological research outside of this. More than an essential note of "being conscious" of consciousness, intentionality gains its fundamental importance for phenomenological research as it defines the "how" of correlation[17]. Thus, on the basis of this understanding of intentionality, Husserl defines the first of the phenomenological meanings of the ego: the I-pole (*Ich-Pol*).

It would be a mistake to take the polarity that has accompanied Husserl's analyses of intentionality from the beginning as implicit. Indeed, there is no language of polarity in "Logical Investigations," and its highly precarious appearance in "Ideas I" has a specific and fairly circumstantial meaning[18].

11 This has already been done successfully. For example, see Serrano De Haro (2006, pp. 103–114), Pereña (2008, pp. 39–54), and Benoist (1999, pp. 21–42).

12 Zahavi, 2005, 2020.

13 Heidegger, 1994, GA 17, § [48], p. 271.

14 Husserl, 1991, pp. 100–103.

15 With regard to *a priori* correlation, and from the many possible references, see Husserl, 1991, §§ [17], [27], [28]; Husserl, 1968, p. 290. Husserl is always much more emphatic when describing the impact of the discovery of *a priori* correlation on the confection of his philosophy than when describing the notion of intentionality inherited from F. Brentano; see, for example, Husserl, 1976b, § [48], p. 169: "The first breakthrough of this universal *a priori* of correlation between experienced object and manners of givenness affected me so deeply that my whole subsequent lifework has been dominated by the task of systematically elaborating on this *a priori* of correlation." Intentionality gains meaning for Husserl (beyond its archaeology in Brentano's recovery of the notion based on ecclesiastical uses) in its strict fit as a vehicle for *a priori* correlation.

16 In the parlance of Husserl's era, the "theory of wholes and parts." Husserl obtains the concepts of "separability/inseparability" (*Abtrennbarkeit/Unabtrennbarkeit*) based on the analysis of independence/lack of independence (*Selbständigkeit/Unselbständigkeit*) of objects (see Husserl, 1984, III LU, § [3], p. 233).

17 He defines it in contrast to alternative models of correlation, for example in Kant, which place it in the structure of judgement and its elements ("subject"—"object" correlation), and thus opens himself up to formal apophantic articulation and, with this, to the possibility of directly positing access to the problem of the self. In this sense, it would not be strange for Heidegger to progressively move away from intentionality (for him, from *SuZ*, fully absorbed in the practical approach to the world environment) and feel ever greater sympathy for Kant's proposition. For an evolution of Heidegger's interpretations of Kant, see H. Hoppe, in Klostermann (1970, pp. 284–317).

18 Husserl locates an opposition to the transcendence of the world as a totality, the transcendence of god, an opposition that occurs "so to speak" (*gleichsam*) diametrically (Husserl, 1976a, § [58], p. 110). Husserl's insecurity in the metaphorical use of the expression of polarity likely places us in an initial, tentative, and imprecise use restricted to metaphorology, far from the operational uses that it would be destined to play in the theory of the pure ego.

The language of polarity to describe the "how" of correlation (and, therefore, to define the specificity to which we refer when we say that correlation is "intentional") is introduced in the descriptions of § [25] in "Ideas II.[19]" The first uses of the language of polarity arise from certain ambiguities that Husserl comes across when attempting to describe the directionality of intentionality (especially in the case of the phenomena of attention), such as a ray (*Strahl*)[20]. In this way, the ray comes before polarity, which serves as a descriptive support or complement. These ambiguities come from the fact that in effect, the ego is both the ray and the point of origin (*Ausgangspunkt*) of the ray. By interpreting the ray of attention as a structure of polarity, certain advantages are won when dealing with the difficult descriptions of intentional life: (1) First, a better distinction is made possible between "I" and "consciousness," and the understanding of the former as a part of the latter is enabled (in the language of mereology in LU III, we would say a "non-independent part"). The idea of "pure consciousness" uses ego as the "whole" of the intentional ray, while the idea of the "pure ego" (for descriptive needs, the first meaning as "I-pole" will be introduced)[21] uses ego as merely a "part" of the former, more specifically to the part that represents the non-separable, identical, and featureless center on which the variations and modifications of all intentional correlation hinge[22]. (2) Second, there is an immediate presumption of the necessary implacable *heterogeneity* between the extremes of correlation (the poles)[23]. (3) Third, *double directionality* between correlation poles is better described[24]. (4) Last but not least, the introduction of the language of polarity (which Husserl derives from physics of the era) paradoxically enables the recovery of etymological specificity preserved in the choice of the term "intentionality." Indeed, *intentio* is derived from the Latin word *tendere*, which we could translate as both "stretch" and "aim/direct." Both translations are possible, thanks to the Latin verb *tendere* having two participles: *tensus*, from where it gets its relationship to the field of forces (in today's physics, we would say "elastic forces"), and the other from the convergence with the Latin verb *temptare* (probe or touch, but also strike or prey), which gives the participle *tentus*, whose frequentative form is tentare[25], from where we could get its relationship to the field of attention and, from this, to the entire semantics of

19 Husserl, 1952, § [25], p. 105. In "Ideas II," the first appearance occurs in the title of §§ [22] and [23], yet not in the content ("The pure ego as ego-pole [Ichpol]" § [22]; "The possibility of grasping [*Erfassbarkeit*] the pure ego" § [23]). These appearances in the titles correspond to the inclusions Husserl added to the L. Landgrebe version in 1924/25. In general, Husserl introduces polarity in the discussion of the difficult problems of empathy and intersubjectivity; see Husserl, 1973b, Txt no. 2.

20 In the volume, *Hua XXXVIII*, *Wahrnehmung und Aufmerksamkeit*, which contains Husserl's early lectures (up to 1912) dedicated to the phenomena of attention, the terminology of polarity barely appears, although the ray does, associated both to the ego (*Strahl des Ich*, p. 400) and intentionality (*intentionale Strahlen*) (Hua XXXVIII, *Beilage* XX, p. 316). He also postulates attention itself as a ray (Hua XXXVIII, *Beilage* XXI, p. 319), with the ego as the center from which these "rays of attention" emanate (p. 402), and this use (as a center of rays of attention) representing the clearest precursor of the "I-pole" notion.

21 Husserl, 1973a, § [19], p. 155. The concept of the "pure ego" is introduced in *Grundproblemevorlesung* from 1910, within the context of the problem regarding the flow of consciousness of time, a problem which forced phenomenological reduction (performed on the immanent experience that is occurring) to become a "double reduction" (which is performed not only on the temporal flow of the immanent experience but also on the temporal flows of content reproduced in diverse presentifications, with their own courses of time: recollections, expectations, etc.). In this second reduction, I can address the backgrounds of those reproduced courses of time, for example (in one of the possible directions) the ego polarities on which those experiences are constituted, and verify how the simple possibility of intelligibility of that direction of attention represents a certain identity with regard to the ego polarity that is performed by reduction on immanent experience. In this sense, the "pure ego" in the area of double reduction is conceived as a possible result of the investigation into the problems of the consciousness of time.

22 Husserl, 1973b, Txt no. 2, p. 30: "The I-pole is what it is, not a carrier, not a substratum for feeling and action, etc. but the ego as a point of radiance, as a function center of attention, as a point of emission; the center of activity for actions, for acts"; Husserl, 1973b, Txt no. 2, Appendix II, p. 43: "The ego is nothing more than the pole with no attribute of the acts, and it has all the determinations of this polarity, whereby the acts themselves are not something that is next to it, something comparable to this ego, with which, in a way, it is related" (author's translation).

23 The fact that heterogeneity between the poles is irreducible closes the path to any attempt of identity between them, such as those attempts that aim to make this heterogeneity a mere moment of a dialectic process, where speculative idealism would be united, such as in Hegel.

24 The ideation of the double directionality of intentionality is strengthened in the concept of polarization, which is less present where descriptions are only based on the phenomena of attention or in the different overlapping time frames in polythetic acts: a double direction is possible for each ray. In Husserl's terms, "two-fold radiations (*doppelte Strahlungen*), running ahead and running back: from the center outward, through the acts toward their Objects, and again returning rays, coming from the Objects back toward the center" (Husserl, 1952, § [25], p. 105). Thus, the intentional object is constituted as the "counter-pole" (*Gegenpol*) of the I-pole.

25 Frequentative or iterative verbs are those that contain the notion of repetition or reiteration in their own semantics. They are formed in Latin through the participle of another verb, to which the suffix of repetition is added. The belligerent nuance of the tactile suggests the idea of an irregular or approximate reiteration, contained in the idea of "tentative".

"aim/direct.[26]" Thus, we see the double play in the notion of *intentio*: the play between "tighten/extend." The grouping of both semantic fields into one makes perfect sense yet should not mean we overlook the relative separateness or isolation of both. In a representation of vector for any elastic forces, we obtain a tension for which the notion of "direct" would only be metaphorically applicable, for example when we attribute a "tendency" to the balance of bodies after the forces of tension cease to act on it. The "direct" force of intentionality as a mental phenomenon has nothing (or, at least initially, little) to do with the "tension" to which an elastic body is subjected when we place a force from one or both of its poles. In turn, the phenomena of attention may be perfectly described based on their self-contained properties, turning their back on an explanation in mechanical terms (here, physiological), without losing any of their meaning: in visual perception, the physiological process whereby the lens flattens or enlarges based on the size of the perceived object, thus enabling one of the key fundamental elements in depth perception[27], may be described without reference to the fact that the I-pole, in its constituent mobility, attentively encircles this object, instead of the other; the "direct" element mobility for phenomena of attention seems to be explained relatively independently from the logic of "tensions" between physical forces, and its description is always sustainable outside them. Nevertheless, the relative isolatable nature of the field of "stretch–tighten" with regard to "direct–expand," both inherent to and contained in the notion of *intentio*, should not lead us to overlook the possibilities that both elements occur in combination in the field of certain specific experiences of "directions that tighten" forces, on the one hand, and "tensions that accommodate" a direction, on the other hand; for example, in a description of archery, both directions occur in combination and overlap in an authentic layering: the experience of direction in archery simultaneously contains an overlap between a set of forces and a postural heterogeneity, including *on* a phenomenon of attention[28].

These four advantages (mereological elucidation of the distinction/association between ego and consciousness; the establishment of the irreducible heterogeneity of the correlation poles; the acceptance of double directionality as recognition of the active–passive dimension of correlation; and for the phenomenological notion of intentionality, the recovery of its dynamic dimension as *life*) lead directly to the second sense of the ego: the ego as a "substrate of habituality" (*Substrate von Habitualitäten*)[29]. This second sense depends on the fact that the I-pole is not separable (as a non-independent part) from the content of consciousness that it directs. Thus, the permanence of the I-pole pulls along the diversity of acts that hinge on it. Nonetheless, these acts cannot occur without organization (here, centralization) into a permanent pole to which they adhere. The pole gains continuity through the diversity of acts, and acts settle on the permanence of the identical pole, becoming a substratum (through the ever-active consciousness of time). The I-pole and I-substrate thus seem to be abstract parts (non-independent) of a whole for Husserl[30]. In this regard, two questions arise: (1) What type of dependency relationship do the I-pole and I-substrate establish? (2) Which "whole" do both senses of the ego form part of?

The second question is the truly relevant one. Husserl answers the first question without hesitation through a bilateral existential dependency model: A and B are existential and bilaterally dependent if and only if it is logically impossible for A to exist without the existence of B, and it is logically impossible for B to exist without the existence of A[31]. In other words, any pole is such from intentional lived experience, and the concept of "intentional lived experience" always involves an ego polarity. However, in the present study, this ontological (mereological) relationship is simply thought of as referring to

26 The Latin verb "*apuntare*" indicates the frequentative idea of "prowling around a point," whose active nature is contained in both the idea of the action itself and the Latin concept of *punctus*, the participle of *pungere*, meaning pierce or punch. The fixed "aim/direct" emerging from the idea of a frequentative suggests a genesis of fixation (of attention) always in a prior process of tentative "pecking"; we believe we found this idea in the marvelous work of Serrano de Haro on the phenomenology of aim, which he terms "informal calculation" (see, Serrano De Haro, 2007, p. 37ff).

27 We are referring to the key point of typically monocular and physiological accommodation (seen in both eyes, taken independently). Accommodation is seen as a physiological key, as the information it provides refers to the oculomotor adjustments that control the position of the eyes: Ciliary muscle contraction leads to increased lens thickness, whereas relaxing the muscles reduces lens depth. Nonetheless, contraction and relaxation of the ciliary muscles depend on the size of the objects focussed on by the retina, whereby, through their combination, in particular with key binocular convergence (and others), it is responsible for depth perception as an "outcome".

28 By recovering the language of polarity for *intentio*, Husserl revitalizes, surely without intent, the original nature of its etymological meaning, even with regard to the original context where Franz Brentano recovered it: the framework of the problem of "intentional (or mental) inexistence of an object," that is the problem of the "mode of existence" of immanent objects in consciousness. With regard to the subordination of categories of existence to the immanence–transcendence axis of the early scholastic presentations of intentionality, see Perler (2001, p. 203ff).

29 The inclusion of this second sense for R. Ingarden represents a major advance with regard to presentations of the ego in "Ideas I"; see Husserl, 1991, p. 215.

30 In the formal mereology of LU III, the "abstract" concept functions as a synonym for "non-independent part"; see Husserl, 1984, § [17], p. 273.

31 Husserl, 1984, § [16], p. 271.

the abstract "I-pole" and "I-substrate" genders. If both parts are simply thought of as abstract (non-independent), we do not seem to gain much terrain for the effective description of intentional lived experiences and their relationship to specific reality. By referencing "substrate" (*Substrat*) and "sedimentation" (*Niederschlag*), Husserl is not merely thinking of abstract objects and conceptual relationships, but rather of structures that constantly overlay in the courses of time for specific lived experiences. This can be clearly seen when Husserl allows the introduction of affections (*Affektion*) between the sedimentations of the I-pole: the I-pole contains a passive habituality for bodily affections[32]. This makes the I-pole and I-substrate pairing a directly linked pair to specific courses of time and concrete bodily passivity. Indeed, Husserl perceives the I-pole through the following original analogy (*ursprüngliche Analogie*), which would become fundamental to Husserl's theory of the ego: the I-pole is to act (intentional lived experiences) in a way the lived body (*Leib*) is to sense phenomena: a center[33]. In the same vein, as any bodily affection immediately obtains its location with regard to the lived body, not being able to occur separately from the orientation with regard to the latter (of which it is part), intentional lived experiences in all their diversity have an abstract I-pole at their center[34]. Nonetheless, with the introduction of bodily affections in intentional life, centralized both in the lived body and the I-pole, we now move into the terrain of the truly relevant second question regarding the whole, where the pole and the substrate form abstract parts: the monadic ego and the third sense of the self. Husserl chooses Leibniz's concept of the monad to answer the question of "full concretion" (*volle Konkretion*) of the ego as everything of which the pole and substrate would only be abstract parts. The monadic ego responds to the question of possessive pronominalization from the sphere of concrete consciousness: what contents of consciousness can I accurately say are mine? For Husserl, mine, what belongs to me (*my* hand, *my* pain, *my* imagination, *my* perception, *my* desire, etc.) constitutes a sphere (*Sphäre*) or a field (*Feld*) to which only I can oppose the idea of "not mine" as that which does not belong to me. Thus, a difference and articulation are established between the perimeter sphericity of the I-monad in its full concretion and the horizontality of the "intentional ray." In contrast to the I-pole, the monad outlines an area, field, or sphericity whose perimeter interiority is also permanently mutable and remains unified by the idea of "property" (*Eigenheit*): the comprising content is *my* content; this precisely characterizes the idea of the monadic ego[35]. Only this I-monad, the only concrete one, vaguely concurs with the idea of possessive pronominalization.

## Husserl's three senses of the ego and the concept of the "minimal self"

It is largely as a response to certain recent theoretical proposals, all with a highly diverse nature[36] which posit the elimination of the ego given its illusory nature, that Dan Zahavi has suggested the notion of the *minimal self* since the first decade of the 21st century. The term has proved highly successful in the field of psychiatry, and this success comes not so much from a defense against "eliminativist" attempts, but rather from the interdisciplinary work between phenomenology and psychiatry that Zahavi has spent years cultivating and consolidating. As a result of this ongoing work (which is not free from controversies), certain researchers have reached the conclusion that acceptance of a "minimal self" enables us to better explain the lived experiences described by certain patients with psychotic and schizophrenic episodes[37]. The idea of the "minimal self" refers to a property of experience flow: the intentional lived experiences already contain a "for-whom" perspective (in Husserlian terms, this is called the I-pole as the inseparable center of lived experiences). This "for-whom" belongs to the lived experience itself within its structure and does not arise from reflexive acts that revert to and project it. Reflexive consciousness does not turn on itself, in an*a posteriori* attributive description, for example, "When I perceive this house, I am what I perceive," but rather in "seeing the house" a "for-whom" occurs from seeing it. If it is appropriate to include the "substrate of habituality" in the perception of the house (whereby it is not the first house I am seeing, I know it has windows and doors and it

32 Husserl, 1952, Appendix II to § [25], p. 310.

33 This analogy appears in Husserl, 1952, § [25], pp. 106–107; Appendix II, p. 311; Husserl, 1973b, Txt no. 2, p. 30; Appendix IV, p. 50, and Husserl, 1973c, § [37], p. 131. The first text where this analogy is established is a manuscript based on Edith Stein's writing, in § [25] of "Ideas II"; for more on this manuscript, see Marbach (1974, p. 159). Husserl also widens the sense of the I as a substrate of habitualities to "infrahuman beings" (*untermenschlichen Personen*), a category that could include animals; for more on the phenomenology of animality in Husserl, see Javier San Martín (2007, p. 39). For a discussion on whether this analogy is more than a mere analogy, see Marbach (1974), § [25], p. 159ff and Micali, 2008, p. 27.

34 The later text from 1931 is also important. Here, Husserl points to an identification between the words of "subject" and "center," thus distancing the subject from the substrate functions of predication and reconciling it more with the sense of the pre-predicative I-pole: "'Subject' is just another word to designate the centralization of all life as life of the ego" (author's translation; see, Husserl, 2006, Txt no. 10, p. 35).

35 The concept of "ownership" is countered by that of "otherness" or "experience of the other." For more on the relationship between the concept of "ownership," which leads to primordial reduction, and intersubjective reduction, see González Guardiola (2021, p. 167ff).

36 From such opposed extremes as "analytical Buddhism" (Albahari, 2006) or cognitive neuroscience (Metzinger, 2003).

37 M. Ratcliffe, in Fuchs et al. (2017, p. 149ff).

matches the other events of "seeing houses" that have occurred in my life), it is also appropriate that the givenness of the house is such "for me" that I am in that position, walking around it, and it offers me ever newer foreshortening. All these foreshortenings are centralized in a perspective on which they hinge, in the form of the I-pole[38]. This pre-reflexive ego, for which the house exists even before I am asked for whom it exists (i.e., prior to the ego, whether the house is part of the sphere of my property), may be perfectly identified with the first and second egos in their mereological inseparability, as Husserl posits in §§ [31]–[33] in "Cartesian Meditations." In turn, one should also explore the possibility that it is precisely in dislocations of mereological relations between the first two senses of the ego, and the whole of which they are part, where one could satisfactorily explain the first-person descriptions of individuals who state they have psychotic or schizophrenic experiences[39]. In large part, these lived experiences are described as experiences containing relevant components of *disorientation*, specifically with regard to the interaction between the three senses of the ego set out earlier. Thus, it is possible to interpret depersonalization in terms of disarticulation between the I-pole and the substrate of habituality, which Husserl himself deems the basis of the personal ego.

Nonetheless, the key to interpreting the ego not as the *producer* of intentional life orientation, but rather as its *outcome* (an outcome that would fail in the case of lived experiences arising from the need of the "minimal self," in terms of intelligibility in the explanation of anomalous lived experiences), can be found in the analogy of the two centralizations of intentional life and bodily life. According to Husserl, both centralizations (intentional life in the I-pole and bodily life in the lived body) are generated based on the orientation (*Orientierung*), as something already present in any originating givenness. It would thus not be the ego that orients, but rather the ego would be the result of the orientation process for intentional life, and, by analogy, it would not be the lived body that would be oriented, but rather the lived body would be the result of the orientation of bodily life[40]. This displaces the senses of the ego from transcendental egology to the possibility of a phenomenological theory of life orientation which, in large part, would remain open to development[41].

38 The best descriptions of the constitution process of the thing around an ego centralization are found in lessons from 1907 concerning "*Ding und Raum*"; see Husserl, 1973c, § [37], p. 131.

39 Parnas and Sass (2001, p. 101ff).

40 Husserl adds: "A question for further consideration (*näher zu überlegen*) would be how far one could progress along this path (*Wege*)"; see Husserl, 1952, § [25], p. 106. However, to which "path" of phenomenology does Husserl refer when being able to extend this exploration with a view to verifying its fecundity? It cannot be the Cartesian path and is unlikely to refer to the world of life or psychology. We will leave this consideration open at this time for subsequent research.

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

## Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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## Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Publisher's note



41 We believe we have found the continuation of this "path" that leads to the phenomenological theory of orientation in some later texts by Hua XXXIX (texts 16, 20, and 21). As far as we know thus far, no attempt has been made to apply a completely systematic theory of orientation, with all the potential of the mereological tools in LU III, to the description of anomalous lived experiences for whose intelligibility the idea of the "minimal self" had been necessary.

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# Wearing face masks impairs dyadic micro-activities in nonverbal social encounter: A mixed-methods first-person study on the sense of I and Thou

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The COVID-19 pandemic has manifold negative consequences for people around the world, of which the psychosocial ones have been rather underrepresented in the public eye. Regarding social distancing measures, there is already some experimental work demonstrating that the use of face masks has detrimental effects on various aspects of social cognition such as emotion reading, face identification, and perceived closeness of persons. However, while these findings provide important clues, they do not shed light on what people experience when interacting in real life in a masked society. Therefore, in critical distance to cognitivist accounts and taking Direct Social Perception (DSP) approaches seriously, we developed a first-person experimental design and conducted a study with thirty-four participants in a dyadic setting with two conditions (without vs. with face mask). Data were analyzed with mixed methods including in-depth qualitative coding at three levels, code relations analyses, and various statistical tests. Results yielded significant differences across conditions at all qualitative levels, comprising, for example, expressive behavior, and, in particular, significant decreases of content-independent, complimentary mental micro-activities. In the context of DSP, we argue in the paper that these activities suggest the constitution of a quasi-sensory modality – conceived as I-Thou sense – that oscillates between strongly and weakly embodied mental activities, as the analyses show. In sum, this study suggests that mask-wearing impairs both functional directions of mental activity in relation to more or less embodied experience and thus intervenes deeply in fundamental processes of social perception and interaction.

KEYWORDS

**nonverbal social interaction, first-person perspective, mental micro-activities, direct social perception, I-Thou sense, weak vs. strong embodiment**

## Introduction

Many governments around the world have mandated the wearing of face covering masks in response to the global COVID-19 pandemic to prevent the spread of the virus. While the medical benefits of face masks are mostly undisputed (Brooks and Butler, 2021; Howard et al., 2021; for review, see Spitzer, 2020), little is known about their (social) psychological consequences. What is known so far is that face masks impair social cognition by hiding areas of the face that carry cues to emotions, identity, speech information, and other social aspects such as trustworthiness, attractiveness, and age (Carbon, 2020; Freud et al., 2020; Biermann et al., 2021; Marini et al., 2021; Noyes et al., 2021). For instance, recent studies found that emotional recognition was made significantly more difficult by the presence of a mask (Carbon, 2020; Gori et al., 2021; Grahlow et al., 2022; Grenville and Dwyer, 2022) or that face masks disrupt holistic processing abilities and thus have impact on facial identification and social cognition (Freud et al., 2020; Marini et al., 2021; Jeevan et al., 2022; Stajduhar et al., 2022; Thorley et al., 2022). Furthermore, face masks make target persons appear less close (Grundmann et al., 2021; Kastendieck et al., 2022), reduce interpersonal trust (Malik et al., 2021; Marini et al., 2021), and impact the recall of spoken sentences and voice radiation in general (Pörschmann et al., 2020; Homans and Vroegop, 2021; Truong et al., 2021). At the same time, there is also some evidence that face masks increase facial attractiveness (Hies and Lewis, 2022; Parada-Fernández et al., 2022; Pazhoohi and Kingstone, 2022).

However, while these findings already stake out the scope of psychological phenomena affected by mask use, they are limited in terms of what people experience in real-life social interactions and how those interactions actually change as a result. Firstly, this is because all the cited studies deployed facial stimuli that were created by using image processing software or images of people wearing a mask. Although such common approaches allow for a high degree of experimental control and large sample sizes due to automated procedures in online survey designs, they circumvent the study of psychological effects of face masks on a more natural, holistic, and dynamic level. Secondly, it is questionable whether standardized data collection *via* measurement of known constructs is sufficient for the purposes of the experiments, or whether lived experience and mental agency should be accessed in a more direct way. Since the latter may uncover unexpected and more elusive aspects of social cognition and interaction (Wagemann and Weger, 2021), the current study was designed to investigate the impact of face masks in an almost natural setting relying mostly on qualitative self-report data without, however, neglecting the virtues of quantitative analysis.

## From Descartes to theory theory and simulation theory

In theoretical terms, a mixed-methods first-person study invites us to more precisely explore from a conceptual and empirical perspective philosophical approaches to social cognition and interaction, which have undergone a significant transformation in recent decades. In the cognitive sciences the traditional answer to the problem of other minds – which has its roots in Cartesian substance dualism – claims that certain internal mechanisms explain how we gain access to the mental (e.g., emotional) states of others and understand their intentions. There is, in Cartesian terms, no direct perception of the world – including the perception of other minds. This is so because the *res cogitans* has to *interpret* the signs of the nervous system (in the spinal gland) that transmit the received information of the sense organs. It is this idea, namely that we do not have direct contact with the external world, that is the starting point of almost every contemporary theory of social perception. Thus, one of the leading theories of social cognition, the theory theory (TT) states, roughly speaking, that we acquire knowledge about other people's mental states by construing a theory based on our own perceptual experience and inference (Bretherton and Beeghly, 1982; Schaafsma et al., 2014). TT claims that we connect sensory data with mental states and behavioral states (input/output states) by assuming causal connections between them, which can be refined, for instance, by exploring these connections in more detail (Shanton and Goldman, 2010). For understanding others' intentions, we then ascribe folk psychological categories such as beliefs and desires to other people by causal inferences. Another well-known attempt to explain our mind-reading capabilities is the so-called simulation theory (ST). In contrast to TT, the simulation theory rejects the idea of theoretical inferences as the basic mechanism for understanding other's intentions and for predicting their prospective actions. Early predecessors of ST – such as the hermeneutical and aesthetic approach to other persons and to artwork – assume that feeling with others ("Einfühlung") or reexperiencing ("Nacherleben") their mental life are the key aspects for intersubjective understanding (Dilthey, 1927, p. 47; Lipps, 1903). In a similar vein, contemporary proponents of ST hold the view that with our imaginative powers we put ourselves in the shoes of others to grasp what people feel or think in different social circumstances (Gordon, 1986; Heal, 1986; Shanton and Goldman, 2010). As Goldman puts it, a "mentalizer" simulates the mental situation of another person by pretending states in herself so as to comprehend what she might presently be feeling and thinking and how she might act in the future (Goldman, 2006, p. 258). There is, however, another variant of simulation theory that is not directly concerned with the ascription of propositional attitudes but with the experience of the basic motor intentions of other people in the context of sensory-motor interactions. In contrast to the simulation theory, which ascribes mental activities at the personal level of descriptions, this complementary variant builds on the mirror neuron system found in monkeys (Gallese et al., 2004) and humans (Freedberg and Gallese, 2007). According to Gallese (2003), these empirical findings imply that the correlated brain activities simulate forthcoming events for predicting social interactions. He calls this process "embodied simulation" and characterizes it as an automatic and unconscious

mechanism, which he conceives as the functional basis of empathy and social cognition (Gallese, 2003, p. 524; Freedberg and Gallese, 2007).

## Direct social perception and interpersonal sensitivity

Nevertheless, the notion of indirect social cognition underlying these two and other variants of the theory of mind has been challenged by embodied and phenomenologically inspired approaches. Drawing on the work of Scheler (1954), Merleau-Ponty (1964), Gallagher (2008), Stein (2008) and others have in recent years delineated a theory of direct perception from the second-person perspective, which rejects the idea that mental states are hidden and unobservable entities. On the contrary, we perceive other people's emotions or intentions immediately, for instance, by voice intonation, facial expressions, gestures, or entire body postures (Gallagher, 2008; Reddy, 2008). One core idea in support of this view holds that *expressive embodied behavior* is a constitutive part of mental states. When we observe such states, we are perceiving what the other is experiencing from the first-person perspective (Krueger and Overgaard, 2012).

Furthermore, the observation of expressive behavior is simultaneously intertwined with the encounter of another subject. When we see another person with an expression of sadness or grief in her face or we observe her entire body posture, we are confronted not only with a mental state of another person but are encountering the other as the subject of those mental states. Matthew Ratcliffe, in particular, has explored this distinction of social content and interactants and the relationship between the two in more detail. Referring to Buber's (1958) famous I and Thou relation (1958), Ratcliffe argues that we are not facing a "Thou" as an entity that we "recognize and address then as Thou" (Ratcliffe, 2007, p. 154), but rather the I-Thou relation is a stance – or a sense which encloses a special field of experience – that already requires a specific activity and openness on the part of the interactive participants to the other as a Thou (Ratcliffe, 2007). A similar notion of "interpersonal sensitivity," which goes beyond emotional empathy, has been studied empirically. In this context, interpersonal sensitivity is understood as "accuracy in judging the meanings of cues given off by expressors, as well as accuracy in noticing or recalling cues" (Hall et al., 2005, p. 237). What supports Buber's and Ratcliffe's concept of dialogic interaction is that there is a positive correlation between participants' own interpersonal sensitivity and the accuracy of their assessment of their partner's interpersonal sensitivity (Carney and Harrigan, 2003). In our context, however, one limitation of this approach is that, by measuring *via* standardized survey instruments, it presupposes the specific content of cues to be observed by the participants and thus is unable to capture novel structural and dynamic dimensions of the interactants' encounters. Another limitation is that, in recent psychopathological research, interpersonal sensitivity is mostly associated with negative personality traits such as low self-esteem and negative self-image that result in high alertness to the expectations of others (Meisel et al., 2018; Lei et al., 2021), which seems to neglect the general functional role of disclosing interpersonal sensitivity in social interaction.

## Extending DSP by (potentially) conscious attention dynamics

In terms of direct social perception (DSP), the gaze plays a proactive and receptive dual role in social encounters, as already noted by Simmel (1921) and Sartre (1956). Apart from Sartre's (one-sided) notion that the gaze of the other is constitutive of myself as an objectified person, his analysis of the phenomenon of shame suggests that it involves a responsiveness to the gaze of the other that can be described as the permanent possibility of "being-seen by another" (Sartre, 1956). From this we can infer an important distinction between two types of experiences, namely to be passively seen-by-another and to actively look-at-another, which both involve the specific personal I-Thou stance. This dual function of eye gaze has also been empirically explored since the 1960s, in relation to various phenomena such as intimacy and dominance (Argyle and Cook, 1976; Ellyson et al., 1981; Jarick and Kingstone, 2015) or turn-taking behavior during conversation (Kendon, 1967; Ho et al., 2015). In the latter, looking at the other and being looked at by the other take place in that speakers change between averting their gaze and turning it toward the listener, while listeners gazed at speakers most of the time (Kendon, 1967). Conversely, listeners tend to avert their gaze and increase overt behavior such as head shifts or gesturing before starting to speak (Harrigan, 1985). However, at least since Posner's influential research, it has been clear that there are also covert attention dynamics which cannot be captured by measurement of overt or external behavior but need to be considered in their own right too (Posner, 1988; Posner and Petersen, 1990), for example, when a detective pretends to read the newspaper while observing people in the periphery of her visual field. While it is often assumed that both overt and covert forms of attention in turn-taking are due to implicit, i.e., unconscious brain processes (e.g., Sato et al., 2016; Bögels, 2020), we have suggested that eye movements are a visible metaphor for more subtle processes of conscious attention regulation that are quite accessible to first-person observation (Wagemann and Weger, 2021). In this regard, we distinguish between two mental modes of listening, namely, first following the other person's utterances with undivided attention, and then, while continuing to listen, detaching one's attention to some extent from the other and developing one's own impulses to (re-)act, e.g., to say something back. Notably, the change from the first ("devotion") mode to the second ("self-assertive") mode can (though need not) be accompanied by overt behavior (Corps et al., 2018). To capture the more subtle attentional dynamics that oscillate between one's own and the other's domain and which could be more fundamental to phenomenal experience in social

interaction than their overt or neural reverberation, we need to pursue a first-person research paradigm and develop an appropriate theoretical approach.

A notion that comes closest to answering our question of not only if but how direct social perception might be possible can be found in Rudolf Steiner's idea of the sense of I and Thou (Steiner, 1964), which he, like Buber, developed in the 1910s. This is because Steiner's first-person phenomenological approach focuses not on specific mental content (to be decoded in terms of social functions or communication purposes) but instead examines underlying mental processes from a structural perspective. Unlike Sartre, however, he explores in a balanced way the mutually alternating roles of proactively sending and receptively opening mental activity, which ultimately result in the "other self" being perceived as a mental agent on an equal footing and with her own inimitable individuality. In the current study, our more concrete question is directed at whether this view, initially supported in a previous study (Wagemann and Weger, 2021), can be further strengthened by confronting it with an experimental setting in the form of social distancing measures. Here, we are concerned with the transition from nonverbal social interaction without mask to that with mask, in order to use this independent variable as a potential indicator of altered experience and mental agency in dyadic encounters. Additionally, we decided to enable participants to focus more thoroughly on hitherto unnoticed subtle inter-mental and intra-mental activities without the distraction of complex simultaneous symbolic (verbal) communication processes. Furthermore, our study aims at contributing to the question of how the presence of the mask in social interactions during the Corona crisis might affect the ability of direct perception and interaction in the social realm.

## Hypotheses

In analyzing the data, we will proceed step by step, examining the data at different levels, progressing from more general aspects to focusing on mental or attentional micro-activities (e.g., Wagemann, 2022). For these, we formulate the following two hypotheses: (1) Mental activity in (nonverbal) social interaction appears in two typical forms which participants can introspectively observe and report (proactive-focusing, receptive-opening) and which are partly expressed *via* overt or bodily behavior and partly act independently. (2) In the transition from interaction without mask to interaction with mask, these forms of mental activity change in the frequency of their occurrence and their characteristic composition. More specifically, we hypothesize a decrease or impairment of these micro-activities in the transition from the first to the second condition, which is in line with the findings presented above (Carbon, 2020; Gori et al., 2021), but which also has the potential to provide a deeper understanding of these effects. If these hypotheses can be empirically strengthened, this could have important implications both for a general, psychological-philosophical conception of social interaction in terms of DSP and for the often insufficiently considered psychological and cultural implications of health policy measures.

## Experimental procedure

The methodological starting point of our investigation is the irreducible phenomenal first-person perspective of experience. This does not exclude, however, the important contributions of neuroscientific or other behavioral research to the externally measurable underpinnings of mental life. Nevertheless, we maintain that operational definitions and functional specifications of mental processes are frequently in danger of losing sight of the phenomenality of conscious experience and subjectivity (Weger and Wagemann, 2015; Kotchoubey et al., 2016). Actually, phenomenal consciousness in its structural coherence provides functional dimensions and empirical evidence which are often neglected in consciousness research (Hatfield, 2005; Locke, 2009; Cleeremans and Tallon-Baudry, 2022). Consequently, a methodologically justified research procedure is needed to deal with conscious phenomena *in themselves*. Only after having established a rigorous phenomenal description and categorization of conscious experience can one start to explore how a non-reductive but integrative mind science from the first-, second- and third-person perspective is to be accomplished (Kotchoubey et al., 2016).

Thus, taking experience from the first-person perspective seriously, we share the conviction with contemporary phenomenological approaches that the content and acts of conscious processes need a qualitative research procedure which aims at specifying their invariant structures and dynamics of experience. Such a phenomenological approach, however, does not exclude the *quantitative* investigation of the phenomena being analyzed, such as different forms of social interaction (Creswell, 2009). Phenomenologically inspired mixed-method approaches focus on the *integration* of qualitative and quantitative (statistical) research procedures for a multi-perspective disclosure of the structures and dynamics in question (Martiny et al., 2021). This, in turn, opens up new research fields for neurophenomenological research projects (Tewes, 2018), indicating the possible integration of different research perspectives in the mind sciences, as highlighted above.

Against this background, we need to connect the question of mental agents' micro-activities and direct social perception with the requirements and quality criteria of empirical research. This means developing an appropriate experimental design and task, capturing people's immediate experience as directly as possible, analyzing the qualitative data in a reliable way that is balanced between inductive (bottom-up or data-driven) and deductive (top-down or theory-driven) perspectives, quantifying the qualitative results, and identifying purely quantitative aspects of the text data before subjecting both to statistical analyses. Here, we would like to note that in this triangulation of qualitative, qualitative-quantitative, and purely quantitative aspects of the data

lies a unique selling point of the present study, allowing it to bridge the gap that often exists between real-life interaction and analytical standards. Against this background, the individual steps of the experimental procedure are explained below.

Firstly, our decision for a within-subjects design requires justification. One advantage of a within-subjects design is to ensure maximum control of the participants' extraneous variables, which reduces noise and leads in many cases to greater statistical power (Charness et al., 2012). Another argument for within-subjects designs is that they are closer to real-life situations where the same person is exposed to a variety of demands. However, care must be taken to avoid unintended carry-over effects that may result from the specific sequence of the experimental conditions; this is usually accomplished by randomization (e.g., Carbon, 2020). The situation is different if, as in our case, a condition is intentionally placed on subjects that they have a defined reference or "baseline" when doing the task under the subsequent conditions. In a sense, this can be understood as a pretest-posttest design, where data is collected before and after the administration of a particular treatment. It must then be conceded, however, that the scope of possible generalization of the findings is limited to exactly this sequence of conditions and cannot simply be transferred to others. Taking these considerations into account, the question of what happens in the transition from an unmasked society to a society that is largely masked in public life can be investigated by limiting the procedure to the change from interaction without to interaction with masks. Another reason for this constraint stems from the mixed-methods approach of our study, which is not only concerned with quantitative results, but also with the qualitative phenomenality of participants' first-person experience and activity. For this reason, qualitative data is collected and analyzed first before it is fed into various quantitative analyses, which requires additional research resources and means a shifted methodological focus compared to purely quantitative studies. Nevertheless, in order to complement and continue the current study, further investigations will be needed.

## Task and participants

The experiment was conducted in June 2020 at Alanus University (Campus Mannheim) as part of a course on Social Aesthetics for students of our B.A. program in Curative Education. The students were instructed by email and carried out the experiment independently at home, for which they received partial course credit. Various theories of social philosophy and psychology were covered in class before the experiment, but of course the study was not discussed before or during data collection and participants were not informed about the hypotheses. The participants were instructed to sit in a quiet room without external disturbances facing a partner at a distance of 1.5 m and to maintain eye contact for 5 min. Other forms of nonverbal communication (facial or other physical gestures, sign language, etc.) were explicitly forbidden. Additionally, participants were asked to observe as closely as possible what they did and experienced mentally, to pay attention to active and passive aspects of this as well as to their thinking, feeling, willing, and perceiving. Immediately after the first phase, participants were to note down their observations, pause briefly, if necessary, but not talk to their partner. For the second round, they were instructed to repeat the same procedure with face mask on and again immediately note down their observations afterwards (without talking to each other). Finally, the reports were sent in by email within 1 week.

Methodologically this setting is a compromise between, on the one hand, highly controlled laboratory conditions (but which often seem sterile and unrealistic) and, on the other, purely qualitative field work (where it is often difficult to move beyond ideographic characterizations to nomothetic regularities). The real-life conditions also include the participants' independent implementation of the trial within the timescale of 1 week, its integration into their daily routine and the inclusion of known people as interaction partners.

A possible objection to this procedure could be that participants had up to a week to reflect on the task before performing it, which could have influenced the way they experienced themselves and their partners in the experimental situation. In particular, the instructions on how to perform the task without vs. with mask could have made it completely transparent to participants what the researchers were interested in, which thus risks expectancy bias. However, especially for first-person studies which focus on agentive phenomena, it is inevitable that the external conditions of the experiment are completely transparent to participants: this is necessary for them to comply with the given task correctly (unlike many social psychological studies in which participants are intentionally misled about the task content). Moreover, even with prior reflection, the pre-reflective forms of experience and mental activity targeted by the hypotheses are performed and become conscious only during the task, and thus remain unaffected by these constraints. The task was designed according to the occasion of this study and the related restrictions for experimental research during the first phase of the COVID-19 pandemic in Germany. The initial idea was to conduct a follow-up experiment closer to that of Wagemann and Weger (2021), but we were unable to work with large groups moving through the room and therefore opted for a dyadic and static setting (for more detailed information on the previous study, see the last part of see section "Results"). Furthermore, there were no face-to-face classes at the university during this time, only online courses, which explains why students could only work at home. The following two reasons supported limiting the task to nonverbal interaction *via* eye contact: firstly, the potential effect of the mask should not be relativized by either additional task content or verbal communication, as explained in the introduction; secondly, participants should be exposed to a somewhat unfamiliar situation that remains unchanged for several minutes in order to temporarily leave their daily routine and engage in more subtle observations.

Thirty-four persons (30 females, 4 males) aged between 21 and 50 years ($M = 25.8$) participated in the experiment. As with the experimental setting, we can also speak of a compromise between qualitative and quantitative criteria regarding sample size. For thematic saturation in qualitative in-depth studies, 20–30 participants are recommended by Dworkin (2012), but other authors also consider sample sizes below 20 to be appropriate (Francis et al., 2010; Guest et al., 2020). On the other hand, for nominal variables, a statistical power analysis aimed at chi-square tests with a medium effect size of $w = 0.3$ (Cohen, 1988) yields with $\beta/\alpha = 4$ and a total sample size of 68 (34 subjects under two conditions) a test power $(1\text{-}\beta) = 0.74$ (Faul et al., 2007), which is slightly below a widely recommended power of 0.8. For metrical variables, a power analysis aimed at dependent-samples t-tests with corresponding parameters and a medium effect size of $d = 0.5$ yields a test power of 0.85. In summary, we consider the given sample size to be appropriate in the context of this mixed-methods study.

## Data acquisition

For the setting described above we applied the method of retrospectively written, open-ended self-reports, since it has several advantages over both other first-person and more standardized methods. This is not to say that we consider this to be the only option; rather it is the best compromise for this type of investigation, as will be explained briefly.

Firstly, unlike interview techniques (e.g., Vermersch, 1999; Petitmengin, 2006), written self-reports are non-reactive in that they are not elicited or triggered by specific questions, thus avoiding any influence by an interviewer. This is especially important for hypothesis-driven research, to prevent forms of the experimenter expectancy effect or related biases. Although these problems may not necessarily arise with trained interviewers, they would require additional safeguards and justifications, which we bypass here.

Secondly, the hardly avoidable time gap between participants' immediate experience and verbalization is minimized, as interviews cannot be conducted immediately after the experiment due to the real-life setting. An even greater temporal proximity of data collection to mental processes could have been achieved with a think-aloud technique (Ericsson and Simon, 1993), but this would disturb the nonverbal dyadic interaction and therefore had to be ruled out. If the notes are jotted down immediately after each trial, the limit of 30 s given by Ericsson (2006) for reliable retrospective self-reports should not be significantly exceeded, although this obviously does not apply to the earlier stages of the task. However, it can be assumed that real-life social encounters, in contrast to abstract cognitive tasks, are accompanied by salient emotions, ensuring that the corresponding experiences and activities are remembered more clearly, more accurately, and over a longer period of time (e.g., Tyng et al., 2017).

Thirdly, especially with regard to the social interaction task, it seems obvious to prefer written self-reports over interviews, since the latter would virtually be a repetition of the dyadic experiment with another person (and would most likely involve different social dynamics) and thus could have backward biasing effects on the actual experiences of interest. In the context of a mixed-methods study, there is also the pragmatic advantage of a significantly smaller data volume for written self-reports, which reduces the analysis effort.

Compared to standardized questionnaire instruments, open-ended written self-reports are advantageous here because they do not carry the risk of cognitive bias due to implicit information about the research hypotheses in the items, which is particularly important when dealing with phenomena and their structural components not previously described by known constructs. In this vein, the possibility of obtaining phenomenologically thick or rich descriptions (e.g., Masrour, 2011; Byrne and Siegel, 2017) and discovering new aspects in the data that go beyond the previous theoretical framework can also be mentioned here as crucial benefits compared to standard survey accounts (for general discussion of first-person methodology, see Tewes, 2007; Weger and Wagemann, 2015). Of course, space allowing, a more in-depth discussion of first-person data collection methods, ranging from more standardized to more (micro-) phenomenological procedures, would be needed here. Nevertheless, we have hopefully made clear the justification for the data collection method used in this study.

## Data analysis

A major part of the analytical work followed this sequence: qualitative multi-level coding of the text data (section "Qualitative analysis"), qualitative and quantitative code relations analysis (section "Code relations analysis"), descriptive and inferential statistical analysis of code frequencies and other quantitative aspects of the protocols (see "Statistical analysis"). Thus, from a mixed-methods perspective, an approach is taken in which qualitative and quantitative data are collected concurrently, as they are different aspects of verbalized experience, but analyzed in sequential steps before being integrated in terms of the research question (Creswell, 2009).

### Qualitative analysis

To begin with the purely qualitative stage, we decided to balance data-driven and theory-driven aspects by coding the self-reports on three levels with different thematic focuses (Corbin and Strauss, 1990). Accordingly, different methods were pursued on each level regarding the coding procedure and intercoder reliability testing, as explained in more detail below. In advance, complete sentences were determined as the largest and partial sentences down to one-word statements as the smallest data segments to be coded.

Regarding the first level, our intention was to explore the data with as simple a categorization as possible, while allowing as much data as possible to be covered. Initial explorations into the data suggested a dichotomous distinction, as participants' experience refers either to currently observed aspects of the interaction between the partners or to their own, somewhat detached thoughts and emotional or bodily states. Starting from this rough distinction between "dyadic" and "monadic" aspects, we elaborated it in three sessions in which individual coding attempts by the authors were compared, discussed, and refined according to successively revised code descriptions. This process resulted in the following categories for Level 1:

1. Dyadic. This includes all formulations that have a clear reference to the other person or the interaction event, but also those that contain the mere attempt to build up a relationship or establish contact as well as the failure of such an attempt, as well as the withdrawal from a dyadic contact and even the avoidance of a dyadic external reference by turning back to oneself. In all these cases, the reference to the interaction partner is present, whether explicitly or implicitly. Thoughts that refer directly to the partner are also part of this category.
2. Monadic. This covers all statements that refer only to the participant's own mental or physical state without explicit reference to the other person, statements that could also be made in other situations or before or after the experiment, speculations about the experiment (in general as well as regarding specific observations that do not refer directly to the other person), attempts to explain or justify the experience, observations that refer to accompanying aspects (e.g., time experience, spatial constellation of the persons).

While this procedure led to conceptually consistent code descriptions and 97% coverage of the data (764 codings, no intralevel overlap), it did not provide any quantitative measure of intercoder agreement. Hence, intercoder reliability was tested with one independent coder who was not previously involved in the project. For 100 randomly selected and re-coded segments, computation of Cohen's Kappa yielded $\kappa = 0.856$, which can be seen as strong (McHugh, 2012) or almost perfect agreement (Landis and Koch, 1977).

On the second level, reported experiences were to be differentiated as precisely as possible, aiming at a thematic categorization as complete as possible while being manageable in terms of the number of categories. In addition, it should be mentioned that the focus here was primarily on more obvious aspects of first-person experience, which again is likely to capture a large part of the data. Here we changed the procedure in that we initially agreed on six major categories, which were then further subdivided and elaborated by one of the authors (JW), who then also did the coding of the complete data. In Table 1, the resulting twelve (sub-) categories are summarized and explained. This resulted in 89% coding of the whole data with 764 encoded segments and 872 codings, which indicates 14.1% (108 codings, distributed over 53 segments) of intralevel overlap (double or triple codings of same segments). About one quarter of the encoded data (189 segments) was randomly selected for intercoder reliability testing and independently coded by the other two authors. For these two sets of codings, computation of Cohen's Kappa yielded a mean value $\kappa_M = 0.699$, which already corresponds to substantial (Landis and Koch, 1977) or moderate agreement (McHugh, 2012). Here, as suggested by several scholars, we conducted one feedback round to clarify understanding and interpretation of the categories regarding the inconsistencies (Campbell et al., 2013; O'Connor and Joffe, 2020), which resolved most of them and ultimately resulted in strong agreement ($\kappa_M = 0.883$). The adjustments required on this basis were included in the final coding at Level 2.

At the third Level, the procedure was rather theory-driven in that most of the categories were adopted from a previous study with a comparable task (Wagemann and Weger, 2021). For this reason, as agreed, two of the authors were not involved in the formulation of the categories and instead this was carried out by one author (JW) alone. However, initial coding attempts with the adopted categories revealed the need to adapt them according to the modified task and to introduce additional categories (Table 2). Besides the four main categories representing the two mental micro-activities of a proactive-focused (PF) and a receptive-opening (RO) gesture observed as emanating from Person A or B each (main categories 1 to 4, see above hypothesis 1), two more holistic and two more specific categories were added. This is because there were many places in the protocols where individual micro-activities were not reported, but whether or not a dynamically integrated or resonant connection of the partners was perceived (categories 5.1 and 5.2). In addition, explicit negations of PF-B and RO-A activity occurred under the mask condition, which can be characterized more precisely as protection from being looked at by the other person (cat. 2.1) and as inhibition of the possibility of opening up and giving space to what comes from the other person (cat. 3.1). Since all these categories comprise more subtle aspects of first-person experience or activity, it is not surprising that a significantly smaller portion of 23% of the data could be coded at this level, resulting in 198 encoded segments, 201 codings, and an intralevel overlap of 5% (three double encodings). Intercoder reliability was tested in the same way as at Level 2, but with half of the encoded segments yielding $\kappa_M = 0.755$ before and $\kappa_M = 0.979$ after feedback, an increase from substantial to almost perfect agreement.

In addition, we performed an (half-) automated qualitative analysis to investigate the (in) dependence of Level 3 categories on body reference, as also addressed by our first hypothesis. To identify body reference in the data, a list of corresponding terms was compiled, and all coded segments were searched for the occurrence of at least one of these terms. In fact, to cover all body references in Level 3 codings, the following terms sufficed: body, exterior, eye, face, mask, to view/see (all forms, only physical

TABLE 1 Second coding level.

| Level 2 – Multiple aspects | Description | Examples |
|---|---|---|
| 1. Thoughts, reflections, memories | Situation-specific or more general thoughts, reflections, associations, speculations, and upcoming memories during the trial, possibly related to the content of the other categories | "I started thinking about the task and also about my own reactions" (P 1)<br>"…and wonder if he perceives something like that in my gaze as well" (P 19)<br>"Incompleteness characterizes the encounter" (P 23) |
| 2. Feelings | Whole spectrum of one's own positive, negative, or absent/neutral feelings (except bodily induced states), and temporal experience | |
| 2.1 Affective feelings | Basic affective feelings, moods, and states; social emotions and emotional attitudes toward the other person; change of feelings | "…I also feel a little depressed in the process" (P 2)<br>"…and felt very close to her" (P 18) |
| 2.2 Metacognitive feelings | Execution of the task, i.e., related cognitive activities, succeeds easily, difficulty, or fails, possibly accompanied by corresponding feelings (e.g., comfort, effort, frustration) | "At the beginning, I found it very difficult to concentrate" (P 5)<br>"Mental: overall tense process" (P 24)<br>"The experiment went much easier and I was able to concentrate better on maintaining eye contact without wandering off" (P 27) |
| 2.3 Sense of time | Time seems to be stretched, or to pass quickly, e.g., in comparison of the experimental conditions | "…In the end, the time was up quickly and could have gone longer" (P 4)<br>"It felt like an eternity" (P 26) |
| 3. Body | One's own bodily sensations and reactions | |
| 3.1 Sensation | Felt energy level, arousal/tension/relaxation indicated by increased heartbeat or breath; sensation of posture, etc. | "Breathing was difficult, and I felt the heat under the mask" (P 15)<br>"…initially tense and in the course very relaxing, the exercise has a very decelerating effect and does lasting good" (P 24) |
| 3.2 Reaction | Externally observable: Blinking, watering eyes, yawning, etc. Smiling/laughing is included if it occurs unintentionally as a (automatic) impulse and without explicit interaction context | "…had to laugh frequently. My posture also changed: first it was rigid and somewhat tense; later it became looser and more relaxed…" (P 5)<br>"I also noticed that I hardly had to blink at all" (P 25) |
| 4. Observation | Physical appearance of the other person and attention regulation | |
| 4.1 Content / quality | Physical appearance of the interaction partner, e.g., eye color, posture, face and facial movements/ expressions, emotions, becoming aware of the other; *perceptual content* appears clear/blurry/altered | "Over and over again I looked at the whole face" (P 4)<br>"Over time, the counterpart became more and more blurred" (P 6)<br>"You seem a little sad to me" (P 14) |
| 4.2 Attention regulation | Direction and scope of focus; changing between focused/defosued attention; clear/blurry/altered *view* (without specific content); concentration/ distraction; distanced/immersed observation | "…as both participants were distracted by the unfamiliar situation" (P 6)<br>"…this focus was primarily on the right eye of my counterpart from my perspective" (P 11)<br>"The view of the other person became more global" (P 13) |
| 5. Intentions | One's own urges, wishes, and intentions, e.g., trying to concentrate, to escape, etc., referring to individual interactions or to the entire trial; not (yet) initiated or completed forms of action, or retrospective explanation of the purpose of an action; often related to Categories 5.2 and 6.1 | "…I tried to focus on what I could see in my counterpart" (P 1)<br>"… in order to make me aware of how the person is doing" (P 17)<br>"Wanted to impulsively rip off her mask at the beginning of the silence" (P20) |
| 6. Behavior and interaction | All forms of one's own and the partner's overt behavior during the dyadic interaction | |
| 6.1 Eye gaze | Mutual gazing, sending and receiving cues; dynamics and phenomenal quality of view | "…my eyes [were] just drawn to my partner's eyes like a magnet" (P 18)<br>"…because I have the feeling to communicate through the eyes" (P 19) |

*(Continued)*

TABLE 1 (Continued)

| Level 2 – Multiple aspects | | Description | Examples |
|---|---|---|---|
| 6.2 | Mirrored behavior | Contagious smiling/laughing, yawning, tension/relaxation, mirrored posture, breath, emotions | "I have to start laughing because the other person is laughing" (P 2)<br>"…mirroring the other person, such as head posture or even the rhythm of breathing…" (VP 5) |
| 6.3 | Other behavior | One's own and the other's behavior beyond 6.1 and 6.2 but also in dyadic or communicative context; one's own prevented behavior (e.g., impulse control) | "…the height of the mask, which is corrected once by me" (P 3)<br>"I had to suppress my laughter all the time" (P 10)<br>"I could see the smile, the smirk and the attempt to remain serious…" (VP 16) |

Coding categories with subcategories, descriptions, and exemplary excerpts from the data.

context). Since the term "gaze" is ambiguous regarding body-related and mental contexts, this was treated as an extra category. The remaining codings contained neither a body reference nor the term "gaze." Below, exemplary excerpts from the data are presented (see section "Results") and discussed in qualitative or phenomenological regard (see section "Discussion").

## Code relations analysis

Code relations include not only the already mentioned overlapping of categories in coded data, but also topological aspects of code distribution in the protocols. Since at Level 1 the data were almost completely coded with two categories and without overlap, we investigated the distribution of dyadic and monadic passages in the data sets per participant and condition to explore whether specific patterns could be detected. With the "document portrait" tool in our qualitative data analysis software (MAXQDA), we found periodic changes between dyadic and monadic sections in most data sets, which were then quantitatively analyzed regarding the frequency of changes per protocol and compared between the experimental conditions.

Regarding overlapping coding, initially intralevel relations are analyzed more precisely before addressing interlevel overlaps. Aggregation of frequencies of overlapping codes in a cross table with selected categories ("Code Relations Browser" in MAXQDA) allows one to find and evaluate the most pronounced code relations. Following the approach of Krikser and Jahnke (2021), the analysis was limited to an interval from the maximum of category overlap to its half. At Level 2, the maximum of seven overlaps occurred between "Attention Regulation" and "Intention," five between "Thought" and "Affective Feelings," and four between "Eye Gaze" and "Affective Feelings" (see Table 1). Regarding the former, this indicates a subtle connection between the categories as in these segments aspects of attention regulation were not only reported but also intentionally controlled at a metacognitive level. The latter two relations refer to different aspects of feeling, firstly as reflecting emotions more intellectually, and secondly as immediately experienced feelings in dyadic gazing. At Level 3, two segments were identified in which the proactive-focused gesture was reported as equally referring to both partners, and in one segment this occurred for the receptive-opening gesture.

Coming to interlevel relations, it is not surprising to find almost complete overlaps between Level 1 and each of the other two levels, which we have broken down for the individual categories. While intersections between Levels 1 and 2 show mixtures of dyadic and monadic forms of experience in most categories (Figure 1), codings at Level 3 coincide entirely with dyadic experience, apart from just two segments in which the receding or lack of connection (still dyadic) transforms into a purely self-referential experience (monadic). For Level 2 in most, but not all, categories dyadic experience predominates, and there are individual (almost) purely dyadic categories, which will be discussed in more detail below. Considering Levels 2 und 3 together, it turned out that 95% of the data was covered by them, which means that Level 3 covers 6% of the 11% that were missing at Level 2, and that 17% of Level 3 encodings are reinterpretations of Level 2 encodings (interlevel overlap). The 5% of the data that remain uncoded consist of unclear, ambiguous, contradictory statements (in the context of Levels 2 and 3), or statements not related to the task or including blanks and paragraph marks that were not coded. An overview of the qualitative and quantitative aspects of overlapping between Levels 2 and 3 is given in Figure 2.

## Statistical analysis

Some quantitative aspects of the protocol data were examined independently of the qualitative analysis, such as protocol length and word frequencies (e.g., first-person pronouns). In the comparison of such measures with other work or between experimental conditions, first indications were discussed in the light of the findings of the qualitative data analysis. Another instance of this is the automated search for body-related words in Level 3 data, which we conducted after qualitative coding but methodologically independently of it, as explained below (see section "Results"). Most statistical investigations, however, were based on the two qualitative analysis steps described above. Here, two variants must be distinguished, the first of which operates with frequencies of coded segments per data set transforming categories into metrical variables. In contrast, for the second variant quantities of coded segments are binarized depending on whether a category occurs in a protocol or not, leading to nominal variables (binary occurrence of categories in data sets) or metrical variables (number of coded categories per data set). The first variant was only applied

TABLE 2 Third coding level.

| Level 3 – Mental micro activities | Description | Examples |
|---|---|---|
| 1. Proactive / focused / self-assertive (A) – PF-A | Focused attention; investigative observation; proactive, extroverted, and initiative attitude in the interaction; person A is aware of herself and her intentions regarding B and thus may express herself self-assertively. | "… First, a consideration of face, shape of nose, mouth, eyebrows, eyes, the face as a whole thinking, observing, being with me and looking at her" (P 23) |
| 2. Proactive / focused / self-assertive (B) – PF-B | Analogous to Cat. 1 with roles reversed; from the perspective of person A, a proactively focused attitude emanating from person B is perceived; one feels looked at, fixed, or challenged; the intention directed at one can be experienced as the self-assertion of person B; uncomfort feelings or escape impulses can arise | "… She was switching back and forth between my two eyes the whole time" (P 10)<br>"The long eye contact feels like a 'nakedness', as if you are giving the other person a glimpse of your inner self" (P 19) |
| 2.1 PF-B protection | Only mask condition: Person A perceives her mask as a protection from PF-B activities or as a means of hiding her facial expressions from the other person's gaze; this can be accompanied by positive, especially relieved feelings. | "With mask I felt more comfortable and confident in the encounter, eye contact was immediately easier" (P 13) |
| 3. Receptive / opening / devotional (A) – RO-A | Person A opens up to, identifies and accepts what is coming from person B as described in Cat. 2; an inner space is given for what emanates from person B and is perceived receptively; person A surrenders to B's presence without asserting their own impulses at this moment. | "It was as if I opened myself for a moment and made myself empty, so that the impression of the other person in me could get space" (P 13) |
| 3.1 RO-A inhibition | Only mask condition: Person A perceives the mask of person B as obstacle for her own RO-A activity and experiences a reduced empathy. Typical expressions include the "depth" or "soul" of the other person, which cannot be adequately grasped. | "The experience of being able to look through the eyes into the depths of the partner was lost" (P 22) |
| 4. Receptive / opening / devotional (B) – RO-B | Analogous to Cat. 3 with roles reversed; person A experiences person B opening to and receptively receiving what emanates from herself (A); person A feels perceived, accepted, or secure; person B is perceived as being with person A and suspending her own intentions. | "The feeling of being noticed" (P 29)<br>"She also noticed that in my eyes and had also gotten 'tunnel vision'" (P 32) |
| 5. Connection / resonance | | |
| 5.1 Positive | Felt connection or resonance between the participants; binding exchange, which is less static, but rather exhibits a subtle and bidirectional dynamic; more general or symmetric than categories 1 to 4; this can be accompanied by feelings of agreement, trust, closeness, or intimacy. | "In the end, I had the impression that we were on the same wavelength" (P 20) |
| 5.2 Negative | The opposite of category 5.1; typical expressions are negations of connection, diminished contact, interaction difficulties, distance, isolation, and feelings of coldness or antipathy. | "…however, I felt that moment as if there was a distance between us" (P 5) |

Coding categories with subcategories, descriptions, and exemplary excerpts from the data.

to Level 1, where data were coded with two dichotomous categories whose portions can be determined for each data set and compared for differences between the conditions by t-tests. For the second variant, nominal variables were investigated by chi-square tests backed up by an exact test for frequencies below five (Boschloo, 1970), and metrical variables were again examined by t-tests. To control for the family-wise error rate in multiple testing, we used the sequential Bonferroni method developed by Hochberg (1988), which is still relatively conservative in terms of maintaining the null hypothesis (Cramer et al., 2016). Code frequencies were also compared with those of a previous study (Wagemann and Weger, 2021) to check whether and to what extent the mental activity structure suggested by Level 3 categories could be replicated.

## Results

The presentation of results begins with purely quantitative aspects of the protocol data and then follows the hierarchical structure of Levels 1 to 3 with qualitative and quantitative results.

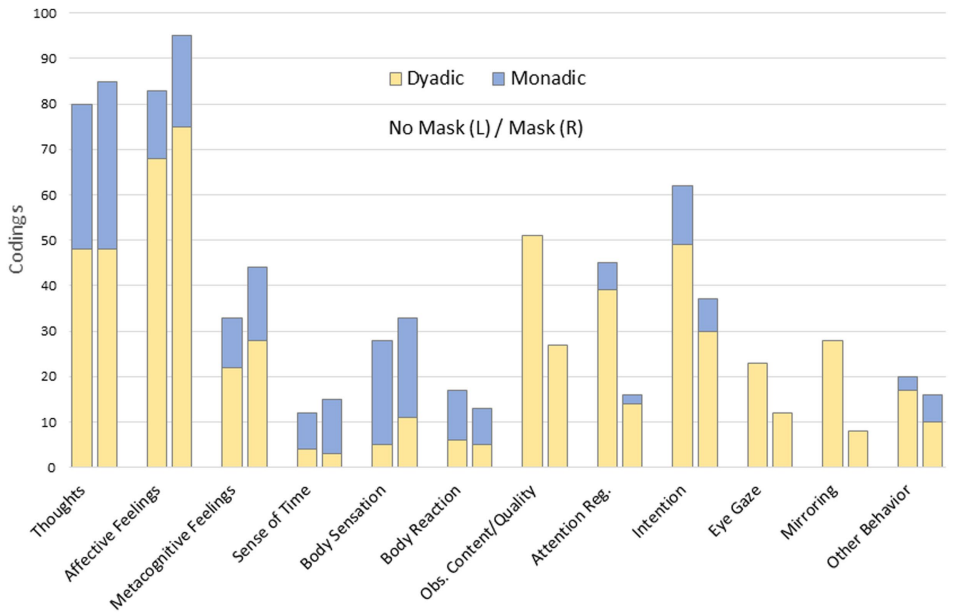


FIGURE 1
Code relations between levels 1 and 2.

While the former results serve to identify initial clues in terms of the hypotheses, those for Level 3 aim directly at the detectability of specific mental micro-activities, their dependence on overt bodily behavior, and their susceptibility on the experimental conditions, as will be shown below.

## Protocol length and first-person pronouns

Initially, the quantity of written words and portions of first-person pronouns (I, my, me) per data set were compared for the experimental conditions. There was a significant decrease in protocol length for the interaction task without mask ($M = 176.7$, $SD = 73.7$) compared to interaction with mask ($M = 136.6$, $SD = 65.9$), $t(33) = 4.5$, $p < 0.001$, $d = 0.75$. Comparison of first-person pronouns yielded no significant difference between the conditions, $t(33) = 0.51$, $p = 0.612$, despite without mask ($M = 9.2\%$, $SD = 0.038$) the percentage was slightly higher than with mask ($M = 8.9\%$, $SD = 0.044$).

## Dyadic and monadic forms of experience

Building on qualitative analysis, at Level 1 the portions of dyadic/monadic codings normalized per data set were compared for the experimental conditions (Figure 3). A one-tailed t-test seems to strengthen our second hypothesis that dyadic experience is stronger without mask ($M_{Dyadic} = 74.8\%$, $M_{Monadic} = 25.2\%$, $SD = 0.193$) than with mask ($M_{Dyadic} = 69.2\%$, $M_{Monadic} = 30.8\%$, $SD = 0.182$), $t(33) = 2.05$, $p = 0.048$, $d = 0.30$. In absolute terms, only the number of dyadic codings per data set decreased from $M_{No\ Mask} = 9.1$ to $M_{Mask} = 6.7$, while the number of monadic codings remained almost constant across the conditions, $M_{No\ Mask} = 3.32$, $M_{Mask} = 3.24$ (Figure 3B). However, to disentangle this from the mentioned reduction in protocol length, we restrict the test to a consideration of the portions. A second quantitative result for Level 1 concerns the frequency of changes between dyadic and monadic passages in the data sets yielding $M_{No\ Mask} = 3.32$ and $M_{Mask} = 3.21$, the difference of which was not significant, $p = 0.409$. The fact that these values are quite close to those for monadic coding may be coincidental, since monadic/dyadic passages partly contain more than one appropriately coded segment.

## Multiple aspects of first-person experience

For statistical analyses at Level 2, as said, coding quantities were binarized per data set and investigated regarding the number of coded categories per data set and, conversely, the portions of data sets containing certain codes. Firstly, the number of coded categories per data set decreased significantly from interaction without mask ($M = 7.0$, $SD = 2.2$) to interaction with mask ($M = 5.9$, $SD = 1.8$), $t(33) = 3.68$, $p < 0.001$, $d = 0.64$, indicating that self-reports under mask condition were not only shorter but also less differentiated in terms of Level 2 categories. Secondly, with a chi-square test, significant differences in code frequencies across the conditions were found for Attention Regulation, $\chi^2$ (1, $N = 68$) $= 7.2$, $p = 0.007$, $w = 0.32$, and Mirroring, $\chi^2$ (1, $N = 68$) $= 12.6$, $p < 0.001$, $w = 0.43$, while all other differences were

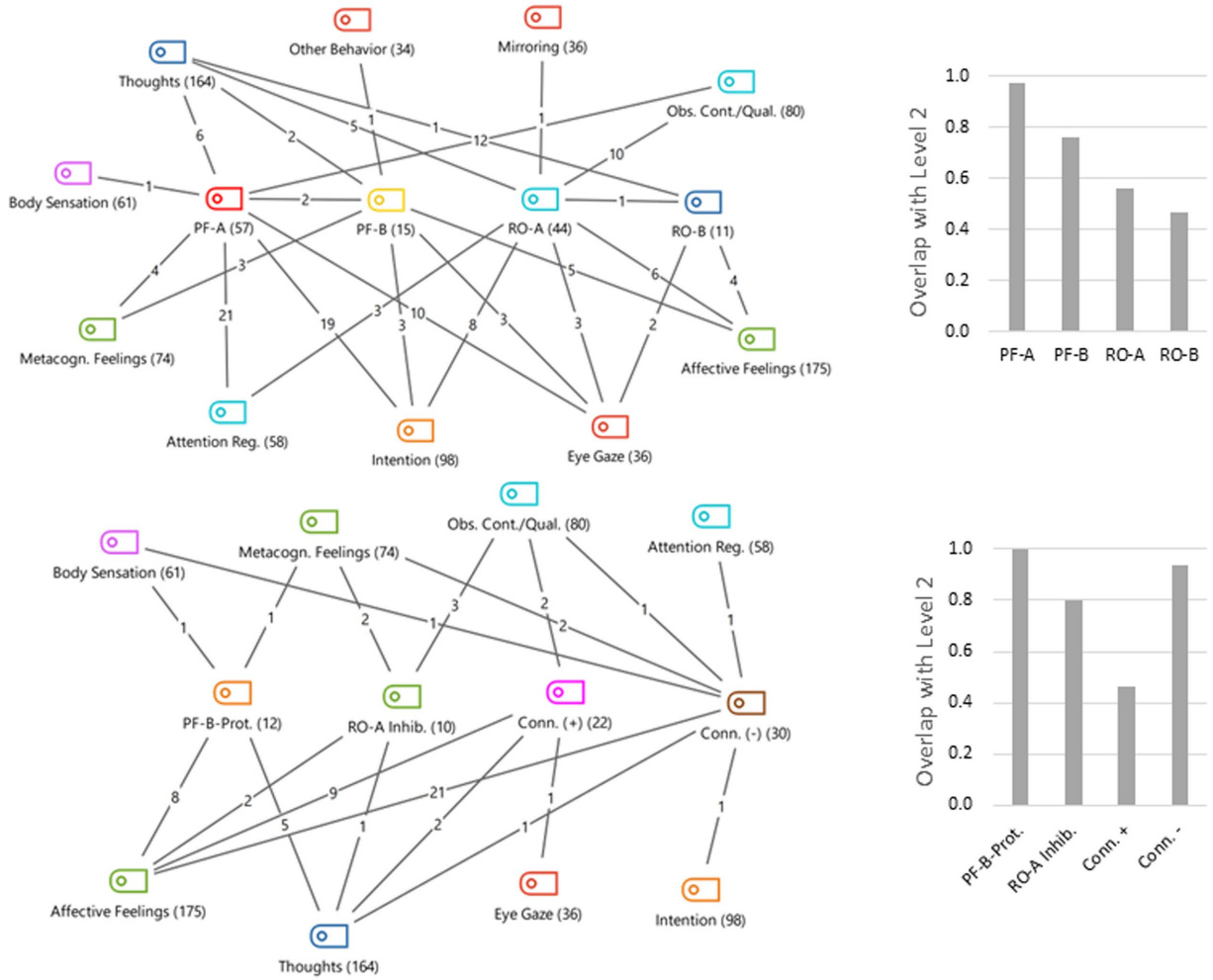


FIGURE 2
Code relations between levels 2 and 3. Level 3 categories are placed in the middle of the code maps, surrounded by level 2 categories that overlap with them. The total frequencies are in brackets, the overlaps are on the lines. From interlevel relations, only those for level 3 are shown. The diagrams show the portion of overlap between level 2 and level 3 categories.

not significant (see Figure 4). This reduction in certain categories can be understood as a concretization of less differentiated self-reports under the mask condition.

## Mental micro-activities

For Level 3, we first provide some examples of coded data for phenomenological illustration (in addition to Table 2), as this is conceptually central to the study. At the same time, the above-mentioned double codings that occurred here for PF-A/B and RO-A/B shall be elucidated. While without mask, the segment of "Both participants kept trying to focus their gaze noticeably" (P 06) was coded under PF-A/B, with mask it was rather a metaphorical expression: "It's like a picture again … as if we are looking over the garden fence, secretly watching each other" (P 08). For RO-A/B, the segment of "The person in front of me and myself was 'open'" (P 31, without mask) immediately illustrates the contrast to the complementary gesture.

Turning to the quantitative results at Level 3, the number of coded categories per data set did not change significantly ($M_{No\ Mask} = 2.1$, $M_{Mask} = 1.9$, $p = 0.36$), which could also be because two additional (negative) aspects occurred under mask condition that were not relevant for the other condition (RO-A Inhibition, PF-B Protection, Figure 5B). Remarkably, in view of both hypotheses, most variables decreased significantly from interaction without mask to interaction with mask, even after correction for multiple testing (see Table 3), which will be discussed below as a crucial point. To test the dependence of micro-activities on overt body behavior, automated text analysis at Level 3 yielded 80 segments (out of 47 data sets) with unambiguous body reference, 23 (out of 19 data sets) containing "gaze," and 98 (out of 38 data sets) without explicit body reference, the distribution of which across the categories is shown in Figure 6. Examples of the coded data subdivided into these three aspects are shown in Table 4. To

characterize the individual distributions, we calculated for each category a *body reference index* (BRI) by weighting segments with body reference by 1, those with gaze reference by 0.5, and all without explicit body or gaze reference by 0 and averaging them accordingly (Figure 6; Table 5). The difference between PF-A and RO-A (independent of conditions) proved highly significant with large effect size in a Chi-square test between BRI = 1 and BRI = 0, $\chi^2$ (1, $N$ = 89) = 33.5, $p < 0.001$, $w = 0.61$, indicating that PF-A is strongly associated with body reference, while RO-A is not. While the mean values suggest a slight predominance of lacking body reference in both conditions, it must be considered that they are derived from the numbers of the coded segments. To balance this with a participants-based measure, BRI was also calculated for each data set, averaged over Level 3 categories. In this way, we obtained a metrical variable that could also be examined across the experimental conditions. For this purpose, however, only data sets from 28 participants with segments coded at Level 3 *in both conditions* could be used for a dependent-samples t-test. The mean values resulting from this procedure show, in contrast to the above consideration, a slight predominance of body reference, $M_{No\ Mask} = 0.60$ and $SD_{No\ Mask} = 0.32$, $M_{Mask} = 0.55$ and $SD_{Mask} = 0.34$, whose slight decrease over the conditions was not significant, $t(27) = 0.85$, $p = 0.401$. The relatively high standard deviations indicate a high interindividual variability of BRI.

In view of our hypotheses, we further narrowed the analysis on Level 3 to the four micro-activities (PF-A/B, RO-A/B), accumulated them as a subcategory, and investigated its overlaps with the three levels of BRI as well as with the Level 2-category of *intention*. Remarkably, every test yielded significant differences across the conditions (even after correction for multiple testing) with medium effect sizes, with the largest results for overlap with intention and with BRI = 0 (see Table 6).

Last but not least, against the background of replicability (Hypothesis 1), frequencies of the four mental micro-activities were compared between the current study and prior work. In Wagemann and Weger's (2021) study, participants were instructed to move around for 5 min in a group of 22, nonverbally form dyadic pairs, and interact nonverbally for a short period of time before separating again and moving on to further encounters. In a between-subjects design, one group was forbidden to engage in physical contact such as hugging or hand shaking while the other group did the task without these restrictions. Frequencies averaged across conditions from both studies are shown in Figure 7. Except for PF-B, similar patterns sloping from PF-A to OR-B emerge, all differences were not significant, $p > 0.130$.

# Discussion

## Summary and evaluation of results

First, we summarize the results and draw initial conclusions for the hypotheses before discussing this in broader psychological and philosophical contexts. The purely quantitative results already contain some clues whose traces can be followed through the various levels of further analysis. Regarding the variation of protocol length across the conditions, we must of course be cautious in that it could be a fatigue effect due to the sequence and that perhaps, in the second condition, participants focused on noting differences from the first condition rather than re-describing repetitive experiences. Conversely, however, the order of conditions could have led them to write more in the mask condition through practice and sensitization in the first phase (Greenwald, 1976; Charness et al., 2012). Considering this

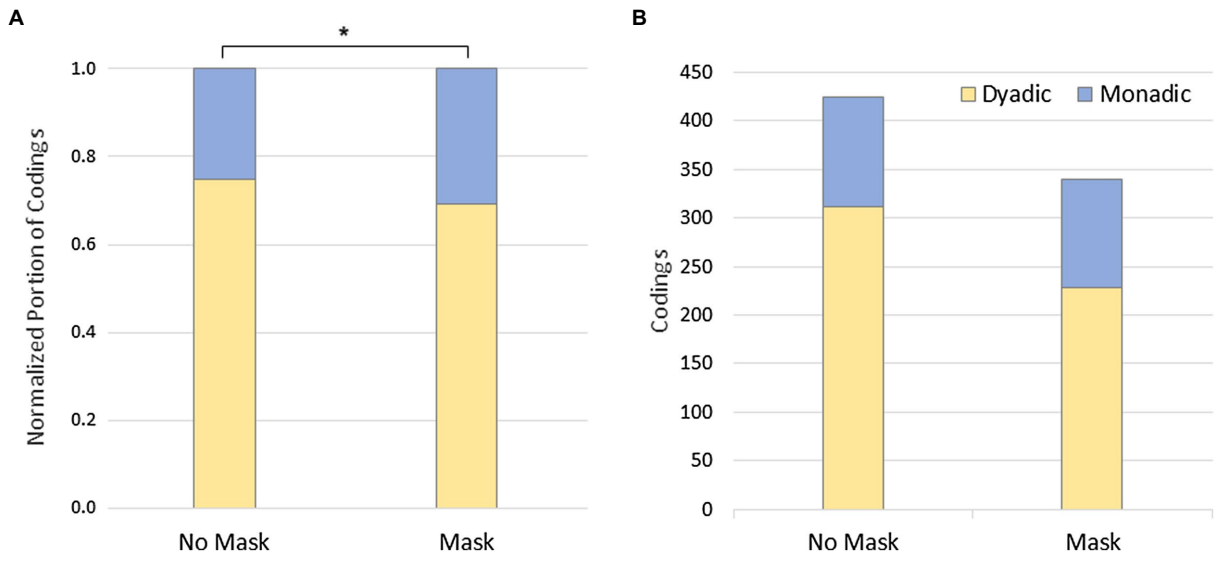


FIGURE 3
Level 1: Dyadic/monadic experience. **(A)** Relative rating, *$p$ = 0.048; **(B)** absolute rating.

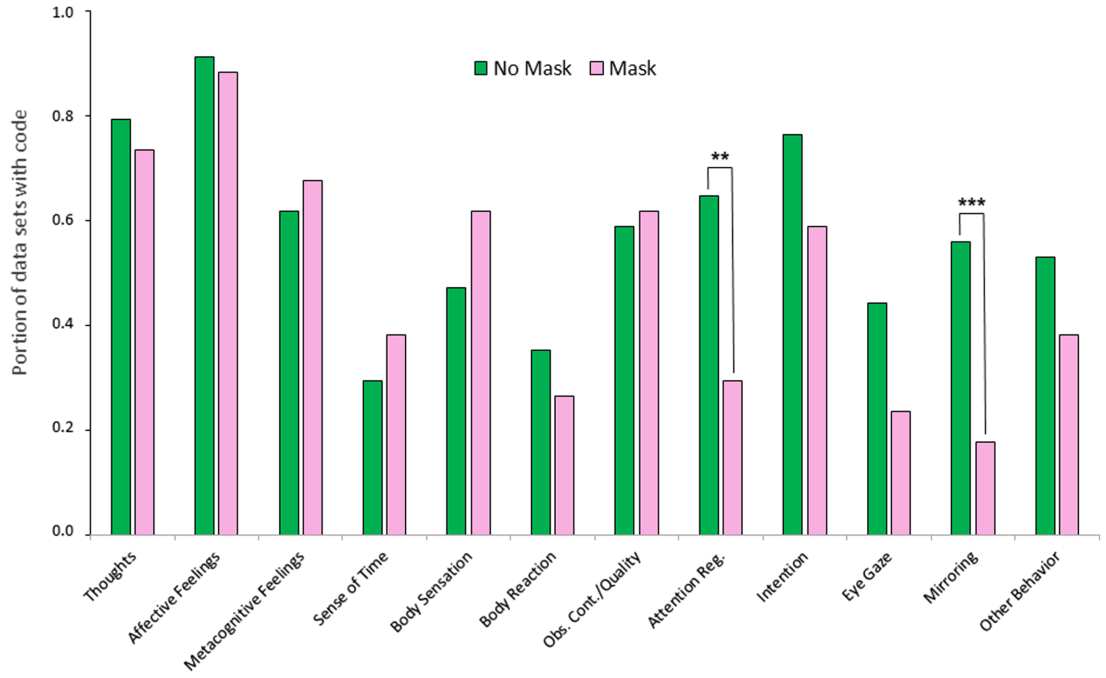


FIGURE 4
Level 2: Multiple aspects of first-person experience. $^{**}p = 0.007$, $^{***}p < 0.001$, all others not significant, $p > 0.072$.

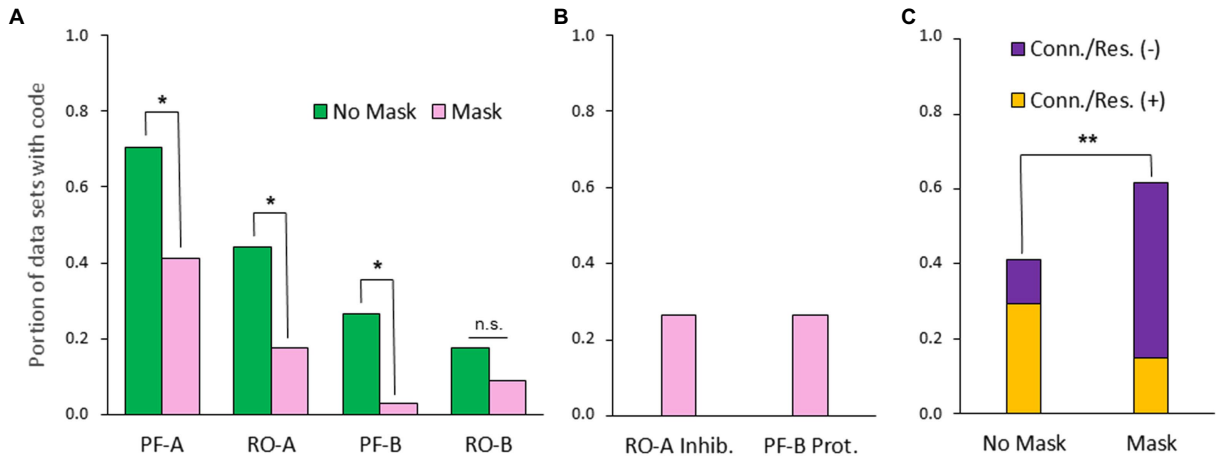


FIGURE 5
Level 3: Micro-activities. **(A)** The four micro-activities (PF: Proactive-focused, RO: Receptive-opening), reordered by size, $^{*}p<0.019$, n.s., not significant, $p>0.39$. **(B)** Negative aspects related to micro-activities (inhibition, protection, only mask cond.); **(C)** Connection/Resonance (+/–), $^{**}p=0.0082$.

ambivalence, one should neither overestimate nor ignore the significantly longer protocols without mask, also because we found such differences in a between-subjects design on another first-person topic which could be well explained theoretically (Wagemann, 2022b). So, apart from carry-over effects, a possible explanation would be that there was less to observe and describe under the mask condition than without mask, which seems to be supported to a slight extent by the reported variation of first-person pronouns. In any case, the fact of the overall high occurrence of first-person pronouns, as confirmed by other work (Chung and Pennebaker, 2007; Seih et al., 2011), suggests that the participants followed the instructions correctly and reported from the first-person perspective. Apart from this, as a first qualitatively grounded aspect, the finding of significantly more differentiated descriptions at Level 2 without mask supports the explanation of an impoverished experiential field under mask condition.

TABLE 3 Level 3: Differences across conditions for portions of data sets with code (binarized).

| | PF-A | RO-A | PF-B | RO-B | RO-A Inh. | PF-B Prot. | Conn./Res. (+) | Conn./Res. (−) |
|---|---|---|---|---|---|---|---|---|
| No mask | 0.706 | 0.441 | 0.265 | 0.176 | 0 | 0 | 0.294 | 0.147 |
| Mask | 0.412 | 0.176 | 0.029 | 0.088 | 0.265 | 0.265 | 0.118 | 0.471 |
| *p* | 0.015 | 0.018 | 0.007 | 0.396 | 0.001 | 0.001 | 0.008 | |
| Test statistic | $\chi^2(1, N = 68) = 6.0$ | $\chi^2(1, N = 68) = 5.6$ | Exact test (Boschloo) | Exact test (Boschloo) | Exact test (Boschloo) | Exact test (Boschloo) | Exact test (Boschloo) | |
| *w* | 0.3 | 0.29 | 0.33 | 0.13 | 0.39 | 0.39 | 0.48 | |
| Adj. *p* | 0.036 | 0.037 | 0.033 | 0.396 | 0.005 | 0.005 | 0.033 | |

An exact text according to Boschloo (1970) was used when absolute frequencies occurred below five. The last row shows adjusted *p* values according to Hochberg (1988). Significant results are highlighted.

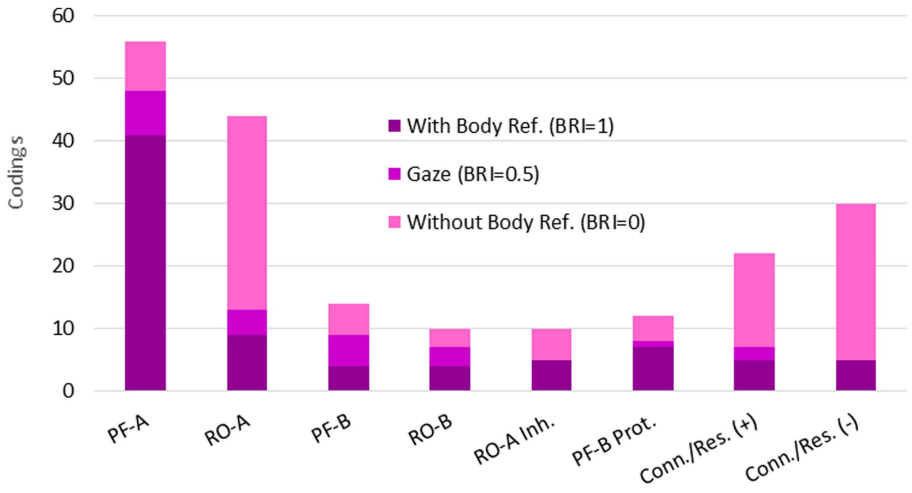


FIGURE 6
Level 3: Body reference in mental micro-activities.

As a further concretization of this tendency, the significant shift of the portions of dyadic and monadic experience can be mentioned, which is based on a reduction of dyadic experience while monadic experience remained almost unchanged. Together with the finding of a nearly constant alternation between the two forms of experience in the protocols, this suggests that the dynamic has shifted toward the monadic pole. If we pursue this issue further at the second coding level, we find that the two significantly decreasing categories are almost exclusively (Attention Regulation) or exclusively (Mirroring) dyadic in origin. In fact, these categories represent two core aspects of dyadic experience, as Attention Regulation refers to Person A's mental capacity to control various forms of attention in the encounter, while Mirroring reflects the embodied resonance of this capacity in the dyadic interaction involving both persons. Similarly, as the rather general effect on Level 1 could be concretized at Level 2, these two sides of dyadic experience – more and less embodied – can be fleshed out even more clearly on Level 3.

Investigation on Level 3, differentiated as on level 2, but focused on mental micro-activities, leads to seven significantly changing categories out of a total of eight (if the categories occurring only under mask condition are counted). Thus, it is probably not too much to claim that the core effect emerges here, which is already implied at the other levels of analysis. However, while code relations analysis between Levels 2 and 3 revealed partial overlap of Attention Regulation with self-centered Level 3 categories (PF-A, RO-A), Mirroring almost did not coincide at all with these forms of mental activity and experience (Figure 2). This could be interpreted as distinguishing embodied dimensions of dyadic interaction and experience (e.g., Mirroring) from more subtle forms of inner behavior and expression that are, at least to some degree, independent of the former. According to the results for the body reference index (BRI) on Level 3, the idea of graded forms of embodied experience is concretized for mental micro-activities which, in this regard, does not seem to change their composition across the experimental conditions. Overall,

TABLE 4 Level 3: Varying dependence on body reference (exemplary codings).

| | With explicit body ref. (BRI = 1) | Gaze (BRI = 0.5) | Without explicit body ref. (BRI = 0) |
|---|---|---|---|
| PF-A | I start to look more closely at the person's face covering. (02/with) | … so that I had the eyes in focus as if in tunnel vision (05/without) | I wanted to be closer to you again and I formulated my feelings and sensations that came up at that moment to you. (28/with) |
| RO-A | … look into her eyes, be open to her (be with her) (23/without) | My partner returned my gaze, but she felt very uncomfortable under observation. (13/without) | I open up to the person and feel strongly involved and responsible. (17/without) |
| PF-B | She switched back and forth between my two eyes the whole time. (10/without) | I also wanted to avert my gaze for a second, because it had become very exhausting to hold the gaze toward the end. (26/without) | I feel naked, exposed (08/without) |
| RO-B | … I had the feeling she opens her eyes to me and with that also the inside, so that I can look into her soul and she has nothing to hide from me. (10/without) | She also noticed that in my eyes, she also got a "tunnel vision" and she noticed that my thoughts are completely with me… (32/with) | … the feeling of being perceived (29/without) |
| RO-A Inhib. | The experience of being able to look through the eyes into the depths of the partner was lost. (22/with) | – | I do not experience you. (14/with) |
| PF-B Prot. | The mask was like a "protective shield" (27/with) | With mask I felt more comfortable and confident in the encounter, eye contact was immediately easier. (13/with) | I did not feel watched and much more relaxed. (10/with) |
| Conn./Res (+) | We both realized that this task is very personal right now and the eye contact is very profound. (32/without) | The look represents a connection, almost a dependence. (17/without) | I felt a connection between us. (18/with) |
| Conn./Res. (−) | The emotional distance was greater than in the first trial, despite the strong eye contact. (07/with) | – | Didn't feel any connection between us. (20/with) |

Information about participant and condition is indicated in brackets.

TABLE 5 Level 3: Body reference index across categories and conditions.

| | PF-A | RO-A | PF-B | RO-B | RO-A Inh. | PF-B Prot. | Conn./Res. (+) | Conn./Res. (−) | *Mean* |
|---|---|---|---|---|---|---|---|---|---|
| No mask | 0.800 | 0.264 | 0.462 | 0.500 | – | – | 0.235 | 0.286 | 0.422 |
| Mask | 0.786 | 0.188 | 0.500 | 0.667 | 0.500 | 0.625 | 0.400 | 0.130 | 0.451 |

TABLE 6 Overlap of accumulated micro-activities (Level 3) with body reference index (BRI) and intention (Level 2) across conditions.

| | Four micro-activities (PF-A/B, RO-A/B) | | | |
|---|---|---|---|---|
| | BRI = 0 | BRI = 0.5 | BRI = 1 | Intention (Level 2) |
| No mask | 0.471 | 0.353 | 0.676 | 0.441 |
| Mask | 0.176 | 0.147 | 0.412 | 0.147 |
| $p$ | 0.01 | 0.05 | 0.028 | 0.008 |
| $\chi^2(1, N = 68)$ | 6.7 | 3.8 | 4.8 | 7.1 |
| $w$ | 0.31 | 0.24 | 0.27 | 0.32 |
| Adj. $p$ | 0.029 | 0.05 | 0.05 | – |

The last row shows adjusted $p$ values according to Hochberg (1988). Significant results are highlighted.

in retrospect, we believe that the various interlocking dimensions of our methodological approach are justified by the rich and nuanced results.

In view of the hypotheses stated above, we can draw the following conclusions. First, the occurrence of mental activity differentiated in the mentioned two or four forms, respectively, is accounted for by the reliable coding at Level 3, which thus replicates the basic finding of Wagemann and Weger (2021). That these micro-activities are likely to play an important explanatory role in social interaction is further suggested by their significant susceptibility across the experimental conditions (without mask/with mask). Regarding the relationship of PF-A/B and RO-A/B to overt and covert behavior, the presumed ambivalence could be supported by an approximately equal distribution of body-related and inner-mental expressions, which seems to

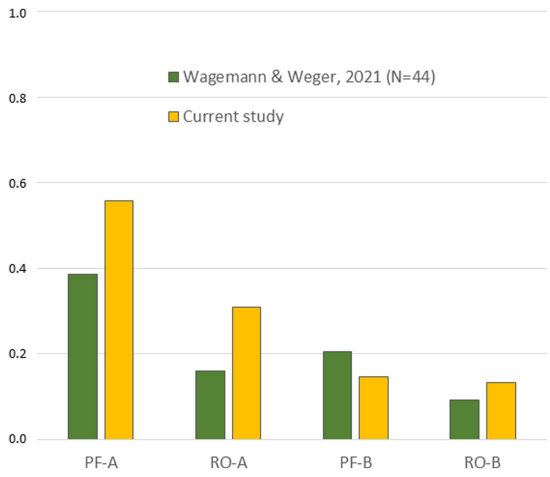


FIGURE 7
Comparison of mental micro-activities between studies. Frequencies were averaged over experimental conditions for both studies. All differences were not significant, $p>0.12$.

be unchanged across conditions. While in the former case (BRI = 1) participants' experience can be characterized as "strongly embodied," in the latter (BRI = 0) we suggest speaking of "weakly embodied" experience, indicating a certain independence of mental activities from overt or bodily behavior, which should not imply here any final ontological view on the body–mind problem (see Menary, 2015). The second hypothesis about decreasing frequencies of the four micro-activities was confirmed and additionally strengthened by the unexpected occurrence of deficit-related statements (PF-A Protection, RO-A Inhibition) and by the significant decrease in holistic relationship quality (Connection/Resonance +/−).

## Theoretical implications

While the empirical hypotheses are substantiated by the results, the theoretical and philosophical implications remain to be developed. Here, we go beyond hypothesis testing and introduce the integrative concept of an I-Thou sense, as indicated in the title of this study, whose applicability to the empirical results only became apparent during data analysis. To realize this key aspect justified in the methodological scope of our mixed-method approach, as indicated in the introduction, direct social perception (DSP) shall be focused upon here based on some preparatory considerations. Firstly, the notion of shared attention will be extended to clarify the structural role of two "quasi-" reference objects in nonverbal social interaction, one bodily and one mental. Secondly, as DSP accounts are challenged to explain in what sense social perception might be direct, the definitional criteria of a *sense* will be examined in order to determine to what extent they could justify a quasi-sensory tool (e.g., I-Thou sense) that goes beyond the commonly known modalities. Then, on this basis, some similarities and differences between our account and DSP are discussed and finally connected with the aspect of face masks.

### Reference "objects" in shared dyadic attention

For the first step, we start by distinguishing *shared attention* from *joint attention*, both of which are often used synonymously. Joint attention refers to situations where one individual (A) follows the gaze of another (B) directed toward a reference object, with B unaware of A's attentional state. Shared attention, in contrast, also includes mutual gazing between the individuals, transforming the situation into a symmetrical one (Emery, 2000; Stephenson et al., 2021). Hence, our experimental setting could be understood in some sense as promoting an unambiguous case of shared attention, although the common reference object is questionable due to the lack of additional task content. Here, we must distinguish between the two basic forms of mental micro-activity. When person A exerts proactive-focused activity directed toward the other, the shared reference object seems to be located in person B's physical appearance, as is evident from the high body reference index of PF-A (Table 5) and from PF-B Protection under mask condition. In contrast, when A exerts receptive-opening activity, it is not the mere physical appearance of B, but B's expression through it in the form of mental activity that stands out, so to speak, as a shared reference object – or "subject-object." While this is empirically supported by the significant decrease in BRI from PF-A to RO-A, the data coded under RO-A Inhibition (mask condition) show that this activity is not completely independent of body reference. Thus, transferring shared attention from its generic triadic context (two subjects, one object) to a "purely" dyadic setting (two subjects without additional object), it is necessary to distinguish two different types of "quasi-" reference objects, a physical-bodily one and a mental one, which are experienced differently (strongly vs. weakly embodied). Moreover, it must be considered that both types of reference objects are not independent of interactants but are related to them and also expose complementary connections to proactive-focused and receptive-opening activity. In particular, the aspect of activity-related reference *objects*, which, from their origination, are also *subjects* ("subject-object"), suggests the need to broaden this modified notion of shared attention into what Michael Tomasello calls *shared intentionality* (Tomasello et al., 2005). Since shared intentionality is understood as goal-directed collaborative behavior, the overarching goal of participants can be seen in the joint performance of the task, while process-related goals can be seen in the coordination of specific forms of mental activity. That intentions and goal hierarchies are indeed relevant here in the context of mental activities is concretized empirically by the significant decrease in overlapping portions between conditions (Table 6). Philosophically, this can be linked to the mental action debate, in which conscious intentions behind mental activities are discussed as criterion for mental action (O'Shaughnessy, 2000; Proust, 2001; Peacocke, 2007), but we cannot pursue this here for reasons of space.

## Aspects of a sense of I and Thou: What kind of information?

Next, as DSP accounts focus on non-inferential, "cognitively impenetrable" processes in early stages of sensory processing (Krueger and Overgaard, 2012; Michael and de Bruin, 2015, p. 250), one might ponder whether this attentional or intentional structure is a sense in itself. Of course, regarding the huge amount of empirical and theoretical research on the constitution of a sense modality, we cannot claim that our findings establish the existence of a hitherto unknown sense. Nevertheless, we do think that the evaluation of the self-reports suggests that further research in this direction could be fruitful. Why is this so?

In order to be able to speak of a sense, at least some definitional criteria, which are mostly accepted in this field of research, must be fulfilled: (1) A sense provides access to information about the external environment or our own condition, (2) each sense has its own organ with corresponding receptors and responds to characteristic stimuli, and (3) can be described by specific forms of processing that are usually thought to unfold along neural pathways leading to specific brain areas (American Psychological Association, 2022). Although this is a simplified version of more differentiated definitions of a sense modality (e.g., Matthen, 2015), it is useful as a first step. To begin with the first point, information referring to the dyadic interaction partner is highly differentiated at a physical level, as described in Level 2 categories (4.1 Observation content/quality, 6. Behavior and interaction), but structurally integrated in terms of the two characteristic mental activities on Level 3. Here, only the PF-B and RO-B activity is what person A captures as coming from person B. Whereas Level 2 information might be interpreted in the Theory of Mind as a basis for inferences about multiple mental states of the other or as an occasion for simulating their differentiated emotions or external behaviors, Level 3 information provides just the two mentioned forms of mental activity that are likewise exercised by oneself. In this respect, beyond one's own activity dispositions, there is no content at all that could presumably be inferred or simulated, and instead of deploying *this content* for ascriptions of propositional attitudes to the other, nonverbal interaction is about shaping the dynamics of attentional movement corresponding to it. So, why should not there be a sense modality that refers to the *exertion and experience* of one's own and others' mental activity, analog to active and passive kinesthesis (as, e.g., in interpersonal touch or dancing, Kronsted and Gallagher, 2021) conveying sensations about intentionally moving or being passively moved, except that here it is not about physical but about mental (self-) movement? As our studies on visual and auditory perceptual reversal have shown, the exercise of productive and receptive forms of mental activity plays a crucial role for these conventional modalities too (Wagemann et al., 2018; Wagemann, 2022). Thus, for two subjects interacting nonverbally and without prescribed social or communicative content, this suggests the reconstruction of a sensory modality that precisely relates to the dynamics of proactive and receptive mental movement otherwise employed in object-related perceptual or other cognitive processes.

## Aspects of a sense of I and Thou: Which receptors?

Concerning the second aspect of sense, our above considerations have shown that, while physical sense organs are certainly needed to provide stimuli referring to external expressive behavior (PF-A), their relevance is attenuated when it comes to identifying the expressor or mental agent standing behind and permeating their bodily conveyed utterances (RO-A). Put differently, the bodily sense modalities (e.g., vision, audition) serve as a necessary but not sufficient condition for "perceiving the other self" (Wagemann and Weger, 2021), being periodically suspended and transcended to some degree (as indicated in low values of BRI) to give access to an experience of the other's mental movements. This is not to be misunderstood as the other's mental activity being perceived (e.g., "seen") *in* the bodily expression; rather, the latter becomes transparent to the activity that may be triggering it or proceeding covertly without external expression. This antagonistic relationship between the phenomenal prevalence of bodily expression and mental expressor (see Table 4) suggests that, in this special case, sensory stimuli and receptors could be of the same kind – mental activity – and differ only in their complementary form and the individual in whom they are enacted at a time. Then, stimuli would be the individually exerted forms of mental activity by one person while portions of receptive-opening activity performed by the other would act as receptor. Although this conception of stimulus and receptor may seem quite unusual at first glance, it simply reflects at a mental level the natural equivalence of physical or chemical stimuli and correspondingly adapted physiological receptors in other modalities. While an acceptance of this idea ultimately depends on the status of reality one is willing to grant to mental versus material phenomena, it finds support in a pragmatist-interactionist approach to aesthetic perception, as will be briefly outlined. Instead of locating aesthetic qualities in certain perceptual features of objects (externalist account) or in detachment from perceptual and pragmatic intentions and the achievement of pure intuition (transcendental account), they can be found in *indications of potential interactions* an observer may have with an object (Bickhard, 1993; Xenakis and Arnellos, 2014). In this perspective, aesthetic experience is stimulated by affordances of the environment, i.e., perception-action relationships which do not require prior knowledge to become effective and can (but need not be) perceived by the individual (Gibson, 1979). Importantly, interactive affordances and their responsive realization are not limited to art-centered contexts, but are inherent to everyday life (Dewey, 1980; Shusterman, 2010; Xenakis and Arnellos, 2014). Applied to our situation, it is not the externally (sometimes only subliminally) perceptible expressions that form the "social-aesthetic" experience of the interaction, but the specific affordance character of mental activities and according responses. The other responds to these affordances with reciprocal or complementary forms of their own mental activity, so that both are connected in a "mental behavior loop"

constituting a dynamic relation of stimulus and receptor, which can be also characterized by the resonance metaphor (Shepard, 1983; Gedenryd, 1993).

## Aspects of a sense of I and Thou: Which processes?

Thirdly, regarding the processual aspect of sense, our empirical findings and theoretical considerations suggest that, in contrast to the accompanying neural processes (e.g., the mirror neuron system, see above), the core dynamics can be reconstructed without leaving the first-person perspective. Although there is almost no immediate evidence in the data for an unambiguous sequential order of the forms of activity, such an order seems logical due to their complementarity and is precisely described by Steiner (1964, 1966). For example, let us start with person A scrutinizing person B's physical appearance with interest (PF-A). In this case, B is likely to feel physically looked at, which implies a certain level of receptivity and may in turn be registered as RO-B from A's perspective. After a short time, however, this receptivity changes into proactive-focused activity on B's part, as is supported by studies on endurance of the gaze directed at oneself (e.g., Binetti et al., 2016) and on dialogical turn-taking (see introduction). Then, the initially somewhat latent receptivity on A's side, which at first only refers to registering B's acceptance concerning her own PF-A activity, increases to a role-inverted acceptance of such an activity, now emanating from B. We suggest that it is this change in B's mental activity in particular that stimulates A to perform a complementary change and, although continuing to keep B physically in view, to then perceive B primarily as the mental agent expressing herself through and beyond her physical organization. In other words, while A's attention was at first directed to B's bodily appearance and expressive content (PF-A received by RO-B), these become transparent to A through the complementary role change for the very same mental activities of B (RO-A receiving PF-B). Consequently, nonverbal dyadic attention regulation can be reconstructed as a complementarily entangled oscillation of mental activities with the periodic sequence PF-A → RO-B → PF-B → RO-A, etc., and correspondingly alternating experiential qualities of stronger and weaker embodiment.

## Connection to and extension of direct social perception

The preceding investigation into the sense-status of the I-Thou relation is admittedly exploratory rather than conclusive in nature. Of course, further empirical and theoretical work needs to be done to verify or falsify this hypothetical modality, but we already see some potential here to support direct social perception. What justifies locating this approach in the context of DSP is the inclusion of the two main features that set the DSP thesis apart from cognitivist accounts such as TT and ST. Here, the relational interspace between subject and object (or second subject) from an ecological psychology perspective (Gibson, 1979) and the original, observable activity of the subject (or interaction with the second subject) highlighted by enactivism (Varela et al., 1991) are to be mentioned, both of which had been neglected by cognitivism. Furthermore, besides these key aspects, our approach is non-representational and non-inferential, which is also advocated by most DSP accounts (Gallagher, 2008; Michael and de Bruin, 2015). Nevertheless, the outlined conception of an I-Thou sense deviates in some respect from other DSP approaches, the most crucial of which relates to the aspect of *embodiment* meaning that bodily expressive behavior makes up a constitutive *part of* persons' mental states (see introduction). Although this notion is sometimes held up as a radical maxim (e.g., Chemero, 2009; Lindblom, 2020), more cautious defenders of DSP concede that not all aspects of social cognition are exhausted by either embodied or direct social cognition accounts (Krueger, 2018). This concession leaves room, from our viewpoint, for additional mental aspects and direct intersubjective, mutual observations as, for instance, the I-Thou relation. For the DSP framework, however, this requires an extension by reconsidering the "part of" relation which explains, according to the proponents of DSP, the *constitutive* role of observed embodied expressive behavior for mental phenomena. Because if something is a part of a whole and the whole cannot exist without the part, then the latter is ontologically co-constitutive of the whole (Husserl, 2001). In terms of DSP, this means that, for instance, the sad bodily posture of a person is co-constitutive of the felt (or observed) sadness (the entire emotional state or process). Indeed, we have found much evidence of this co-constitutive interrelation at the second level of analysis (e.g., under the category of Mirroring). As analysis of Level 3 has shown, however, such part-of relations do not exhaust the mental phenomena described in the data. Take, for example, Participant 19 describing a phase of eye-contact in such a way that she is proactively focused by the other person (PF-B, BRI = 0.5), feels exposed or "naked" in a metaphorical sense (PF-B, BRI = 0), and then notices the other's "vulnerability" residing behind the proactive gesture (RO-A, BRI = 0). This encounter is initially co-constituted by the mutual gaze but then goes beyond it in the subject's experiencing the change in the other's mental activity to the receptive form and so coming to view the other as a mental agent on equal footing, independently of expressive bodily behavior and communicative content. This is so because eye contact functions here as a medium for the direct I-Thou encounter and recedes into the background, so to speak, by enabling the direct experience of the other's mentally performative presence. This contrasts with the above-mentioned sad embodied behavior, which is not only a medium of the perceived sadness but at the same time a genuine part of it. But since this does not address the other person as such, but only one of her contingent mental states, we can say that for the former, eye-contact serves as a necessary but not sufficient condition in contrast to a constitutive relation, which justifies the integration of weakly embodied forms of social perception (the I-Thou relation) into an extended framework of DSP.

Besides graded forms of embodiment, this argument already includes another way in which our approach suggests an extension

of DSP in terms of mental content. As pointed out above, the experience of an I-Thou encounter is not a contingent mental content, like emotions. It is rather the performative, "kinaesthetic" experience of mentally moving the other and being moved by them. Therefore, the actual content of the I-Thou sensorial experience, beyond particular mental states, is the attentional movement oscillating between the reference objects of shared attention (or intentionality), bodily appearance and mental activity, which can be conceived as a *dynamic self* (Wagemann, 2020) or *attentional self* (Watzl, 2018). Understood this way, the self as the basic unit of the I-Thou relation is not relegated to a transcendent phenomenal or even non-phenomenal transcendental realm, but rather penetrates externally perceived behavior to the point of mental affordances and can be perceived as such from both sides. Since this quasi-sensory process, in which stimulus and receptor are of a functionally complementary but phenomenally identical nature, is independent of particular mental content, it establishes another, more fundamental or, as proposed, "social-aesthetic" dimension of DSP.

Connecting this suggested extension of DSP with the aspect of unmasked vs. masked interaction may initially cause irritation: although the experimental conditions actually concern embodied perception, the effects of the study occur most strongly (in statistical terms) and in most detail (in phenomenological terms) with respect to mental activity, which relativizes embodiment to some extent. This paradox can be resolved as follows: on the one hand, mental activities decrease significantly across conditions but, on the other hand, their composition of stronger and weaker embodiment does not change. This could be taken to mean that although mask-wearing affects the quantitative occurrence of mental activities in total, it does not affect the basic, quasi-sensory mechanism mediating between more and less embodied activities (PF-A/B vs. RO-A/B). Both aspects taken together constitute the ambivalence of this mechanism in relation to embodiment: Body-related perception is necessary, on the one hand, in order to be able to interact with others at all and to perceive them as embodied persons, and, on the other hand, in order to be able to leave behind their corporeality in favor of their mental agency, which, beyond contingent communicative or pragmatic purposes, is the basic content of social perception. Social distancing through mask-wearing impairs *both aspects* of mental function related to corporeality in more and less embodied directions. While the first, strongly embodied effect of mask-wearing has already been proven for various topics (see introduction), our study reveals the other, less obvious but experientially fundamental effect on the unfolding and awareness of mental activity in interpersonal perception and corresponding interaction quality. The latter, however, seems to have been already touched upon in terms of perceived closeness (Grundmann et al., 2021; Kastendieck et al., 2022) or interpersonal trust (Malik et al., 2021; Marini et al., 2021), but only in the context of the indicated phenomenological limitations regarding the experimental setting and data collection and without the philosophical contextualization provided here.

## Conclusion and outlook

In this study, the impact of mask-wearing on social perception in nonverbal interaction was investigated in a first-person experimental design with two conditions, analyzed at three qualitative and various quantitative levels, and discussed in theoretical and philosophical regard. It is in the mixed-methods integration of these wide-ranging aspects that we see the strength of this research, which is quite close to people's immediate experience, deploys the proven tools of empirical research, and gives a new impetus to the DSP debate by proposing a quasi-sensory modality mediating between different grades of embodiment. The crucial effect of moving from interaction without mask to interaction with mask points to characteristic, complementarily oscillating forms of mental activity that constitute this I-Thou sense and replicate previous work on social interaction (Wagemann and Weger, 2021) and other cognitive processes (Wagemann, 2020, 2022a,b).

Beyond these basic research findings and conceptions, practical implications may also arise from this study, as will be briefly indicated. For example, the structure of dyadic and monadic passages in the data can also be understood as intermittently changing engagement of participants in the sense of I and Thou. This and the varying distribution of reported mental activities across participants could raise questions about personal state or trait dispositions for using this sense. While this would of course have to be investigated in future research, it can be surmised that the I-Thou sense could probably be developed and cultivated just like other sensory modalities in educational, therapeutic, or other social (−aesthetic) contexts, which would require identifying facilitating and detrimental factors beyond the issue of mask-wearing (e.g., similar to a "Sensory Processing Sensitivity," Lionetti et al., 2019). As Helmuth Plessner has pointed out in his "aesthesiology of the senses," the unfolding of the discriminatory capacity of the sense modalities depends on their constant interaction with the cultural realm. To give an example, the sense of hearing develops constantly with the experience and active acquisition of musical compositions. Famously, he calls this developmental process the "spiritualization of the senses" (Plessner, 2003). How exactly this is accomplished with the I-Thou sense is a significant field of prospective research.

Furthermore, we suspect that the findings obtained here for the face mask issue would similarly emerge for other social distancing aspects such as online communication (e.g., Osler, 2020), although this would require a task accounting for the lack of direct eye contact in online settings. Particularly in the developmental context, we consider the I-Thou sense to be an important conception in that social encounters in early infancy are purely dyadic until 9 months of age, before competence in triadic relations to objects and people related to them emerges

(Scaife and Bruner, 1975; Bretherton, 1991). Today, when immediate personal encounters and interactions between people of any age is becoming less and less frequent due to the digitalization of many areas of life and global pandemics, research that elucidates in equal measure the bodily, phenomenally conscious, and mentally active foundations of social encounter, and from which practical consequences can be derived, is vital.

Beyond such potential applications and continuations of this study, further research desiderata arise from its content and methodological limitations. While we have highlighted the blending of different methodological traditions as a strength, it can also be seen as a weakness in that it cannot do justice to the individual aspects in sufficient depth. From an experimental-psychological point of view, the asymmetric experimental design (without mask → with mask) and the relatively small and specific sample (in terms of age, gender, educational background) are the most important aspects that stand in the way of generalizing the findings. From a qualitative perspective, an even deeper phenomenological or hermeneutic analysis of the data would certainly be desirable, which could only be achieved here initially with a focus on mental activities. And philosophically, only the most important aspects could be addressed here – these would require further discussion within the context of related debates (especially DSP and mental action, but also cognitive phenomenology and mind–body). In these three directions, thematic and methodological focal points for further research can be added, which, however, would have no starting point without this integrative study. In this sense, we look forward to an expansion and intensified dialog in the field of transdisciplinary social cognition research.

## Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

## Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

## Author contributions

JW: study design and implementation, qualitative and quantitative analyses, and structure and main body of the article. CT: qualitative analysis, theoretical and philosophical aspects, methodological discussion, and article revision. JR: qualitative analysis, literature review, methodological discussion, and article revision. All authors contributed to the article and approved the submitted version.

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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# Understanding incomprehensibility: Misgivings and potentials of the phenomenological psychopathology of schizophrenia

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## 1. Introduction

Incomprehensibility is canonically regarded a key characteristic of schizophrenia. Bizarre delusions, in particular, contribute to its clinical picture and have been considered essential for diagnosing schizophrenia. Accordingly, the DSM-IV-TR speaks of bizarre delusions "if they are clearly implausible and not understandable and do not derive from ordinary life experiences" (American Psychiatric Association, 2007, p. 299). The ICD-10, on the other hand, complements that bizarre delusions are "culturally inappropriate and completely impossible" (World Health Organization, 1992, p. 87). In light of this, schizophrenia makes for the paradigm case of a *psychopathological shift in consciousness*, which has been described in terms of "*a transformation in our total awareness of reality*" (Jaspers, 1997, p. 95) or an "altered framework for experiencing" (Parnas and Henriksen, 2013, p. 320). The enigmatic character of this psychopathological shift consists in its all-encompassing nature, boiling down to its "core Gestalt" of "a fundamentally changed subjectivity that may manifest itself across all mental domains: affect, expression, motivation, mood, cognition, willing and action" (Parnas, 2012, p. 68). Since this shift consists in a pronounced instability of the schizophrenic *self* (Henriksen et al., 2021; Burgin et al., 2022), it is subject to debate whether it is best conceived as an *explorable transformation of consciousness* or as its *unfathomable disorganization*. This question has troubled the psychopathological discourse on schizophrenia significantly (Andreasen and Flaum, 1991; Parnas, 2011; Henriksen, 2018), in spite of the widespread recognition of the clinical utility of the notions of incomprehensibility and bizarreness (Cermolacce et al., 2010; Feyaerts et al., 2021).

The conundrum of schizophrenic incomprehensibility consists in whether there is any meaningful sense in which we can *understand this incomprehensibility*. We believe that there is. However, accessing the phenomenon of schizophrenic incomprehensibility is hindered by several confusions surrounding the psychopathological discourse.

In order to arrive at an unclouded judgement, the confusion surrounding the issue of incomprehensibility must itself be investigated. We propose that this confusion stems from three distinct sources. In the following we elaborate on each of them and advance a scheme for structuring the discourse on schizophrenic incomprehensibility (see Table 1):

TABLE 1 A scheme for structuring the debate on schizophrenic incomprehensibility.

| Theory | Concept | Obscure | Un-understandable | Inexplicable | Psychopathological shift in consciousness |
|---|---|---|---|---|---|
| General psychopathology | Primary phenomenon ("*Urphänomen*") | Yes | Yes | Yes (experience) Preliminary (origin) | Disorganization |
| *Daseinsanalyse* | Mode of being-in-the-world | No | No | Preliminarily | Transformation |
| Phenomenological psychiatry | Ipseity-disturbance model | Yes | No | Preliminarily | Transformation |

The debate on schizophrenic incomprehensibility is troubled by several equivocations. The scheme above proposes a remedy by distinguishing whether incomprehensibility refers to an impossibility to empathize with schizophrenic patients (obscurity, "*Uneinfühlbarkeit*"), an impossibility to understand schizophrenic experiences (un-understandability, "*Unverständlichkeit*") or an impossibility to explain schizophrenia (inexplicability, "*Unerklärbarkeit*"). This framing can be applied to historical and contemporary approaches to schizophrenic incomprehensibility and helps to systematize the discourse on psychopathological shifts in consciousness.

1. *Overreliance on delusional beliefs*. The problem of incomprehensibility is ill-posed, biasing the discourse toward the *delusional beliefs* as is evidenced by their characterization in the ICD and DSM. Consequently, the *origin and the experience of delusions* are overlooked. Since they lie at the root of the psychopathology of schizophrenia, the discourse on the origin and experiential structure of incomprehensibility must be revisited.
2. *False threat of irrationalism*. Acknowledging the clinical reality of schizophrenic incomprehensibility is misevaluated as endangering the scientific status of psychopathology by pushing it toward irrationalism. Such an evaluation ultimately hinders the project of determining the possibilities and limits of psychopathological knowledge, which is essential to establishing it as a strict science: In light of the phenomenological approach, schizophrenic incomprehensibility does not mark the endpoint of our understanding of schizophrenia but is a starting point for developing a *psychopathological agnotology* (i.e., the scientific investigation of the production and experience of incomprehensibility).
3. *Equivocations*. The discourse on incomprehensibility is riddled with equivocations. This means that conflating concepts such as un-understandability, oddity, schizophrenic alterity or the praecox feeling is the norm rather than the exception. In order to distinguish these related concepts, it is helpful to consider their intellectual origins and to systematically classify competing approaches to schizophrenic incomprehensibility. Considering incomprehensibility can aid in enriching the discourse by moving beyond the classical framing in terms of the understanding-explanation dichotomy to the more adequate and encompassing trichotomy of *un-understandability* ("*Unverständlichkeit*"), *obscurity* ("*Uneinfühlbarkeit*") and *inexplicability* ("*Unerklärbarkeit*").

In what follows, we sketch how phenomenology can aid psychopathology in overcoming these idols and, ultimately, arrive at a more encompassing and adequate assessment of schizophrenia. This entails that not only the clinical reality of schizophrenic incomprehensibility must be acknowledged, but—beyond that—investigating its experiential structure (both, of the patient and the clinician) is of the essence.

## 2. Overreliance on delusional beliefs

In order to outline a potential remedy for the bias toward delusional beliefs, we first turn to a historical perspective. Spitzer et al. (1993) notes that the concept of bizarre delusions derives from Kraepelin characterizing schizophrenic delusions as "nonsensical" and from Jaspers deeming them "incomprehensible" (cf. Cermolacce et al., 2010). The latter also originated the *standard view* of schizophrenic delusions, according to which they are conceived of as false beliefs that cannot be corrected and are entertained with subjective certainty (Jaspers, 1913a; Parnas, 2012). This standard view was maintained in the ICD's and DSM's insistence on the impossible contents of delusional beliefs until recently (cf. Heinimaa, 2002). Consider, for instance, the DSM-IV-TR's definition of schizophrenic delusions: "Delusions are erroneous beliefs that usually involve misinterpretation of perceptions or experiences" (American Psychiatric Association, 2007, p. 275–276). Whereas contemporary treatments focus on the incomprehensibility of the delusional *content*, i.e., the falsity, robustness and certainty of the propositional belief, Jaspers, originally, was concerned more with the *origin* and the *experience of delusions* (Jaspers, 1913a,b; cf. Schmitt, 2018).

With regard to this, three different notions of incomprehensibility ought to be differentiated. The first one derives from Jaspers' interpretation of Dilthey (1894) methodological dualism (cf. Henriksen, 2013). Since Jaspers posits a somatic origin of delusions, their scientific investigation ought to treat them as causal-genetic objects of explanation (cause-effect; nexus of causality). Accordingly, incomprehensibility pertaining to the origin of delusions arises because of the *categorical inapplicability of understanding*, which presupposes a meaningful psychological motivation through previous experiences (purpose-consequence; nexus of finality). Thus, a failure to identify the somatic origins of schizophrenia is more aptly described in terms of *inexplicability* ("*Unerklärbarkeit*"), which depends on the progress of the natural sciences and, accordingly, might be merely temporary.

The second and third notion of incomprehensibility both pertain to the status of schizophrenic delusions as primary phenomena ("*Urphänomene*") (cf. Heinze and Kupke, 2006; Kupke, 2008; Thoma, 2013). One the one hand, primary delusions that occur in schizophrenia amount to an immediate, perception-like "awareness of meaning" that "undergoes a radical transformation" (Jaspers, 1997, p. 99). This entails that such primary delusions, in contrast to delusion-like ideas, cannot meaningfully be traced back to 'the content' of preceding mental states and, thus, are 'unmotivated' or exhibit no 'meaningful connections'. Therefore, primary delusions are *un-understandable* in the sense that they *defy the purpose-consequence structure* of the nexus of finality.

On the other hand, primary delusions encompass changes on the level of subjectivity (Owen et al., 2004). Such primary delusions are disorders of self-consciousness and object-consciousness, such as thought broadcasting, thought insertion, delusions of passivity, etc. Since they pertain to the sphere of the conscious experience of reality ("*Wirklichkeitserleben*"), they cannot be reduced to or analogized with other phenomena but unveil a primary stratum of existence. For this very reason, Jaspers holds that primary delusions lie outside the realm of science altogether and must, instead, be investigated philosophically (Kupke, 2008). Hence, incomprehensibility concerning delusional experience arises because primary delusions exceed the scope of scientific investigation and, accordingly, *lie beyond the dichotomy of explanation and understanding*.

Considering this third sense, incomprehensible delusional content (as well as "crazy actions"), in turn, would be conceived of as a manifestation of the underlying primary delusional experience and has only a secondary status. This implies that it would be a mistake to take impossible delusional content as a sufficient criterion for diagnosing schizophrenia. Instead, "we must realize that the content and structure of these experiences are dialectically intertwined, and therefore we must take into account the altered framework of experiencing in schizophrenia" (Parnas and Henriksen, 2013, p. 324).

## 3. False threat of irrationalism

Explicating the changes of the experiential structure in schizophrenia converges with the prime interest of its phenomenological treatment. In the recent discourse, researchers agree that the psychopathological shift in consciousness occurring in schizophrenia can be described as a disturbance on the level of the *minimal self* (Cermolacce et al., 2007; Hur et al., 2014; Nelson et al., 2014), i.e., an abnormal sense of the first-person quality of experience, a loss of "mineness" that can lead to a quasi-solipsistic world-view and a pervasive alienation from the lived-body, i.e. disembodiment (Fuchs, 2020b). This disordered structure underpins changes (a) on the level of the *extended self* (Gallagher, 2003; Phillips, 2003; Parnas and Zandersen, 2018), i.e., a fragmented or delusional narrative self-understanding that becomes explicit in schizophrenic belief contents, and (b) on the level of *extended intersubjectivity* (Stanghellini and Lysaker, 2007; Fuchs, 2010; Frith, 2015; Gallagher and Varga, 2015; Van Duppen, 2017), i.e., difficulties in participating in conversational exchanges, explicit other-understanding *via* theory of mind, and an intense sense of threat coming from the social realm. In sum, the outlook of phenomenological psychopathology can help reorient the discourse on schizophrenia from its surface level features (delusional belief content) back to the underlying changes in the structure of experience.

What can such a phenomenological outlook contribute to understanding incomprehensibility in schizophrenia? First of all, conceiving of schizophrenia as an altered framework for experiencing allows to identify "a developmental continuity from early non-psychotic self-disorders to the fully formed first-rank symptoms" (Parnas and Henriksen, 2013, p. 324). It is important to note that this continuity is neither one of physical causation (nexus of causality), nor one of mental motivation (nexus of finality), but rather an *eidetic continuity* (Parnas and Henriksen, 2013). Hence, the ipseity disturbance model (Nelson et al., 2014; Nordgaard et al., 2023) conceives of schizophrenia in terms of a disorder at the level of the minimal self and attempts to identify experiential structures that are present in the sub-clinical and clinical picture of the disorder. In terms of a phenomenological act-analysis, this means that the disturbance on the level of the minimal self-corresponds to a dialectical process in which perturbations of the intentional structure of experience (e.g., an excessively self-referential act-structure) elicit compensatory symptoms (e.g., hyperreflexivity or excessive introspection) and disturbances of the pre-reflective, passive synthesis of meaning.

Delusional belief contents, then, can be viewed as an attempt to thematize these underlying changes and, hence, exhibit a so-called "delusional logic" ("*Wahnsinnslogik*") (Wulff, 1992). By unearthing these foundational layers to psychopathological shifts in consciousness, phenomenological psychopathology contributes not only to a better understanding of the patient's experience from his or her own perspective, but also offers conceptual and methodological means for the early detection of schizophrenic psychosis (Parnas et al., 2005; Sass et al., 2017), which is sometimes prematurely reserved for neurobiological approaches to psychopathology (Insel, 2010; Heinssen and Insel, 2015). By shedding light on this eidetic continuity, phenomenological psychopathology provides a framework that furthers scientific understanding of incomprehensibility by illuminating its development.

Over the course of the discourse's development, the "theorem of incomprehensibility" (Kupke, 2008)—sometimes also referred to as Jaspers's theorem—has been criticized and ultimately rejected by several competing psychopathological approaches, for instance, systems approach (Bateson et al., 1956) and psychoanalysis (Freud, 1911), but also other, phenomenologically inclined approaches such as anthropological psychiatry (Zutt, 1963) or *Daseinsanalyse* (Binswanger, 1957). The very concept of incomprehensibility has been perceived to push psychopathology toward irrationalism and, correspondingly, acknowledging schizophrenic incomprehensibility has been equated to abandoning the scientific enterprise altogether. Before this backdrop, the concept of incomprehensibility was reduced to that of delusional content and psychopathological interest in the notion has shrunk down to its operational value for diagnosis.

Why, then, did Jaspers and his successors insist on maintaining the concept of incomprehensibility in phenomenological psychopathology?

Firstly, an overemphasis on resolving incomprehensibility runs the danger of misconstruing the clinical picture of schizophrenia. Schizophrenic incomprehensibility lies at the root of nothing less than what Jaspers holds to be "[t]he most profound distinction in psychic life," namely "that between what is meaningful and allows *empathy* and what in its particular way is *ununderstandable*, 'mad' in the literal sense, schizophrenic psychic life" (Jaspers, 1997, p. 577). Accordingly, this pertains to "the basic problem of psychopathology" (Jaspers, 1997, p. 702) that consists in learning to differentiate unified personality developments from disruptive processes that break with life's continuity.

> "[T]he facts are overlooked in an endeavor to see the individual as understandable [. . . ]. [W]e [. . . ] should recognize what is not understandable in all its complex heterogeneity and grasp it methodically according to what its nature may be" (Jaspers, 1997, p. 705).

Therefore, recognizing schizophrenic incomprehensibility must not be confused with giving up on its psychopathological investigation, but rather is an integral part of a strict and sober *clinical description*.

This brings us, secondly, to the potential of establishing a *psychopathological agnotology* that revolves around the concept of incomprehensibility. This means that acknowledging incomprehensibility is no longer viewed as an endpoint of the scientific treatment of schizophrenia, but as marking the starting point of a new field that differentiates forms of incomprehensibility and investigates the mechanisms that underlie and produce it. Not unlike the adventurers of the Age of Discovery, who charted unknown parts of the globe, the so-called *terra incognita*, psychopathological agnotology can provide guidance and direction for studying schizophrenic incomprehensibility, analogously: *mens incognita*. In its strongest form, however, such a psychopathological agnotology goes beyond the mere mapping of what might one day be rendered understandable and homes in on the "positive message of incomprehensibility" (Wulff, 1992, p. 7; cf. Schlegel, 1800; Bauer, 2011).

For the most part, this remains a desideratum for further research. Nevertheless, genetic phenomenology and the analysis of disturbed patterns of passive synthesis in schizophrenia afford promising research perspectives. In this vein, Wulff spells out the delusional logic in terms of "acts of paradoxicalization" (1992, p. 9) that describe how subjective-situational meaning ("*Sinn*") and objective-general meaning ("*Bedeutung*") become decoupled and reconfigured. Similarly, Moskalewicz and Gozé turn to a genetic analysis of "bizarreness of contact" (Moskalewicz and Gozé, 2022, p. 144) as a pre-reflective and ante-predicative atmospheric quality that surrounds the encounter with schizophrenic patients and corresponds to Rümke's (1941) infamous praecox feeling by the clinician (cf. Varga, 2013; Gozé and Naudin, 2017). Relatedly, Fuchs (2020a) advanced a genetic analysis from an enactive perspective that conceives of the experiential change at the beginning of psychosis in terms of a subjectivization of perception that results in a disembodiment and derealization of experience. Instead of capitulating before schizophrenic incomprehensibility, genetic phenomenology provides the theoretical scaffolding for acknowledging and analyzing its experience.

## 4. Equivocations

Considering the phenomenological discussion of the praecox feeling is telling, because it allows to shed light on an equivocation troubling schizophrenia research (see Table 1). The praecox feeling has been described as a feeling of bizarreness and unease when encountering schizophrenic patients and, ultimately, as the impossibility of empathizing with them (Rümke, 1941). Albeit being subject to considerable criticism, both concerning the prospect of its phenomenological rehabilitation (Parnas, 2011) and regarding its empirical and diagnostic validity (Grube, 2006; Gozé et al., 2019), the notion of the praecox feeling has recently been reconsidered in light of interactionist interpretations of direct perception theory of empathy (Haker and Rössler, 2009; Gallagher and Varga, 2015). Within this framework, the praecox feeling is explicated as a lack of interaffective and interbodily resonance, ultimately leading to a breakdown of enactive sense-making and social understanding (Varga, 2013). Hence, the patient's schizophrenic disembodiment is *empathically experienced* by the clinician *through* the praecox feeling (Fuchs, 2020b) or, following Moskalewicz and Gozé (2022), the preceding "bizarreness of contact."

From a historical perspective, the debate concerning the praecox feeling connects to the discourse on *obscurity* ("*Uneinfühlbarkeit*"), viz. the *impossibility to empathize*. In the beginning of the 20th century, a controversy ensued regarding the conceptualization of schizophrenic incomprehensibility within phenomenological psychopathology (Schmitt, 2018), sometimes referred to as the *Jaspers-Binswanger controversy* (Basso, 2016). Essentially, Binswanger (1913; 1914, cf. 1957) opposed Jaspers' theorem of incomprehensibility and conceived of schizophrenia as a specific and deficient, yet understandable mode of being-in-the-world. Binswanger's (1913, 1914) and Jaspers (1913a,b) exchange during 1913–1914 was embedded in ongoing debates in the vicinity of Kraepelin's and Bleuler's schools as well as the broader context of the method dispute that started at the end of the 19th century. A number of psychopathologists influenced by Scheler's notion of sympathy, Bergson's concept of intuition and Heideggers' term of being-with took issue with Jaspers' framing of schizophrenic incomprehensibility *via* the distinction between static and genetic understanding, since it remained indebted to Dilthey's understanding, Lipps's *Einfühlung* and Freud's interpretation (cf. Kupke, 2008; Henriksen, 2013).

Indeed Jaspers' notion of incomprehensibility never properly connected with the phenomenological tradition of empathic other-experience that originated with Scheler's (1913) proposal of unmediated expression-perception, i.e., in the same year as Jaspers' psychopathology was first published. Accordingly, Minkowski (1927) proposed a "diagnosis by penetration," Wyrsch (1946) advanced the notion of "diagnosis by intuition" and Binswanger (1955) argued for a "diagnosis by feeling" (cf. Parnas, 2011; Moskalewicz and Gozé, 2022):

> "The question of whether the psychic life of the mentally ill follows the same laws as that of healthy people is intimately connected to the question of whether and to what extend we can empathize ["einfühlen"] with the psychic life of the mentally ill; with other words: we will approximate a decision

> regarding this question to the degree that we learn to empathize with the psychic life of the mentally ill" (Binswanger, 1914, p. 596).

On the one hand, these concepts aimed at establishing a specific role of empathy in conceiving of schizophrenic incomprehensibility that is distinct from the role of understanding. On the other hand, they challenged Jaspers's theorem of radical incomprehensibility and attributed a broader epistemic scope to the phenomenological analysis of schizophrenia. Taking this into account and connecting it with the argument from (1), the canonical framing of the Jaspers-Binswanger controversy as evolving around the understanding-explanation dichotomy can be recast in terms of a trichotomy of empathy-understanding-explanation. Consequently, this allows to differentiate three senses of schizophrenic incomprehensibility that are routinely conflated, namely obscurity ("*Uneinfühlbarkeit*"), un-understandablility ("*Unverständlichkeit*") and inexplicability ("*Unerklärbarkeit*"; see Table 1). Learning to structure the debate accordingly is helpful for accounting for whether schizophrenic shifts in consciousness are best conceived of as explorable transformations or unfathomable disorganizations.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Publisher's note



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# Thinking action as a performative and participative mental awareness

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This paper seeks to evaluate experiential facets of thinking action using first-person phenomenological methods. We begin our considerations using a simple mathematical proof as a case study—and also employ phenomenological contrasts between different types of thinking. They reveal that thinking actions produce performative insights rather than dispositional or remembered knowledge. This distinction allows us to introduce a new mode of thinking that is different from most known types of thinking, namely pure thinking action. The performative nature of this pure thinking action is participative and receptive with respect to concepts and has the quality of being persistent and coherent during its episode of action. Moreover, it is the often unattended source of thinking everyday life.

KEYWORDS

**thought experiment in philosophy, phenomenology of thinking, mental activity, mental performance, shifts of conscious experience**

## 1. Introduction

Thinking is an inherent part of our daily life. In most cases it just happens to us, meanders along its own paths, and we become aware of it only when helpful flashes of insights or associations appear that carry our thoughts further and feed our reflections. However, in some cases, we need to take care of it in more systematic ways or think something through more deliberately. Yet, once again, what stands out for our consciousness in such a process are the results achieved, not so much the process itself.

Arguably, at the center of all types of conscious thinking there is *reflection*, i.e., thinking *about* given observations as well as thinking about thinking experiences accessible *after* performing thinking actions. Reflection draws on the two sources hinted at above: first on associations, memories, examples etc.; secondly, it draws on what has been done and experienced in thinking actions. Thinking action itself, as it will be discussed in this paper, is no reflection, but an explorative and experiential bringing about of conceptual relations by active thinking performance. However, in everyday thinking consciousness it appears in most cases *after* such actions, making us somehow aware that we *just recently did think* actively.

To be sure, thinking has been studied from many different perspectives. Thinking as an active process, as an action persisting for a certain period of time, however, is not evaluated on a regular basis (exceptions exist, see for example Burge, 1998; Proust, 2001, 2013; Buckareff, 2005; Soteriou, 2005, 2009b, 2013; Peacocke, 2007, 2009; Gibbons, 2009; Korsgaard, 2009).

A preliminary definition of thinking action runs like this: Pure thinking action is a performative action, a focused productive thinking within pure conceptual relations. Purity in this sense means being independent from factors outside active thinking performance

(such as the involuntary or automatic popping up of associations and the like) as well as the conceptual content being independent from words, language in general, mental images etc. As to the content of thinking actions, namely concepts and conceptual relations, more on this subject has been written elsewhere (Ziegler and Weger, 2018, 2019).

Our current study is primarily concerned with thinking actions that are focused on types and conceptual relations (as in the definition of a triangle in the Euclidean plane) rather than with tokens (comprising statements such as: it rains in London, Grosvenor Square; there is cheese in my fridge). Available studies on this kind of thinking are rare (for an exception, see for example, Anderson, 2016, 2018) which is why we see a particular need in this direction. In addition, we work with the hypothesis that pure thinking action is not based on the use of words, sentences, or the like (these may be just there, parallel to it, but without determining its conceptual content)—making it elusive and difficult to observe to begin with. Some authors have already pointed to modes of thinking that are not guided by words (Jorba and Vicente, 2014; Lohmar, 2016). Some among them emphasize the role of concepts in determining the role of words etc. as we do (Pitt, 2011; p. 151; Nes, 2012; p. 103). But by and large, our understanding of pure thinking action as we understand it here remains underrepresented in psychological research. This is unfortunate because this type of thinking is something of a blueprint or birth-place of the other (type II) thinking.

The main issue then that this paper takes up is to show *first* that thinking action exists and, in particular, may be accessed and evaluated by phenomenological methods. *Second*, it turns out to be crucial that we are aware of the fact that thinking action may be contrasted distinctly from other known types of thinking. The latter means that we need to delve deeply into other, more common types of thinking in order to make explicit, by *contrast*, the characteristic features of thinking performances as mental *actions*.

While just thinking we often forget that *we* are doing it and that *we* are performing reflections and the like. Hence, in accordance with the first thesis this paper takes up, namely the possibility of evaluating thinking actions using phenomenological methods, it is important that it does not suffice to just *do*, for example, thought experiments or mathematics, but to *notice* and be *aware* of what kind of structural transitions occur while pursuing these pure thinking actions—in order to note (and avoid) potentially confounding intrusions from other kinds of thinking. Some of these issues are discussed in cognitive phenomenology (Bayne and Montague, 2011a; Breyer and Gutland, 2016b) and within the field of mental action and mental agency (O'Brien and Soteriou, 2009). However, the phenomenology of thinking *action* is rarely taken into account; sometimes it is only referred to in passing (Bayne and Montague, 2011b, p. 14–15), sometimes it is not mentioned at all (Breyer and Gutland, 2016a), sometimes it is explicitly excluded (Chudnoff, 2015, p. 80).

In order to meet this challenge, it is proposed here to tackle the experiential facts of thinking action by using first-person phenomenological methods (for a discussion of the reliability of introspection see Bitbol and Petitmengin, 2013a,b; Gutland, 2018b; Hackert and Weger, 2018; Weger et al., 2018a). Hence, Section 2 presents an example that encompasses—in a first step—important facets and features that need to be experienced individually, shared and integrated into research on the phenomenology of thinking action. This provides us with the experiential basis for many of our later excursions and considerations.

We now give a short overview of the main steps of this paper. With Section 3 on the phenomenological analysis of the said example, we emphasize that this paper is a contribution toward the description of the phenomenology of mental agency concerning thinking actions, and not about theories of mental actions or thinking in general. Hence, relevant experiences in this rather uncommon or under-appreciated field of research are described in relevant details: They make explicit what we mean by accessing thinking action. However, the aim is not just to describe these experiences, but to provide particular type experiences, namely detailed descriptions of experiences that can be shared intersubjectively at the type level and that are comparable with other research in this field. This is something to be learned from Husserlian phenomenology where the objective is not to collect endless descriptions of token experiences, but to identify invariant, essential structures (Gutland, 2018b). The main results of Section 3 are: Thinking action is a goal-oriented thinking performance guided by conceptual entities; it has two main functions: first, the productive capacity to arrange concepts according to their own rules and second, a receptive participative awareness of conceptual relations.

In Section 4 we review some core objections which might be at the forefront of the issues that readers concerned with the phenomenology of thinking action expect to be discussed. Section 5 outlines some characteristic elements of this phenomenological analysis which guided us in our introspective approach. Particularly it exposes what it entails to access thinking action, namely to take into account peripheral layers of thinking, in particular pre-reflective experiences, by extensions of our awareness.

In order to get a deeper and more nuanced view into thinking action, we now contrast this process extensively with other types of thinking, namely knowledge (Section 6), routine thinking (Section 7) and associations and flashes of insight (Section 8). Based on these contrasts, Section 9 presents an explication of our new thinking mode, namely pure thinking action introduced above, and juxtaposes it with Type1/Type2 modes of thinking.

Section 10 tries to answer the question: What exactly is pure thinking action? It draws together our main results by giving first a short summary of important types of thinking discussed in this paper; second, it presents an integrated overview of the most relevant features of our new mode of thinking, taking into account the results of the phenomenological analysis from Section 3 as well as the features gained from the phenomenological contrasts detailed in Sections 6–9. These main features are: Pure thinking action is embedded within all other types or modes of thinking discussed in this paper; it feeds these other types of thinking with conceptual content *after* being performed (which we are normally unaware of); it is explorative by its nature; it is initiated by a goal-setting thinker; it encompasses awareness in a participative and receptive mode; and it is consistent and persistent in its performative contribution.

Building upon the above considerations, we shortly discuss our approach in the light of some other

approaches to thinking in Section 11. Section 12 draws relevant conclusions.

## 2. Experiential approach: an example of thinking action

Considering the main of this paper from Section 1 and phrasing them as a question we ask: can thinking action be accessed and, if so, what are its main features in contrast to other types of thinking? The following mathematical example goes a long way toward answering this question. Some preliminary results are presented in Section 3, taken up, advanced and expanded in Sections 6 to 10.

Why a mathematical example? Our focus is not on mathematics in particular, but on thinking action in general. We contend that, within mathematics, pure thinking actions with respect to pure concepts are simpler and easier to perform (and hence to access and assess) in an exact manner than in any other field, as for example in philosophy (logic, metaphysics). The questions of what is, and what is implied by, the purity of concepts have been explored in detail in other papers (Ziegler and Weger, 2018, 2019).

The example is about the proof that the sum of all angles of a triangle in the Euclidean plane is equal to 180°. This example serves several purposes: Firstly, to consider and then experience the presence of pure thinking action within this geometrical proof (namely to experience a mode of thinking that has been mostly overlooked, as explained in Section 9). Secondly, to realize what this thinking action, namely thinking in pure concepts, consists of, in particular in contrast to just gazing at or acknowledging the presence of specific geometrical figures or delving routinely into proofing the theorem. Thirdly, this example is the basis of the following phenomenological analysis in Section 3 (as well as of some considerations later on) which demonstrates some specific qualities of pure thinking actions. To serve as this basis, the example has to be actively performed by the reader, not just read through or simply acknowledged as such. There needs to be an experience of thinking action in the here and now in contrast to having some thoughts or memories of past experiences *about* thinking actions.

Some effort is needed to carry out the proof in our example, which encompasses several different steps. The example as such is not important, there are other possibilities or variations of it. Our aim is to present a specific cognitive task in which just one flash of insight is not sufficient; a process of interconnected insights is required to achieve an autonomous overall understanding. In this geometrical example, the main interest lies *not* in the various mental pictures or images, representing tokens rather than types, but in the conceptual relations they represent or that hold *between* them. Individual mental images may *point* or *refer* to universal conceptual relations but they do not directly convey conceptual qualities in the first place.

As said above, the following example is about the proof that the sum of the angles of any triangle in the Euclidean plane is equal to a straight angle or 180°, the full angle being 360°. This requires some preliminary insights or premises for geometrical relations in the plane: (1) There are parallel lines. (2) Any line intersecting two parallel lines has equal corresponding angles (Figure 1). (3) Together with the equality of opposite angles in one vertex (Figure 2), we have the equality of alternate angles (Figure 3).

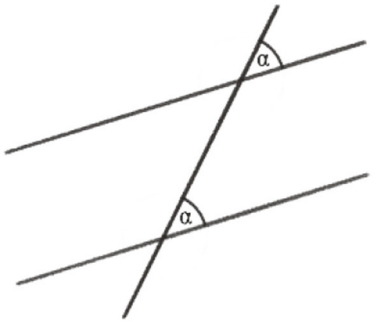


FIGURE 1
Corresponding angles $\alpha$.

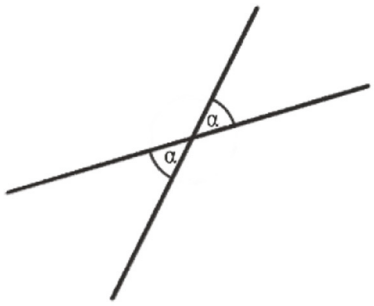


FIGURE 2
Opposite angles $\alpha$.

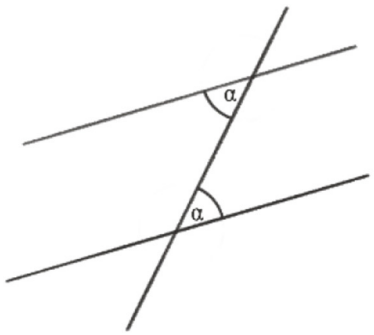


FIGURE 3
Alternate angles $\alpha$.

(4) Given a line $c$ and a point $C$ not lying on it, there is one and only one line $p$ parallel to $c$ through $C$ (Figure 4).

Now take an arbitrary triangle with vertices $A$, $B$, $C$, and angles $\alpha$, $\beta$, $\gamma$ (Figure 5). Draw the line $p$ parallel to $c$ through $C$. The angles adjacent to $\gamma$ on both sides, namely $\alpha'$ and $\beta'$, are alternate angles of $\alpha$ and $\beta$ respectively, hence $\alpha' = \alpha$ and $\beta' = \beta$. They sum up in $C$ together with $\gamma$ to a straight angle:

$$180^\circ = \alpha' + \beta' + \gamma = \alpha + \beta + \gamma.$$

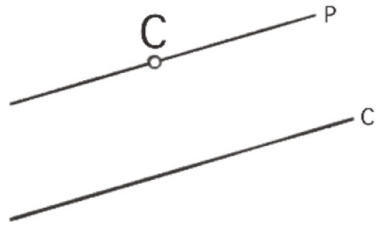


FIGURE 4
Parallel postulate: There exists exactly one line *p* through *C* not lying on *c*.

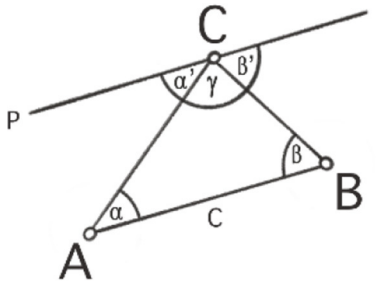


FIGURE 5
Triangle with vertices *A*, *B*, *C*, angles $\alpha$, $\beta$, $\gamma$, alternate angles $\alpha$, $\alpha'$ and $\beta$, $\beta'$ and parallel line *p* to *c* through *C*.

Since we did not use any particular idiosyncratic details of the triangle *ABC* in question (no specific angles or lengths), we can conclude: *The sum of all inner angles in an arbitrary triangle in the Euclidean plane is equal to a straight angle.*

## 3. Phenomenological analysis of our experiences with the example

The following descriptions concerning the example above in Section 2 are not descriptions of experiences of thinking in tokens or examples, but rather of experiences of thinking in types, or more succinctly, in concepts and conceptual relations within thinking actions. They therefore represent generalized, and in this sense artificial, reconstructions that serve primarily to illustrate what the authors of this paper want to share with the reader. These descriptions work toward the comparability and translational quality of our approach with other researchers working on these topics. The main purpose is to direct readers' attention to their own thinking experience since this is the only source available. Hence these descriptions are not intended as main evidence that guarantees the legitimacy of our contentions. Readers find such legitimacy only by using their own experiences as a tool to verify what is proposed in this paper. If readers cannot notice in the first instance what we have found and described here, they might try again and keep in mind that thinking action is not a capacity we can naturally draw and reflect on but something that has to be trained continuously and reactivated each time we want to experience it.

The following observations and reflections are an organized summary of experiences of performative thinking actions gained by both authors. They illustrate what we mean by accessing thinking action as proposed at the beginning of Section 2. We conducted these actions separately; the first author worked out the examples, went through these thinking experiences for a long time and did them more than 50 times (each session takes 5 to 10 min); the second author followed his instructions and further explored the field on his own. We then compiled the results and evaluated them conceptually by reflecting about them and writing them down.

The following part describes in more detail the method we applied. We first merely thought through the example several times and having completed this process, reflected about it afterwards (see Ziegler and Weger, 2018). After several cycles of this process, we were increasingly able to notice thinking experiences during the performance of thinking actions. This includes the extension of awareness focused on the qualities of conceptual content to begin with; and then on the performative experiences guided by the exploration of conceptual relations. Later on, these experiences (that is: the descriptions thereof) were collected and organized by both of us according to the noticed characteristics or qualities of experiencing pure concepts and thinking actions. With these characteristics in mind, thinking actions were performed again and assessed against the former results. That is, we compared the former descriptions with the new ones. Where differences remained beyond confirmations, we adjusted and enhanced our descriptions by gaining new specifications from performing again an experience of thinking action. This was done several times until we reached agreement on the main features of thinking action as outlined below. Our points of reference, or standards, for adjustments and correction were always the direct and noted experience we had from thinking actions, not just from any description of it.

The example from Section 2 can be analyzed on several levels: (1) First, one needs to specify the subject of the investigation, namely, analysis of the proof for the sum of the angles of an arbitrary triangle within the Euclidean plane. This is what one intends to think about. As soon as one is prepared to do this, several things start to happen: memories, mental images, words etc. might pop up, representing triangles, parallel lines, angles, propositions about angles and parallel lines, arguments, proofs etc. which are eventually gathered and collected for the purpose of thinking about them. We might speak here of occurrent (unordered) thoughts or mental images which carry with them beliefs that are based on past experiences.

(2) In this paper however, we want to focus on pure, productive conceptual thinking action. This means, we do not want to search for an insight that depends on what we already know or remember, but on what we can actually perform. This means that all our knowledge and memories are only the starting material for our active conceptual insight, namely for the shift from everyday type of thinking to the type of pure thinking proposed in this paper. If we want to give our thinking the shape of vigorous action we need to explore some surrounding concepts that might lead to the intended result, the main goal, namely the said proof (Buckareff, 2005). Some effort is required to think through the relevant concepts in order to execute a directed, controlled and voluntary thinking action (Proust, 2001, 2010; Soteriou, 2005; Peacocke, 2007). For example, are the concepts we considered necessary or sufficient as a set of

concepts to prove the theorem (e.g., one needs the concept of a right angle only indirectly: a straight angle is equal to the sum of two right angles)? This means, the goal-oriented action needs to be persistent through the entire argument: it has to carry us through, although different concepts are involved; one needs to find transitions from one concept to the other—always keeping the main goal (the proof of the triangle theorem) in mind and staying committed to monitoring the process (Proust, 2010); otherwise one gets lost and does not find the correct argumentative path or is diverted to different, even non-geometrical subjects (Weger et al., 2018b). In other words, this goal-oriented thinking is participative with relation to the conceptual realm. This participation means that pure concepts are an experiential reality if and only if such a thinking action is performed, that is, only during such action.

To come back to the details of our example from Section 2: looking back after completion of the actual thinking process, one may observe that the decisive step in the whole argument is the step to introduce the line $p$ in $C$ parallel to the base line $c$ of the triangle $ABC$ (Figure 5). Having realized the necessity, the existence and the uniqueness of this line, all other pieces can be put together: the conceptual facts that corresponding and alternate angles depend on parallel lines and on the straight angle representing the sum of all three angles can now easily be accessed. From this point on, everything seems necessary, one knows how and why the concepts are connected, there is no arbitrariness. We are now in the position to autonomously arrange the entire argument by ourselves as presented above in Section 2. We can now weed out unnecessary side-lines (such as pondering on the intercept theorems), let go possible variations (for example, triangles on a sphere) and compose the argument so that everything can be woven together. Concentrating on the various conceptual relations involved in this argument, one might see the performance as merely revealing conceptual relations according to their own rules. This unveils a conceptual coherence that belongs to the subject matter rather than to the agency that performs the thinking action.

(3) However, if we extend or shift our awareness into agentive awareness [this term was first introduced by Bayne and Pacherie (2007), see also Proust (2009), and Mylopoulos (2017), for a defense] through active attention steering, a glance at the exact role of the performative action shows that the situation is more complex. In particular, if we look at the process of how we arrive at the final result, the first phases depend strongly on our own action: Particularly, one gathers and sorts out the elements that are needed for the proof of the theorem. This means, our agentive involvement is intense, we own the process as well as the content, we arrange the argument into a logical order such that it might even seem that we were constructing it (in contrast to discovering it). In the end, however, when all things are said and done, when we review the results culminating in the proof, our involvement seems to stop: In contrast with our earlier involvement, we now seem to be owned by the factualness of this small coherent cosmos of conceptual relations. Hence, we seem to have gone from active involvement to a merely receptive mode. This might then be the starting point for a period of post-evaluation.

To be more exact, however, this state of being owned by the factualness of conceptual relations, is only half the truth. In the first phase leading up to the proof, our sense of agency, our *performative persistency*, dominates our experience, but is already oriented toward the logical and geometrical relations relevant for this process: it is *participative* in terms of the conceptual realm. However, as soon as the whole proof stands before our inner eye, the sense of inner activity in arranging conceptual relations diminishes and gives way to a more *receptive state* that realizes the conceptual coherence in which we participate; that is, our inner action has transformed itself from arranging lines of arguments to seeing the whole conceptual arrangement.

Summing up the above, our thinking action appears to have two equally important structural aspects, or better, two non-separable functions: Firstly, a performative *capacity to arrange concepts* and arguments or whole processes from elementary conceptual facts, and secondly, a *participative awareness* while discovering the content of these elements and their overall conceptual structure. Thinking is then experienced both as (mainly) productive in its performative function and (mainly) receptive in its participative discovering function. However, there is no strict divide, temporal or otherwise, to separate the active and the receptive part; both functions involve the two aspects, depending on the viewpoint one takes on the whole action. One may shift in a controlled manner from one to the other and back. It is therefore appropriate to qualify this kind of pure conceptual thinking as an action which brings conceptual relations into experiential existence, and which discovers them by making them appear in our experience: it is constitutive for our having conceptual relations as an experiential reality.

(4) The importance of the receptive part of thinking, namely the self-sufficient consistency and invariance of the pure conceptual content, has been outlined elsewhere (Ziegler and Weger, 2019). In the following, the experiential-phenomenological qualities of the *performative part of thinking action* will be further studied in the form of two phenomenal contrasts (Chudnoff, 2015, Ch. 2; Bayne, 2020, p. 150–152).

For these contrasts one needs to differentiate between *performative insight* and *given knowledge* on the one side (first phenomenal contrast, Section 6) and between *performative action* and *routine thinking* on the other (second phenomenal contrast, Section 7). These are examples of structural differences between separate modes of thinking between which we may shift our awareness.

However, we first present a discussion of some objections against introspective accounts of thinking action (Section 4) and then describe some characteristics of our introspective account (Section 5). Both Sections provide some further important details of our method and may help the reader to work out specific pathways to first-personal experiences, in particular toward the experiences of thinking actions we are discussing here.

## 4. A review of some objections to introspective accounts of thinking action

The first objection against the possibility of introspective accounts of thinking actions that is discussed here is the "impossible

split" objection. Thinking is an action we carry out ourselves; to observe it as a fact may entail an impossible split between the action one is carrying out and the simultaneous observation of this act. However, what is proposed is neither some kind of *observing* something as an object nor a reflection about the experiential content. What is required is to *be aware* of our thinking action *during* this action with an extended awareness that incorporates the fringes or margins of our consciousness. It can be described as an exploration that is *not* like using a torch or searchlight directed to what we want to experience, but experiencing something in a non-objectifying sense: It is a pre-reflective experience which forms the indispensable basis of any *later* reflections *about* it (otherwise, there would be nothing to reflect about—see also Section 5):

> "Rather than switching the light on suddenly to see what the room looks like in the dark, it is rather exploring it in the dark, patiently, by feeling, with precision and delicacy, a little as a blind person would do. It is not a matter of 'looking at' one's experience but of 'tasting' it or 'dwelling in' it. This exploration is encouraged by a particular attentional disposition, which is both open and receptive. Unlike focused attention, which is narrow, concentrated on a particular content, this attention is panoramic, peripheral, open on a vast area. This diffuse attention is however very fine, and sensitive to the most subtle changes." (Petitmengin and Bitpol, 2009, p. 378)

We remark in passing that Husserl (1976, p. 162–165) argues—against our suggestion—that in his perspective of phenomenology such experiences are necessarily objectified. In his chapter on "Mathematical Intuition", Tieszen (1989, p. 86–87) argues along similar lines, although in the different context of the construction or intuition of mathematical objects.

A second concern against the experiential grasp of thinking actions is that this experience might somehow interrupt or immobilize the process of the thinking action. But this is not the case, since we are not exploring something far away, foreign or opaque, but something manifestly present just within thinking action, something we are commonly not aware of in our everyday thinking life. What is required, is a shift in the quality of attending. Again Petitmengin and Bitpol (2009, p. 381) have argued against this concern quite succinctly:

> "Far from disrupting it, freezing it or shrinking it, it seems that an increased consciousness of experience makes it more efficient, more fluid and meaningful, contrary to what indeed happens in the attitude that would consist in trying to consider oneself as an object. Entering into contact with our experience does not divide us into two but gives us back our entirety, our integrity."

One may add that the *post hoc* knowledge about what we experienced during thinking action is reliable, that is, reflects what really happened, since there is no direct evidence to call this into question: We do not experience the transition from thinking action to *post hoc* acknowledgment of it as something corrupting, or substantially altering the content we experienced other than its active vs. passive presence. We are able to assess this and put it in an accessible form that takes up the generalizable features of our subjective agentive involvement, in particular, type experiences rather than several token experiences.

## 5. What are the main characteristics of introspective accounts of thinking action?

The primary aim of introspective accounts of thinking action, then, is to access and encompass these more peripheral layers of experiences that are located on the fringes of our consciousness and accompany focused (narrow) awareness on thinking action. It is certainly the case that these realms might be "concealed by our fascination for the objects of experience" and that they are "also masked by our preconceptions and beliefs" about such kinds of experience (Petitmengin and Bitpol, 2009, p. 384). However, as was pointed out above and is discussed further on, these experiences may be unearthed and integrated into our reflective awareness through a particular attentional practice (see also the discussion of this subject in Anderson, 2018, Ch. 4).

Another way to characterize the capacity of introspective accounts is the notion of *pre-reflectivity*. Reflective actions would not be possible without some kind of pre-reflective experience. Reflective assessment of what we have experienced in a non-reflective mode presupposes that there was an experience that was already inherently pre-reflective: "without this, the ability to re-appropriate past experience after the event would be inexplicable" (Gallagher and Zahavi, 2013, p. 56). This kind of experience implies immediacy in the sense that one is aware of such experiences without first reflecting about them, they are a pre-condition of knowledge: "Experiential episodes have [...] a first-person ontology from the start, i.e., even before the subject acquires the conceptual and linguistic skills to classify them as his own" (Gallagher and Zahavi, 2013, p. 43). This implies further that what "is needed if we want to 'observe' the thinking process is not consciousness *of* what we do when we think, but consciousness *in* what we do when we think." (Anderson, 2018, p. 61) One may add: We need a consciousness of *how* we experience thinking actions while we are performing these actions—prior to any kind of reflection *about* it.

Another important aspect was pointed out by Korsgaard (2009, p. 32) she observed that for the capacity of reflecting, there needs to be a "space of reflective distance" such that we are able to exert a kind of control over what and how we are reflecting: "we must step across that distance" such that we can be "active, self-directing".

## 6. First phenomenal contrast: having knowledge vs. performative insight

Up to this point, we analyzed essential features of thinking action using only the example from Section 2. We now need to go further because thinking action is much richer than what has been extracted from our example so far. We emphasize that thinking action in general and in its details in particular is mostly overlooked because other types of thinking are in the forefront of our consciousness. It may therefore be necessary to look at more

common types of thinking and use them, by way of contrast, to get a clearer idea of the specific features of thinking action.

We argue that to perform and be aware of an instance of thinking action is one thing but to be able to contrast it *in detail* with other kinds of thinking is another. Hence, we take up a methodological tool from cognitive phenomenology and discuss three phenomenal contrasts. The first, within this section, is concerned with having knowledge against performative insight; in essence, it shows that performative insights from thinking actions are the overlooked source of a substantial part of our thinking content (knowledge). The second contrast (Section 7) explores routine thinking relative to focused productive thinking action as described in Section 4. It shows that routine thinking may be overcome by a focused exploration of conceptual relations through thinking actions. Since associations and flashes of insight form an important part of what we usually consider thinking to be, they are dealt with in Section 8 and are put into perspective: they are contrasted with our approach to thinking action. It turns out that they do not belong to thinking action as we understand it here.

To begin with, knowledge can be understood as the result, the outcome that arrives as we finish our thinking process about the sum of the angles of a triangle in the Euclidean plane. In this sense, such results are the source of most of our common knowledge. One may write this knowledge down, express it in some computer programming language, communicate it, remember it, reproduce it, preserve it in whatever fashion one likes.

Performative insight is different: It depends on presence, on our involvement, it cannot be preserved by whatever means. It ends with our performative action.

This difference between performative insight and knowledge may be illustrated by the following phenomenal contrast: In the example from Section 2, knowledge is involved at two points, namely *before* we delve into the proof and *after* we have finished it. First, the proof can only be executed if we know what a proof is about, if we know what lines are, points, parallels, angles etc.; we may even have some prior knowledge about how the proof of the angle sum theorem should look like. Second, after performing the proof, after completing it and looking back at what we have achieved, perhaps planning to write about it or communicate it by other means, we enter into an episode of evaluative control, self-probing and post-evaluation where we have testable knowledge of all relevant details and the series of steps needed for the proof. Since this is the most accurate and up-to-date knowledge we have at hand presently, we take the last situation (completed proof immediately *after* our performative involvement) as one side of the first phenomenal contrast; the other side is the performative action while we actually go through the proof according to the example in Section 2. Table 1 gives details of the main features or structural dimensions of this knowledge vs. the performative insight we produce and are aware of *during* the pure thinking process present in the proof.

TABLE 1 Characteristics of the phenomenal contrast between having knowledge vs. performative insight.

| | Having knowledge | Performative insight within pure conceptual thinking |
|---|---|---|
| (1) | Static, given, fixed | Dynamic, brought about, variable |
| | Instantaneous, non-transformative | Evolvement in time, expanding awareness |
| (2) | Given beliefs, truth and falsehood | Insight, understanding |
| | Propositional | Pre-propositional |
| | Predicative | Pre-predicative |
| | Combination according to formal rules based on beliefs of their truth | Composition according to conceptual contents based on insight/understanding |
| | Belief of truth as a propositional attitude | Experience the reasons why conceptual relations are true |
| | Object oriented awareness | Extended awareness to fringes of consciousness |
| (3) | Product/result of pure thinking action | Performative source of propositional facts |
| | Unknown origin | Source and messenger known |
| | Intentional | Non-intentional |
| | Sense of factualness | Sense of productive agency |
| | Detached | Performative involvement |
| | Sense of ownership | Sense of participation |
| (4) | Self in possession of knowledge | Self as source revealing conceptual relations |
| | Self having knowledge | Self with agentive awareness of conceptual relations |

(1) First, we look at the dynamic or temporal quality of the proof performance (Anderson, 2018, Ch. 7; Bayne and Montague, 2011b, p. 26; Ziegler and Weger, 2019, § 5.4): The performative insight is dynamic in the sense that it evolves, something is brought into experiential existence that was not an experiential fact beforehand (namely the conceptual relations between parallels, angles and the triangle); it takes time to advance an awareness of them. During the thinking process, we realize that we came from some point that is still present at the fringes of our thinking consciousness and that we are finding our way to the next steps by some prospective foresight or anticipation. – In contrast, knowledge is static, fixed; there is, beyond our performative action, no time involved in gaining or having it, nor is there any kind of transformation or evolvement of content: it is just there as it is.

(2) Within a pure dynamic thinking action, the specific relational facts are furthermore not given in the form of propositions about concepts (and predicates) as in our usual knowledge, loaded with truth values according to our beliefs in the form of propositional attitudes; the relational facts have to be formed, or better: discovered or excavated in the first place from pre-predicative and pre-propositional experiential facts, guided by our performative insight or understanding: We experience *why* they are true or not, for what reasons, not just *that* they are. – In contrast, knowledge has the quality of being additive and combinatorial, the concepts, predicates and propositions are arranged according to formal rules, using truth values (coming from our beliefs); on the other side, within performative

insight, the experienced composition evolves according to the unearthed (that is, gradually expanding awareness of) conceptual contents based on insight and understanding.

(3) As to knowledge, we might have a sense of ownership: it is our knowledge, we possess it; however, as we are aware of its intentional structure, we look at it, we are detached from it. – In contrast, performative insight, as opposed to a sense of ownership, comes with a sense of participation: we brought it into experiential existence, we are not detached from it but are rather in some performative engagement with it; we are inherently in it rather than looking in from outside. In those experiences of thinking actions, we are *immediately* aware of the source (experiential facts: conceptual relations) and the messenger (ourselves) of our insight. Unlike our knowledge, nothing just presents itself to us and appears as true or not: in performative pure thinking actions we have to work for these insights. This kind of thinking experience is direct, immediate and thus reveals the non-intentional nature of thinking actions. Levine (2011) claims, for example, that "it's a mistake to view thinking with understanding as a matter of interpreting one's own thoughts." (p. 109). Why is this so? We do not think *about* something but *within*; we are immersed in our thinking action experience, not looking at something from outside: *This* thinking experience *is* performative insight. This makes us further aware that knowledge comes with a sense of factualness, whereas performative insight comes with a sense of productive agency.

(4) Finally, the experiential qualities of the self are very different for knowledge and for performative pure thinking. The awareness of the self in having knowledge is thin indeed: we know that this knowledge is our knowledge in the sense that we are in possession of it. – In contrast, performative insight during active focused pure thinking, that is, thinking action, is intrinsically linked to the awareness that we ourselves are the source of action, the agents of this process, we have agentive awareness (Bayne and Pacherie, 2007): We own it in the sense of bringing it into experiential existence (Horgan, 2007, p. 8, Horgan, 2011, p. 65; Mylopoulos and Shepherd, 2020, p. 174–183). As long as we focus on content, this agentive performance might be only aware at the fringes, or margins of our consciousness but is nevertheless crucial for our sense of engagement. The whole process is in our hands in the sense that we are the agentive source that turns universal conceptual relations into individual or subjective experiential facts: We experience the universal within the individual.

## 7. Second phenomenal contrast: routine thinking vs. focused productive thinking

The second phenomenal contrast involves a learning process where we produce our knowledge by our own means and are open about how we arrived at it. Initially, as we perform the proof that the sum of the angles of a triangle is equal to a straight angle for the first time ourselves, maybe with some outside help to induce or enable our thinking action, we have a fresh, pristine experience of the coherence of all relevant elements in one grand overview: our thinking process does not depend on anything outside its present and persistent action: no procedural memory or memory of the relational structure is involved (see below for more details on memory), no authority, no tradition; this might even evoke awe, wonder or joy in seeing all these concepts brought together and arranged in a harmonious whole. Soteriou (2013, p. 266–268), seems to discuss a similar example. He concludes:

> "The suggestion here is that one brackets one's belief by reasoning in recognition of a self-imposed constraint; and importantly, the reasoning one thereby engages in is actual (and not pretend[ed] or imagined) reasoning [...]. This involves mental activity that is self-conscious and self-determined, but which is also epistemic, truth directed, and subject to epistemic evaluation."

Turning now to the contrast (see Table 2): (i) Assume that we have executed this proof many times, we have developed some routine, we have preserved it even in our procedural memory. Having routine means that after some minor stimulus (for example, someone mentioning the triangle and its angles) we are able to perform the proof that the angles of a plane Euclidean triangle sum up to a straight angle. Characteristic of such routine thinking is, first, its reliance on some memories (working memory) and/or mental representations (words, sentences, symbols, images, diagrams) that guide and organize our thoughts. We need *not* understand what we do and why we are doing this, it just happens, using the sources of our procedural as well as our representational memory; we may even remember some narrative that comes with this proof and makes it easier to reconstruct it.

(ii) Having routine shows itself in the same pattern of thought processes every time we call it up: the reproduction of the proof turns out as a repetition, no variations are possible without falling out of the routine (and starting a new thinking action).

(iii) The mind may wander away while we are still doing this proof and communicate it to someone else: we may simultaneously, while executing the proof, observe the clothing of the person we are talking to or ponder about our lunch menu. This does not necessarily disrupt the routine thinking process.

(iv) No wonder or awe is present, no feeling that we do this for the first time; there may rather be some boredom, some disinterestedness which goes parallel to ongoing comparisons with memories of similar past experiences.

(v) Routine is, at its best, sound knowledge, but not understanding. We need not understand presently what we are doing routinely; we just have to know which series of steps we have to follow through.

Now comes the difficult part: After having acquired our routine (maybe by some hard training work), is it possible to carry out the same proof again as if for the first time? Can this structural shift be carried out in a controlled manner? And what are the phenomenological differences?

To set the stage: Yes, it is possible, and the differences as well as the consequences are profound. To think the proof anew without falling back into the acquired routine means to work against or break up the five characteristic features of routine thinking outlined above. In our own experience, this is best done by delving

TABLE 2 Characteristics of the phenomenal contrast between routine thinking vs. focused productive thinking.

| | Routine thinking | Performative insight within pure conceptual thinking |
|---|---|---|
| (i) | Reliance on memories and mental representations (words, sentences, symbols, diagrams); they determine the routine thinking process; narrow focus on known facts and reliance on procedural memory | Permanent reassessment of mental representations and memories: transforms them from given knowledge to elements determined by the performative thinking action; widening the awareness and at the same time focusing on the present understanding of all elements involved |
| (ii) | Reproduction, repetitive: no variation | No reflection on previous thinking activities; fresh approach involves diverse variations |
| (iii) | Parallel mind wandering happens and need not to disrupt the routine | Mind wandering disrupts pure thinking: needs to be overcome |
| (iv) | Boredom, disinterestedness, ongoing comparison with past experiences | Happiness, awe, thinking lives only in the present with no comparison to past experiences |
| (v) | Sound knowledge of relevant consecutive steps | Knowledge may be present but is not directly relevant; soundness lies in the focused performative action, in the performative consistency and coherence |

into the conceptual details of the proof, trying to understand it right now in the present and finding out why and how it is convincing. This involves the gradually expanding ability to harness our wandering mind (Weger et al., 2018b) and deal with diversions and associations (see below).

The experiential consequences of doing so are as follows. Regarding (i): If we focus on the *relational conceptual structure* of the said proof rather than on the elements that are related to it (points, lines, angles), then all memories and mental representations, words, pictures, diagrams, symbols etc. need to be reassessed for their meaning; they need to be transformed from elements determining the line of routine thoughts to elements that are determined and controlled by the actual performative and participative thought process. In other words, they have to be relegated to the background of thinking as mere accompanying features. As to the relational structure, our *present* understanding guides our thoughts, nothing else. To put it succinctly: We understand everything performatively from this structure but still know nothing (in contrast to our knowledge of the related elements themselves). In other words: our actual structural insight does not depend on given, previous knowledge of this proof—such might be the result, but not the pre-conditions of the proof performance.

Regarding (ii): As soon as we know that we did this proof some time ago, we are back to the routine and out of the actual productive thinking process. The active thinking process, the thinking action, does not allow reflections on what we did earlier or might do in the future: it lives in the conceptual relations present in the thinking process (otherwise we fall out of this thinking action). This means that we can carry out this proof with slight variations each time we do it—or even make some big variations by considering triangles on a sphere where the angles sum up to an angle greater than 180°.

Regarding (iii): Mind wandering and diversions are serious threats to thinking action in the sense presented here: they disrupt the continuity of the thought process, stray from the relevant conceptual relations and as such prevent understanding or insight. Hence, mind wandering and diversions, including associations, are incompatible with focused active productive thinking.

Regarding (iv): The fresh execution of our thinking process, a thinking action, makes us feel happy and content every time we do it. We are highly interested in what we are doing, and boredom has no chance since we are not reflecting on past experiences nor are we comparing them with our present doing. We have done something exciting by ourselves in the presence, have gained pristine insight by our own means—not directly or immediately depending on, or determined by, another person or authority or past experience: it happens just now.

Regarding (v): Knowledge in the sense of given representations of elements of the proof or even the whole proof procedure may be present in the background of our mind while we perform thinking actions. However, these representations do not determine our insight in the thinking action. Insight may be gained by using these representations as some starting material, but it leaves them eventually behind and comes to a fresh understanding. The soundness of our insight depends on the focused performative thinking action—not on given or memorized knowledge. The overall thinking action is due to its performative consistency (Petitmengin and Bitpol, 2009, p. 400) and its performative coherence (Bitbol and Petitmengin, 2013a, p. 270).

## 8. Third phenomenal contrast: associations and flashes of insight vs. thinking action

One might argue that disruption of routine thinking is not primarily due to active performative thinking, namely thinking action, as characterized above, which refocuses our attention on to what we are actually thinking. Instead, it may be due to associations or flashes of insight (Gutland, 2018a, Ch. VI.2.4, p. 425–429). Leaving aside the kind of diversions unrelated to our ongoing thoughts (for example, if we remember the grocery list for the afternoon), we are left with something that intrudes on us, interferes with us with its own force against our intrinsic action (which might be welcome for different reasons, but not for the ongoing thinking action).

As such associations—due to their content—may connect well with our performative stream of thoughts, they can delude us into thinking that they are in fact a direct continuation of our own action, even if they are not—and carry us away by their own (not our) intrinsic force (Weger et al., 2018b). A difficulty with this realization (that associations and flashes of insight are diversions and not part of the performative thinking process or thinking

action) lies in the fact that flashes of sudden (deep) insight might appear as an enhancement, as an enlightenment, as a continuation or even a climax of our thinking action. We welcome them, are happy with them, we need them. We do not want to dismiss them because they may be exactly what we worked for, namely unexpected variations of our thought process, deep insights or at least some as yet unknown associations. However, even if they are stimulated or triggered by our active conceptual phase, even if we experience them more often than not after an intense period of active explorative thinking, they have to be classified as something different: they are, at best, indirect or secondary outcomes of our action but not part of it in its essence: they may pop up or not. There is no intrinsic necessity in active performative thinking, or thinking action, that produces, or brings about or asks for, flashes of insight; they happen on their own account, not as an essential ingredient, or a compulsory consequence of performative thinking actions.

Important arguments for the foreign character of flashes of insight with respect to active performative thinking are the following: If we fail to integrate them into what we already know, in particular into a coherent explorative survey of relational content, they are lost, they pass by and become worthless. On the other hand, if and only if we embed them into one of our active streams of performative thinking, they may become fruitful. That is, we must make them part of our active thinking process in order to arrive at something that we can evaluate ourselves and that in the end can further our research.

It should be clear by now that this paper does not want to rigorously exclude this kind of sudden insights from any general account of thinking (on the contrary). But one may argue that they do not belong to the type of thinking that is the main subject of this paper—namely active performative thinking or thinking action—as long as they are not actively integrated into it.

This being said, it nevertheless seems that some kind of "flashes of insight" are experienced that appear to be the pinnacle of some more or less complicated performative thinking actions. Often, they occur *after* such performances during a time of relaxation. They may mark the ultimate success of actively understanding something instead of just passively knowing it. We think that this is indeed the case. But one should carefully differentiate the gentle *light* of insight during actively understanding something via a thinking action from the more dominant *flashes* of insight that take place without our immediate action. The first unfolds more or less gradually as we proceed along our performative thinking process: it is an intrinsic part of our productive thinking *action* or performance, it encompasses more and more of the whole structure until we have the overview we longed for. The latter, the flashes of insight, come over us from outside the thinking performance as such, like flashes of lightning appear from the outside with respect to our body (and our eyes particularly), and are, in their quality of appearance, *not* part of our thinking *action* in the more immediate sense of the word. Instead, they simply appear as an element that is foreign to our active thinking performance (however, not to our thinking in general).

## 9. Thought, reason, and reflection—Introducing a new mode of thinking: pure thinking action

In this Section we argue that, according to the research laid out in the foregoing, particularly concerning the contrasts in Sections 6 to 8, the psychology of thinking may require to consider a new mode of thinking, namely *pure thinking action*, a new mode to complement the conventional Type 1 and Type 2 thinking processes.

To begin with, Jorba and Moran (2016, p. 98) pointed out that in psychology, particularly in cognitive psychology, there is "a well-established division between unconscious and conscious thoughts on the basis of two different cognitive systems or processes that underlie thinking." Type 1 thinking includes forms of reasoning that are passive, reflexive, spontaneous, unreflective, fast, automatic, behavioral and non-conscious. Type 2 thinking involves processes that are actively adopted, actively executed, rule-based, analytic, language-related or reflective and use hypothetical thinking and mental simulations as well as working memory (Evans, 2008, 2010; Frankish, 2010; Evans and Stanovich, 2013). This so called dual-process theory approach can be found in separate areas of psychology and philosophy, such as learning, reasoning, social cognition, judgment, decision making, and in the philosophy of mind under various different designations. This distinction goes well back into the history of psychology; however, apart from minor adjustments, it has been quite stable over time until today.

In philosophy, one finds this differentiation labeled as belief vs. opinion, or belief vs. acceptance. Most psychologists and philosophers think that Type 2 processes are based on natural language; in addition they contend that natural language in general serves as the medium of conscious, explicit thought. Moreover,

> "many researchers now accept that it is wrong to characterize System 2 [=Type 2] reasoning as uniformly abstract, rule-based and logical. Explicit reasoning, they argue, may involve a variety of other techniques, including the application of heuristics, explicit associative thinking, manipulation of mental imagery and selective direction of attention." (Frankish, 2010, p. 921; see also Evans, 2009; Stanovich, 2009)

A further important aspect of Type 2 thinking is the capacity of "cognitive decoupling," a central feature of Type 2 hypothetical reasoning:

> "In order to reason hypothetically, we must be able to prevent our representations of the real world from becoming confused with representations of imaginary situations." (Evans and Stanovich, 2013, p. 236)

Evans introduces a further distinction, a further category of processes, Type 3, that is supposed to be responsible for initiating Type 2 processes and possibly resolves conflicts between autonomous (automatic) and analytic processes, and which have ultimate control over behavior (Evans, 2009). Along similar lines,

TABLE 3 Main types of thinking.

| | Occurrent thinking, type 1: thoughts happening to us | ⟶ | Reflection, type 2: thinking about thoughts | ⟵ | Pure thinking action: new type: awareness within thinking action |
|---|---|---|---|---|---|
| **Content** | Associative relations, flashes of insight, mental images, memories, occurrent thoughts | | Given knowledge (additive, combinatorial, propositions, predicates, conceptual relations attached to words, images, propositional attitudes) | | Pure conceptual content, thinking in types (focused productive conceptual thinking) |
| **Activity** | No individual action, routines | | Mixed activity: actions and occurrences | | Pure individual action, active process, performative exploration, active performative insight (evolving during time), participative, discovering, sense of agency, self as source of action |

Stanovich (2009, p. 67–72) makes a distinction *within* Type 2 thinking between the reflective and the algorithmic mind and contends that the reflective mind is at the top level, consisting of higher-level goals and higher thinking dispositions such as open-mindedness and willingness to engage in effortful thought, which regulate and shape our conscious reasoning [see the discussion in Frankish (2010, p. 922–923)].

From the perspective of this paper, the distinction between Type 1 and Type 2 thinking processes is indeed important. What has been called knowledge in the first phenomenal contrast is close to Type 2 processes, as is the case with routine thinking, involving some complicated routines that need our thinking attention, in the second phenomenal contrast. Associations, flashes of insight and simple thinking routines, however, belong to Type 1 reasoning. Closer inspection reveals that things are more complicated. The most important aspects of Type 2 reasoning seem to be reflexivity—based on working memory and language. However, this rules out what has been called pure thinking action above; such pure thinking action is neither of Type 1 nor of Type 2 (nor of Type 3 within Type 2), since it is neither passive nor language-related, nor associative, nor based on imagery.

Thus, the faculty of hypothetical reasoning as well as the engagement in higher level goals and higher thinking dispositions (open-mindedness, willingness to engage in effortful thought) *within* Type 2 reasoning outlined above, comes close to this pure thinking action, but there are still considerable differences.

In conclusion we may say that reflection, particularly, as a Type 2 process, draws upon several sources: it works with what comes to mind automatically, without effort, spontaneously, and integrates the output from these sources into the reflexive reasoning if and where applicable (see the discussion of associations and flashes of insight above in Section 8). Reflective reasoning also works with explicit memory, inference rules, logic, language, etc. However, and this is one of the main points this paper wants to suggest, it also draws on the *results* of pure thinking action although these results stem from a quite different thinking type. It has been outlined above why this type of thinking action eludes normal attention and that it takes quite an effort to remedy this situation. This is true even when we contend that reflexive thinking draws on the results of pure thinking actions in the form of representational modes of concepts, namely conceptual relations reduced to propositions and their relations.

The upshot of this observation is that the distinction of Type 1 and Type 2 reasoning is not complete: There is another type—rather distinct from Type 3 mentioned above, namely *pure thinking action*, that needs to be considered for a more comprehensive theory of what thinking entails. These actions are neither spontaneous nor unreflective events (Type 1) nor higher order reasoning processes based on working memory and language (Type 2). The latter type of thinking works with explicit memory, inference rules, logic, language, etc. However, and that is one of the main points this paper suggested repeatedly, it also draws on the *results* of thinking actions without us realizing that these results stem from a quite different type of thinking.

This is the reason for evaluating this type of thinking, namely pure thinking action, more thoroughly. Pure thinking action encompasses a controlled structural shift and a change of levels of consciousness from Type 1/Type 2 thinking to dimensions of thinking that are not covered by this theory.

## 10. What exactly is pure thinking action?

First, we give an overview of the most important types of thinking discussed in this paper (Table 3). At the center of all types of conscious thinking there is *reflection*, i.e., thinking *about* given observations as well as thinking about thinking experiences accessible *after* performing thinking actions. Reflection draws on two sources: first on associations, memories, tokens of thinking, examples, images, observations, mental representations etc. It combines, then draws conclusions, makes predictions, has knowledge and uses thinking routines and working memory. However, secondly, it also draws on what has been done and experienced in pure thinking actions which is often overlooked. Thinking action itself, as already outlined above, is no reflection, but an explorative and experiential bringing about of conceptual relations by thinking performance.

Reflection about the results of former thinking actions as a starting point is a way to access this action. And then, after some practice, we take these results into a non-reflective focus—goal-oriented as a result of previous reflection—and thus envisage our thinking action in its entirety; in this process we extend our awareness from conscious conceptual content to the performing action itself.

Some results will now be drawn together, namely from the phenomenological analysis of the example (Section 2) in Section 3 and the results from the two phenomenal contrasts in Sections

6 and 7. They are integrated with our further considerations of flashes of insight in Section 8. These lead toward a comprehensive overview of the main features of pure thinking action and allow us to set this new mode of thinking apart from Type1/Type 2 thinking discussed in Section 9. These results achieve the character of statements that can be discussed and put into perspective with results from other research. What has been explored in this paper, namely focused productive conceptual thinking actions with their performative features, will now be abbreviated consistently with the term *pure thinking action*. As mentioned above, more has been said elsewhere about the content of thinking actions, namely concepts and conceptual relations (Ziegler and Weger, 2018, 2019).

(I) *Embedding*: Pure thinking action is preluded by, surrounded by and *embedded in occurrent thinking*, that is, in pre-performative and post-performative events; it is often—but not always—triggered, occasioned, or induced by knowledge, memories, associations, mental images, and mental representations. However, these factors neither determine its content nor its performative appearance. This means that they may continue as diverting factors or accompanying events on the fringe of our overall thinking consciousness but do not determine the content or performance of pure thinking actions. This content of pure thinking actions has its own experiential reality that does not depend on anything else (Ziegler and Weger, 2018, 2019); it is part of the experiential reality present in this kind of thinking [see also below (4) and (5)]. Thinking action is the frequently overlooked source of substantial parts of our common knowledge.

(II) *Explorative nature:* Pure thinking action as a mental action does not bring pre-specified conceptual content into experiential existence, but tries to pursue and explore, by its overall goal of conceptual awareness, the specifics of conceptual relations which do not emerge on their own. However, as such they constitute intrinsic conceptual constellation before, after or outside pure thinking actions or processes which are not constructed but revealed or discovered by our pure thinking action [see below (4)]. Pure thinking actions or processes have the character of explorative experiments where a process of experimental awareness is initiated with clear-cut initial conditions that are varied during the performative engagement. In this sense, pure thinking action is an awareness which is pre-predicative, pre-propositional, pre-inferential and pre-reflective as well as pre-intentional. We are aware that the latter qualities are traditionally applied to very basic, passively experienced, even unconscious facts. However, our contention is that these qualities may be applied to pure thinking actions as well. Even in such a simple example as the one in Section 2, these qualities are present: If we do not know the proof in advance (or ignore knowledge of it), we have to explore the relational features of points, parallel lines, angles, and planes in order to find the relevant elements for the proof. This exploration might bring us temporarily to some other structures, such as triangles within circles (for example, the Thales case with a right angle) or triangles on a sphere, before we come back to what we set out for.

(III) *Initiation and goal setting:* Pure thinking actions are initiated and governed or directed by overall goals, as for example the aim to incorporate into phenomenal awareness the proof of the angle theorem for plane Euclidean triangles. This may be transformed into a more general mode of exploration, where different and/or extended subject matters may be pursued and conceptually connected with each other without interruption. One example is the exploration of the conceptual relations with respect to segments on a line and their interrelations with the concept of triangle, circle, etc. (Ziegler and Weger, 2018).

(IV) *Conceptual awareness:* The performative conceptual awareness during pure thinking action reveals conceptual relations that are invariants of the actions of pure thinking performances. The individual act of pure thinking actions meets universal conceptual content and thus experiences *universals within the individual*, namely universal concepts with experiential qualities that are beyond time and space, since these relations have neither time-dependent nor space-dependent features. For example, the universal conceptual content of the proof of the triangle theorem in the Euclidean plane (where there are parallel lines and there is a unique parallel with respect to a point outside it) can be spelled out as follows: Given that corresponding and alternate angles in a line intersecting two parallel lines are equal, and given a line through any vertex parallel to the opposite side of an arbitrary triangle, then it follows that the angles of any triangle must always add up to 180°. Given this, it is obvious that the overall structure of the proof of the triangle theorem has no spatial or temporal features; it is sufficient and essential in itself, has its own inner connections which we experience when actively thinking it through. One might speak here of *participative insight* into the intrinsic necessity, or the essence, of concepts and conceptual relations. For the agent performing this encounter this comes with a sensation of clarity or light, which can be described as seeing something as transparent with the mind's eye.

(V) *Participative nature:* Pure thinking action is performative as it creates (that is, brings into existence) an experiential awareness of conceptual relations; it is participative in its ownership, in its engagement through insight and understanding. Being aware of the said proof by pure thinking actions means being part of it, participating in its structure, revealing this structure, discovering it, making it experientially available (in contrast to constructing it, inventing it, making it up). Pure thinking action has its own agentive phenomenology: we experience it as an individual force with its performative and participative awareness, with its active encounter of conceptual relations *within* its extended awareness from conceptual content to performative action.

(VI) *Receptive nature:* However, by closer inspection, participation as outlined in (5) above reveals another aspect of our pure thinking action or performance which we now can spell out more explicitly: Participation means that there is something that we participate in, which is not by our own making. However, and that is the important point that we now want to present, this participation happens only *while* we are performing and are aware of pure thinking action. It is a participation *within* active involvement, when we encounter something (namely pure concepts) which is revealed by this performance in its experiential existence but does not result from it. We wrote earlier in Section 3 in our phenomenological analysis that this might be termed a *receptive* mode of thinking action. However, this has nothing to do with the more common types of thinking such as knowledge, routine thinking etc. More clearly, it is a receptive mode *within* the performative action of pure thinking action. The action itself (besides being an action) also has the function of taking

into account, receiving, acknowledging, "seeing" etc. conceptual content (we are not suggesting that these contents force themselves upon us by their own account). In other words: The receptive mode or aspect of the performative action of pure thinking is *relatively* receptive with respect to this action, not receptive in itself. The receptivity is not a sufficient hallmark of pure thinking action, but only a necessary ingredient. Hence, it cannot be separated substantially from pure thinking action but only distinguished conceptually from its pure performative aspect. If we want to find out if the conceptual contents "received" by this receptive mode are part of the performative action, we only need to check whether the conceptual content is revealed as something manifestly and intrinsically clear without reference to any previous or non-performative knowledge—if not, a different kind of reception has taken place (association, flash of insight, remembrance etc.).

(VII) *Performative consistency and persistence:* Pure thinking action has its own dynamic quality and persistence. Pure thinking action is not tied to only one concept or conceptual relation but works with transitions between them. This active persistence enables pure thinking actions to perform transitions from one concept to another without leaving the performative realm; this is in essence the sense of agency that includes the persistence of performance as well as the persistence of participation. The performative awareness which guides itself by staying engaged with its content leads to the performative consistency as well as to the performative coherence that qualifies pure thinking actions.

(VIII) *Performative contribution:* Pure thinking action ends by contributing elements to our knowledge: its transformation, or rather its fall, from active involvement to the static character of its results (which can be written down and communicated), adds to the environment that encompasses all pure thinking processes or actions: What we have thought actively beforehand belongs now to the starting material we may use and need to initiate a subsequent thinking performance. Thus, we are back to (1) and may start a new pure thinking process.

## 11. Thinking action in light of other fields of research

Mental action and mental performance in their dynamic quality within pure thinking actions have already been evaluated by phenomenological methods using first-person experiences (Anderson, 2016, 2018; Jansen, 2016; Ziegler and Weger, 2018, 2019). These evaluations take into account that such thinking processes are temporarily extended, i.e., they unfold in time (Bayne and Montague, 2011b, p. 26; Chudnoff, 2015; Jorba, 2015; Ziegler and Weger, 2019, § 5.4). This might shed some light on whether the dynamic quality of agentive experience within physical actions could be extended to cover mental acts.

Since thinking action is a multifaceted experience, first-person awareness has to be extended to the margins of consciousness: this has already been suggested by other authors (Mangan, 2001; Bayne, 2008, p. 108; Petitmengin and Bitpol, 2009; Mylopoulos and Shepherd, 2020, p. 169). Furthermore, several kinds of self-consciousness have to be taken into account, particularly of the pre-reflexive or pre-predicative kind (Gallagher and Zahavi, 2013, Ch. 3; Ziegler and Weger, 2019, § 6.2). This includes the capacity to generally enhance conscious awareness in thinking (Montague, 2016). This pre-reflective self-consciousness facilitates reflective self-consciousness but is not in itself a reflective self-consciousness.

Mental action and mental agency are major fields in their own right: This paper is not the appropriate context to address the diverse discussions and debates in detail, see for example (Soteriou, 2009a; Fiebich and Michael, 2015; Metzinger, 2017). For a short discussion, the challenge by Strawson, 2003; is taken up and confronted with our approach. Similar viewpoints have been worked out [see for example Tye and Wright (2011) and Vicente and Martínez-Manrique (2016); see also the discussion in Anderson (2018, p. 80–92) and Fiebich and Michael (2015, p. 685–687)]. One should not take the easy way out in stating that Strawson's point would be similar to what has been called "having knowledge" and "routine thinking", or even associations and flashes of insight: Strawson leaves this option open by making sure that he considers only what he believes most thinking people do: "most of our thoughts—or thought-contents—just *happen*" (p. 228), namely, that people who believe "that much or most of their thinking is a matter of action are, I believe, deluded" (p. 231). However, one should take seriously his contention that "the role of genuine action in thought is at best indirect. It is entirely *prefatory*, it is essentially—merely—*catalytic*" (p. 231). Strawson is sure that there are actions in our thinking, but these are "acts of *priming*, which may be regularly repeated once things are under way, [they] are likely to be fully fledged actions" (p. 231), even attention is assumed to be "a matter of action" (p. 232).

Perhaps Strawson found it rather odd that we should experience something intrinsically existential, namely conceptual content, while performing a thinking action where the latter might rather suggest that we construct our thinking contents ourselves. However, paradoxically, this is exactly the case: The pure thinking action is the *conditio sine qua non* of experiencing pure concepts and conceptual relations *not* produced by the action in any respect (except their experiential appearance). This is another way of saying that pure thinking includes agentive and receptive aspects: bringing something into experiential existence *and* being aware of it at the same time.

To consider this further, we need to take into account what has been described in the Sections above: After some effort to capture what happens on the fringes of our consciousness (Mangan, 2001; Petitmengin and Bitpol, 2009), we may become conscious of our own agentive contribution toward the thinking action in the sense of the agentive awareness according to Bayne and Pacherie (2007), which does not impinge on the non-subjective essence of conceptual thought content (as in the mathematical example in Section 2). One has to consider something like "seeing with the mind's activity", or "grasping" (Brown, 2004; Pitt, 2004, p. 10–11; Chudnoff, 2015, p. 39–40). This means that in thinking we are aware of universal conceptual relations that transcend our individual consciousness but nevertheless appear within it (Hopp, 2014). This is "not a matter of positing purely abstract ideality as metaphysically existent, but rather grasping or 'seeing' the universal in the individual" (Froese and Gallagher, 2010, p. 89). For more on the content-oriented view of thinking, see Parsons (1979), Bealer (1993, 1998), Tieszen (2010), Chudnoff (2014); and Ziegler and Weger (2019).

Others took up the challenge of Strawson's claims by pointing to qualities of the thinking action that come close to what we present in this paper. Among those views on thinking action, the most appropriate and promising approach to evaluating thinking processes appears to be the goal-oriented view on mental action (Mele, 1997, 2002; Buckareff, 2005). This view takes into account that specific thinking tasks are performed while one keeps up with thinking activity in general. A thinking process is a complex undertaking with different phases and encompasses various tasks (Anderson, 2016, 2018); therefore a teleological theory and an appeal for trying is appropriate (Proust, 2001, 2010; Soteriou, 2005).

The sense of agency or sense of ownership cannot be discussed in any detail here, since this is a complicated matter (Gallagher, 2012, 2013; Mylopoulos and Shepherd, 2020) that needs to be pursued in further research on thinking action. However, let it be stated that it is the sense of agency that makes us aware that we are thinking and not doing something else (Bayne and Pacherie, 2007; Gallagher, 2012; Proust, 2013; Mylopoulos, 2017); in addition, one may have to take into account what is called agentive phenomenology (Pacherie, 2008; Jansen, 2016).

Another aspect that cannot be addressed further in this paper is the role of the self in thinking actions. It should be noted, however, that the role of human agency in thinking action, the issue of autonomy and self within thinking action has been barely researched (Guillot, 2016; Jansen, 2016; Jorba and Moran, 2016).

## 12. Conclusion

Thinking may in many cases just happen, filling our mind with memories, ideas, propositions and the like. However, there is another mode of thinking which in this paper is called focused productive thinking action, or short, pure thinking action which is the source of many insights we just have and do not know where they came from. This paper is also concerned with making us aware of pure conceptual relations—having their own universal status—which are not the product of our subjective self or the environment but nevertheless play an important role in the advent of our representational knowledge. Phenomenal contrasts serve to show that thinking actions produce performative insights rather than merely dispositional or remembered knowledge. Our presentation seeks to extend routine thinking into focused productive thinking actions that open up new perspectives. This extension presents shifts of awareness to new structural dimensions of the conscious experience of thinking. The performative nature of thinking actions is explorative, guided by overall goals, participative and receptive for concepts or ideas and has the quality of being performatively persistent and coherent during its episodes of action.

All this is intrinsically linked to our self as being the agent of this action and executing it by keeping up our thinking action with persistence and coherence. In the end this can reveal something about our self: We are capable of executing something that, as an action, does not depend on anything else other than our self.

## Data availability statement

The original contributions presented in the study are included in the article material, further inquiries can be directed to the corresponding author.

## Author contributions

RZ conceptualized this research topic and wrote the first draft using the methods of phenomenology of thinking. UW worked through the manuscript and contributed his expertise in the psychology of thinking. All authors contributed to the article and approved the submitted version.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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# The embodied mind in motion: a neuroscientific and philosophical perspective on prevention and therapy of dementia

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The embodied mind in motion is a concept in which health and well-being, prevention and therapy, as well as lifestyle and habits meet. The mind changes profoundly in the course of dementias, affecting daily living and resulting in reduced quality of life. Interdisciplinary approaches are required for a holistic understanding of how the mind is affected by dementia. We here explore what such a holistic theory of dementia might look like and propose the idea of "embodied mind in motion". The paradigm is biopsychosocial or biocultural, the theoretical anchor point is the lifeworld, and the guiding concept is "embodiment," as body and mind are constantly in motion. Physical activity is, hence, central for the experience of health and well-being, beyond being "exercise" and "health behavior". We discuss the embodied mind in motion referring to phenomenology, enactivism and (philosophical) anthropology. In our view, habits are embodied long-term memories and a philosophical equivalent to lifestyle. They unfold the meaningfulness of moving the body, complementing the objectifiable benefits of physical exercise. Empirical studies on "holistic activities" like hiking, yoga, music and dance illustrate improved integration into everyday life. Their meaningfulness enhances compliance and increases the preventive and even therapeutic potential. A crucial factor for this is the emotional dimension of lifestyle, exemplified by the virally popularized performance of "Swan Lake" by wheel-chair bound ex-ballerina Marta Cinta González Saldaña, suffering from Alzheimer's disease. A number of epistemological and ontological consequences anchor "embodied movement" as a valuable principle for dementia research.

KEYWORDS

**Alzheimer's disease – AD, neurodegeneration, plasticity, reserve, exercise, resilience, body-language, environment**

## 1. Introduction: embodied prevention as the silver bullet against dementia?

From an evolutionary perspective, movement is intimately linked to the genesis of nervous systems, which are the necessary condition of higher cognition. Consequently, movement might play a crucial role for the maintenance of nervous systems and cognition. How great this potential actually is can be investigated in cases of neurodegenerative diseases. For this, purely mechanistic conceptions of movement that have dominated medicine to date have to be overcome by establishing a more holistic understanding of human movement.

The simplest operational definition of dementia is the irreversible loss of brain functions. These functions are not limited to higher cognitive functions, such as memory, orientation and language, but ultimately include everything the brain does. Nevertheless, in most contexts dementias are used as an umbrella term for age-related, chronic, progressive, incurable, and, by and large, irreversible symptom complexes that are interpreted as "fundamental disorders of higher-order consciousness" (Fuchs, 2020a, 670). Dementias are no diseases in themselves and the causal factors, clinical manifestations and courses differ vastly. Alzheimer's disease (AD) accounts for roughly two thirds of all cases of dementia. Given the far-reaching consequences of AD across scales from molecular to social, narrow operational definitions are obviously insufficient as they neglect the complexity of the human condition.

Even within the biomedically originating perspective a *bio-psycho-social paradigm* can already overcome certain conceptual shortcomings: while dementias are the consequences of neurodegeneration at a biological level, there is no strict causal correspondence between neuropathology and the clinical symptoms and manifold consequences of the dementia. Some affected persons might, despite massive neurodegeneration, have relatively low functional losses and due to a supportive social environment live reasonably well with their disease. On the other hand, even with comparatively low neuronal degeneration, functional losses might be great and, especially in challenging social environments, result in a low quality of life. However, the bio-psycho-social framework requires concretization. For care research this has been accomplished for example in *positioning theory* (Sabat and Harré, 1992, 1994) or *person-centered care* (Kitwood and Bredin, 1992; Kitwood, 1997), but not yet for prevention.

Currently, the life sciences and the humanities tend to mark extreme poles in the discourse on the prevention of dementia: On the one hand, evidence-based "checklists" of health behaviors, obtained from large epidemiological studies and meta-analyses dominate the life sciences. While the recommendations by themselves are entirely reasonable and well-grounded, the one-size-fits-all approach results in low compliance and ignores many interaction effects. For example, energy uptake through diet and energy consumption stands in a complex interdependence that can affect risk and course of dementia in many ways. On the other hand, approaches like *New Dementia* (Leibing and Schicktanz, 2021) reflect political, economic, social, cultural, and ethical aspects in epistemic terms. Thus, *New Dementia* offers a critical re-evaluation of the "preventive turn" that questions the evidence, objectivity and neutrality of life science recommendations (Schweda and Pfaller, 2021), but runs at the same time the danger of losing touch with the clinical realities. We thus believe that a clinical definition of dementia is needed as an anchor point for a comprehensive interdisciplinary dialogue. Clinical definitions are necessary for all practical purposes and they must also provide the starting point for our considerations here, because only for definable clinical entities epidemiological and clinical data provide solid grounds to define and appreciate the consequences of prevention.

As a fertile middle ground in a demanding sociohistorical constellation, we propose the interdisciplinary idea of "the embodied mind in motion" (Kempermann, 2022): first, there is to date no causal therapy for dementias; second, demographic change results in disproportionately more old and oldest people, increasing the prevalence of dementia and demand for institutionalized care, for which fewer care-givers will be available. Third, institutional care faces the challenge of exploding costs to stressed social systems and an increasing shortage of specialists. Finally, multimorbidity and polypharmacotherapy increase in old age so that attention to numerous illnesses with a wide variety of treatments have to be coordinated. As a result, the quality of life of people with dementia is reduced not only due to the dementia itself, but also through the many indirect effects on family, caregivers and society.

This situation is not solvable even if the current promising small successes with antibody-based treatments such as Aducanumab and Lecanemab become more widely applicable therapies. Rather, emphasis on prevention is key, especially under a global perspective with massive increases in the incidence and prevalence of dementias in Asian and African countries. However, the full potential of prevention is not yet fully exploitable. For example, the temporal dissociation of necessary early preventive interventions and the evaluation of their success is problematic. The discovery of early biomarkers for dementia are changing this, but are burdened with ethical conflicts, if healthy populations are screened in the absence of true treatment options. Nonetheless, prevention has proven success in terms of dementia-free years and the reduction of symptoms. However, to define the success of prevention merely as the reduced incidence (and prevalence) of dementia symptoms is not sufficient, because in their individual setting, people might be impaired differently by states with comparable biomarker profiles. A more individualized approach is necessary.

In addition, check-lists of recommended health behaviors remain life-less and, despite the proven effects of individual actions, receive too little compliance. As insufficient a simplistic definition of dementia is, as insufficient is a purely mechanistic understanding of prevention that is mainly reactive to key physiological parameters. But lifestyle-based prevention is promising, if it reflects what the individual can do to increase resilience under his or her personal set of conditions.

All phenotypic variation, including the response to preventive strategies, is the consequence of genetic variance and the influence of an environmental factor. Environment, however, encompasses both *extrinsic* influences, e.g., socio-economic, climatic, etc., and *intrinsic* influences, the non-shared environment. The non-shared environment reflects the impact of our individual response to genetic and environmental conditions, including lifestyles, which are highly personal and individual behavioral patterns shaped by experience. While dementias tend to have substantial heritability, both types of environmental factors play an important role. The decrease in the cohort-specific prevalence of AD in the past decades (a relative reduction of roughly 16% per decade) speaks to the fact that the influence of behavior and hence lifestyle matters (Wolters et al., 2020).

Lifestyle is of eminent importance for at least two additional reasons: Firstly, we can actively influence lifestyle ourselves and thus take action in an area that is otherwise characterized by the experience of helplessness; secondly, lifestyle factors are not only directly related to prevention but also to therapy and care, thus truly accompanying an individual over the course of life, through health and disease.

## 2. The embodied mind in motion

"Leading a good life" might be the best way to effective prevention, but what this exactly means has been the subject of thousands of years

of human discourse in philosophy and religion. In order to live a good life under the Damocles sword of dementia, reductionistic, physical and actionist perspectives on health and aging must be complemented with a holistic, qualitative and lifeworldly perspective. What is known about the success of preventive measures, especially those based on personal lifestyle, paints an increasingly concrete picture of how "leading a good life" is also healthy and can, under supportive genetic and environmental conditions, lead to resilience in old age and "successful" aging in terms of well-being. Empirical studies on examples like hiking, yoga, music and dance illustrate that activity needs to be "embodied" in everyday life and in a way that is meaningful to the individual in order to unfold its medical potential (Kempermann, 2022).

Especially for chronic, progressive and terminal diseases, the complementary perspective captures on one side the subjective and objective deficits that lead to the diagnosis and on the other the individual and social resources that are required for successful prevention, therapy and care. Moreover, it captures not only physical and mental health but also well-being and, ultimately, *eudaimonia* (Aristotle, 2017). This holistic concept, best translated as "flourishing life", complements by its long-term orientation the short- and medium-term oriented notion of well-being, while it also counterweights the shortcomings of concepts like successful aging. According to a prevailing reception of successful aging, dementia "appears as a worst-case scenario of later life, the ultimate demise of the rationally planning, autonomous, and accountable self—a process that needs to be prevented by any means" (Schweda and Pfaller, 2021, 207). According to the idea of flourishing life, this is by no means the case. And it by no account follows from a low well-being in dementia that life is no longer perceived as flourishing. For Woopen et al. (2021, 139, our transl.), "a person perceives his or her life as flourishing, when he or she can develop those of his or her characteristics and live values and beliefs that are particularly important to him or her." The challenge, then, is to balance health, well-being and flourishing life without delegating responsibility for it solely to the individual.

From this, a clear task statement for the prevention of dementia can be derived: Evidence-based recommendations for lifestyle interventions in dementia (Livingston et al., 2020) should thus be complemented with this approach that takes greater account of the values of the patient. Subjectively perceived and biographically anchored meaningfulness is a key to realize sustainable prevention strategies in vital contact with the environment.

Evidence-based medicine recommends "moderate physical activity" or taking 10,000 steps per day as a lifestyle intervention for healthy aging in general (Paluch et al., 2022) and "successful" cognitive aging in particular (Iso-Markku et al., 2022). Worldwide, physical inactivity increases the relative risk for AD with a factor of 1.82 (95% CI 1.19–2.78), low educational attainment as proxy for general cognitive activity by 1.59 (1.35–1.86) (Norton et al., 2014). But both factors, as well as other key lifestyle-dependent measures such as diabetes mellitus, midlife arterial hypertension, obesity, depression and smoking are not independent from each other: they have a large communality of up to 65%. Taking care of one risk factor has an impact on other factors. In addition, there lies an immense preventive power in the interaction effect itself.

Classical reductionistic single-intervention approaches decompose holistic lifestyles into abstract (well-measurable) components, which are used as building blocks for standardized but abstract preventive interventions. But for prevention as a lifelong process, a rigid focus on health benefits in the far future is ineffective. The effects of the intervention on well-being at presence must be taken into account. But orientation towards well-being can be reductionist as well: A high level of well-being in the presence by no means entails a high level of it in the future if, for example, the former consumes the resources required for the latter. Here, only the idea of "flourishing life" offers the necessary orientation. Physical activity, health, well-being and flourishing life now need to be brought into a sustainable equilibrium compatible with what is known to promote what is typically referred as successful aging, given the factors of genetics and environment. The scientific challenge is how this healthy and preventive balance in "leading a good life" today can be captured (and measured) and inform healthy lifestyle decisions without checklists.

Physical activity is the lifestyle factor with the greatest and best documented effect sizes in prevention and it directly interacts with other factors, such as sedentary time, diet, body mass index, tobacco and alcohol use, sleep quality, depression, socio-economic status and others. If levels of physical activity are improved in a holistic manner, combining present and future benefits, chances are good that overall lifestyle is improved at the same time. The interdependencies not only exist at the systemic physiological level (e.g., in energy uptake and expenditure) but also in brain and mind. Exercise, for example, affects sleep, can help to suppress craving for nicotine, and induce changes in dietary behaviors.

The dynamic interplay of part (movement) and whole (lifestyle) explains why holistic lifestyle interventions are likely to have sustainable effects, but also why the barriers to their successful implementation are so high. If the movement practices come along with subjectively perceived meaningfulness, they result in sustainable lifestyles that are associated not only with good health but also with a high level of well-being both in the present and in the future. Subjectively perceived meaningfulness and the related emotions are main drivers for particular actions and comprehensive lifestyles that increase the likelihood of successful implementation and an improved quality of life and well-being.

## 2.1. Premises, hypotheses and traditions

The existing comprehensive studies on holistic activities, such as hiking, yoga, music and dance, suggest that the mutual relationships between body and brain, mind and spirit, and environment and life are key determinants of their effectiveness, certainly subjectively, but most likely also objectively. At the interface of philosophy, cognitive and life sciences, we find important theoretical approaches to rethink the relation of those elements. Against the background of the question of personal identity in dementia, Thomas Fuchs writes: "According to the paradigm of embodied cognition, consciousness is not a pure product of the brain, but is rather a comprehensive activity of the entire organism in relation to its environment […]. In this respect, personhood is a manifestation of the life process of a human organism and it is thereby embodied in the capabilities and activities of the whole body" (Fuchs, 2020a, 667). The idea of the *Embodied Mind in Motion*, as roughly outlined previously (Kempermann, 2022), goes in the same direction within the context of the prevention of dementia.

As we want to demonstrate, the *embodied mind in motion model* offers a framework for a comprehensive interpretation of the link between movement, cognition and environment, building upon well-established neuroscientific bases, but with the help of philosophy. To unfold this guiding assumption, we can draw from three complementary philosophical traditions: *Phenomenology*, *Enactivism*, and *philosophical Anthropology*. These share the premise of a correlation or interrelation between subject(s), object(s), and world, that is essentially moderated by the body.

*Phenomenology*, as one of the most influential philosophical currents of the 20th and 21st centuries, offers systematic reflections on topics like consciousness, subjectivity, embodiment, expressivity, personhood, etc. The founder of phenomenology, Edmund Husserl, coined the philosophical *lifeworld* theorem. At the heart of the lifeworld-theorem is the attempt to comprehensively grasp the general structures of subject-relative experience in order to establish its function as foundation and orientation for the sciences (Husserl, 1976, 1993, 2008; Dzwiza-Ohlsen, 2019). The phenomenological tradition has consequently been in a productive exchange with psychopathology, psychiatry and psychology for more than 100 years (Stanghellini et al., 2019). The phenomenological research on dementia will be discussed in more detail below. The neurosciences as an overarching discipline still have some untapped potential to use phenomenological reasoning for its theoretical foundations, although there are already path breaking contributions like "neurophenomenology" (Varela, 1996).

The title of our contribution here explicitly alludes to *The Embodied Mind* by Varela et al. (2016, first published in 1991) as the "birth certificate" of *enactivism*. Due to its roots (Maturana and Varela, 1987) and its scope, enactivism appears even more compatible with cognitive and neuroscience than phenomenology, since here embodied cognition serves as the key to the fundamental and dynamical correlation between *organism* and *environment* (Varela et al., 2016). But because this tradition explicitly tries to bridge the gap between the cognitive sciences on the one side, according to which self and mind are the result of the dynamic interplay between brain, body and environment, and our lived everyday experience on the other side, it stands in a highly productive relationship to phenomenological philosophy (Thompson, 2007; Gallagher and Zahavi, 2012; Fuchs, 2017). After overcoming its initial preconceptions against phenomenology, Thompson (2016, xxii–xxix) explicitly acknowledged that the Husserlian lifeworld-theorem provides the foundation for enactivism in terms of theory of science. Enactivism will be discussed in Section 4 of this paper.

At the beginning of the 20th century, the tradition of *philosophical anthropology* was reshaped by philosophers like Max Scheler, Helmuth Plessner or Nicolai Hartmann in an interdisciplinary manner (Dzwiza-Ohlsen and Speer, 2021; Fischer, 2022). Before Plessner's major bio-philosophical work appeared in 1928, *The Levels of Organic Life and the Human* (2019), together with biologist Frederik J. J. Buydendijk, Plessner (2019) proposed a theory of the understanding of embodied movements in 1925. This theory can serve as a connection between enactivism and phenomenology. On the one hand, it takes its starting point from the lifeworld perspective, indicated by the modified use of the formula for the lifeworld by speaking of "*natural pre- and extra-scientific understanding of expression*" (Plessner and Buytendijk, 2017, 125; emphasis and all quotes of this text were translated by us), while deepening the reflections on embodiment in intersubjective terms. On the other hand, philosophical anthropology remains in constant dialogue with the natural sciences, so that the biologically accentuated considerations on the organism within the environment can be connected. The anthropological approach will be applied in Section 5.

## 3. The phenomenological response to the loss of identity in dementia: embodied habits as embodied long-term memory

Within the philosophical discussion of dementia, the discourse on the identity of self and person stands out (Hughes et al., 2006; Hydén et al., 2014). The question is often not only whether and how dementia-related illnesses change the identity of a person's self, but, more fundamentally, about whether there is a progressive loss of the identity towards becoming "quasi-persons" or "post-persons" (McMahan, 2003, 46ff., 55). The phenomenological tradition provides a strong counterweight against a dominant tendency in philosophy to doubt the fundamental identity of self and person for people with (late-stage) dementia due to their loss of autobiographical memory abilities.

In the last two decades, there has been a productive application of the embodiment approach to dementia in phenomenology. These go back to thinkers of both classical phenomenology like Edmund Husserl (1859–1938), Martin Heidegger (1889–1976), or Maurice Merleau-Ponty (1908–1961), those in the social phenomenological tradition, such as Alfred Schutz (1899–1859), as well as from the neo-phenomenological tradition, such as Hermann Schmitz (1928–2021). Current examples can be found under keywords such as *embodied selfhood/embodied expressivity* (Kontos, 2005), *intercorporeal expression* (Käll, 2017), *intercorporeal personhood* (Zeiler, 2014), *body memory/embodied personhood* (Fuchs, 2020a), *gestural-communicative action* (Döttlinger, 2018, our translation), *therapeutic atmospheres* (Sonntag, 2020, our translation), *disrupted intercorporeality* (Winniewski, 2022), or *situated expressivity* (Dzwiza-Ohlsen, 2021, 2022).

These phenomenological approaches share three premises:

1. Dementias can be understood not only as neurodegenerative *diseases* of the brain but also as psycho- and socio-degenerative *illnesses* of the whole person within his or her lifeworld. Thereby the phenomenological approach represents a counterweight to the often dominant, naturalistic paradigm, which essentially aims at explaining the phenomena through underlying *causalities*. Instead of investigating dementia with a "naturalistic attitude" (Husserl, 1989, 173), it investigates the lifeworld perspective that is characterized by the "personalistic attitude" (Husserl, 1989, 174). This attitude encompasses the emotion, volition, and cognition of embodied persons who stand in a relation of *motivation* to their socio-cultural lifeworld. Like enactivism, all these approaches share the assumption that "experience is not an epiphenomenal side issue but is central to any understanding of the mind, and accordingly needs to be investigated in a careful phenomenological manner" (Thompson, 2016, xxvii). Thereby

the phenomenological method tries to grasp "the structure of lived experience" (Kyzar and Denfield, 2022) and thereby also to facilitate a holistic interpretation of psychopathologies (Stanghellini, 2010). Authors like Fuchs (2020a), Summa (2014), and Dzwiza-Ohlsen (2021) have identified the progressive loss of a meta-perspective as a structural feature of Alzheimer's disease, which links central symptoms. More precisely, this loss is characterized by the reduced ability to reflectively distance oneself from the present situation in temporal, spatial, and social terms through symbolically mediated knowledge. Since two important sources of autobiographical memory, namely episodic and semantic memory (Tulving, 1972), are diminishing; and these are of great importance for everyday communication, not only intra-, but also intersubjective identity constitution is considerably challenged. This condition has already been famously described by Auguste Deter, the first patient diagnosed by Alois Alzheimer in 1905, with the words: "I have, so to speak, lost myself."

2. The phenomenological approaches share the assumption that for full comprehension we need to look beyond the deficits. Here, the embodied nature of our existence is a crucial resource, providing the basis for several arguments in the aforementioned discourse, for example against the revocation of personhood in late-stage dementias (Tewes, 2021). First of all, these accounts share the assumption that the body is not just a "vehicle of the mind" (Fuchs, 2020a, 665), but body and mind form an inseparable unity. Secondly, they utilize a fundamental distinction between the "lived body" and the "living body", with divergent definitions existing. Husserl (1989, 240), for example, differentiates between "Leib", translated as "Body" with a capital b, and "Körper", translated as lowercase b "body," which fits well with the terminology of Plessner and Buytendijk (2017, 80), explaining "Leib" as "lived body" (*lebendiger Leib*) and "Körper" as "living body" (*belebter Körper*). On one side, our *lived body* appears to us within the lifeworld as a double-sided unit, i.e., as an experiencing subject and as an experienced object. Husserl has illustrated this with the example of self-touch (Husserl, 1973, 163). On the other side, the *lived body* becomes the *living body/biophysical body* via naturalistic theoretization in biology and medicine. The living body is the organismic, biophysical side, including the brain as an organ.
3. All these accounts, at least according to our reading, agree explicitly or implicitly that the lifeworld is ontologically primordial. The lifeworld is and will remain the foundation of all sciences, which is why all "scientific models […] are formalized representations of the world" and are "destillations of our embodied experiences as observers, modelers, and interveners" (Thompson, 2016, xxvii). However, this fundamental premise does not conflict with interdisciplinary dialogue between philosophy and the life sciences, but forms the very foundation of such dialogue. Nevertheless, the process of such productive interdisciplinary collaboration in the context of dementia seems to be just beginning. Rather than fighting dogmatic battles, we should remember what Merleau-Ponty had stated in 1945, and 75 years later was quoted in an editorial of The Lancet Psychiatry (2021): "There is no choice between a description of the illness that would give us its sense and an explanation [of the disease] that would give us its cause, and there are no explanations without understanding." For successful medicine, lifeworldly experience and scientific evidence must complement each other as optimally as possible: For example, one may learn to address the lived body also as a living body through technical measurements of vital parameters to inform the embodied practices and overall lifestyle of his/her daily living (e.g., for a more effective training, therapy or prevention).

As a consequence, the perceived discrepancy between natural science's and philosophy's perspective on dementia is less dichotomic than it is often postulated. The phenomenological approach can aid a movement towards a more personalized medicine and extend the focus to include the impact of dementias on more aspects of the life of the affected person than usually addressed and include partners, relatives, caregivers and others. The phenomenological tradition will usually offer a richer and more complete description than the empirical studies. Nevertheless, to unfold its full potential in dementia research, phenomenology must be solidly rooted in the measurable, objectifiable facts. For example, the potential of embodiment to serve as a resource in the context of neurodegenerative diseases is quite different depending on whether we are talking about Alzheimer's dementia, Parkinson's disease, or Amyotrophic Lateral Sclerosis (ALS) and which stage of the disease is in the focus.

## 3.1. Habits as embodied long-term memory

According to the philosophical locus classicus, Aristotle's *Nichomachean Ethics* (2017), habits are the sedimented history of our practices within our social environment. As virtues and vices, they are of central importance for our lifelong pursuit for a flourishing life (*eudaimonia*). Biologically speaking, habits on the other hand are behavioral routines, performed consciously or unconsciously. As such, they are the consequence of associative learning and an expression of a stimulus–response relationship (Robbins and Costa, 2017). Importantly, those habits become detached from the goals to which the action might have originally been directed to. Whereas the reductionistic biological definition thus leaves out important aspects of habits in everyday life (e.g., their value), with philosophy alone we cannot study elementary mechanisms that mediate between organism and environment. We propose a middle ground by the notion of embodied habits and lifestyles from within the idea of the embodied mind in motion.

Embodied habits are emblematic of the unity of body and spirit and prove to be a critical resource in the face of AD. According to Fuchs (2020a, 666) embodied habits can be seen as a kind of individual and implicit memory, "which remains preserved right up to the last stages of the illness, and in which the biographical history of the patient is manifested." This means that these kinds of habits are an essential "form of memory which from birth on integrates a person's past into her present bodily constitution" (*Ibid.*, 669). But these habits do not only have a "deep vertical" biographical meaning (such as hobbies, rituals, sports, etc.), but also a "broad horizontal" relevance

for everyday routines (e.g., brushing teeth, making coffee/tea, dressing and undressing, walking the dog, etc.). We assume that those embodied habits which are vertically deep and horizontally broad are stable and thus can help to sustain health and well-being in times of instability.

Embodied habits form a tacit background of all actions, feelings, and thoughts. They represent a web of pre- or subconscious relations to oneself and the environment and are familiar to me as an intuitive "I-can" (Husserl, 1989, 266). But embodied habits can lose their tacit character through accidents, disabilities, illnesses, and reflection, so that the lived body may become the living body: For example, if my ankle hurts while walking, an arthritis is diagnosed and specific therapeutic measures are initiated, the physical realm steps into the foreground, the disturbed relationship becomes conscious and the subjective unity and stability of the experience is disturbed.

With Kontos (2005), Fuchs (2020a) and Heersmink (2022) one can differentiate several aspects of embodied habits: the procedural, situational, intercorporeal, expressive, and narrative aspect. We briefly explain these aspects, using the example of walking, before we connect them to the notion of lifestyle in Section 4 and use them in an in-depth analysis of dance in Section 5.

The *procedural* aspect entails more or less simple motor sequences and sequences of actions. These range from elementary functions like walking, to more elaborate basic functions like brushing teeth, and finally to complex patterns of, for example, breakfast routines. Procedural habits tend to be very stable and are to a large extent subconscious. Walking upright requires the seamless and constant integration of multimodal sensory information and the adaptive recall of pre-established motor programs.

The *situational* aspect refers to circumstances that elicit certain behaviors. Below this are mechanisms that attract much attention in the cognitive neurosciences (Keum and Shin, 2019). Responding adequately and efficiently to given situations and for planning ahead, being able to recur to pre-formed "habits" in the sense of triggerable response routines offers massive advantages: The cyclist who escapes the opening car door does so by relying on a pre-configured complex, yet flexible response. Bachelard (1964, 92f.) has illustrated the situation-specific yet flexible familiarity of our lived body with the environment by the example of the house we grew up in. Even after years, we intuitively know at which step of the stairs we have to take a larger step in order not to stumble.

The *intercorporeal* dimension can also be illustrated by the example of walking: We synchronize our gait when we walk together and can reach under each other's arms when the gait becomes unsteady. Striking examples of this aspect are couple or group dancing, team sports or the "embodied choreography" in busy pedestrian zones, which seem to glide effortlessly close to each other.

Following on from this, the *expressive* aspect captures a (socioculturally variable) familiarity with individual and collective habits. To stay with the example of walking, each person has an individual or even characteristic gait, which can signal mood and state through nuances of variation.

Finally, the *narrative* aspect emphasizes that embodied habits are highly significant to our identity. In our view, our narrative identity (Schechtman, 1996) is composed not only of episodic and semantic memory, but also of embodied memory. As we will detail below in Section 6, a narrative can be told not only verbally, but also non-verbally based on embodied habits, consciously used in acting and dance.

## 4. Neurobiology and enactivism: lifestyle-based prevention, embodied cognition and brain reserves

With regard to their temporal dimension, prevention and therapy seem to describe two fundamentally different strategies: Prevention aims at the (distant) future, the occurrence of unwanted events is to be blocked or at least altered; therapy, on the other hand, responds to something that has already occurred in the present and which must be dealt with as adequately as possible by rehabilitative means in order to shape the (near) future in the best possible way.

In the case of dementia, however, it is an important question, whether (not only from a lifespan perspective) prevention and therapy indeed describe two fundamentally different strategies. With the rise of regenerative medicine and its concepts, being more attentive to the processes than the mere end results, the distinction becomes less sharp than it is often assumed. The reason is not only that rehabilitative strategies as part of a therapy are often identical to preventive measures, and that preventive interventions might have therapeutic effects on existing pathology, there is also a fundamental relationship and co-development of pathology and the physiological response of the "healthy" rest of the body. In chronic disease, and especially neurodegenerative disease, which can run clinically silent for decades, plasticity and pathology are linked in a way that can only be grasped with holistic perspectives. The disease not only destroys the healthy brain, it also provokes responses from the parts that (initially) remain unaffected.

The concepts behind the key terms of neural or brain reserve, cognitive reserve, brain maintenance, resilience, etc. have been developed to capture the potential for compensation that an organism has in the face of pathological cognitive aging, e.g., in the sense of a positive difference between the actual cognitive abilities and those expected from the age of an individual. These ideas arose from the observation that there was no strict relationship between the signs of disease-causing pathology in the brain and the clinical phenotype observed. While such buffering capacities can be measured in groups of subjects, what actually constitutes the "reserve" is highly individual. In the past years, a large international interdisciplinary consortium spearheaded by Yaakov Stern has developed consensus definitions of reserves (Stern et al., 2019, 2020). While there are still open questions and some remaining disagreements, what has become increasingly clear is that reserves to a large part depend on the activity of the individual, based on the genetic predispositions and within the opportunities that the personal environment offers. Against this background, prevention equals the formation, maintenance and usage of reserves.

Reserves, however, must be "enacted." In so far, the metaphor of a reserve equaling the gasoline reserve tank of a car falls short: the reserve is not a fixed, static and passive entity, but the direct expression of a lived potential and is only maintained through active enactment. By and large the available evidence can be summarized as stating that leading a "more active" life in general and by means of the embodied mind in motion in particular is associated with greater reserves. It is precisely on the ground of this model that reserves, which were initially defined in purely preventive terms, and resources, which were also defined in purely therapeutic terms, meet and merge in a dynamic manner. Practices of individually meaningful movements have a preventive potential because, on the one hand, they help us to build

up cognitive reserves; these reserves allow us to selectively activate habitual resources for longer and at a higher level. On the other hand, they help us to establish habitual resources that carry as implicit foundations the way we think, feel, and act. In effect, a wider range of cognitively stimulating behavior can be sustained at a higher level, because a greater breadth and depth of the autobiographically significant past is available to shape the life at present. Embodied reserves can be maintained longer. Since embodied habits can be reactivated to make autobiographical aspects accessible which are not, or no longer, accessible to declarative long-term memory; and since procedural memory is, and embodied habits are preserved in AD, embodied long-term memory is a crucial resource in AD and other dementias. This means that if embodied habits are biographically significant, they should also have a preventive potential.

Additionally, the situational aspect of embodied habits from the perspective of the lived body and its relation to reserves could be discussed in the future in a broader context with regard to the relation of organism and environment by means of the living body. Experimental studies in animals, complemented by human research inspired by them, have demonstrated that exposure to "enriched environments" results in positive effects across functional domains, and it includes structural changes and improves resilience (Nithianantharajah and Hannan, 2006; Kempermann, 2019). This research points to the central role of plasticity, the bidirectionally causal relationship between structure and function in the brain. While the enriched environment paradigm is reductionistic, the intervention itself remains a "black box" and open to interpretation and experimental specification. The beneficial effects (compared to a rather arbitrarily defined baseline) have been robust to a wide range of concrete experimental settings. This points to the existence of an evolutionarily conserved fundamental principle of how activity in the sense of "acting in the world" shapes the brain and with that its potential for life-long resilience.

With plasticity, we have at hand a fundamental mechanism that captures the embodied interaction of brain, body, mind, and environment. From the perspective of evolutionary anthropology, the logic of this link is: the more we move, the greater the cognitive load and potential for experience, the more we actually learn. We have to make decisions more often–from which we learn, which allows us to better anticipate the future. The greater our predictive powers the better our adaptations to the challenges imposed by our environment, including the consequences of our own actions and the actions of others. This circular dynamic is reflected at several levels of the embodied mind in motion. On the level of the living body, it modulates the interplay between sensory input, motor output, and the processing of both. Sensory inputs, including proprioception and balance, provide a constant and massive flow of input from the moving body to the brain. Additionally, rhythms of neural activity resonate with patterns of physical movement. On the level of the lived body, we experience the positive effect of rhythms (of movement, music, etc.) not only on a subpersonal, but also on a personal level, so that its dynamism and adaptivity permeate all levels of the human lifeform and lifestyle as facets of the (non-shared) environment. It is precisely this dynamic interplay between both levels that is explicitly underlined by the central research findings on reserves and resources in dementia.

However, in order to better bring neuroscientific and phenomenological perspectives into dialogue, we would like to propose enactivism as a "bridging theory". According to the difference between *lived body* (of a subject in the lifeworld) and *living body* (of an organism in an environment), one could utilize the *axioms of enactivism*, as proposed by Evan Thompson, to put the bridge on solid pillars. The first two axioms help us to generalize the findings of the perspectives of neurobiology and evolutionary anthropology on the living body, while the third and fourth axiom help us to integrate the findings from phenomenology and philosophical anthropology on the lived body:

- "First, […] cognition and world are interdependently originated via the living body" (Thompson, 2016, xxvi).
- "Second, the nervous system is accordingly [i.e., as part of the living body] understood as an adaptively autonomous dynamical system." (*Ibid.*)
- "Third, cognition as sense-making is the exercise of skillful know-how in situated and embodied action." (*Ibid.*)
- "Fourth, a cognitive being's world is not a pre-specified, external realm, represented internally by its brain, but is rather a relational domain enacted […] by that being in and through its mode of coupling with the environment." (*Ibid.*, xxvii).

After the first two axioms have been unfolded in this chapter, the other two axioms will be unfolded and discussed using ex-ballerina Marta Cinta as an example.

## 5. Dance, music, and emotion in dementia: movements of expression in action

There is good, albeit sketchy empirical evidence of the importance of dance, music, and emotion in dementias for prevention, therapy and care.

Meng et al. (2020) offered a meta-analysis on the effects of *dance* on global measures of cognition, executive functions and memory performance. A literature review by Klimova et al. (2017) supports the idea that dancing therapy would have positive effects on cognitive, physical, emotional and social performance in dementia. Nevertheless, the majority of studies are based on a rather reductionist understanding of dance. One exception is the study by Kontos et al. (2020), which emphasized the social, emotional and creative dimension with explicit reference to the concept of *embodied selfhood*. Across disciplines, including phenomenology, dance and music are considered to increase the well-being of people living with dementia (Tewes, 2021, 367) and are of particular importance for creating supportive "therapeutic atmospheres" (Sonntag, 2020).

With regard to the therapeutic significance (of the reception) of *music*, a literature review of Bernatzky and Kreutz (2015) encompasses a whole range of positive effects regarding anxiety, attention, depression, apathy, aggression, delusions, agitation, sleep and eating behavior (short and long-term) memory, self-esteem, social behavior, and quality of life. At the same time, these studies, similar to those on dancing, are written in a therapeutic logic, so that the subjective and intersubjective meaningfulness hardly comes into view. Fitting to the basic idea of the embodied mind in motion, a meta-analysis of three studies described a 60% reduction in the risk of dementia when playing a musical instrument (Walsh et al., 2021), while a cohort study on the effect of the frequency of playing music in mid-life on cognition

later in life found that the most active musicians had 80% greater odds of being in the top cognitive decile. Musicians suffering from Alzheimer's disease supposedly keep their skills for a long time, sometimes even remaining able to learn some new pieces. Phenomenological reasoning based on empirical findings suggests that "implicit musical memory (for example developing a liking for melodies heard repeatedly) is preserved much longer than explicit memory for melodies" (Baird and Samson, 2009; Fuchs, 2020a, 671).

With regard to the role of *emotions* in dementia, emotional abilities are retained longer than cognitive ones (Tölle and Windgassen, 2012, 303; Summa, 2014, 484; Fuchs, 2020a, 672). It is widely assumed that persons with dementia can still perceive everyday situations in an emotionally differentiated way and express their emotional state non-verbally, almost regardless of the stage (Deutscher Ethikrat, 2012, 26). So, presumably, musical and emotional skills of persons with dementia are also retained longer than verbally mediated ones. As music can directly speak to both the emotional brain and to the intellect and has a strong social component its fundamental spiritual significance is comprehensible. Additionally, there is a remarkable transfer of positive effects for those engaging in musical training and listening to music (Matziorinis et al., 2022).

## 5.1. The case of Marta Cinta

As the example of Marta Cinta González Saldaña illustrates, there are fundamental connections between music, dance and emotion on the one hand and embodied habits and lifestyles on the other. Marta Cinta has become posthumously famous with a video published on *YouTube* by the NGO "Música para Despertar" (2023).[1] What we know about the ex-ballerina today is that she dedicated her life to ballet, ran a ballet school in Madrid and that her passion for ballet was known to the people around her. She tried to inspire people for ballet, so that she even posed with ballet students from Valencia in the year before her death in 2020 (Süddeutsche Zeitung, 2023).[2]

In the video of 3 min length, Marta Cinta—sitting in a wheelchair and with an advanced stage of AD—performs movements from a choreography of Peter Tchaikovsky's *Swan Lake* that she had danced decades ago. Within the terminology offered by the notion of embodied habits, the music was able to activate her procedural and situative long-term memory. The awakened performance conveys high emotional significance through the rich expressive character of her lived body in motion (i.e., the combination of posture, gesture, mimic and gaze), up to a climactic point, when music, movement and expression are in perfect synchronicity. As much as this was still possible to her, Cinta "analyzes" her choreography afterwards and expresses the intense emotions to her caregiver. What is striking to the observer is that her whole appearance in this moment appears to fully embody the attitude, habitus and lifestyle of the ballerina she had been. Or, to put it another way, Marta Cinta actualizes her narrative identity through performance.

This "performance" is highly moving for the viewers, as evidenced by the high click rates that the video attracted. *Prima facie*, the key question seems to be, to which extent what we see are the unconscious traces of past encompassing memories of both motoric programs and cognitive and emotional contents. Is the performance a reflection of a persistent understanding that just cannot be communicated by other means any more, or has it become an emptied vehicle? Against this kind of (plausible but epistemologically problematic) parallelism/representationalism, Merleau-Ponty's (2005, 209) reflections on the performative nature of speech allow a change of perspective:

> We must recognize first of all that thought, in the speaking subject, is not a representation, that is, that it does not expressly posit objects or relations. The orator does not think before speaking, nor even while speaking; his speech is his thought. In the same way the listener does not form concepts on the basis of signs. The orator's "thought" is empty while he is speaking and, when a text is read to us, provided that it is read with expression, we have no thought marginal to the text itself, for the words fully occupy our mind and exactly fulfill our expectations, and we feel the necessity of the speech.

We could make a similar argument with regard to Marta Cinta's performance. It is not at all the case that cognitive and emotional contents that are represented internally are expressed by embodied movements externally, but rather the embodied performance is the medium of emotional and cognitive content, whose validity we have no reason to question. Performativity, then, is a non-verbal mode through which our narrative identity can potentially unfold. However, this does not exclude the possibility of evaluating the experience and its meaning by means of verbal language. Marta Cinta's documented words to the caregiver are living proof of this argument: first, that she felt strong emotions while performing; second, that this performance is highly relevant to experiencing and nurturing her personality; and third, that despite Alzheimer's, she was still able to perform verbalized evaluation.

Even if these conclusions remain speculative after the singular example, we can still on the basis of empirical findings assume that a high and regular activation of individually meaningful and familiar bodily practices have a great chance of benefiting general cognitive abilities and beyond. Furthermore, building reserves of this kind obviously also means building such a reservoir of experience to be drawn from, when declarative memory and language abilities are already failing. In short, embodiment stands for a fuller notion of memory than what can be put into words.

In some sense, this insight is related to the important yet somewhat blunt notion that for care and therapy, the individual, not the population mean, matters. The reference point becomes intrinsic (even though it includes the social relations) and is not objective evidence derived from large numbers of subjects. Such objectifiable evidence is important for diagnosis and the understanding of the overall condition, but not so much for the appreciation of the individual in its situation.

Remarkably, we can connect these considerations of embodied habits with the concept of lifestyle even from within the phenomenological perspective: Husserl already reflected on the "style of life in affection and action, with regard to the way he [/she] has of being motivated by such and such circumstances. […] The style is […]

1 https://www.youtube.com/watch?v=owb1uWDg3QM&t=22s

2 https://www.sueddeutsche.de/kultur/marta-cinta-ballerina-demenz-1.5115417

something permanent, at least relatively so in the various stages of life […] As a result, one can to a certain extent expect how a man [/ woman] will behave in a given case" (Husserl, 1989, 270). Admittedly, this notion of lifestyle differs from the definition used in contemporary evidence-based approaches in medicine. However, this is not necessarily a disadvantage: After all, lifestyles entail individually meaningful ways of embodied movement practices, which can be better understood with the help of phenomenology, i.e., exploring its subjective and intersubjective experienced meaningfulness. Potentially, a phenomenologically enriched notion of lifestyle could (help to) bridge what we have called a "subjectivity gap" (Kempermann, 2022) in intervention studies, i.e., the gap between subjectively perceived quality on the one hand, e.g., the joy or dislike of exercising, and the objectively measured quantity, e.g., the VO2max., on the other.

The tacit nature of habits is a good example of how the quality of experience may noticeably change without us being able to clearly articulate this change or measure it. Along the general theory of habits by Husserl, affective (life) styles and habits have the following four features: (1) They shape the way what and how we perceive, judge, and value. (2) They can become attitudes, like in optimism or pessimism, guiding the way we evaluate, judge and decide. (3) They can become embodied in movement, expressivity, clothing, etc. And (4), they are crucial for intersubjectivity, especially empathy, allowing the anticipation of personalities and communities.

In Marta Cinta we might see an ideal example of how an individually meaningful and lifelong cultivated embodied practice fulfills these features. We can assume that ballet has profoundly shaped the way Marta Cinta (1) perceives, judges, and evaluates (including but not limited to, what music is particularly meaningful to her and touches her emotionally); (2) what she evaluates, expects, and discovers according to what criteria (e.g., the critical evaluation of a ballet performance by her former students); (3) how she dresses, makes up, does her hair, and acts (in order to further correspond to her ideal of a ballerina at an advanced age); so that (4) those around her know which activities, topics, and manners she values most. In other words, she literally embodies the subjective component of a life with dance, which can never be captured by the objectifiable effects of taking up dancing as a health behavior. From a scientific, medical, or public-health point of view, the implication obviously cannot be that everybody has to become a ballerina in order to obtain these benefits. Rather, the challenge lies in the fact to empower people to develop their own "Cinta-potential" within and through their lifeworldly body–mind activities. Which body–mind activities can concretely elicit this potential will vary greatly between individuals. The potential lies in anything that keeps the profound link accessible, so that it becomes the foundation of preserved quality of life. Items on prevention checklists do not tend to do this.

We emphasized in Section 3 that embodied habits bear a "deep vertical" significance for personal identity and "broad horizontal" significance for everyday ability. The example illustrates that the lifelong devotion to an embodied, highly meaningful practice formed an intra- and intersubjective identity (deep verticality), which is of huge relevance for carrying through everyday life, especially one would assume, in the reductions of care environments (broad horizontality). The case of Marta Cinta makes us understand that personal identity is deeply rooted in the integrity of the relationship between body, mind and environment. Herein it matches exactly with the third axiom of enactivism, deeply changing the way we understand human cognition: "Third, cognition as sense-making is the exercise of skillful know-how in situated and embodied action" (Thompson, 2016, xxvi). Especially in late-stage dementias, this embodied perspective is of importance for the preservation of identity: "To be embodied means to be situated and oriented towards a field of experience as this body, as *this* history, *this* point of view; and *this* unique personal orientation conveyed by the lived body still exists" (Fuchs, 2020a, 670). With this in mind, Marta Cinta's example is symbolic of what might be said, echoing the famous words of Auguste Deter: "I have, so to speak, preserved myself."

These considerations make it clear that, on the one hand, personal identity–also in the case of Auguste Deter–can never be completely lost due to the embodied and embedded nature of cognition. On the other hand, neurodegenerative diseases, such as Alzheimer's dementia, affect higher cognition to such an extent that those affected can no longer follow the path of identity formation by means of their declarative memory. This is exactly what Auguste Deter expressed and Marta Cinta will not be exempt from this either. Admittedly, the situations in which the ballerina's lifestyle unfolds do not coincide with her life as a whole, although in this case they permeate each other particularly strongly on the basis of her embodied and embedded narrative identity. Therefore, in the sense of broad horizontality, it can be assumed that the ability to cope with everyday life is maintained at a higher level by both before and after the onset of symptoms. Finally, these considerations are vital for an interdisciplinary dialogue: it is not just about personal identity (which is what philosophers typically focus on) nor just about functional preservation (which is what medicine focuses on).

To sum up, while the unity between brain, body, mind, and environment can never completely dissolve, neurodegenerative diseases profoundly alter the integration of these elements. The embodied mind in motion model helps to capture the essence of this relationship, its endangerment by dementia and its potential for preservation through leading "a flourishing life."

## 6. The epistemological and ontological shift of the *embodied mind in motion*

By recognizing the expressive dimension of the embodied mind in motion within our sociocultural lifeworlds, the ground is taken away from numerous intrusive dualisms. Embodied expression is fundamental for communication and interaction. At this point, however, there is a gap. On one hand, non-verbal expression in dementia receives increasing attention, given the loss of verbal expression in the course of the disease, on the other hand, there is a lack of theories that capture embodied expression as we experience it in our social interactions in the lifeworld. This gap has already been addressed by an interdisciplinary essay from the biologically oriented philosopher and sociologist Helmuth Plessner and the philosophically oriented biologist and physiologist Fredrik J. J. Buytendijk, which appeared in 1925.

The achievement of Plessner and Buytendijk lies in a theory that unfolds the intersubjective dimension of the lived body from a lifeworld perspective. The lived body creates an "intersphere" (Plessner and Buytendijk, 2017, 88) between person and sociocultural environment which is also characterized as a "sphere of behavior"

(*ibid.*, 129). This sphere is indifferent to dualisms like "sensuality and spirituality, physis and psyche, objectivity and subjectivity" (*ibid.*, 89). From a lifeworld perspective "we do not perceive a body-object whose movements lead us to infer an 'inhabitant' hidden in the brain like in a capsule" (Fuchs, 2020a, 667). Embodied movements are a means of lifewordly communication and interaction sui generis before these dualisms arise.

This does not mean that we would always immediately understand the respective *content* of the embodied movements, but rather that this always requires a context in each situation (Plessner and Buytendijk, 2017, 125–129), varying, for example, with regard to age, culture, or species. More fundamentally, the approach acknowledges that we are in a direct communicative relation with our social environment by the *mode* of embodied movements. Embodied movements are characterized by "sensefulness and understandability" (*ibid.*, 81) articulated as "body-intentionality" (*ibid.*, 122). Finally, body-intentionality realizes itself between the poles of "movement of action" and "movement of expression" (*ibid.*, 91) in a constant interplay with a socio-cultural environment. This is why the authors (*ibid.*, 79) speak about the "environmental-intentionality of the lived body." In dementia, this intersphere probably fades much later than the ability for verbal expression.

This means that we rather immediately understand the meaning of the lived body's expression. If a person limps and contorts the face in pain, we do not reflect at length on the mental state on which this expression is based but simply respond by helping. Nobody would question the trueness of the emotion in a laughing or crying infant. This intuition should also guide us in the case of adult persons with communicative limitations.

Looking at Marta Cinta from this perspective we do not have to ask ourselves what she might actually perceive, feel and think. We immediately grasp the sense of the embodied movements, when she begins by undulating her hand in resonance with the music, several times raises her fingertips quickly and slightly towards her caregiver to turn the music louder. Her head drops in discouragement, when she does not seem to "get in". The caregiver gently clasps her hand and kisses it so that, thus encouraged, she begins her performance. This all only makes sense in the situation of performing and of being seen by others, and probably no one would doubt that these movements are carried by the sense of a choreography.

It is precisely this familiarity with embodied expression on all sides of the involved parties that is Kontos' (2005) crucial argument to overcome dualistic, reductionist and constructivist concepts in the discussion of dementia. The example of Marta Cinta demonstrates that in "contact with others, bodily modes of expression and behavior become more important than cognitive powers and the mostly diminished or fragmented speech acts" (Fuchs, 2020a, 670).

Not acknowledging this lifeworld perspective also results in epistemological dualisms. Either the *body–mind* problem arises, i.e., how between a thinking substance (res cogitans) and an extended substance (res extensa) can be mediated. Within this logic, embodiment appears as a "connecting cable between subject and object" (Plessner and Buytendijk, 2017, 113), which is why we then need complicated theories to understand the nature of the "cable" (for example, through theories of simulation, representation, or empathy). This classical dualism provides the background of what enactivism tries to overcome, as the fourth *axiom of enactivism* expresses: "a cognitive being's world is not a pre-specified, external realm, represented internally by its brain, but is rather a relational domain enacted […] by that being in and through its mode of coupling with the environment" (Thompson, 2016, xxvii).

However, as Fuchs (2020b) has defined the "lived body" as experienced from the first-person perspective of the subject, and the "living body" as object from the third person perspective, the dualism might now become the *body–body* problem (Hanna and Thompson, 2003), i.e., how lived body and living body can be mediated. In contrast, we assume with Plessner and Buytendijk that in our lifeworldly communication and interaction we constantly switch back and forth between first-personal and third-personal perspectives on the ground of the second-personal perspective. Contrary to what Fuchs (2020b, 2f.) suggests, the example of the physician's attitude toward the patient cannot be reduced to a mere objectivation from a third-person perspective; more precisely, a visit to the doctor illustrates that all perspectives—lived body/living body, first-personal/third-personal, personalistic/naturalistic—constantly intertwine and inform each other within the framework of a dialogical second-person perspective. Or in other words: The lived body is to be thought intersubjectively in the face-to-face-encounter. As a result, the lifeworld approach can lead to a fundamental change in perspective which is of high relevance for our communication and interaction with people with dementia in particular and communicative limitations in general. It can also inspire more realistic frameworks for health behaviors, prevention, care and therapy.

## 7. Discussion and perspective: a call for interdisciplinary movement research

In this article we have brought phenomenological and neuroscientific perspectives into dialogue, revolving around the embodied mind in motion. In light of dementia being one of the significant global challenges, we thoroughly examined and discussed the vital role of the embodied mind in motion in promoting both preventive and therapeutic benefits for health, well-being, and a flourishing life.

Although there is now well-established evidence for the enormous effect of moderate physical activity on health in general and successful aging in particular, the potential of this prevention strategy can only be unfolded if it is incorporated into the lives of the people as literally a true lifestyle in the sense of how to live a good life. This need for subjective meaningfulness as a main factor with regard to the probability of enduring implementation of health behaviors is indicated by empirical studies on holistic activities like hiking, yoga, playing a musical instrument, and dancing. Such evidence is deepened by phenomenological reflections on embodied habits and linked to the philosophical question of identity in progressive dementia. Moreover, plasticity as the structural relation between body, mind and environment offers mechanistic insights into the dynamics of embodied prevention. The *embodied mind in motion model* offers a framework for a comprehensive interpretation of the link between movement, cognition and environment, building upon well-established and -studied neurobiological bases, but with the help of phenomenology, enactivism, and anthropology beginning to conceptually fill the black boxes of, for example, the studies on environmental enrichment. In addition, we suggest that a phenomenologically enriched notion of lifestyle as embodied habits

could be able to bridge any "subjectivity gap" in lifestyle intervention studies. Finally, the emotional dimension of embodied habits in general and embodied expressivity in particular and its significance for therapy and care was unfolded using the example of the ballerina Marta Cinta. With regard to expressive movements, non-verbal expression has to be researched much more intensively than has been the case so far (Döttlinger, 2018). New measurement techniques and settings have to be used or developed, e.g., using eye tracking, video recordings, wearables or smartphone-based sensors. Furthermore, a reevaluation of institutional care is imperative, aligning with the "transformational shift" proposed by Kontos (2005, 565). The prevalent health-oriented model of institutional care, which often creates a discord between freedom and security, needs to be expanded to incorporate a eudaimonistic-oriented approach. Such a model would provide the essential framework for individual needs, desires, and values to flourish through personally meaningful movement practices within their sociocultural environment.

However, it is important to point out some limitations of the philosophical concept of embodied habits as a resource: first, since these embodied resources also rely on the structural integrity of the brain, the potential of this resource, too, gradually diminishes in later stages of dementia-related illnesses; second, it also becomes clear (again) that conceptual considerations and empirical findings must complement each other. Although the findings presented here have a high face validity for Alzheimer's dementia, this approach would still need to be evaluated with regard to other neurodegenerative diseases, such as Parkinson's, frontotemporal dementia or ALS as well as to secondary neurodegeneration after stroke or infection. The degree to which physical integrity and cognitive performance may be decoupled is particularly impressive in ALS, where in the locked-in state communication and expression is reduced to eye movements. As long as the ALS patients do not suffer from cognitive deficits, which happens in certain forms of the disease, they still maintain a rich inner life and even a surprisingly large quality of life. This subjective quality of life tends to be greater than estimated by the care-givers and relatives (Aust et al., 2022). Thirdly, the preventive perspective continues to be of fundamental importance, but the central task at the level of individual biographies is to develop the Cinta-potential and thus to build up reserves in a targeted manner. This article offers some pointers to how this could be done more successfully.

## Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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# The monoid-now: a category theoretic approach to the structure of phenomenological time-consciousness

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Human consciousness is characterized by constant transitions in time. On the other hand, what is consciously experienced always possesses the temporal feature of "now." In consciousness, "now" constantly holds different contents, yet it remains "now" no matter how far it goes. This duality is thematized in Husserlian phenomenology as "the standing-streaming now." Although this phrase appears contradictory in everyday language, it has a structure that can be clearly understood and formalized. In this paper, we show that this structure can be described as a monoid in category theory. Furthermore, monoids can be transformed into the coslice category, which corresponds to the way of perceiving present moments as juxtaposed in succession. The seemingly contradictory nature of the "now" as both flowing and standing can be precisely structured and comprehended through the monoid, while the perspective of the "now" as discrete points on a timeline can be effectively formalized using the coslice category. This framework helps us more precisely understand the differences between ordinary consciousness and meditative consciousness, specifically the experience of the "eternal now." We illustrate how the meditative states of consciousness presented in the early Buddhist scriptures (Pali Canon) and Dōgen's *Shōbōgenzō* remarkably reflect a monoid structure.

KEYWORDS

**time, consciousness, phenomenology, category theory, monoid, Husserl, time-consciousness, meditation**

## 1. Introduction

"Time" has played an important role in human recognition of the self and the world, which has developed since ancient times, especially in philosophy and religion. Among the various theories of time developed in history, Edmund Husserl's phenomenology provides a unique interpretation of how time is experienced. In the current paper, we focus on the fact that the twofold meaning of the present and the structure of time-consciousness based on it, which are discussed in Husserl's phenomenology, seem to have a kind of mathematical structure. Given that, a certain formal expression may be possible using "category theory," a new type of mathematics that did not exist in Husserl's time. This paper will try to pursue this possibility. Furthermore, based on such a mathematical, category-theoretic interpretation of time-consciousness, we will show that the Buddhist view of reality based on meditative experiences is also very compatible with a category-theoretic approach to structuring temporal reality.

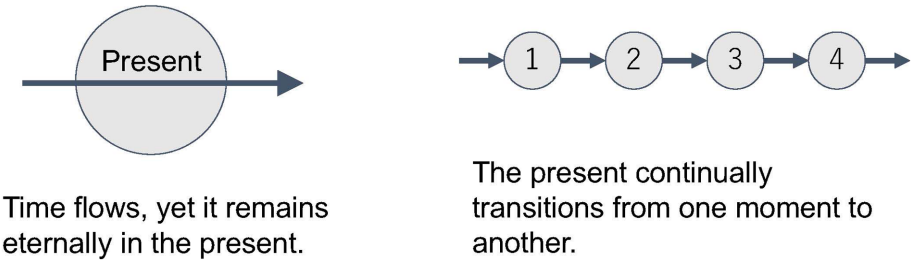


FIGURE 1
The twofold meaning of the present.

The aim of this paper is not merely to present a new interpretation of Husserl's theory of time-consciousness, but to provide a phenomenological understanding and mathematical formalization of time experience itself. We will pursue this objective with the support of analyses of time and temporalization from Husserl, Kitarō Nishida, and Dōgen. One possible implication of our framework would be to offer insights into comprehending standard and altered experiences of time.

## 2. The twofold meaning of the present

In phenomenology, time has been an important topic of investigation. The phenomenological approach to time is characterized by its concern with time as lived through (experienced) subjectively, as distinguished from objective time (Husserl, 1992). We are particularly interested in the concept of "standing-streaming present" (*stehend-strömende Gegenwart*), which is discussed in Husserl's late theory of time (Held, 1966; Husserl, 2002, 2006; Kortooms, 2002). According to it, the present has a twofold meaning.

(1) On the one hand, what we experience is always "now." Whatever we experience, it is always experienced in the present. As St. Augustine said, the past is experienced as memory in the present and the future as expectation in the present (Augustine, 2006). Husserl refers to the present in this sense as the "nunc stans" or the "standing 'present,'" but he notes that the term "present" is not entirely appropriate here, as it usually pertains to a time modality (a single moment within the structure of "past, present, and future"), which is constituted in the "present" in the former sense (Husserl, 2002, p. 384).

(2) On the other hand, each "now" is different. What you experience "now" will soon pass away and the next "now" will appear. You might think that these are merely different *contents* passing through the same *form* of "now." But what has passed retains the meaning of the "now that was once experienced." If "now" is reduced to only one form, then it becomes impossible to distinguish between separate nows, such as "the former now," "the actual now," and "the coming now." The fact that we can refer to different nows demonstrates that the concept of "now" cannot be reduced to a single form, but consists of multiple moments that are inseparable from the content of each now. Time can be represented as such a continuous transition from moment to moment (Figure 1).

In this way, the concept of "now" or "the present" is established in a way that cannot be reduced to a single moment or a multitude of moments, but possesses both characteristics. In other words, the present is passing, yet not passing; it is different, yet remains the same. Saying it in this way, it sounds like we are simply abusing contradictory expressions. However, the twofold meaning of the present here has a rather clear structure and can be expressed without contradiction if the appropriate method is used. In fact, in our everyday life, we accept the above-mentioned twofold meaning of the present quite naturally without question. It is included in our obvious understanding of time without any sense of discomfort.

Such a very basic structure of experience, so basic and obvious that we do not usually need to mention it, often sounds contradictory when expressed in natural language (which is why philosophy often seems to play with contradictions to those who do not share the understanding of the issues with philosophers). To describe such very basic structures, category theory, which formalizes basic structures in general, seems to be more suitable than natural language (at least in particular cases). In the following, we will attempt to express the above-mentioned twofold meaning of the present using category theory, in particular, the "monoid" and the "coslice category."

## 3. Category and monoid

### 3.1. Category

Let us briefly explain the notion of category.[1]

A category is a system consisting of what are called "objects" and "morphisms," and it satisfies the following conditions, which are called the axioms of category theory. In the following, we will describe each condition and then provide an intuitive explanation, followed by remarks.

**Condition 1.** For each morphism, an object called its "domain" and an object called its "codomain" are determined.

**Intuitive explanation.** For intuitive understanding, it is recommended to interpret objects as "things," "events" or "phenomena," and morphisms as oriented "relationships," "processes" or "transformations" between objects. Consistent with this intuition, when the domain of a morphism f is A and its codomain is B, we write f as a morphism from A to B, and say that f is a "morphism from A to B." Note that there may be many other "morphisms from A to B" other than f (Figure 2).

1 The explanation of this section is based on Fuyama and Saigo (2022).

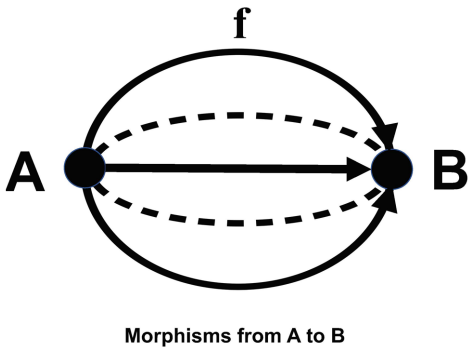


FIGURE 2
Morphisms.

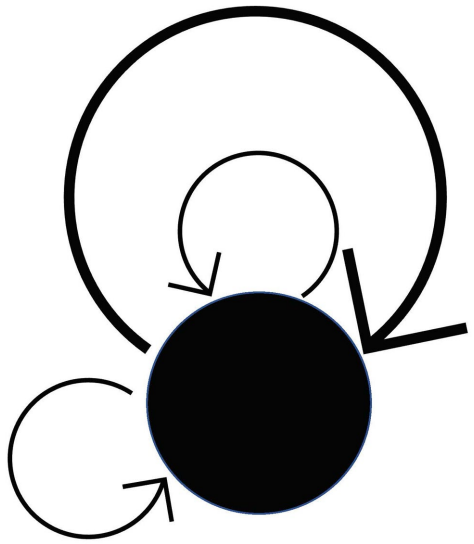

FIGURE 3
Endomorphisms.

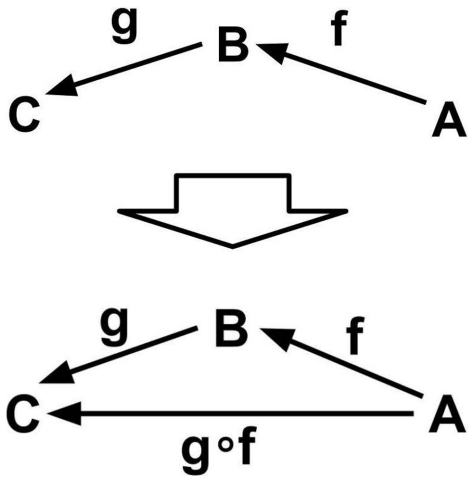


FIGURE 4
Composition.

**Remark.** However, there is no need to be bound by the above intuition (because anything that satisfies the axioms is a category). A system that satisfies Condition 1 (when the "whole" of objects and morphisms is a "set" in axiomatic set theory) is called a "directed graph." For general directed graphs that are not categories, the terms "vertex," "edge," "source" and "target" are used instead of the terms "object," "morphism," "domain" and "codomain." Note that the domain and the codomain may coincide. A morphism in which the domain and the codomain coincide (like a "loop") is called an endomorphism (there can be many endomorphisms) (Figure 3).

**Condition 2.** An (ordered) pair (g,f) of morphisms is said to be composable if the codomain of the morphism f coincides with the domain of the morphism g. For a composable pair of morphisms (g,f), there is an operation ∘ called "composition" that makes the morphism g∘f called the "composite of f and g." The domain of g∘f coincides with the domain of f, and the codomain of g∘f coincides with the codomain of g (Figure 4).

**Intuitive explanation.** For example, if f and g are "processes" and the "final state" (codomain) of f and the "initial state" (domain) of g are the same, we can think of the "composite" g∘f as a "connected process," and the operation "composition" as the operation of "connecting" processes (morphisms).

**Remark**. Note that if the codomain of one morphism does not match the domain of the other morphism, the composite morphism is not defined. Composition of any pair of two morphisms is always possible only when there is only one object, because only in this case, the domains and the codomains of the morphisms are the same without exception. A category with only one object is called "monoid" (when the "whole" of objects and morphisms is a "set" in axiomatic set theory), which we will focus on in the next subsection and which will play a crucial role in the paper.

**Condition 3 (Associative law).** For any morphism f,g,h such that (h,g) and (g,f) are composable, $(h \circ g) \circ f = h \circ (g \circ f)$ holds.

**Intuitive explanation**. In short, "the order of parentheses does not matter." If we think of morphism as a "process" and composition as an operation that "connects processes" (just connects them without doing anything additional), it is a condition that naturally seems to hold.

**Remark.** However, general operations do not always satisfy the above condition ("associative law"). For example, $(5+3)+2=5+(3+2)$ holds but $(5-3)-2=5-(3-2)$ does not. It can also be seen that the associative law demands that composition be a "fairly simple type of operation," such as "just connecting processes."

**Condition 4 (Unit law).** For each object A, there exists a unique morphism $1_A$ whose domain and codomain is A which satisfies "$1_A \circ f = f$ for any morphism f whose codomain is A" and "$g \circ 1_A = g$ for any morphism g whose domain is A." Morphism $1_A$ is called the "identity morphism" of A (Figure 5).

**Intuitive explanation**. Each object corresponds to an identity morphism, which is a morphism that "does nothing" (a morphism that plays the role of "1" in multiplication). Due to this condition, we can "identify" each object with its identity morphism (Figure 6). In other words, this condition makes it possible to think of objects as just a special kind of morphism.

**Remark.** The part of condition 4, "unique" is actually unnecessary. This is because if it is guaranteed that the identity morphism exists, the "uniqueness" of such a morphism for each object holds automatically. (To prove this is a good exercise of category theory.)

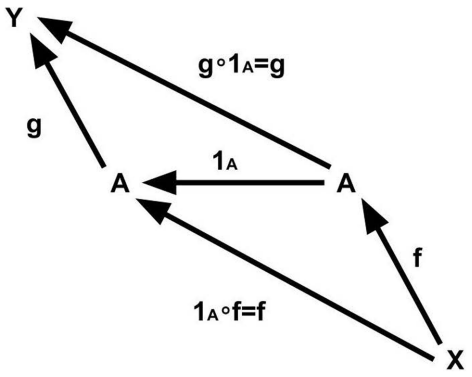


FIGURE 5
Identity morphism.

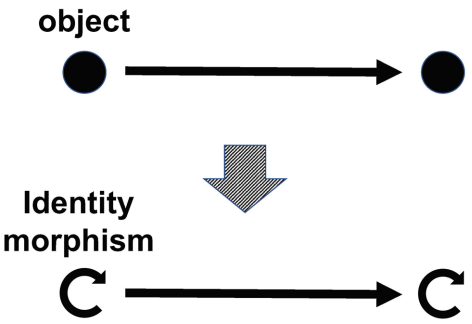


FIGURE 6
Object = identity morphism.

Note that although there is only one identity morphism for each object, there can be an infinite number of endomorphisms.

## 3.2. Monoid

A category with only one object is called a monoid. (See also the remark for condition 2 in the axioms of category theory). Since there is only one object, any two morphisms of a monoid are composable. In other words, composition becomes a "dyadic operation" of morphisms. (Note that every morphism in a monoid is an endomorphism by definition, as it is easy to see from Figure 7[2]).

As a simple example, let us define a monoid whose unique object is a point p in the space E and whose morphisms are all the paths (loops) in the space E from p to p. Although point p itself has no structure, the monoid defined above contains rich structures and captures the information of the structures of E viewed from the perspective of point p.

Let us take another example. The set of all natural numbers can be thought of as a monoid where every natural number is a morphism,

2 This is the same as Figure 3, but since monoid consists of only one object and endomorphisms, it can be illustrated by the same figure.

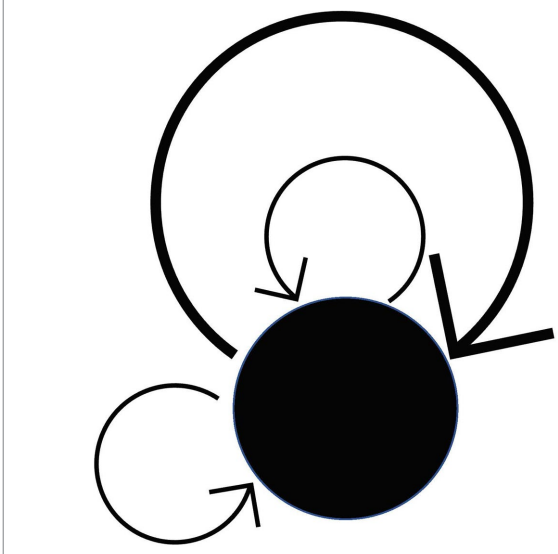

FIGURE 7
Monoid.

the number 0 is the only object (recall that an object can be identified with the identity morphism), and composition is addition.

Note also that any group is a monoid. The concept of monoid is a generalization of the concept of group. Readers may find it interesting to try to give other examples.

## 4. Monoid and the structure of time

Now, we are ready to interpret the structure of time in terms of category theory. In this section, we will demonstrate that this idea is compelling.

The monoid is a very primitive structure and can be found in many places. The examples in mathematics are too numerous to list, and in the real world, as well, there are often structures that develop and constantly return to the same state, which have a monoid structure. Time is one such structure. Time consists of processes, whose beginning is the present, and whose end is also the present. Thus, time can be said to have monoid-like characteristics, since the processes in time are always "processes from now to now."

We pointed out with Husserl that the present in time has two different characters simultaneously: the standing and the streaming. The monoid beautifully formalizes this structure. A monoid consists of a number of morphisms, all of which represent the flow of time. The continuous unfolding (or the extension) of the present can be expressed by these morphisms. On the other hand, all morphisms of a monoid come from the same object as its domain and end up in it as its codomain, which can represent that temporal flows are perpetually standing in the same place (*nunc stans*). In short, the streaming aspect of the present corresponds to the various morphisms of a monoid, whereas the standing aspect corresponds to the unique object of the monoid. In this way, a monoid effectively captures the structure of the present, encompassing both its standing and streaming aspects (Figure 8).

Time has also the structure of *modification*, in which the "present" that has already flowed away can be experienced as "being past." The

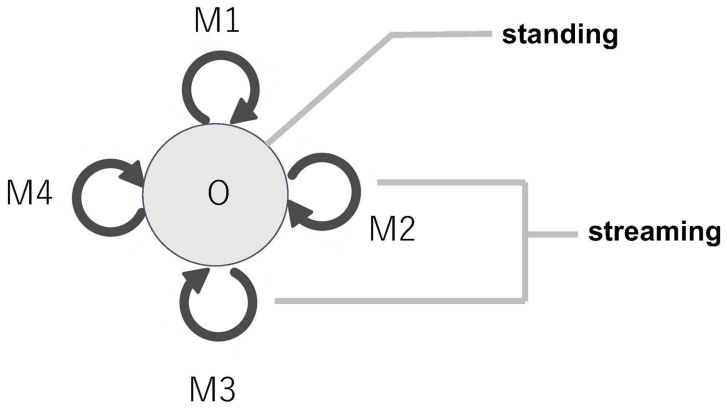


FIGURE 8
Representation of the standing and streaming aspects of the present within a monoid structure.

"past present" is a temporally modified present. How is this structure represented in a monoid? We can focus on the *composition* of morphisms. Given that the morphisms of a monoid are composable, and that the result of such composition is also a morphism of the same monoid, the structure that preserves multiple pasts in the same standing "present" is implied in the monoid structure.

Some may argue that the structure of time does not align with the structure of the monoid because each present is a different present (each present is distinct from the others). However, when we think of each present as a "different present," this view is already a result of certain objectification, abstraction, and spatialization. In such cases, we look at the present not from the standpoint of "living through" it, but rather as if multiple presents were lined up side by side in front of us. Of course, this view is not inappropriate in all respects, but it is a higher-order view derived from the most basic view of the present. This derivative view will be discussed later in this paper using the term "coslice category." In contrast, the most basic structure of time is considered to be a monoid-like one, i.e., consisting of processes that constantly move from the same to the same.

We may further respond to the above objection as follows. Suppose time is made up of different presents. In this case, it becomes a difficult problem to explain how these different presents can be integrated into a single time. However, in fact, time is naturally united as a single stream. On the other hand, if there were only one static present, there would be no time. Therefore, it is natural to think of time as a process, but simultaneously as "coming back to the same place" in some way. At least when we consider experiential time, we cannot help but say so because, as we already said, time, in its constant motion, remains both the same and different simultaneously.

Next, we can further support our interpretation by noting that the descriptions of time by some philosophers naturally remind the nature of the monoid. Husserl attempted to conceive of time with such a primitive concept. The concept of "standing-streaming present," which we have already mentioned, seems to express precisely the monoid-like "process of continually returning to the same place." Kitarō Nishida, a modern Japanese philosopher of the Kyoto School, likewise speaks of the "eternal now," which also expresses the monoid-like nature of time as a process of continually returning to the present (Nishida, 1948, p. 181–232). While these expressions may appear inherently "contradictory" in everyday language, it is possible to consider that both Husserl and Nishida had a highly clear structure in mind. When attempting to express these ideas in natural language, however, the resulting expressions inevitably appear "contradictory" and even mysterious.

In the time of Husserl and Nishida, of course, category theory did not yet exist. However, Nishida attempted to express the structure of the self using the concept of "group," which today is considered a special case of monoids,[3] and it is quite possible that what he was describing in his "contradictory" expressions was based on intuitions that could be called mathematical. (Nishida originally attempted to become a mathematician.) Husserl started out as a mathematician, and his arguments often contain statements that suggest a mathematical structure. If category theory had existed during the time of Husserl and Nishida, they might have readily embraced the idea.

For example, the following statement by Nishida may seem less paradoxical when read with the idea of monoid structure in mind.

> Time disappears everywhere and is born everywhere as the self-limitation of the eternal now. Therefore, time touches the eternal now at each moment. It can be said that time disappears moment by moment and is born moment by moment. Time can be thought of as a continuity of discontinuity. (Nishida, 1948, p. 342; our translation)

At first glance, the statement "time touches the eternal now at each moment" may sound mystical. However, when we consider the

3 At that time, the concept of monoids had not been established, and the formulation of groups was more complex because category theory did not exist.

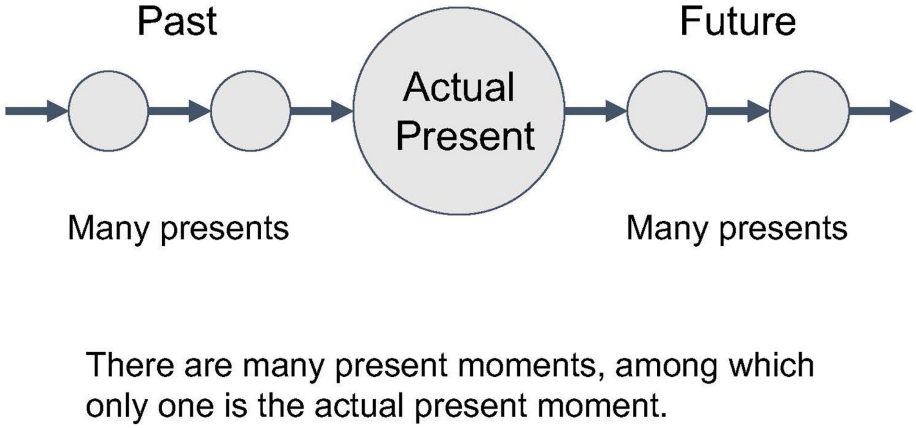


FIGURE 9
The actual present within a multitude of present moments.

monoid's characteristic of "always coming back to the same no matter what operation is performed," the former statement seems to convey essentially the same idea as the latter. There is nothing mysterious or contradictory about the "continuity of discontinuity" if we think of it in terms of the structure of the monoid, in which each morphism of the monoid is a different one, but all are connected through the same object. What Nishida was trying to say may have been something very simple but difficult to express in everyday language, as is often the case with the monoid concept.

Finally, we would like to emphasize the significance of formalizing the structure of experience, particularly that of time-consciousness, using category theory. A monoid is mathematically very simply defined, but it sounds contradictory in some cases. As examples, we can consider statements such as "there can be an infinite number of morphisms from one object to itself," or "every morphism goes from the same to the same, but they are all different." If these expressions seem strange, it is likely because when the morphism is understood as a "relation," people tend to think that there is only one morphism from object X to object Y. The notion of "relation" is often thought to be reducible to a pair of relata. (Even in mathematics, a relation on a set is defined as the set of pairs of relata belonging to the set.) However, the morphism in category theory is not of the kind that can be reduced to such pairs of relata. Therefore, of course, there can be innumerable (or sometimes no) morphisms from X to Y. In particular, there are innumerable morphisms from X to X. By definition, there are identity morphisms, but there can be any number of other morphisms. This diversity is the source of the mathematical interest in the concept of a monoid.

In short, what is being revealed here is something richer than the concept of a mere "relation," which cannot be simply reduced to a mere "pair of relata," and this something may indeed be closer to our actual experience.[4] It is not that the monoid in category theory coincides with the structure of our experience of time by chance, but it is because the morphism of category theory expresses a rich dimension that falls outside the scope of the simple concept of relation, as we have just described. It matches the very basic structures of experience and reality, which normally can only be expressed in a contradictory manner.

## 5. Modification: from monoid to coslice category

In the next step, we will focus on another aspect of the experience of time and try to formalize it using another type of category: Coslice category. Different from the "monoid perspective" of time, which represents the fundamental dimension of time experience that is hard to describe, we can also talk about time in a more "rationalized" manner. Fundamentally (or, from a monoid point of view), we can say that time consists of a present that is different in each moment and always the same. On the other hand, however, we can also consider each present as a separate object, and among such "many presents," the "actual present moment" as a special present. In this case, unlike when viewed from a monoid perspective, there is no particular contradiction, since the present is being viewed as a "multiplicity of objects" (Figure 9).

In Husserl's phenomenology, such a view of time is described in terms of *modification*. The term "modification" is also used in a very basic and universal sense; for example, the present moment (primal impression) is "retentionally modified" and loses its living actuality. It transitions into the immediate past. This continuous transition is called "retentional modification" (Husserl, 1992). We can assume that this corresponds to morphisms and their compositions in category theory. However, what we would like to focus on here is a more global structural modification. That is, the view of the present moments as a series of distinct objects is already different from the way we experience time in the midst of the actual time experience itself. We do not see the ever-changing present as individual (discrete) objects in the latter case. It is always experienced as the same present, even though it is constantly changing. Therefore, we can speak of a "modification" from such a more fundamental experience of time to an experience that objectifies time, in which the mode of experience changes.

Let us consider how to formalize this "modified" experience of time using category theory. In this type of time experience, multiple

4 Taguchi (2019) describes the rich reality beyond such relations as "mediation." "Mediation" is more than relation, and the Japanese philosopher Hajime Tanabe describes it as "connecting by cutting" (Tanabe, 1963a, p. 335, Tanabe, 1963b, p. 486). In other words, "mediation" is a concept that includes both difference/disconnection and connection/relationship, and reality is considered to consist of such "mediations" in the most basic sense.

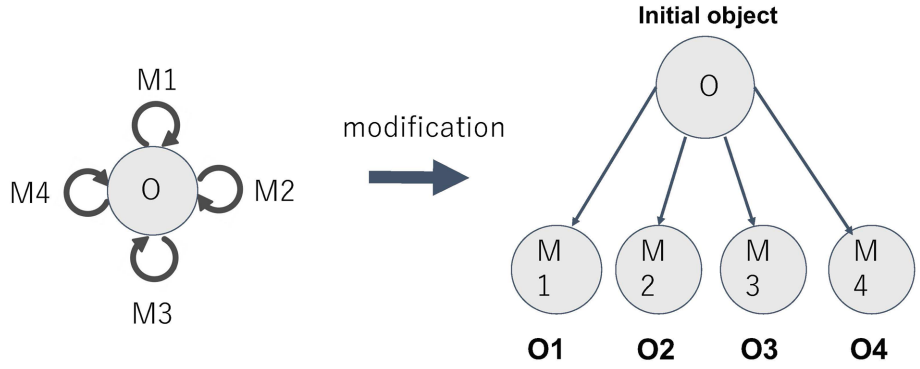


FIGURE 10
Relationship between monoid and coslice category.

presents are differentiated and juxtaposed. This differentiation corresponds to the fact that the various morphisms of a monoid are differentiated. In other words, the individual presents, observed in juxtaposition in the "modified" experience, can be viewed as objectified forms of the various morphisms of the monoid. Here we need to focus on a certain construction that plays an important role in category theory: the construction that creates a new category by focusing on a certain object of the original category and seeing the morphisms from it as objects. This new category is called the coslice category. The operation described above called "modification" can be expressed as an operation to construct a coslice category from a monoid.

As already mentioned, the monoid is a category that has only one object. On the other hand, there can be any number of morphisms. By taking those morphisms as objects, we can construct a coslice category. In this case, since the monoid has only one object, the coslice category is uniquely determined. The unique object in the monoid can also be regarded as a special type of morphism, i.e., the "identity morphism," and thus, it is also included in the coslice category as an object. This becomes a special type of object, called an "initial object," in the coslice category (Figure 10).

Returning to the discussion about time, the unique object of the monoid corresponds to the present when we say that "the present is always present." On the other hand, the various objects in the coslice category correspond to the presents viewed as juxtaposed, and the initial object of the coslice category corresponds to the objectification of the "actual present currently being experienced." Although this objectified "actual present" still retains a special meaning, it is merely *a present* taken in juxtaposition with various other presents. (In this sense, it differs from the standing "present," which is conceived as the unique object of the monoid, i.e., the identity morphism.) This view fits very well to the formalization of the modified time experience through coslice category.

Let us quote some passages from Husserl's late research manuscripts to further explore the meaning of the modification from the fundamental to the objectified view of time. Husserl speaks of "standing-streaming self-present (*Selbstgegenwart*)" as the "primal phenomenon in which everything else that may be called phenomenon in any sense has its source" (Husserl, 2006, p. 145). He also talks about "the sphere of the primal temporalization, in which the first and primally welling meaning of time appears—time just as living streaming present. All other temporality, whether subjective or objective—whatever sense these words may have—receives its sense of being and its validity from it" (Husserl, 2002, p. 187; see also Husserl, 2006, p. 1–3, 40).[5] Here, Husserl refers to the living present as a "source" (or "wellspring"). However, the relationship between the "source" and "what springs forth from it" is not immediately obvious. Husserl also speaks of the living present as the "primal mode of the present." This indicates that there is the primal and the derivative mode of the present. It seems possible to think of the relationship between the "primal source" and "what springs forth from it" as the relationship between the "monoid-like present" and the "various objectified and juxtaposed presents." At the very least, we may assume that "what flowed out from the source" suggests a linear view of time, portraying various presents as standing side by side in succession.

Such a development from the "primal mode of the present" to the "multiple presents" can be represented as a development from the monoid to the coslice category. If we can comprehend the primal present and the sequentially juxtaposed presents as being in a source-derivative relationship, it would be appropriate to formalize their relationship through the construction of the coslice category from the monoid. The structure of the original monoid is faithfully preserved in the coslice category, which reflects the character of modification in the constitution of juxtaposed presents. Simultaneously, the uniqueness of the primal present and the multiplicity of the modified presents are well represented by the unique object of the monoid and the multiple objects of the coslice category.

## 6. Meditation: from coslice category to monoid

If we can understand the experience of time as we have described, it becomes possible to use this framework to illustrate various transformations of time experience. For example, it is often reported that time experience is transformed by mental illnesses such as schizophrenia and depersonalization, by taking psychedelic drugs such as LSD, and by meditation such as mindfulness (Novak, 1996;

5 All English citations from Husserl's German writings are translated by us.

Kramer et al., 2013; Wittmann and Schmidt, 2014; Wittmann et al., 2015; Linares Gutiérrez et al., 2022). Here, as an example of the experience gained through meditation, we will take up the Buddhist recognition of time as an expression of the experience obtained through Buddhist meditation practice (*zazen*), and discuss how it can be interpreted in terms of our framework.

Gautama Buddha says that the following things are what Buddhist practitioners should keep in mind.

> The past should not be followed after, the future not desired.
>
> What is past is got rid of and the future has not come.
>
> But whoever has vision now here, now there, of a present thing,
>
> Knowing that it is immovable, unshakable, let him cultivate it. (Horner, 1999, p. 233)

Here, it is stated as a training principle for Buddhist practitioners to concentrate on the "present" rather than focusing on the past or future. This may imply a return from the coslice category-like view of time, in which the various presents are mutually juxtaposed side by side, to the monoid-like view of time, which consists of only one object and various morphisms.

Dōgen, a Japanese Zen master, provides a more structured description of this idea in his work *Shōbōgenzō*. Dōgen coined the term *Uji* (being-time), suggesting that what is called "being" is, in fact, time (Dōgen, 1990). In terms of category theory, various "beings" in the usual sense can be interpreted as the objects of the coslice category because they are distinct individual things. However, if we bring the coslice category back to the original monoid, that is, if we reduce it to the original "time" (or temporalization), "beings" are in fact morphisms. In the monoid, all the morphisms pass through only one point, the unique object of the monoid. If we take the point of view of the unique object of the monoid, it leads to all the morphisms. Of course, we cannot see all the morphisms, but we can notice that all the morphisms pass through this one point.

Viewing each now as a discrete point in time means objectifying the now (seeing it as a being). This corresponds to a coslice category whose objects are the respective now as morphisms. On the other hand, if we convert the coslice category to its original category, there is only one unique object which is the domain and the codomain of all morphisms. At this unique object, all the morphisms are connected. If we stand on the object of this monoid, we can obtain a picture in which there is always an invariant among the innumerable morphisms, and all of them are connected at this invariant point.

This is just like the view that "time is always flowing and moving, yet at the same time it is still." It is close to the Buddha's view that there is only now.

In meditation practice, it is said that we should focus on the "now," and the Buddhist perception of reality gained through meditation emphasizes the perspective of seeing everything in the "now," but this does not mean that we simply cut off the past and future and leave only the present among the various points in time (past, present, and future). Rather, it is essential to realize that there is a structure in our experience that allows us to go through the "now" to all of time. In our view, this means becoming aware of the monoid structure in our experience of time and (re)activating it consciously. When Buddhist practitioners talk about "focusing on the now," what they have actually in mind is not the separate moment of the "now" but the monoid structure, which is composed of numerous becomings (morphisms) and designates the "now" as its unique object.

Dōgen says, "…it may look like it is far away in the distance, but it is the Now…" (Dōgen, 1990: the chapter called *Uji*).[6] This means the one and only now, which can also be called the eternal now. He further structures this statement as follows.

> "If time is not seen as flowing, then the time when you climb the mountain and look around is the Now of the being-time. Even if time is seen as flowing, there is the Now of the being-time for me. Thus, the time seen as flowing is also the being-time." (Dōgen, 1990).

Time is always now, whether we see it as flowing or not. If time has a monoid structure, it is also possible to view all morphisms from the perspective of the object of the monoid. This means that all time can be viewed from the eternal Now that corresponds to the unique object of the monoid. In this view, our perspective is on the object of the monoid, which never changes, and in terms of time, we are always in the "now."

On the other hand, we can also trace each morphism of the monoid. This view corresponds to the view that time is always flowing. Even if we take this view, since each morphism is always from one and the same object to the same object, we can say that we are always in the "now" in spite of the passage of time.

Monoid-like structures are also frequently found elsewhere in Dōgen's text (the *Uji* chapter).

> "Being-time has the virtue of passage. That is to say, today passes to tomorrow; today passes to yesterday; yesterday passes to today; today passes to today; tomorrow passes to tomorrow. This is because the passage is the virtue of time." (Dōgen, 1990)

One morphism and another, one morphism and itself, can all be composed because the morphism of a monoid has only one object, which means that all morphisms ("passages") are connected at the same object ("now") because their starting points (domains) and endpoints (codomains) are one and the same object ("the eternal now").

One of the essential points of *zazen* (zen meditation) is to become aware of this kind of structure, the monoid structure of time. The monoid structure of time usually recedes into the background in our consciousness, and the dominant structure in our consciousness is that of the coslice category. In contrast, in *zazen* meditation, it is desirable to return to a monoid view of time, in which all time is connected in the "here and now" and is simultaneously present, rather than the coslice category view of time in which each point in time is viewed in succession.

Moreover, if we also see that the coslice category view of time can be generated from the monoid view of time by certain consistent operations, then the view of time that we usually think of as consisting

6 Our English translations of Dōgen's texts are based on the modern Japanese translation by Yorizumi (2015).

of separate points in time can be seen simultaneously from a monoid perspective. This makes it possible for all time to be seen in the only temporal structure in which all time is Now, and all beings as temporally existent.

By viewing time from the perspective of the monoid/coslice category, as described above, it is possible to make consistent interpretations of the experience of time as it is talked about in the context of the meditation experience. At the very least, we can say that beyond the naive view, it offers a more structured view of what it means to focus on the now. In other words, we propose that focusing on the now does not simply mean focusing on the now as one of a series of juxtaposed points in time, but that it means looking at all events as a myriad of morphisms that arise from the now and becoming aware of the monoid structure of time as such.

This is only one implication of our framework. Starting from our framework, it may be possible to interpret the altered temporal experiences seen in depression, depersonalization, schizophrenia, autism, and so on. We plan to cover this subject matter in a different article.

## 7. Conclusion

In this paper, starting from a phenomenological theory of time, we interpreted the structure of time-consciousness by using the structure of the monoid and the coslice category in category theory. This allows us to unite, without any contradictions, the view of the various "nows" placed side by side and the view that "what we are experiencing is the now, no matter how far our experience goes." The structure of the temporal present is often described in contradictory terms such as "standing still while flowing," or "moving and still." Our framework makes it possible to fully grasp the intent of these natural language expressions and to bring them into a consistent understanding. This does not mean that we merely offered a convenient method of abstraction to explain the structure of time experience. Instead, what we presented was a phenomenological and formal expression of time (or temporalization) itself, as experienced both primally and derivatively.

Such an interpretation of time using category theory fits nicely into the Buddhist description of the meditative experience. In meditation, "focusing on the now" does not imply a dismissal of any point in time other than the now, but rather a reduction of the view of time to a monoid view, suggesting a position of seeing everything from the now (the only object of the monoid). Such a view is a natural outgrowth of our framework.

In sum, the monoid provides us with a simple yet content-rich structure. Our experience contains numerous structures that may seem contradictory when expressed in natural language. However, category theory allows us to understand such structures with great clarity. This paper illustrates these possibilities of category theory by examining time as its subject matter.

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

## Author contributions

ST and HS conducted the entire process of completing the work. All authors contributed to the article and approved the submitted version.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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# The shift from quantitative to qualitative thinking—problems and prospects as viewed from Husserl's and Hegel's philosophy

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This article contrasts the views of the philosophers Husserl and Hegel on quantification in science and compares their proposals for conducting rigorous qualitative research. Both deem quantification integral to science, but furthermore proposed methodologies to investigate qualitative necessities achieved by a shift in conscious activity and awareness. However, their methodologies differ significantly. While Husserl rejects idealization and instead proposes intuitive means to ideate qualitative essential relations, Hegel suggests idealizing less one-sidedly, namely, qualitatively over and above quantitatively. The article first examines how quantification is achieved and how it contrasts with measuring. This contrast reveals that measuring implies knowledge of qualities. These qualities, however, thus far remain oddly external to the mathematical relations linking the various established equations. The article then follows Husserl's reconstruction of the development of science to illustrate the dismissal of many experiential qualities and how philosophy further amplified skepticism about science on qualities. Husserl's notion of the life-world and the method of eidetic variation are then introduced as means to counterbalance mathematical proceedings in science. However, this method reveals both eidetic qualitative structures and psychical structures without being able to distinguish between them. It is thus susceptible to idiosyncratic, traditional, and cultural biases. Subsequently, Hegel's description of the shift in conscious experience that sets qualitative from quantitative thinking apart is introduced. This shift may overcome the biases, but it faces skepticism that calls for further investigation of the experience of different kinds of thinking.

KEYWORDS

**qualitative thinking, experience of thinking, methodology, quantification, measurement, consciousness, Husserl, Hegel**

## 1. Introduction

This article contrasts the viewpoints of the philosophers Edmund Husserl and Hegel on how quantification as a methodological yardstick of scientific objectivity relates to qualitative research. Both deem quantification integral to science but suggest methodological means to further explore the essential qualitative aspects of reality. Curiously, both propose that the study of these qualities involves a certain shift in conscious activity and awareness. Nonetheless, their respective methodological proposals are very different. After discussing the techniques of quantification and measurement, this article compares these proposals.

Consistently portraying the two philosophers' views requires two terminological clarifications. First, what Hegel and Husserl call "science" (*Wissenschaft*) encompasses natural

sciences, social sciences, arts, and the humanities. Since the historical split between natural science and the humanities is a topic here, "science" here is similarly used as an umbrella term. Whenever only natural science is meant, it is referred to as "natural science." Second, this article follows Hegel (1986c, p. 44) in understanding "mathematics" strictly as the science of quantity. This needs to be emphasized because some subsume qualitative concepts when they speak of "mathematics."[1]

Given the hostility toward mathematics occasionally encountered in the phenomenological tradition, it is worth highlighting: This article's goal is not to abandon measuring and quantification. That would only substitute one one-sidedness for another. Quantification brought unquestionable merits. The question, instead, is how the focus on quantity may be complemented by methodologically integrating quality. It is also worth noting that the focus is not on qualitative research in general but specifically on *conceptual* or *essential* qualitative relations.

The second section examines the process of quantification and how measuring transcends quantification because it depends on qualities. This dependence and integration of qualities in scientific measuring are then investigated further. With Husserl, the historic scientific dismissal of consciously experienced qualities is traced along with his suggestion of where to find and how to investigate reality as still consisting of these qualities. This will reveal shortcomings in Husserl's suggestion. Lastly, how Hegel proposes to integrate the qualitative understanding of nature and consciousness methodologically will be considered.

Given the format of an article, the focus lies on unveiling and contrasting the views as expressed in the primary texts while drawing occasional links to scientific proceedings today. The outlook section then sketches how qualitative thinking relates to more recent scientific approaches.

## 2. Background: quantification and measurement

### 2.1. Pure quantification

When critically revising a habit, Spinoza (2018, p. 231) suggests to first "focus on what is good in" the habit as it is. In this sense, a striking merit of mathematics and quantitative thinking is their remarkable immunity to the influences of cultural, national, or historical differences and biases. Unlike in philosophy and religion, we do not distinguish between Indian, Chinese, and European mathematics. Instead, mathematics is a common ground wherein people from all cultures can equally participate, contribute, and cooperate. No one is excluded because of their culture, nation, language, or history, and neither can anyone point to these factors to claim themselves superior to others.

Given its goal of achieving objective and valid truths while avoiding biases and prejudices, it is easy to see why mathematics became a scientific yardstick. Kant (2004, p. 6) famously held that "in any special doctrine of nature there can be only as much *proper* science as there is *mathematics* therein." It is characteristic to this day to consider as scientific only what can be quantified. Only few take serious suggestions like Wittgenstein's (1974, p. 414) that mathematics might be relative to language and result from conditioning by one's teacher. Yet why is mathematics so immune to cultural and historical biases? And why are such factors so prone to meddle with philosophical and religious reasoning?

The answer lies in the degree of abstraction required when quantifying something. Husserl (1970a, p. 145, 2003, p. 153)[2] gives a striking example: "To the question, 'How many are Jupiter, a contradiction, and an angel?' we immediately answer: 'Three.' […T]he units are 'the same' as each other. But these samenesses of theirs are a *consequence* of number abstraction, not its basis and presupposition. They arise, not through a preliminary comparison, but rather through that absolute depletion of content which number abstraction requires under all circumstances." That is to say: *To count something, we must abstract from all its qualities*. The only remaining property is that whatever was counted is a "one." In this way depleted of its qualitative content, we can then combine it with *any other* quantifiable content, no matter how qualitatively unrelated they are.

After all, the qualitative differences between an angel, Jupiter, and a contradiction might make it difficult to see any reason to group them together. Mathematically, however, we may relate them by adding them up, and then they *are* three. This abstraction from qualitative content is thus a reason why mathematics overcomes cultural differences. Different cultures have very different notions of an angel. Yet no matter whether someone assumes angels to exist or not, whether they deem them real, ideal, metaphysical, good, or evil—everyone seems to agree that if counted, an angel is "one." As such a "one" it can be added at will to further instances of "one," yielding "two," "three," etc. Whatever else an angel is beyond a "one" is ignored, and the mere oneness instills no cultural disputes.

Hegel (1986d, p. 244, 2010, p. 178) similarly explains that a number's "element is the difference which has become indifferent." Like Husserl, Hegel (1986d, p. 80, 2010, p. 56) emphasizes that the "one" is not the basis of thinking, but rather an advanced abstractive result: It "is clear from a comparison of quality with quantity that the former is by nature first. For quantity is quality which has already become negative; *magnitude* is the determinateness which […] is the sublated quality that has become indifferent." Hegel (1986d, p. 91, 2010, p. 65) adds, "*numbers* are neither the first simple, nor the self-abiding thought, but thought rather which is entirely self-external". The self-externality of mathematical thinking is picked up further down again.

Mathematics in and of itself can explore the relations of quantities in dependence on a select number of presupposed axioms. Yet the endeavor of science is more expansive than such pure mathematical exploration. Science *applies* mathematics to the world. By applying it, however, it already transcends quantity and inevitably re-enters the sphere of qualities.

1 The restriction to quantity has its problems, as will become clear when discussing geometric idealities. However, it helps to portray the benefits and issues with quantification much more clearly.

2 The quality of the English translations of Husserl is frequently called into question. Where available, I quote the English translation but also indicate the German original's pages.

## 2.2. Exceeding pure quantification via measurement

We apply mathematics to our world whenever we measure. However, measuring is not a purely quantitative process. It is only possible drawing on qualities. In measurement, quantities are related to qualities like length, volume, speed, or mass. Measuring is geared toward such qualities and determines the quantity of a related unit within the measured quality. For instance, we measure a certain length (quality) by determining how many (quantity) inches (unit) it contains. The unit is thus a necessary fulcrum for measuring: It defines a certain quantity of quality to count as "one." For many units, there is quite some latitude to standardize this "one." An illustration for this latitude is the contrast between the imperial system (using inches, feet, miles, etc.) and the metric system (using centimeters, meters, kilometers, etc.).

Thus, if we take Kant's view literally, proper science must not measure, because the quality inevitably entailed in measuring is beyond mathematics. As an illustration, take Einstein's famous equation $E = m\,c^2$. Mathematics is used here merely as a means to *express* a particular relation between the variables E, m, and c. These variables represent qualities measured in specific units. In Husserl's (1962, p. 40, 1970b, p. 41) words mathematics is used to "express general causal interrelations, 'laws of nature,' laws of real dependencies in the form of the 'functional' dependencies of numbers." Because of the abstraction from all content that is more specific than "one," however, these variables all represent pure quantities. Consequently, the related qualities as such cannot enter mathematics.

Husserl (1962, p. 44, 1970b, p. 44) describes a consequence of this when we are doing geometry purely arithmetically: "In algebraic calculation, one lets the geometric signification recede into the background as a matter of course, indeed drops it altogether; one calculates, remembering only at the end that the numbers signify magnitudes." This observation is valid for any calculation containing variables representing qualities. *During the calculating* of an equation like Einstein's, we *must* leave out what qualities (and their related units) the quantities stand for. Because of this, once we succeed in calculating the result, we may have to look up what quality the resulting figure stands for. Quality cannot enter this kind of thinking.

Scientists are quite aware of the related temptation to only mind the quantitative relations. An introductory physics book seeks to impress on us: "The measurement of any quantity is made relative to a particular standard or *unit*, and this unit must be specified along with the numerical value of the quantity. […] To specify that the length of a particular object is 18.6 is meaningless. The unit *must* be given" (Giancoli, 2014, p. 12). However, mathematically speaking, units like µL or km are meaningless. *Only* a figure like 18.6 is meaningful. The strong accentuation that "the unit *must* be given" is thus not least to compensate for the need to abstract from all quality during the calculating.

Consequently, mathematics cannot know or process what energy or mass qualitatively *are* in an equation like $E = m\,c^2$. They can be processed only insofar as they are quantifiable. However, on this pure mathematical level, any "one" can be added to any other "one" to form two "one." The need to be mindful of the unit also relates to this. For in physics, we must pay attention not to sum up a "one" that represents a length's unit with a "one" representing an impulse's unit.

To this day, the mathematical structures encountered in science remain in the way described *detached* from the measured qualities. Even though the qualities are usually related to some variable's letter (like "m" for mass or "v" for velocity), whenever mathematically processing them, the respective numbers get detached from these qualities. If we could *think* such that *our thinking included* these qualities, we would neither forget them during the thinking nor need to be reminded to indicate their unit. The later sections of this article ponder the possibility for such a thinking.

From what was observed also follows that there is no mathematical reason why $E = m\,c^2$ is true. If our world were such that instead $E = (1/4)m - c$ or $E = \sqrt[m]{c}$ were correct, mathematics would be just as apt to express it. Thus, the specific way the variables relate to each other, albeit mathematically *expressible*, is not the way it is for mathematical reasons. If we want to know which of the three equations is true, we again need to go beyond mathematics.

What is possible, of course, is to mathematically transform equations that have been established. For instance, if $E = m\,c^2$ is correct, then $E/m = c^2$ is also correct. *This* correctness is mathematical. For these transformations are correct *irrespective of the qualities* E, m, and c. They would be correct even if $E = m\,c^2$ would not be true.[3]

One can furthermore mathematically relate $E = m\,c^2$ with other equations containing E, m, or c, thereby "discovering" otherwise not yet established equations. That such transformations tend to conform with empirical reality can be considered remarkable. It shows that the mathematical relations we experience purely in our minds are somehow woven into the constitution and fabric of external reality. Nevertheless, we first need to non-mathematically establish a set of such equations. As was shown, we cannot establish them purely based on mathematics.

The point of this section was to show that although qualitative elements are quantitatively related within equations, their qualitative meanings remain external to this processing. In Hegel's (2010, p. 234) words: "[M]athematics is in principle incapable of demonstrating the quantitative determinations of physics, for these determinations are laws based on the *qualitative nature* of its elements." Husserl (1962, p. 40, 1970b, p. 41) likewise remarks about equations that "their true meaning does not lie in the pure interrelations between numbers (as if they were formulae in the purely arithmetical sense)." Hegel (2010, p. 234) adds "as long as it is not clear about the distinction between what can be proved mathematically and what can only be taken from elsewhere, […] scientific culture will lack rigor and purity." His view on how qualitative relations can be investigated with the same rigor as mathematical ones will be developed further down.

Yet if measuring is impossible without relying on qualities, but knowledge of qualities cannot stem from mathematics, then how does science acquire knowledge about qualities?

# 3. Science and empirical observation

In the last quote, Hegel said that knowledge about qualities has to be 'taken from elsewhere.' What is this elsewhere?—Hegel (2010, p. 298) writes: "Proofs of this kind *presuppose* their theorems and even

3 This difference between mathematical correctness and actuality is reminiscent of the difference between validity and soundness in logic.

the laws to be proved from experience; what they manage to accomplish amounts to this, that they reduce such theorems and such laws to abstract expressions and convenient formulas." The non-mathematical source of knowledge about qualities is thus experience, namely in the form of empirical observation. Based on empirical observation, science establishes, confirms, and reassess its formulas and theories. This principal dependency on experience remains unaltered even if it is used to falsify (Popper, 2002) rather than verify theories.

However, since Hegel's days, science abandoned Bacon's inductivism and switched to hypothetical-deductive theory building (Carrier, 2009, pp. 17–19). That means: It is now allowed to assume unobserved hypothetical elements in theories. A theory that postulates such elements is accepted if the observable events that follow deductively from the acceptance of the theory are consistent with actual empirical observation. Such lenient criteria[4] for theory building lead to Duhem-Quine underdetermination: Two or more theories assuming different unobserved elements may equally well predict observable events. An example from physics is Bohm's mechanics versus the standard model of quantum mechanics (Carrier, 2009, p. 20).

However, this article does not delve into the issues due to allowing entirely hypothetical elements in theories. It needs to be mentioned because it entails that scientific theories not only take up qualitative elements from actual observation but may also contain hypothetical elements. Nevertheless, even in hypothetical-deductive reasoning, experience or empirical observation has "the last word" insofar as observations contradicting a theory's predictions falsify the theory.

But how did science's use of experience and the establishment of mathematics as its yardstick develop historically?

## 3.1. Husserl on the idealization implied in measuring with geometric idealities

In his reconstruction of modern science, Husserl focuses on Galilei and sees his principal achievement as a "*mathematization of nature*" (Husserl, 1962, p. 20, 1970b, p. 23). Husserl observes that before Galilei, people knew about the individual differences in experiencing the world, yet nonetheless naively assumed all experience the same world (Husserl, 1962, p. 20, 1970b, p. 23). Measurement for the first time substantiated this assumption as it allowed to determine certain properties such that the outcome was *the same* for *all*, i.e., objective (Husserl, 1962, p. 25, 1970b, pp. 27–28).

Yet the initial measurements had two prerequisites. The first are standardized units like meters or inches. Secondly, they require knowledge of geometric idealities like straight lines or squares. Say we wish to measure a length. Then we need both an established *unit* like meters and a way to conceive of the length's *form*. After all, a mere length does not specify its form, and neither does its unit. When we measure a broom's length, we use the ideal geometric shape of a straight line. If we measure a tire's circumference, we do so by conceiving of it as a circle.

Husserl puts much critical focus on the required geometrical idealities, interpreting them as an idealization that estranges us from the experienced reality. For instance, Husserl (1962, p. 21, 1970b, p. 24) requires to "separate the space and the spatial shapes geometry talks about from the space and spatial shapes of experiential actuality." He stresses that even in imagination, we cannot intuit geometric ideality (Husserl, 1962, p. 22, 1970b, p. 25). Consequently, for Husserl (1962, p. 22, 1970b, p. 25), "geometrical space does not mean anything like imaginable space." This distinction between ideal and intuitive space at the root of Husserl's critical attitude will be picked up again further below.

Husserl thus believes scientific theories are *not directly about* the world we experience: "In geometrical and natural-scientific mathematization […] we measure the life-world—the world constantly given to us as actual in our concrete world-life—for a well-fitting *garb of ideas*, that of the so-called objectively scientific truths" (Husserl, 1962, p. 51, 1970b, p. 51). If we measure the area of a cornfield, we objectively obtain a mathematically exact figure. However, Husserl assumes the experienced world to be inexact. Therefore, he believes that through measuring—due to the employed idealities—we inevitably exit the inexact experienced world and enter an idealized one. This is why Husserl believes that when we measure, rather than getting to know the world we experience more intimately, we get estranged from it.

That measuring with lines, areas, and volumes depends on geometrical idealities is frequently overlooked. Even less noticed is that these ideal shapes are still *qualitative*. That means: Strictly speaking, geometry supersedes mathematics as defined by Hegel. Husserl critically notices the same point when describing the 'arithmetization of geometry.' Therein, the "spatiotemporal idealities […] in geometrical thinking" become "pure numerical configurations," thus undergoing the same "emptying of meaning" discussed above (Husserl, 1962, p. 44, 1970b, p. 44).

Before discussing the problems of measuring qualities, it is useful to briefly illustrate how mathematical functions are used in science. This allows to better contrast the different acceptance criteria for quantitative versus qualitative idealities.

## 3.2. The tolerance toward geometric idealities and mathematical functions

A suitable example is to look at how biology estimates the growth of a bacteria population in an environment of limited resources. The logistic function is used to model such growth. As a result, we may encounter a graph like this:

In this diagram (Figure 1), the blue dots represent the measurements and the orange line the ideal logistic growth curve. Notice how almost all dots are slightly above or below the mathematical curve.[5] In spite of this deviation, a scientist still uses the curve to model the actual growth within the scientific calculations. It is, after all, well known that—over and above the inevitable

4 Quine (1951, p. 41) parallels such hypothetical elements with believing in gods: "[I]n point of epistemological footing the physical objects and the gods differ only in degree and not in kind. Both sorts of entities enter our conception only as cultural posits."

5 See Urry et al. (2021, p. 1199) figure 53.10 (a) for a graph with similar characteristics as described here while contrasting the logistic function with actual measurements in a growing *Paramecium* population.

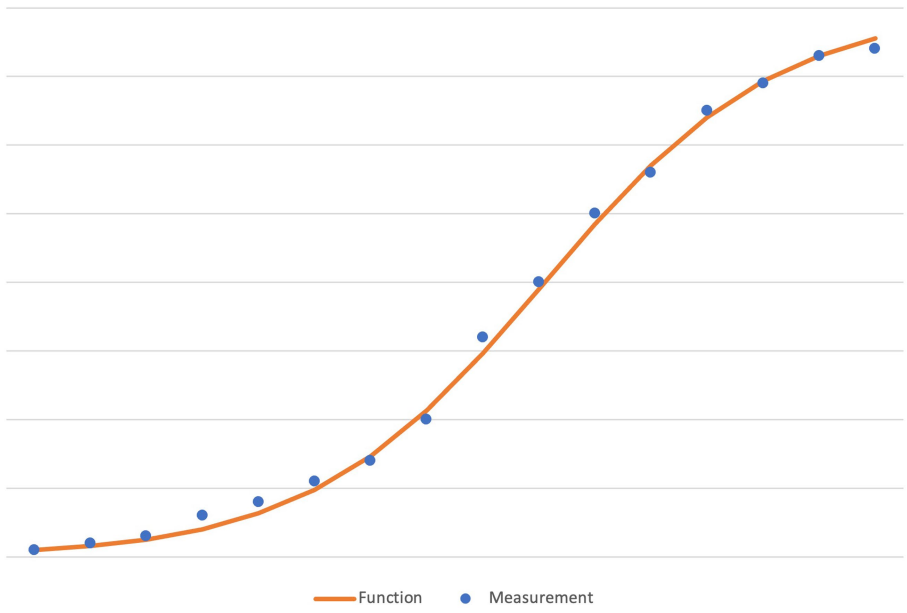


FIGURE 1
An illustration of the typical deviations between actual measurements and an ideal curve (here: the logistic function).

measurement errors—there are always factors that cannot all be controlled.[6] Therefore, some deviation of the actual measurements is accepted and may be indicated in the graph as the standard deviation. We may read sentences like: "The logistic model fits few real populations perfectly, but it is useful for estimating possible growth" (Urry et al., 2021, p. 1212).

Thus, even if no measurements are exactly on the curve, they can be seen as *confirming* the appropriateness of the curve, rather than a reason for dismissing it as a mere fiction. Put another way: The *individual* measurements, despite their distance from the curve, are accepted as confirming the *ideal* curve. When pressed hard about the deviation, a scientist may say these lines and curves are "only models." Nonetheless, such models are powerful tools of prediction. Let us now first turn to what could not be measured with geometrical idealities.

## 3.3. The dismissal of our subjective conscious experience from objectivity

For quite some time, the idea that the entire world is but a complex mathematical system had to wait. The reason was that it is not possible to measure *everything* we experience with geometrical shapes. Until Galileo, aspects of our conscious experience, namely colors, tones, smells, tastes, temperatures, and odors, escaped scientific measurability. Locke (1997, p. 135) called them the "secondary qualities." Because they, so to speak, "fill out" the pure geometric shapes, Husserl calls those qualities "plena" (*Füllen*). Although these qualities are experienced in graduality—as more or less sweet, bright, sharp—measurements were at first impossible (Husserl, 1962, p. 32, 1970b, p. 34). What was missing were "particular ideal structures," akin to the geometrical ones when measuring lengths, "that can be correlated with given scales of measurement" (Husserl, 1962, p. 33, 1970b, p. 34). For instance, when we look at a table, we easily think of various geometric forms that would allow to measure its dimensions in space. Nevertheless, we seem to lack similar ideal forms that would allow to measure the table's color. Thus, the project to objectively determine all our experience through measurement stalled whenever confronted with these qualities.

However, these qualities *indirectly* correlate with *other* phenomena that are measurable with geometric shapes. Already "the ancient Pythagoreans had been stimulated by observing the functional dependency of the pitch of a tone on the length of a string set vibrating" (Husserl, 1962, p. 36, 1970b, p. 37). The quality of such a tone escapes measurement with geometric idealities, yet the swinging string's length, amplitude, and frequency do not, and the tone quality is reliably related to them. Such an *indirect* access to measure more and more plena was discovered. This paved the way for the bold hypothesis of a "universal idealized causality" that "encompasses all factual shapes and plena in their idealized infinity" (Husserl, 1962, p. 38, 1970b, p. 39).

Soon, however, whatever was only indirectly measurable was dismissed as "merely subjective" in the sense of non-objective. Husserl (1962, p. 54, 1970b, p. 54) mentions "Galileo's famous doctrine of the merely subjective character of the specific sense-qualities, which soon afterward was consistently formulated by Hobbes as the doctrine of the subjectivity of all concrete phenomena of sensibly intuitive nature and world in general. The phenomena are only in the subjects; they are there only as causal results of events taking place in true nature, which events

6 Biologists are aware of one deviation that I do not mean here: "The logistic model assumes that populations adjust instantaneously to growth and approach carrying capacity smoothly. In reality, there is often a delay before the negative effects of an increasing population are realized." (Urry et al., 2021, p. 1199) Such a delay could be modeled using a different function. What I mean here, however, are the inevitable deviations between the ideal curve and actual measurements even if populations adjusted instantaneously.

exist only with mathematical properties. If the intuited world of our life is merely subjective, then all the truths of pre- and extra-scientific life which have to do with its factual being are deprived of value. They have meaning only insofar as they, while themselves false, vaguely indicate an in-itself which lies behind this world of possible experience and is transcendent in respect to it." That is to say our consciousness presents the object to have qualities like colors and tones that are not objective properties. Dismissing the specific sense qualities from objective reality like this means: *Our conscious experience of the world is not only flawed; it betrays us*.

What does it mean that these "objectively inexistent" qualities are "in the subjects."—Galilei (1957, p. 274) elaborates: "I think that tastes, odors, colors, and so on are no more than mere names so far as the object in which we locate them are concerned, and that they reside in consciousness." Newton (1952, pp. 124–25) similarly stressed about light rays: "Rays, to speak properly, are not colored. In them there is nothing else than a certain Power and Disposition to stir up a Sensation of this or that Color." Views like these render our conscious experience only partly trustworthy, but on many counts as misleading or outright false.

It is worth noting that science here had it both ways: It considered the merely *indirect integration* of the qualia as reason enough to *accept* its thoroughly mathematical worldview. However, at the same time it *excluded* these qualities from objective nature as if their integration had failed. One of the many consequences of this inconsistent inclusion–exclusion is the debate on qualia (Tye, 2021). For instance, in the Mary's Room thought experiment, the question is whether a color qualia is reducible to the objective (neurophysiological) processes involved (Jackson, 1986). Due to the dismissal of secondary qualities as non-objective, the very awareness that there might be a method to directly integrate them faded. Science began to contrast objectivity with conscious subjective experience.

Up to this point, science's relation to qualities is thus threefold: It (1) takes up knowledge about certain qualities through empirical experiments, (2) adds hypothetical elements to its theories, and (3) excludes only indirectly measurable qualities from objective reality.

To be fair: in his portrayal, Husserl leaves out other reasons that seemingly jeopardize the specific sense qualities' objectivity.[7] However, today still, science frequently tries to go beyond (transcend) our "subjective" consciousness to find the "real" properties and processes. Husserl (1960, p. 24, 1973a, p. 63) sees Descartes as the father of this "transcendental realism." A look at Descartes and Hume indeed reveals the considerable philosophical support for the dismissal of qualities.

## 3.4. Philosophical attitudes toward qualitative idealities before Husserl and Hegel

Descartes strived to replace Aristotelian physics with a mechanistic approach (Moriarty, 2008, p. xix). For Aristotle, the sensory quality of heat corresponds to an objective property, while Descartes (2008, pp. 58, 240) sought to reduce it to bodily movements instead. Descartes casts doubt on the sensory qualities as a reliable basis for objective knowledge. He sees them as merely helpful to preserve our bodies (Descartes, 2008, pp. 51–64). However, Descartes (2008, p. 51) maintains that "the whole of this bodily nature which is the object of pure mathematics […] can be plainly known to me with certainty." With a view like this, he inspired not only transcendental realism but also views like that of Kant's on mathematics.

Hume (2007b, pp. 45–46) famously required that thoughts or ideas be made clear based on experience. However, Hume (2007b, p. 18) notably excluded "Geometry, Algebra, and Arithmetic," claiming their propositions are "discoverable by the mere operation of thought, without dependence on what is any where existent in the universe."

Let us—for a moment—assume Hume had also required geometry, algebra, and arithmetic to strictly base their ideas on experience. Then, a biologist could only use the logistic function to predict population growth if *all* previous measurements were *exactly* on the function. Otherwise, our experience would have been no basis to even think the idea of the logistic function. Consequently, such mathematical functions would be unusable. Experience would need to be interpreted such that it, if anything, proves the inexistence and thus inadequacy of this function. Where we even obtained the idea of the function would be an enigma. Hence, if Hume's requirement for a sensory basis for idealities were made a criterion for all science, we could not use mathematic idealities in science.

This shows how Hume's philosophy helped establish a double standard regarding quantitative and qualitative idealities. After Hume, qualitative idealities had to pass a test that mathematical idealities would fail. However, Hume did not prove at all that qualitative idealities are not just as well 'discoverable by the mere operations of thought.' The fifth section will pick up a suggestion that they can.

For finding out which features essentially belong to something, Hume suggested to proceed inductively. And Hume (2007a, p. 62) is quite right claiming "there can be no *demonstrative arguments* to prove, *that those instances, of which we have had no experience, resemble those, of which we have had experience*." To use the standard example: Even if all swans we saw were white, this would be no ground to assume all individual swans are white. However, this is trivial on the level of individuals. Hume's assumption gets problematic if it is interpreted such that knowing the *totality* of *individual* swans would reveal *essential* features of a swan. There are at least three reasons why the quantity of observed individuals, even if complete, does not warrant knowledge of essential or ideal properties.

7 Already Democritus (Diels and Kranz, 1972, pp. 139, 166, 168), believing only atoms and the void to be real, concluded that colors and tastes are not. Aristotle (2016, pp. 34–35/418a) noted that some qualities, like color and tones, are "exclusive to an individual sense," while he calls qualities like "motion, rest, number, shape, and magnitude" 'common objects,' "since these sorts of objects are exclusive to no one sense but are, rather, common to them all." After all, we can get to know an object's shape through touch *and* vision, but we cannot touch an object's color. Observations like these gave rise to the notion that specific sense qualities are more subjective, potentially only being effects of specific sense organs rather than objective properties of perceived objects. This is precisely what Johannes Müller claimed. Müller (1844, pp. 667–668) observed that an identical stimulus brings about different sense qualities in other sense organs. He concluded that the specific sense qualities are relative to the respective organ and do not correlate with anything objective. Unfortunately, delving into the logical fallacies of this line of reasoning would lead astray here.

The first is that the presence of a certain quality in *all individuals* (i.e., a particular quantity) is no sufficient condition to know whether this quality is *essential*. Put another way: essential quality is irreducible to the quantity of individual totality. The second section of this article demonstrated the impossibility to know quality based on quality, since in order to know quality, we need to abstract from all quality.[8] Hegel (1986a, p. 111/§39, 1991, p. 80) therefore criticizes Hume: "It is true that empirical observation does show many perceptions of the same kind, even more than we can count; but universality is altogether something other than a great number."

Second, Hegel (1986b, pp. 34–36/§250) points out that *deviations* of an individual's features from those *essentially* belonging to it—like the measurements usually slightly deviating from the logistic function—*occur for all essences (universals)*. Therefore, he suggests abandoning the requirement of a *complete alignment* of essential features with empirical ones not only for mathematical functions, but also for qualitative essential features. How Hegel instead believes we can know essentiality is discussed further down.

The third problem is that the supposed result of induction is instead presupposed at its outset. The problem can be summarized in the question: *If all swans we saw were white, and then we see a black bird, how do we know if it is a swan*? Hume's induction naively presupposes that *if* the black bird we see *is* a swan, *then we will know*. But on what basis do I make this judgment? Answering *this* question, i.e., *how I know a black bird I have never seen is a swan even though all swans I saw before where white* seems much more promising than the tedious observation and protocolling of all swans and their features. For this categorizing ability is naively presupposed to perform this kind of protocolling.

This is precisely where the qualities underlying our everyday life are overlooked. We may furthermore note that a black swan and a one-winged swan relate to our underlying notion "swan" very differently. We may feel pity for the swan with one wing, realizing it is deprived of something essentially belonging to it. However, we feel no similar pity that the black swan is not white.

At this point it may seem as if the qualitative idealities that help us seeing a swan as a swan are all already present in our everyday life, unnoticedly underlying it. If so, the problem would merely be to find a means to bring them to light. Yet is this so? At times, Husserl seems to advocate this with his notion of the life-world.

## 4. Husserl's life-world ripe with qualities

To better understand Husserl's critique of science, it is worthwhile to point out an underlying chicken or the egg problem. Science usually explains consciousness as based on objective processes: First, we need physical matter. Afterward, there can be life, then consciousness. Consciousness is thus conceived of as only possible based on physical matter (sometimes even as entirely reducible to it). Husserl's view is quite the opposite. Not, however, because Husserl thinks there could be no matter without consciousness. Instead, he wishes to be mindful of our epistemological starting point. He believes that however much science abstracts from or belittles conscious experience, science *as a human practice* is inevitably *situated in it*. Husserl (1962, pp. 48–54, 1970b, pp. 48–53) assumes that scientific measuring, abstracting, and theorizing is something we constantly—albeit unnoticedly—*perform within consciousness*. For Husserl, consciousness thereby becomes a necessary condition for *doing* science. He views science is an evolving construct, a web of meanings developed in and based on consciousness. That is why for Husserl, abandoning conscious experience as unreliable reveals a methodological lack of self-awareness. For it is *in and based on* consciousness that we first learn about science, understand it, then rethink and develop it further.

Nonetheless, Husserl views it as only natural that our consciousness's role in getting to know the world was almost constantly overlooked. He even calls the attitude of being only interested in worldly things and their existence the "natural attitude." He contrasts it with the *epoché* as a shift in conscious awareness that allows us to instead note how we are *conscious of* the world (Husserl, 1976, pp. 56–134). Husserl (1962, p. 204, 1970b, p. 200) calls this shift of consciousness required to investigate consciousness a "complete inversion of the natural stance of life, thus into an 'unnatural' one." Within this shift of conscious awareness, we can examine how our normal conscious awareness functions as the foundation of scientific theory building.

Husserl calls the "world" that existed before science and that implicitly underlies all scientific practice the "life-world." Many phenomenologists emphasize the founding role that the life-world played according to Husserl (Staiti, 2017, p. 177; Ströker, 1979; Sowa, 2010). For instance, when we enter a laboratory, we do not leave the life-world behind and experience scientific objectivity. When we experience the instruments, probes and colleagues and interact with them, we continue experiencing qualities like colors, sounds, smells, and even use them to orient ourselves. We do so when we look at a chromatography's color distribution, listen to the sounds of a Geiger counter, or detect by a pungent smell that oxygen transformed into ozone. Husserl (1962, p. 128, 1970b, p. 125) stresses that "to use the life-world in this way is not to know it scientifically in its own manner of being." An unbiased investigation of how natural science's theoretical attitude to experiential qualities relates to its practical reliance on them is still a desideratum.

Yet Husserl not only views the life-world as science's foundation, but also as its "ultimate purpose which the new science […] growing out of prescientific life and its surrounding world, was from the beginning supposed to serve: a purpose which necessarily lay *in* this prescientific life and was related to its life-world. Man (including the natural scientist), living in this world, could put all his practical and theoretical questions only to *it*—could refer in his theories only to it" (Husserl, 1962, p. 50, 1970b, p. 50). Even today, we constantly raise questions based on how we consciously experience the world and relate science's answers to it as well.

For example, even those who believe colors are not objective often still care about the color of their car or cell phone. Most have found ways to seamlessly switch between the opposition of our conscious experience of the world and what science claims it "really" comes down to. Others even suggested we can learn to ignore experiential reality. For instance, Brown (1992, p. 357) writes: "[O]nce we grasp the correct scientific account of an item, we can respond to stimuli directly

8 The general idea underlying induction—that experience of individuals is the yardstick for accepting or rejecting idealizations—is still present in Popper's (2002, pp. 3–10) attempt to replace induction with deduction.

in terms of the concepts of that account. Instead of describing a physical object as red, we can learn to describe it as reflecting light of wavelength 6,300 angstroms—and we can do so without conscious inference […]. Thus, in the long run, we will be able to describe physical objects immediately and directly in terms of their intrinsic properties." To my knowledge, however, such efforts have not borne fruit.

Husserl (1962, p. 52 1970b, pp. 51–52) explains his own view of this relation as follows: "Mathematics and mathematical science, as a garb of ideas, or the garb of symbols of the symbolic mathematical theories, encompasses everything which, for scientists and the educated generally, *represents* the life-world, *dresses it up* as 'objectively actual and true' nature. […]. It is because of the disguise of ideas that the true meaning of the method, the formulae, the 'theories,' remained unintelligible and, in the naive formation of the method, was *never* understood." Thus, while science renders our conscious experience a deceitful disguise of the objective processes underlying it, Husserl instead counters that science deceives us by making us believe the world objectively is something we do not experience.

Yet what it is that, for Husserl, sets apart the ideal entities that his phenomenology explores from those that science explores? He writes: "Plainly the essential forms of all intuitive data are not in principle to be brought under 'exact' or 'ideal' notions, such as we have in mathematics. The spatial shape of the perceived tree as such, taken precisely as a 'moment' found in the relevant percept's intentional object, is no geometric shape, no ideal or exact shape in the sense of exact geometry. […] The essences which direct ideation elicits from intuitive data are 'inexact essences,' they may not be confused with the 'exact' essences […] like an 'ideal point', an ideal surface or solid […which] arise through a peculiar 'idealization.' The descriptive concepts of all pure description, i.e., of description adapted to intuition immediately and with truth and so of all phenomenological description, differ in principle from those which dominate objective science" (Husserl, 1984a, p. 249, 2001b, p. 15).

Husserl here again distinguishes the two spaces mentioned above. He suggests that phenomenology, within its *ideation* of the essential structures underlying conscious experience, stays faithful to this experience. The price it pays for this faithfulness is "inexactness." On the other hand, science achieves exactness but pays the price of unfaithfulness to the experience that underlies its *idealizations*. Another way of putting this would be to say that our life-worldly experience does not contain the ideal entities that result from idealizing. Instead, it contains other ideal entities—essences or eide—which can be investigated and clarified through ideation.

This supposed distinction of ideation and idealization, among other things separating intuitive and ideal space, however, is not without problems. For as was just seen, Husserl assumes the life-world with its intuitive idealities to be the foundation for any idealizations. One should thus expect that one does not really understand the idealizations if one does not know how they originate based on life-worldly experience. And yet Husserl (1984a, p. 249, 2001b, p. 15) also claims that the kind of ideal entities phenomenology describes based on intuitively ideating "differ in principle from those which dominate objective science." Such a difference in principle, however, would mean that idealization's foundation in the life-world is irrelevant to understanding idealization. The separation is thus unconvincing. The reason why passively occurring life-worldly types and clear insight into conceptual relations differ is discussed in the next subsection.

As Lohmar (2017, p. 153) (my translation) emphasizes, Husserl differs from Kant in assuming "perception and experience can organize themselves all by themselves" without relying on concepts stemming from the understanding. In Kant (1999, p. A 125–128), the concepts in our scientific judgments about nature are identical to those shaping our experience of nature. Conversely, Husserl separates the concepts in scientific predications and the essences underlying our perceptions of the world. Jansen (2017, p. 143) likewise stresses this difference, assuming even an irreducibility of essences to concepts, because she sees *eide* or essences as ontological entities and concepts as semantic entities.

This interpretation is fitting insofar as Husserl (1939, p. 21, 1973b, p. 27) calls seeing things as this or that in our everyday lives the "pre-predicative experience." Brudzińska (2017, p. 106) explains this term such that it contains no "veiling" idealities, i.e., no concepts. The term "pre-predicative" is undoubtedly apt insofar as I usually see, for instance, a cell phone as a cell phone without forming a predicative judgment. No subject in contrast to a predicate, no sentence uttered in inner speech, not even the word "cell phone" needs to become aware when we *see* a cell phone *as* such.

Given these anti-mathematical,[9] anti-conceptual and anti-predicative tendencies in Husserl, one may wonder: How does Husserl propose research on essences and *eide* to be possible?

## 4.1. Eidetic variation as a supposed means to intuitively investigate essences

Husserl's (1939, pp. 409–443, 1938, pp. 72–87) answer is the method of eidetic variation: One varies the possible appearances of a selected essence, e.g., "table," "thing," or "perception," in imagination. This way, in and through these *imaginative variations*, an *identical essential* structure that is *invariant* throughout the manifold of variations supposedly becomes intuitable. In line with Hume, Husserl (1939, p. 414, 1976, p. 15, 1984b, p. 600) assumes intuiting an essence without a sensory foundation is impossible. However, Husserl (1976, pp. 147–148 1983, pp. 158–160) suggests basing one's variation on imagination rather than perception, as this way we can easily produce an abundance of variations of a single essence.

When describing eidetic variation, Husserl at times conflates totality and universality. This mistake was discussed above in the context of induction. For instance, Husserl writes eidetic variation requires "an infinite variation in our sense as a foundation." (Husserl, 1939, p. 423, 1973b, p. 350) If so, one could only say: "*As far as* I have varied this essence in imagination, its eidetic properties are x, y, and z." His characterization of how to intuit the essence "red" by running through ever more variants makes this mistake: "[A]t each level the red is more red. We anticipate a pure red, a red in pure perfection" (Husserl, 2012, p. 232, my translation). However, the reverse is true: The *same ideality* enables us to see each *different sensory shade of red as the same*, namely as red. The ideal is thus neither the sum nor the mean of all sensory individuals or imaginative variants. It is what allows us to see *each* of

9 Besides refusing to understand phenomenological essences mathematically (Husserl, 1984a, p. 249, 2001b, p. 15), Husserl (1976, p. 127) also excludes formal logic and Leibniz's *mathesis universalis* from phenomenology.

them "as *a kind* of x." In other words: *It is not through the sensory multitude that we get to know the correlating essence. It is through essences that we can distinguish different sensory multitudes*.[10]

Still, eidetic variation is not as ignorant of the employed idealities as Hume's induction is. Lohmar (2005, p. 86) highlights that its purpose is to bring them to light and clarify them. Moreover, it will also not run into the kinds of malformations that nature presents to us via perception impeding induction. When we vary the essence of a swan, we would, for instance, not imaginatively run through a series of one-winged swans and intuit them just as easily as swans as we would two-winged ones.

However, if all swans we perceived were white, we likely would not imagine black swans in eidetic variation. This is because underlying variations in imagination is what Husserl calls the "apperceptive type." Lohmar (2005, p. 85) (my translation) summarizes: "The types I have depend on my history of perception; they are by no means universal." Types are based on previous experiences and what features of the observed instances I happened to notice and passively associate with the type in question (Lohmar, 2005, p. 82). Lohmar (2005, p. 87) furthermore illustrates the cultural relativity of many of our everyday types with a chair as "something to sit," which takes a different form in Japan and central Europe. Lohmar (2005, p. 87) concedes "that what we think of in a general conception depends on our cultural socialization." This, however, means that eidetic variation cannot break through the barriers of history, tradition, culture, and language. Lohmar (2005, p. 88) furthermore concedes that non-intuitable essences remain entirely ineffable in eidetic variation.

The types we become aware of by means of eidetic variation are thus unnoticedly shaped by idiosyncratic, cultural, and other prejudices. The problem is that these types may both *contain* associations of *non-essential* features and *lack essential* ones. That is why eidetic variation does not reliably yield insight into essential structures. However, as we can easily run through a manifold of possible variations, it is tempting to misinterpret the underlying types as eidetic or general structures. As a means of becoming aware of one's idiosyncratic or cultural prejudices, eidetic variation has merit. However, most of Husserl's investigations into the supposedly transcendental genesis of such structures contribute to psychology, not philosophy (Gutland and Wendt, 2023). Husserl's analyses help explain how the cultural and historical prejudices that often impede science as a transcultural endeavor arise. They do not, however, reveal eidetic structures as such. That is because in eidetic variation, we cannot reliably distinguish between actual eidetic relations and psychical structures like associations.

An *ex negativo* consequence until this point is that finding essences or idealities must imply an emancipation from what sensory experience provides. After all, sensory perception equally presents individuals having all essential features and those lacking some. Conversely, imaginative variation does offer insight into the types underlying our life-worldly perceptions and beliefs. Yet within these types, essences and psychically rooted structures like associations are intertwined in ways that eidetic variation cannot discern. Therefore, the abstraction process yielding universals must thus be one *away from* sensory experience. Yet what might then be the *positive* source for knowing idealities?

## 5. Hegel on how to discover qualitative idealities

Although Hegel does not use the term "life-world," he is aware of how most of our everyday beliefs are as firm as they are unfounded. The first step, for him, therefore consists in reflecting on them such that instead of whatever may appear in sensory experience or in imagining, a *different kind of necessity* becomes palpable. Such necessities do appear in mathematical thinking, yet with shortcomings. He points at a shift of conscious awareness which is characteristic for the experience of qualitative idealities.

### 5.1. Overcoming one's life-worldly prejudices

Hegel (1977, p. 18, 1986c, p. 35) points out that what is life-worldly "familiar, just because it is familiar, is not cognitively understood. The commonest way in which we deceive either ourselves or others about understanding is by assuming something as familiar, and accepting it on that account; […] such knowing never gets anywhere, and it knows not why. Subject and object, God, Nature, Understanding, sensibility, and so on, are uncritically taken for granted as familiar, established as valid, and made into fixed points for starting and stopping." An example for such a taking for granted of concepts is Kant's (1998, p. B xvi) first *Critique*, where the concepts "object" and "subject" are presupposed without explanation let alone deduction.

Hegel also describes the life-worldly passivity and arbitrariness in which such psychically rooted prejudices and familiar beliefs appear to us: The "beginnings are immediate, found, or presupposed[…], the form of necessity fails to get its due. Insofar as it aims at satisfying this need, meditative thinking is the thinking that is philosophical in the proper sense" (Hegel, 1991, p. 33/§9). Within the passively appearing beliefs that make up our life-world, we remain unaware which connections are necessary (ideal) and which are contingent like associations. The first step out of this state is to subject this kind of passive knowledge to our thinking, to reflect (meditate) on it. Within our thinking, we can emancipate, in a sense, "purify" our knowledge from the contingencies of sensory and psychically rooted experience.

Hegel describes the different steps of this proceeding for natural science: "It is a great service to discover the empirical numbers of nature, e.g., the distances of the planets from each other; but an infinitely greater service would be to make the empirical quanta disappear by raising them to a *universal form* of quantitative determinations in which they become the moments of *law* or of measure—immortal services which,

10 Some reject conceiving eidetic variation as akin to Hume's induction: Lohmar (2005, pp. 79–80) because he maintains the current variation already includes future ones in the idea of an 'I can.' Brudzińska (2017, p. 112) and Jansen (2017, p. 145) because its imaginative freedom liberates eidetic variation from induction's dependency on an empirical and thus factual manifold. I nonetheless maintain that the problem of induction exists as long as one binds intuiting essences to sensory variation. Such varying is but one of many possibilities to intuit essences. Scheler (2018, p. 64) stressed that ideation is possible based on just one example. Fichte, Schelling, and Hegel assumed it to be possible in pure thinking, i.e., independent of concurring sensory experience.

for instance, Galilei achieved for the motion of falling bodies and Kepler for the movement of the celestial bodies. These men have *proven* the laws they have discovered by showing that the full compass of the singular things of perception conform to them. But a still higher proof of these laws must be demanded—nothing less, namely, than of knowing their quantitative determinations from the qualities or determinate concepts connected in them (such as space and time). Of this kind of proof there is still no trace" (Hegel, 1986d, pp. 406–407, 2010, pp. 297–298).

The first step is thus the establishment of concrete empirical numbers, like the distances between Jupiter and Saturn, via measurements and empirical observation. The second step is to find the respective formulae that—using their universality—allow, e.g., to calculate the distance between Jupiter and Saturn in one year's time. The third and final step is to *understand* the quantitative formulae *based on thinking the qualitative idealities that are related in them*. The last step is thus not again a way to quantify qualities, but one that proceeds from the discovered quantitative relations toward an understanding of the related qualities and their qualitative relations. Such proceedings are not encountered often, and where they are encountered, the interpretations commonly diverge.[11] This is, however, hardly surprising, since once we attempt to think purely qualitatively, we are confronted with all our culturally and historically rooted prejudices. This issue shall be picked up further down again.

A pivotal difference between Husserl and Hegel is thus: Husserl assumes that once science idealizes, it betrays its own foundation. Conversely, Hegel sees science's flaw in idealizing only one-sidedly, namely, quantitatively, but not yet qualitatively. To proceed here, let us look in more detail how Hegel characterizes the emancipation from sensory life-worldly perception that mathematical reasoning offers. Closer characterizing the conscious experience in this kind of thinking later serves as a foundation to contrast how qualitative thinking differs from it.

## 5.2. The one-sided merit and mechanizability of mathematical thinking

Due to its emancipation from the sensory, Hegel (2010, p. 181) sees value in mathematical thinking: "Number is not an object of the senses, and to be occupied with number and numerical combinations is not the business of the senses; such an occupation, therefore, encourages spirit to engage in reflection and the inner work of abstraction, and this is of great, though one-sided, importance." In mathematical reasoning, therefore, one can experience pure or non-sensory thinking, the content of which is not determined by sensations.[12] Thus, Hume was right that the propositions are here discoverable "by the mere operations of thought."

Hegel explains mathematics' one-sidedness in that "since the basis of number is only an external, thoughtless difference, the occupation proceeds without a concept, mechanically" (Hegel, 2010, p. 181). The externality was already illustrated with how quantification transforms a contradiction, an angel, and Jupiter each into an indifferent "one." Afterward, because we abstracted from any qualitative connections that would normally prevent this, we can combine the "one" at will in line with some arithmetical procedure. That this kind of thinking occurs nearly entirely self-external has two further effects.

Hegel already mentioned the first: Mathematical thinking can be *mechanized*, or, in general, computerized. Notably, Husserl concurs: A mathematical "solution can be obtained in a purely mechanical fashion. This happens in that one substitutes the names for the concepts, and then by means of the systematic of names and a purely external process, derives names from names[…;] calculating […] is not an activity with concepts, but rather with signs" (Husserl, 1970a, pp. 239–240, 2003, pp. 253–254). Husserl (1975, p. 79, 2001a, p. 50) therefore stresses that computers do not think: The ways in which the results "spring forth is regulated by natural laws which accord with the demands of the arithmetical propositions which fix their meanings. No one, however, who wants to give a physical explanation of the machine's procedures, will appeal to arithmetical instead of mechanical laws. The machine is no thought-machine, it understands neither itself nor the meaning of its performances." In other words: While we do mathematics, we *experience* conceptual necessities *in consciousness*. Computers have no such experience. They are built such that *instead of experiencing concepts,* they connect *symbols* in accordance with *natural laws*. This connecting is *directly* explainable by laws of nature (namely mechanical, electrical, maybe chemical laws).

A computer's output is thus no concept, but a symbol. This output symbol is directly processed and generated not by arithmetic laws, but by physical ones. If a computer is broken, all its parts and processes still adhere to natural laws. But the way these parts then function, while still in accordance with natural laws, no longer indirectly (symbolically) adheres to arithmetic laws. However, when seeing computer-generated output symbols, we are usually able to go beyond the mere sign and *understand* its meaning: We can *think* the respective concept. We should not, however, assume the computer experiences these symbols alongside the respective concepts like we do. Probably one of the greatest misunderstandings of human thinking is the belief that it resembles a computer's processing and can be modeled algorithmically.

The second consequence of the self-externality of mathematical thinking is noticeable within the thinking experience itself: The thinker has a high degree of freedom and control. The initial impulse *which* thoughts to connect *and how* depends entirely on her. For instance, after quantifying Jupiter, an Angel, and a contradiction, we are free to add them all up to three, or add up only two and subtract the third, or divide one by the product of the two others, etc. Hegel (1977, p. 26) explains: "In a non-actual element like this there is only a truth of the same sort, i.e., rigid, dead propositions. We can stop at any one of them; the next one starts afresh on its own account, without the first having moved itself on to the next, and without any necessary connection arising through the nature of the thing itself. […] For what is lifeless, since it does not move of itself, does not get as far as the distinctions of essence, as far as essential opposition or inequality, and therefore does not make the transition of one opposite into its

11 Some notable attempts at thinking through scientific observations philosophically do exist, e.g., in Scheler's (2018) and Plessner's (1975) attempts to establish philosophical anthropology.

12 In the same volume this article is written for, Ziegler and Weger (2023) offer a description of the experience when thinking through a mathematical proof.

opposite, does not attain to qualitative, immanent motion or self-movement."

Hegel here metaphorically calls mathematics "dead" due to the lack of self-movement of the contemplated content. As in mathematical thinking the "one" is cut from its qualitative content, this qualitative content can no longer be our "guide" to whatever is qualitatively related to it. Consequently, the impulse to connect it with other thoughts must come from us: *We* control with which other "one" to relate it and also whether we add, subtract, or multiply them. Nothing "happens" in mathematical thinking if we do not initiate such an impulse. Only afterward, and depending on what we try, we encounter necessities[13] within this thinking. Yet we come across them by so to speak "bumping into" them. They prove to be "obstacles" of what we can do, "guiderails" of where we can go and what follows if we go through with our initial impulse. Notably, we *experience* that we cannot do entirely as we please. Nevertheless, for instance when trying to prove a theorem, we may still freely make a plethora of possible choices.[14]

These conceptual necessities both constrain and guide us in our thinking experience, indirectly helping us to proceed to the solution. That they have no self-movement is the reason why they can be symbolically "outsourced" to laws of natural causality. Just like the result of a calculation depends on what we decided to calculate, the computer's output as a physical effect is shaped by the input as a physical cause. The rigidity and non-self-movement of arithmetic laws is the reason why they can be symbolized in something as rigid as natural causality. Our freedom, however, cannot be transferred this way. We still must decide what the computer is to compute.[15]

In sum, it would be wrong to conceive of the necessities we encounter in mathematical thinking experience as in some way sensory. And neither do they stem from cultural or historical biases. They are actual thinking experiences—we *encounter* them *experientially*. Yet how does mathematical thinking differ from qualitative thinking?

## 5.3. The shift in conscious experience when thinking qualitatively

Hegel assumes that even though quantity occurs within it, logical thinking outstrips mathematical thinking. Therefore, he fiercely opposed attempts like Leibniz's to mathematicise logic (Hegel, 2010, pp. 607, 544). That is why for Hegel, logic entails quantitative and qualitative thinking. He writes that within pure logic "thoughts are grasped in such a way that they have no content other than one that belongs to thinking itself, and is brought forth by thinking. So these thoughts are *pure* thoughts" (Hegel, 1991, p. 58/§24). Herein lies the emancipation from the sensory: Both perception's malformations and prejudice-based imaginations need no longer distract us when we meditate purely on thought contents themselves. Only based on what we find in this kind of thinking can we, e.g., identify malformations as such, discover essential relations we do not associate and realize that our associations are non-essential.

Yet the description thus far would also be adequate to mathematical thinking. What separates qualitative thinking from it becomes evident in Hegel's further characterization: "When I think, I give up my subjective particularity, sink myself in the matter, let thought follow its own course; and I think badly whenever I add something of my own." I must thus give up the freedom I still have in mathematical thinking. Instead of myself being the motor of what I wish to combine and in what way, I actively *observe* how my thoughts unfold in and out of themselves.

The possibility to "drop out of" this observing is much higher than in mathematical thinking. Relatedly, the "adding something of my own" refers to idiosyncratic associations, passive syntheses based on life-worldly types, cultural beliefs, traditional convictions, and so on. They amount to what Hegel calls the "subjective particularity." All those influences are ready to distract me. They occur with the same passivity as in everyday perceptions, and they tempt me to *judge* based on them rather than continue to *think* and therein *observe* how the thought evolves in and out of itself. If I do not keep them at bay or fail to notice how they influence me, these familiarities likely lead me astray.

Thus, whenever attempting to find out how one thought relates to another qualitatively, we quite literally *fight ourselves*. A much lesser self-discipline, but still some, is needed when performing mathematical thinking. After all, doing mathematics, i.e., solving an equation, is not guaranteed to succeed. Even the most outstanding mathematicians err at times. A mathematician who can self-reflect on how she does her work will know the difference between judging step by step based on actual experience versus based on guessing or simply drawing on memory. An example: One may remember that $12 \times 12 = 144$. Nevertheless, one can also reaffirm this by entering actual mathematical thinking. The first kind of judging would be one where I draw on what Hegel calls my "subjective particularity." However, only the second one deserves to be called "thinking" over and above mere "judging," as it involves *experiencing* the necessity of the result. Naturally, judging, e.g., based on memory, is not necessarily wrong.

Hegel speaks of "life" in qualitative thinking because of the "self-movement" of thoughts therein. In this thinking, although I initially can still freely choose a thought to focus on, this thought, then, leads me to a different thought. It, in a sense, becomes this other thought, illustrating through this movement how both thoughts are related. Then the second thought leads to a third or moves back to the first, revealing a hitherto unnoticed qualitative relation. There is an immanent rhythm guiding the course of this thinking. It evolves akin to an organism. Self-movement of the thought and growth of our resulting knowledge are the two facets it shares with life.

Mathematical thinking does not have such properties. Otherwise, it would not be mechanizable. A certain quantity like 7 does not, through self-movement, become 8. It was shown how we must thoroughly abstract from thinking any qualities to handle quantities properly. Instead of experiencing qualitative necessities, *we* initiate combinations within the mathematical possibilities, experiencing the respective quantitative necessities as we move along.

We *lose* this control once we manage to think qualitatively. Then we are no longer the ones who connect a thought with the next, but

13 Since these necessities still depend on the chosen set of axioms, they are conditioned necessities.

14 Hegel (1986c, pp. 42–44) assumes this arbitrariness even for geometrical theorems. That, however, might go too far since geometrical idealities are still qualitative unless arithmetized.

15 Exploring how far the recent developments in artificial intelligence and quantum computers changed this would lead too far here.

the thoughts *relate themselves*. Experiencing this lack of control and how, instead, something else "takes over" *in one's own consciousness* can at first be startling. Being in control as we are when doing mathematics is certainly at first more comfortable. That is why for many first experiencing the life Hegel describes does not at all feel comfortable. However, the price one pays for remaining in control within mathematical thinking is absence of guidance by qualities.

Johann Gottlieb Fichte's characterization of qualitative thinking is remarkably similar. Fichte (1982, p. 30) emphasizes that in it we are not dealing with "a lifeless concept, passively exposed to its inquiry merely […], but a living and active thing which engenders insights from and through itself, and which the philosopher merely contemplates. [H…]ow the object manifests is not his affair, but that of the object itself, and he would be operating directly counter to his own aim if he did not leave it to itself, and sought to intervene in the development of the phenomenon." He contrasts this kind of thinking with the typical philosophical "system-makers," who "proceed from some concept or other; without caring in the least where they got it from, or whence they have concocted it, they analyze it, combine it with others to whose origin they are equally indifferent. [The philosopher] is fashioning an artifact. In the object of his labors he reckons only upon the matter, not upon an inner, self-active force thereof. Before he goes to work, this inner force must already have been killed, or it would offer resistance to his efforts" (Fichte, 1982, pp. 29–30). Fichte's characterization here resembles Hegel's right down to the metaphors of life and death.

In sum, human reasoning can take different forms. The first, life-worldly one, operates with whatever types have already been established and—sometimes more actively, sometimes more passively—combines them with other such previously established types. One judges, not necessarily using language, but one usually does not make thinking experience one's anchor point for making these judgments. The thinker herself or her cultural, social, traditional, etc. biases are the driving force for the how and what of the connecting. In mathematical thinking, the thinker controls which concepts she thinks about and how she attempts to connect them with others. We experientially encounter conceptual necessities, but no connection comes about through the self-movement of the conceptual content we think. Lastly in qualitative thinking, the freedom is reduced to the choice of thought to begin the reflection with. After initiating this reflection and focusing on the thought, the thinker gives up her freedom to control the development and instead observes how the thought unfolds out of itself and into others. The thinker, "instead of being the arbitrarily moving principle of the content, [chooses] to sink this freedom in the content, letting it move spontaneously of its own nature, by the self as its own self, and then to contemplate this movement" (Hegel, 1977, p. 36).

After offering this brief characterization of qualitative thinking, it is now time to address some of the many concerns that thus far prevent it from being widely accepted.

## 5.4. Critical reflection

A first concern is that while Hegel and Fichte similarly characterize qualitative thinking, their philosophical systems nonetheless differ. How to account for this difference? Are the insights within qualitative thinking different for each person? If so, how could it be scientific? If it is scientific and thus the same for everyone, would not it imply that those who fail at it would have to blindly believe those who claim to be able to perform it? Would that not lead to an impoverishment of cultural diversity such that we would end up with a scientific monopoly instead of a pluralism of rich and historically grown perspectives?

Trains of thought like these show how a possible scientific insight into qualitative essential relations soon turns political. The fears underlying these questions need to be taken seriously. After all, did Foucault not show how truth in science is prone to power dynamics that frequently undermine rather than foster its discovery and acceptance? And yet, even Foucault (1974, p. 24) refrained from a thorough relativism, for instance, when stating Mendel told the truth albeit the discourse of his time rejected it. Against the worry that scientific truth is a façade for political power, it must be emphasized that the point of qualitative thinking as portrayed here is not that one should let others dictate what is true. Rather, it was to inspire confidence that in principle *everyone in their own thinking can experience* essential qualitative relations as *they* are. Intersubjective exchange is but one of several ways to find a truth. At best it helps find the truth, but it cannot substitute one's own experience of veracity.

Due to an article's brevity, some of the other concerns are best countered with other questions. For example: Does the word 'truth' remain meaningful and valuable if there are as many truths as there are traditions, languages, and cultures? Is it only negative if the search for truth ultimately unites people from all cultures and traditions rather than discriminating against them based on their backgrounds? And with regard to historically grown perspectives, Scheler (1976) offered a noteworthy suggestion of how the historically accumulated knowledge of the different cultures and traditions could be construed as complementing each other.

For sure, this will not ease everyone's reservations or cease their doubts. Especially the phenomenological tradition has rejected a thinking on which everyone can agree, irrespective of their culture and tradition. Husserl (1962, p. 396) himself sometimes treats scientific theories as if they were merely cultural constructs. He thereby inspired relativisms, for instance in Heidegger, Gadamer, and Derrida, who became inspirational figures for postmodernism (McGee and Warms, 2008, p. 536), a movement questioning all objectivity.

It is common to find phenomenologists appealing to factors akin to the life-world as both an ineffable and unsurmountable foundation that relativizes all we can ever know. Heidegger (1993, p. 29) points at tradition and calls it naive if someone assumes a fresh beginning in philosophy to be possible. Gadamer (2010, p. 361) rejects Hegel's hint at an experience of pure thinking, instead maintaining to "be situated within a tradition does not limit the freedom of knowledge but makes it possible" (Gadamer, 2004, p. 354). Merleau-Ponty invokes the lived body as such a primordial foundation. Even when it comes to abstract space, as the geometer conceives it, Merleau-Ponty (2002, p. 117) maintains that "there would be no space at all for me if I had no body." Waldenfels (2006, p. 109) claims it to be impossible to objectively compare cultures because we belong to one from the outset. Stähler (2003, p. 239) holds that in the face of history, it is hubris to believe that true knowledge is possible, as Hegel did. Whichever of such factors (or a combination) one favors, the consequence is that it undermines our attempts to achieve true knowledge and knowledge of universal structures.

However, one must distinguish between such factors and *our* judgment about them. Suppose at some point in our life, we become convinced that our tradition opaquely influences all our judgments.

Because we cannot know where tradition misleads our judging, our judgments would become untrustworthy. Then, however, the same would apply to our initial judgment on tradition leading us astray. We could only trust our judgment on tradition if we knew that this judgment is *not misguided* by tradition. Yet precisely this kind of knowledge would be impossible if this judgment were correct. Therefore, judgments like these are performative self-contradictions. They judge to be impossible what they presuppose as true. The same ratio applies to any of the named factors one might choose here.

And yet, not only those who oppose the existence of universal truths, but also those who propose them, often jump to conclusions. A more intricate analysis of the possible shifts in conscious experience is thus required. Particularly, one needs to learn to distinguish between the acts of judging and thinking. Otherwise, one is unable to distinguish the passively occurring psychical prejudices from the self-movements of thoughts.

Judging, because it is a psychical process, is prone to the mentioned factors. And we cannot form a belief without judging. What we experience in thinking neither causes nor otherwise forces us to also judge it to be as experienced. This likely is the reason why Hegel's and Fichte's systems differ. In our everyday judgments, such life-worldly prejudices usually remain effective even after we become aware of their contingent and psychically rooted constitution. Unless we encounter a viable alternative in thinking or perceiving and decide to consciously judge in accordance with it, every now and then remembering this new insight, we hardly stand a chance to alter our prejudices.

In many ways, the endeavor to think purely is thus preceded and impeded by the psychical forces embedded within our life-world. Without our life-world, however, we could not even master a single day in our everyday life. Thus, the life-world is not simply something bad. Epistemically opaque as it is in its passivity, it has an indispensable pragmatic value for our everyday lives.[16] Nevertheless, if we wish to attain ethical responsibility instead of being passively driven, we need to become aware our life-worldly preconceptions, reflect on them, and correct them where required. One way to do this is to enter qualitative thinking. Its experience provides either viable corrections or consciously understood confirmations of the passively intruding life-worldly prejudices. Based on it, we can choose to overcome our respective prejudices. Naturally, within thinking, we can do so only for our judgments on *essential* relations. Sensory perception remains the corrective of our life-worldly beliefs about *individual facts*.

The point here thus was not to claim that Hegel, Fichte, or another thinker "got it all right." Instead, it was to remind of the possibility of an experience in which everyone could for themselves find out how thoughts interrelate within thinking.[17] Needless to say, given the sheer richness of the ideal content of our world, hopes as well as fears that one could quickly lay it out in its entirety once and for all are equally unfounded.

## 6. Summary and synthesis

This article drew on the philosophies of Husserl and Hegel to analyze the quantitative proceeding in science and to remind us that a qualitative thinking might be possible. It is now time to offer a synthesis of the main points. After that, an outlook is in order, considering some more recent developments in science that were not available in Hegel's and Husserl's time.

In order to quantify something, we must abstract from all its qualitative features and relations. We then enter a pure and clear thinking in which everyone can contribute and cooperate regardless of their traditional or cultural background. The abstraction is so thorough that it leaves behind what is at stake in most cultural or historical controversies. However, the abstracted qualities remain detached from mathematical thinking. We cannot mathematically establish units, measure, or determine whether $E = m\,c^2$ or $E = \sqrt[m]{c}$ is true. Knowledge beyond mathematics has been acquired in science mostly through empirical observation and hypothetical reasoning. But a way of thinking that is as rigorous, clear, and interculturally uncontroversial as mathematical thinking, yet able to operate directly with qualities, is still a desideratum.

Historically, philosophy and physics have "cooperated" in denying the qualities we experience by excluding them from scientific objectivity. Physics deconstructed the objectivity of the secondary qualities as "merely subjective." Hume then claimed that quantitative idealities are discoverable by the mere operations of thought, while setting up empirical standards for qualitative idealities that quantitative idealities would fail. As a result, the qualities populating our life-worlds were mostly excluded from rigorous science. Yet Husserl showed how our life-worldly experience, including its qualities, underlies the way science is practiced even though scientific theory denies most life-worldly aspects.

If science wants to overcome its naïve use of the life-world and its qualities, it must critically reflect on the way it relies on it. Husserl and Hegel offered different ways of doing this. Husserl provided methodological means for becoming aware of the structures of the life-world. He also offered psychological investigations that help to understand how the contingent life-worldly associations and passive syntheses come about. One important result is: It is almost impossible for two people to have exactly the same life-world.

However, Husserl failed to see that his supposedly transcendental investigations on the genesis of consciousness are contributions to psychology, not epistemology (Gutland and Wendt, 2023, pp. 112–115). As long as we stay within life-worldly reasoning, we cannot find out how two ideal qualities are *ideally* related. This cannot be achieved by becoming aware of how we or other subjectivities happen to life-worldly associate qualities, nor by becoming aware of how these associations are genetically constituted.

Such a positive source of actually experiencing qualitative idealities and their relations is given in qualitative thinking as characterized by Hegel and Fichte. The characteristic shift of

16 Notably, more recent attempts to model human decision-making based on quantitative functions seek ways to include tacit knowledge, which would be roughly equivalent to life-worldly knowledge (Bizzarri et al., 2022).

17 Throughout this text, thinking is described as an experience. Within the cognitive phenomenology debate (Bayne and Montague, 2011), some reject this. Shields (2011, p. 233) mentions a reason for this: If thinking were an experience, then instead of being part of a functionalist solution, it would become part of the so-called 'hard problem of consciousness' (Shear, 1999). See Gutland (2018, 2021) for attempts to closer characterize the experience of thinking and to answer whether this experience has a phenomenal character.

consciousness going along with it was contrasted with the conscious experience during life-worldly associating and mathematical thinking. Like life-worldly associating, qualitative thinking contains qualitative ideal contents, but does not connect them based on contingent psychical forces. Like mathematical thinking, qualitative thinking is clear and pure, but instead of oneself controlling the how and what of combining, one allows the thought to unfold itself. The shift of consciousness here is thus such that one keeps up the active attention but becomes a passive observer of how one's thinking spins itself forth from one thought to the next.

If qualitative thinking is to be established scientifically, combining the insights of Husserl and Hegel is a viable starting point. One would have to develop and contrast them further. If one only consults Husserl, one easily falls prey to the mentioned relativisms, then claiming all our thinking is ineffably prone to factors like tradition, culture, language, or history. If one only consults Hegel, one easily underestimates the psychical force of the life-world, believing one is thinking purely and selflessly, while in reality, one's life-word passively and unnoticedly shapes one's beliefs. What is required, instead, is learning to distinguish life-worldly judging from qualitative thinking *based on their different characteristics in conscious experience*. Otherwise, one will conflate life-worldly passive syntheses and the kind of passivity encountered in qualitative thinking. One will mistake one's psychically rooted cultural prejudices to be the self-movement of thoughts and vice versa. Among other things, it is important to distinguish the different *act types* of pure thinking and judging and learn to recognize their characteristics (Gutland, 2021). In short, one must not only be aware of the content that one connects, but one must extend one's awareness to the *How* of that connecting.

Yet how would qualitative thinking impact science and integrate with its quantifying and measuring?—Qualitative thinking deepens our understanding of the elementary concepts in science as well as their relations. Hegel (1986b, pp. 41–47/§§ 254–256), for instance, faults the quantitative approach for handling space's three dimensions—length, height, and width—as entirely interchangeable. There is nothing about the *x*-axis that prevents us from instead calling it the y-axis and vice versa. Hegel believes this is so because few people observe how space's three dimensions develop out of one another in qualitative thinking. Instead, they are presupposed and then only quantitatively, i.e., abstracting from their qualities, related in equations. The same is the case in other elements of equations. Even simple ones like Newton's $f = ma$ are quantitative expressions of qualitative relations. The more we learn to think the qualities involved and how they relate qualitatively to other qualities, the more we would ideally or essentially understand the Why.[18] Qualitative thinking thus does not replace or invalidate the quantitative relations, it would deepen our understanding of the related qualities as such.

Using quantitative modeling in combination with experimental data gathering, one can only establish *that* certain formulae adequately model reality. Without thinking through the qualitative elements and relations connected therein, we mostly fail to understand the *Why* of them. Even quantum physics, where stochastic probabilities replaced Newton's belief in necessary determination, is no exception. After all, knowing that an event occurs with a certain probability differs from understanding why this is so based on reflecting on the essential nature of the involved qualities.

Table 1 provides an overview of the respective advantages and disadvantages of the life-world, scientific objectivity, Husserl's phenomenology, and qualitative thinking.

There certainly are scientists who already today look through and beyond mathematics such that they form some notion of the *Why*. This allows them to have valuable hunches and intuitions, inspiring discoveries. However, because of the current quantitative emphasis, they cannot convey their insight in an academically acceptable manner. This article is written not least in the hope that such knowledge can, in the future, be shared in scientifically accepted ways.

Today, the emphasis on quantity in science has come full circle: Quantification, instead of being used by scientists, is now being used on them. Lazebnik (2015, p. 1599) describes a worrying trend in science: "reputation based on discovery is no longer the currency." Although Lazebnik (2015, p. 1599) mentions several causes, he also mentions how scientists are now frequently assessed by "the number of papers published, the number of citations, citation indexes, impact factors, formulas to calculate their relative values." Such criteria are not *per se* wrong, but they are one-sided. At first, they seem convenient: Anyone can check article numbers and citations, as it is both easier and quicker than reading them and objectively assessing their quality. But this convenience is due to the abstraction inherent in quantifying. Like Jupiter, a contradiction, and an angel, three published articles are three, whatever their quality is. And this is where the one-sided focus on quantity begins to hollow out academic work. For—within such assessment criteria—someone with 10 mediocre, repetitive articles is 'better' than someone with five original ones that tackle and solve difficult problems. Practices like being hired or fired based on the number of one's publications are thus an example of where the ability to instead find and establish objective criteria for directly assessing quality would warrant science's own quality does not decline. Relatedly, another hope out of which this article was written is that it helps ensure scientists can again, without worry, delve into difficult and time-consuming problems, knowing that their results will be evaluated beyond being a mere "one."

## 7. Outlook: scientific developments since Husserl's and Hegel's days

I am grateful to one of the reviewers suggesting to also relate the key finding here to how today's science has developed since Hegel's and Husserl's days. However, since these two philosophers are its focus, this article had first to discuss 'their' respective science. Now that their standpoints have been discussed, what changes in light of some newer developments may be briefly considered.

For a long time, a belief in natural science was that the principles explaining all phenomena must be found on the smallest scale. All processes on larger scales would then be explainable by these smallest scale processes, i.e., reducible to them. To be precise, this belief has been predominant in physics, while chemistry proceeded early on to assign to certain structures a non-reducible or "autonomous meaning" (Di Paola et al., 2013, p. 1598). This is even in line with Hegel (2010, p. 646), who called "the chemical object […] a self-subsistent totality." The reductionist belief, however, had quite some discursive force in

18 That empirical reality, e.g., in the form of measurements, may slightly deviate from essentiality should have become clear by now.

TABLE 1 An overview of the subject areas and their differences as covered here.

| | The life-world | Scientific objectivity | Husserl's phenomenology | Qualitative thinking |
|---|---|---|---|---|
| Advantage | Populated with qualitative content, culturally and historically rich. | Emancipates itself from life-worldly associating insofar as it sticks to a quantifying methodology. Applying this methodology to the world, science uncovered vast amounts of reliable, objective, and valid quantifications of the qualities structuring reality. | Provides psychological methodological means to become aware of life-worldly structures and investigate their genesis. | Provides direct experiential access to essential qualitative relations. This allows us to deepen our understanding of the quantitative relations found thus far and discorver new ones. |
| Disadvantage | The connections of its content vary from person to person, as they are brought about mostly passively and associatively. | Its quantitative emphasis detaches it methodologically from directly investigating qualities and qualitative relations. The ways it nonetheless relates to qualities are: empirical observation, hypothetical reasoning, and the situatedness of scientific practice within the scientist's life-world. These dependencies on qualities, especially the last one, frequently are used without much critical reflection. | Cannot methodologically distinguish between psychological associations and essential relations. | Hard to attain and, without clear and critical awareness of the difference between the act types of judging and thinking, easily confused with life-worldly passivity. |

the sense of Foucault. For instance, "emergent organized behavior" on the mesoscopic scale was "accepted as true only after repeated confrontations with experiment left no alternative" (Laughlin et al., 2000, p. 32). By now, in many scientists, the belief in a theory of everything, i.e., "a set of equations capable of describing all phenomena" (Laughlin and Pines, 2000, p. 28), gave way to the realization that different principles rule phenomena on different scales.

Meanwhile, the ideal of infinitely accurate measurements that Husserl mentions was undermined by both Heisenberg's uncertainty principle and the realization that, for instance, calculating interaction of more than 10 balls on a billiard table is impracticable (Weaver, 2004, p. 67). And yet, when one abstracts from measuring all details, one may take a step back and use stochastics to compute probable developments. As Weaver (2004, p. 68) elaborates, within such approaches, which are also successfully used by life insurances, the "method applies with increasing precision when the number of variables increases." Here, higher-order principles emerge that are again not predictable by knowing the principles on smaller scales, i.e., these higher order principles are not reducible.

Nevertheless, within empirical reality the belief might persist that there could be some as yet unobserved link confirming reductionism. Yet emergence and complexity appear even in mathematics. When used to model population growth, the logistic function mentioned above may lead to emergent phenomena like bifurcations and self-similarity (Richter and Rost, 2002, pp. 9–24). Another example would be John Horton Conway's mathematical *Game of Life* that, on higher scales, shows patterns rendering impossible to deduce the simple mathematical principles that govern them (Richter and Rost, 2002, p. 40). That emergence also occurs in mathematical contexts rules out denying it by appealing to insufficient empirical observation.

The discovery and establishment of emergence and complexity are also relevant for our conscious life-worldly experience, for they may re-establish aspects of our conscious phenomenal experience as scientifically objective. For instance, Giuliani et al. (2014, p. 1) explain that the reductive approach "considers biological systems having a strictly hierarchical architecture going from molecular to whole organism level and in which the ultimate causative layer is the most microscopic one, i.e., the molecular level (genes)." Consequently, the phenotypes that appear as wholes in our conscious experience would be subjective illusions. Objectively, instead of wholes, they would be manifolds of molecular processes causally orchestrated by—and thus reducible to—laws on the genotype level. Yet Heckman (1990, p. 782), for instance, showed that "shape changes […] have physiological significance in cells." Observations like these, combined with emergence and complexity, might objectively rehabilitate the perception of wholes as they appear in our conscious experience.

The receding reductionism incited a "surge of interest in graph-theoretical and, in general, network-based approaches in both physics and biology" (Di Paola et al., 2013, p. 1598). Such approaches have been successfully used to find new drugs, where these more systemic approaches prove more efficient (Csermely et al., 2013). Also, in drug development, approaches like principal component analysis (PCA) overcome the need to—before one even begins analyzing a set of data—assume certain variables to find the other variables based on these assumed ones. Instead, purely by analyzing the data set, one can identify the "hidden independent factors modulating a given set of observed variables" (Giuliani, 2017, p. 1070). Insofar as cultural biases can make one assume certain variables rather than others, such biases can thus be overcome.

In Husserl's and Hegel's time, approaches like these were unavailable not least due to the sheer amount of computational data processing they require. Approaches like these have considerably enriched our scientific understanding of the complexities that underlie and govern our world. They overcame the deterministic and reductionist "if-then" kind of thinking and made emergent relational or systemic structures scientifically accessible and acceptable. As noted above, they may even reconcile conscious phenomenal experience with scientific objective reality, which would be a major scientific breakthrough.

Yet the procedure is still to quantify these qualitative structures. In chemistry, the goal is "to derive mathematical descriptors of molecular structures" (Di Paola et al., 2013, p. 1598).

The network approach is described as "a quantitative framework" (Di Paola and Giuliani, 2015, p. 47). The graphs used in network approaches are described as "a mathematical object used to model complex structures" (Giuliani et al., 2014, p. 2). Likewise, "PCA can be thought as the fitting of an *n*-dimensional ellipsoid to the data, where each axis of the ellipsoid represents a principal component" (Giuliani, 2017, p. 1075). Thus, approaches like these should not be confused with the kind of qualitative thinking outlined above.

However, just like Kepler's or Newton's laws, the quantified structures uncovered by these approaches provide a significant orientation for qualitative thinking. And not only that, for—within these new approaches—we can identify steps that would benefit from qualitative thinking. For instance, Csermely et al. (2013, pp. 337, 342) mention several times the difficulties in defining nodes and edges of networks. Giuliani (2017, pp. 1070–1071) mentions the need to give names to components that result from rotating and collapsing a data set within PCA. Here, a qualitative understanding of the involved concepts and their relations would prove very valuable. Examples like these thus show the complementary and cooperative potential between these newer approaches and qualitative thinking as outlined here. Ideally, there would be an interplay and mutual fostering between observation, quantification and qualification.

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

## Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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## Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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# An evidence-based critical review of the mind-brain identity theory

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In the philosophy of mind, neuroscience, and psychology, the causal relationship between phenomenal consciousness, mentation, and brain states has always been a matter of debate. On the one hand, material monism posits consciousness and mind as pure brain epiphenomena. One of its most stringent lines of reasoning relies on a 'loss-of-function lesion premise,' according to which, since brain lesions and neurochemical modifications lead to cognitive impairment and/or altered states of consciousness, there is no reason to doubt the mind-brain identity. On the other hand, dualism or idealism (in one form or another) regard consciousness and mind as something other than the sole product of cerebral activity pointing at the ineffable, undefinable, and seemingly unphysical nature of our subjective qualitative experiences and its related mental dimension. Here, several neuroscientific findings are reviewed that question the idea that posits phenomenal experience as an emergent property of brain activity, and argue that the premise of material monism is based on a logical correlation-causation fallacy. While these (mostly ignored) findings, if considered separately from each other, could, in principle, be recast into a physicalist paradigm, once viewed from an integral perspective, they substantiate equally well an ontology that posits mind and consciousness as a primal phenomenon.

KEYWORDS

**philosophy of mind, mind–body problem, psychology, neuroscience, material monism, physicalism, dualism**

## 1. Introduction

Since the times of René Descartes in the 17th century, the mind–body problem has been one of the central debates in the philosophy of mind, psychology, and neuroscience. The conventional Cartesian dualism is no longer considered tenable but other forms of dualism, or theoretical frameworks of philosophical idealism, or more generally, non-physicalist ontologies, state that mind and consciousness cannot be explained as a mere result of neural processes.

Dualism is opposed by an identity theory, which, instead, considers mind processes as identical to brain processes, and consciousness as nothing other than an emergent epiphenomenon arising from the collective interaction of the neuronal activity. Sentience, with all its subjective dimensions of experiences, feelings, and thoughts, is a physical process determined only by the laws of physics. Qualia–the subjective, phenomenal, and mental experiences we can access only introspectively, such as the perception of color, or that of pain and pleasure–are physical brain states, while any speculation concerning an immaterial mind or consciousness is considered an unnecessary hypothesis.

Dualists and monists have different schools of thought but, despite the variety of opinions, it is fair to say that most scientists and philosophers consider themselves to be material monists. For example, according to a survey (Bourget and Chalmers, 2020) 51.9% of philosophers declare themselves 'physicalists' vs. 32.1% as non-physicalists, and 15.9% as 'other'. On the other hand,

exceptional human experiences occur frequently in both the general population and in scientists and engineers (Wahbeh et al., 2018).

However, there is a growing awareness that a mere functional investigation will not answer questions of a more philosophical nature. The belief that the progress of modern neurosciences would soon shed light on David Chalmer's notorious 'hard problem of consciousness' (Chalmers, 1995) has turned out to be too optimistic. This is because, unlike other physical processes, in which both causes and effects can be observed from a third-person perspective, in consciousness studies, one is confronted with a cause–the brain activity–that one can still analyze from a third-person perspective that, however, apparently produces an effect we call 'conscious experience,' or just 'sentience,' which can be apprehended only from a first-person perspective. This 'perspectival asymmetry' makes consciousness in its subjective and experiential dimension stand out as a phenomenon alien to any attempt at conceptual causal and ontological scientific reduction. Inside a naturalistic framework, the origin and ontology of the phenomenal subjective conscious experience remain unclear.

While most arguments were based on a physicalist line of reasoning (for a review, see (Seth and Bayne, 2022)), and also other post-materialistic models of consciousness that are not exclusively based on brain activity exist (for a review and discussion see (Wahbeh et al., 2022)), here it is shown that there are also strictly neuroscientific facts that have not received sufficient appreciation and that give us good reasons to look upon the physicalist assumptions with a more critical eye. Non-neurocentric paradigms of consciousness that posit mind and consciousness as a fundamental primitive, rather than matter, remain a viable option. No particular dualistic, panpsychist, Eastern philosophical, or metaphysical scheme is favored. Rather, a variety of findings, especially when seen jointly and in their relationship to each other, could suggest other possible ways of interpreting the neuroscientific findings, and that this might even have more explanatory power in terms of an underlying post-material ontology.

A preliminary note of conceptual and terminological clarity is necessary. In psychology, or the philosophy of mind, and neurological sciences, the words 'consciousness,' 'mind', and 'self-awareness' are defined and used with different significances, sometimes with overlapping or conflating semantics. In fact, for historical reasons, the mind-brain identity theory used the terms 'mind' and 'consciousness' somewhat interchangeably (Smart, 2022). Here, however, 'consciousness' will relate to phenomenal consciousness–that is, Nagel's famous 'what-it-is-like' states (Nagel, 1974) underlying our subjective qualitative experiences, 'qualia,' that what makes us sentient of perceptions, feelings, sensations, pleasures or pains, and self-aware as a unified subject. Phenomenal consciousness is not to be confused with 'mind' which, at least in the present context, relates to the cognitive functions of thought, memory, intelligence, ideas, concepts, and meanings. The two are to be kept distinct in the sense that the mind's thoughts come and go, while the conscious experiencing subject is permanent. I deem this distinction necessary because the question relating to the physicality of the spectrum of all our psychological dimensions, as we are going to see later, may not have a unique answer. For example, one can argue for the unphysical nature of phenomenal consciousness but maintain that memory is in the brain, or that low-level cognition (e.g., sensory perception modalities) are neuronal epiphenomena, while other high-level functions (decision-making, agency, reasoning, and planning) are not.

Having made this distinction, in the following, I will first examine more closely the logical framework that sustains a mechanistic conception by pointing out some conventional neurological causation-correlation fallacies.

Let us first question some basic assumptions. Does the physical change of a brain state leading to cognitive impairment or altered states of consciousness provide a necessary and sufficient logical proof that mind and consciousness are an emergent cerebral phenomenon?

After all, it is undeniable that there is a direct relation between the physical state of our brains and our subjective experiences (e.g., Aguinaga et al., 2018), (Vollenweider and Preller, 2020), (Davis et al., 2008). Dopamine is a neurotransmitter molecule that enables biochemical transmission among neurons and that is responsible for the effects of a drug like cocaine. We know that psychedelic drugs can lead to intense subjective effects. It is a well-known fact that brain damage can lead to severe cognitive impairments. If Broca's area, a left cerebral hemisphere area, is lesioned, one loses the ability to speak (interestingly, though, not the ability to comprehend language). Someone being anesthetized using anesthetic drugs (seemingly) 'loses' consciousness. And nowadays, we have a number of sophisticated brain scan technologies making it clear, beyond any reasonable doubt, that for every conscious experience, there exists a neural correlate in our brains.

Thus, apparently, a neuroscience that is based on brain chemistry and loss-of-function lesion studies leaves no place for any form of non-material monistic approach. Mental states and conscious self-awareness seem to emerge from matter; there is no distinction. Our personalities, identities, moods, and states of consciousness seem to depend on the biophysical state of our brains.

And yet, few further critical thoughts should make it clear that such a correlation is not a sufficiency criterion. One must secure one's theoretical framework from a possible logical fallacy believing that correlation implies causation. The fact that two events are always coincidental or always happen shortly, one after the other, does not imply that the first event caused the second event to happen. If event B always follows event A, we are not entitled to conclude that A is the cause of B. These sorts of logical fallacies are known as 'post-hoc fallacies'.

Nevertheless, the necessity and sufficiency that the explanation of our qualitative experiential dimension is to be chiefly found in neural circuits remains a rarely questioned belief [with few exceptions, e.g., in the field of behavioral processes (Gomez-Marin, 2017)]. There is a general tendency to believe that causal mechanistic explanations based on neural lower-level properties are better than higher-level behavioral accounts. For example, Krakauer et al. pointed out that neuroscientists (and, I would add, too many psychologists and most analytical philosophers of mind) frequently use language to hide more than to reveal, by assuming that a neural causal efficacy equals understanding–that is, charging it with an explanatory power it does not have. The result that "neural activity X is necessary and sufficient for behavior Y to occur" allows a causal claim often added by a further explanatory sentence that rearticulates the same causal result employing 'filter verbs' (such as "produces, "generates," "enables," etc.) and that, however, masks the faulty logic to cause a metaphysical position to pass as empirical data (Krakauer et al., 2017).

But, what are the alternatives to the mind–body identification that could be in line with the above correlation between mental states and physical neural correlates of consciousness?

In fact, the metaphor most idealists prefer is the 'filter theory of consciousness,' which dates back to an original idea of William James, who stated: *"My thesis is now this: that, when we think of the law that thought is a function of the brain, we are not required to think of productive function only;* ***we are entitled also to consider permissive or transmissive function****. And the ordinary psycho-physiologist leaves this out of his account*" (emphasis in the original text) (James, 1898).

James thought of the brain and thought in the frame of a 'bidirectional transducer theory' using the analogy of the prism separating white light into respective colored beams. If a broken prism fails in its function to 'reveal' the colored light beams, this should not lure us into the logical correlation-causation fallacy that the prism 'produces' colored light. The material and structural modification of the optical medium modifies the refractive gradient that 'transduces' light with a different chromatic dispersion but does not 'create' it. A prism is just an object with a transmissive function; it does not 'generate' anything.

Aldous Huxley expressed a similar idea and proposed that the brain is a 'reducing valve' of what he called a 'Mind at large,' a universal or cosmic Mind comprising all of reality with all ideas and all thoughts. According to Huxley, our mind filters reality under normal conditions because, otherwise, we would be overwhelmed by the knowledge of this universal Mind. Psychedelic drugs can remove the filter and bring us into contact with the Mind at large, leading to the experiences that several mystics describe. In his words: *"To make survival possible biologically, Mind at large has to be funneled through the reducing valve of the brain and nervous system"* (Huxley, 1954). For Huxley, the brain was a material 'connecting device,' an 'interface' or 'relay station.' In this view, human mind is a localization of a universe-wide Mind projected into our brains. The brain filters and suppresses this universal Mind but does not 'produce' it.

An understanding of the mind-brain relationship reminiscent of Eastern philosophies, and that maintains similar views, is neatly summarized by the Indian mystic and poet Sri Aurobindo: *"Our physical organism no more causes or explains thought and consciousness than the construction of an engine causes or explains the motive-power of steam or electricity. The force is anterior, not the physical instrument"* (Aurobindo, 1919).

From these perspectives, mind uses the brain as an instrument, as an interface of expression. Mind and consciousness are constrained and interdependent from the brain but aren't generated by the instrument itself.

Notice that this standpoint is not entirely alien to our ordinary understanding of how a digital computer works. Knowing everything about its hardware, and recreating its exact physical structure in every detail, would not lead us to a machine that makes anything meaningful or useful. Software–that is, a running code written by an intelligent external agent–is needed. Here, also, a computer is only an instrument, a means of expression for a cognitive entity, not its origin or source. In fact, studying a microprocessor with the same criteria employed by modern neuroscience, trying to reverse-engineer its functions by analyzing local field potentials, or selectively lesioning its units by correlating this with its behavior, would turn out to be a quite difficult task: We would still have a long way to go to explain how it works and figure out the whole running code, which is the real 'agent' causing the behavior of the machine (Jonas and Kording, 2017).

Thus, neural correlates of consciousness, or loss-of-function lesion-based studies, do not constitute a sufficient logical foundation for a mind-brain identity theory. We have the right to maintain the contrary hypothesis: Consciousness, mental states, and emotional states are more or less 'funneled through' depending on the physical state of a brain. The brain could equally well be seen as a physical substrate *through which* these conscious states manifest without leading to any inconsistency with current scientific knowledge. How current neuroscience not only fails to falsify this hypothesis but maybe even suggestive of this claim, is the purpose of the next section, with a review of old and new neuroscientific findings that are asking for clarification if one wants to save the mind-consciousness-brain identity theory. Another part will review the evidence for the neural correlates of memory. A brief section will focus on the emergent fields in the study of plant and cellular 'basal cognition.' A discussion and concluding remarks will follow.

## 2. From (lack of) evidence to interpretation

### 2.1. The search for the 'seat of consciousness'

Crick and Koch once postulated that the claustrum, a sheet-like neuronal structure hidden beneath the inner surface of the neocortex, might give rise to "integrated conscious percepts"–that is, act like the "seat of consciousness" (Crick and Koch, 2005). Modern neuroscience, however, indicates that the claustrum behaves more like a neuronal information router than an organ responsible for a specific function (Madden et al., 2022). To date, there is no evidence, not even indirect or circumstantial, of a single brain region, area, organ, anatomical feature, or modern Cartesian pineal gland that takes charge of this mysterious job of 'producing' or 'generating' consciousness. Most of the brain is busy processing sensory inputs, motor tasks, and automatic and sub- or unconscious physiological regulations (such as the heartbeat, breathing, the control of blood pressure and temperature, motor control, etc.) that do not lead to qualitative experiences. Neural activity alone cannot be a sufficient condition to lead to phenomenal consciousness. The vast majority of brain activity is unconscious–that is, non-conscious cognitive processes (e.g., mnemonic, perceptual, mental or linguistic tasks) and physiological processes (e.g., cardiac, hormonal, thermal regulation, etc.) taking place outside of our conscious awareness. This raises the question: What distinguishes a neural process that leads to a conscious experience from that which does not?

For example, the cerebellum is almost exclusively dedicated to motor control functions, and its impairment leads to equilibrium and movement disorders. However, it does not affect one's state of consciousness. Its role in 'generating' experience seems to be marginal, if any. There are also rare cases of people who live without a cerebellum ('cerebellar agenesis') and have only mild or moderate motor deficits or other types of disorders (Feng et al., 2015). This is a fact that seemingly confirms the brain's proverbial neuro-plasticity, which we will see next through other extraordinary examples.

It may be worth recalling that the neuronal architecture in our bodies is not confined to the brain–that is, it goes far beyond our heads, through the brain stem, and down through the spinal cord. The central nervous system is made up of the brain and the spinal cord. The latter is responsible for the transmission of nerve signals from and

to the motor cortex; as is well known, injury to it can result in paralysis. But, again, no cognitive deficit or state of consciousness is altered by impairments of the spinal cord. This leaves only one option: If there is a 'seat of consciousness,' it must be identified somewhere in the cerebral cortex or subcortical areas of the brain (Figure 1).

Another interesting example of how the correlation-causation fallacy conditions scientific and popular understanding of the mind–body problem can be illustrated by an interesting experimental finding that showed how stimulation of the thalamus arouses macaques from stable anesthesia (Redinbaugh et al., 2020). The awake, sleeping, and anesthetized states could be aroused with the stimulation of the central lateral thalamus. The straightforward conclusion seemed clear. The ultimate origin and switch 'modulating' consciousness was discovered. If your consciousness 'depends' on the state of your thalamus, which is 'switched' on and off with the touch of a button, then the thalamus must be the 'seat of consciousness.' Is this an unavoidable conclusion?

First of all, observing from a third-person perspective the absence of an external physiological signature as evidence for a lack of internal first-person sentience is yet another correlation-causation fallacy that has too frequently led to unwarranted conclusions. For example, that anesthesia induces an unconscious state with the patient having no subjective experience is far from obvious. We simply do not know if it really induces a completely unconscious state or a conscious but non-metacognitive no-report state that makes one unable to recall past experiences once one is back in the waking state. The former assumption is, unfortunately, taken in most cases as the standard scientific approach. Whereas, indications suggest that anesthetic-induced unresponsiveness does not induce complete disconnectedness (Radek et al., 2018; Turku, 2018). Interestingly in this regard is also the so-called twilight anesthesia, an anesthetic technique that sedates patients only mildly and induces amnesia but no loss of consciousness (Scheinin et al., 2020). During this 'twilight state,' patients are responsive and can be asked to perform some tasks that they will not be able to recollect after the surgery. This case alone shows that the inability to recall events during sedation is no proof of unconsciousness.

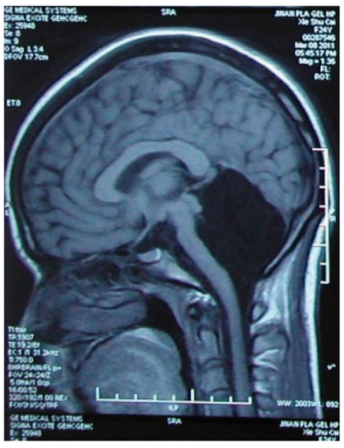

FIGURE 1
Case of cerebellar agenesis: Living (and walking) without the cerebellum. Credit: Feng et al. (2015). Reproduced with permission of Oxford University Press.

Moreover, there is now a non-negligible amount of scientific literature, presenting empiric evidence on parasomnia (sleepwalking), hypnosis, non-REM sleep, and subjects in a vegetative state, that some form of conscious awareness is also present in all these non-responsive states of consciousness (e.g., Owen and Coleman, 2006; Oudiette et al., 2009; Cruse et al., 2011; Siclari et al., 2018; Mackenzie, 2019). Arguing and extrapolating from the lack of superficial physical cues and mnemonic retention to a verdict that declares someone to be 'unconscious'–that is, as having no subjective phenomenal experience–is, at least from the philosophical perspective, again betraying a logical correlation-causation fallacy.

But even if we assume that there is no internal experience when we are anesthetized, the relevant question remains: Do these sorts of experimental findings confirm that the thalamus is the 'seat of consciousness'? Is it a sort of modern replacement for Descartes' pineal gland in its mechanistic-material monist version?

The thalamus is responsible for sensory information processing. It is known that its main job is to function as a relay and feedback station between sensory brain areas and the cerebral cortex. For example, it functions as a hub between the optical nerves that transport the visual information coming from our retinas to the visual cortex. Even if one remained conscious by turning down the functionality of the thalamus, one would no longer see anything because the neural pathways between the retina and the visual cortex are interrupted. From that, however, nobody would conclude that the thalamus is the seat of the visual experience for which the visual cortex is responsible, as we know that it is a 'hub,' a 'transducer' or a 'filter.' From this perspective, the thalamus' function is to 'integrate' the information flow of the several brain areas; if this is disrupted, it leads to a 'loss' of consciousness.

Thus, these findings do not tell us much about the generation of conscious experience. However, if there is not one single 'seat of consciousness,' could it be that the combination and activity of some or all of the different brain areas do 'produce' the subjective experience? Considerable attention in this direction has been focused on theories such as the 'Integrated Information Theory' (IIT) (Oizumi et al., 2014; Tononi, 2015) and the 'Global Workspace Theory' (GWT) (Baars, 1988), according to which the amount and integration of information and the momentarily active and accessible memory determine the level of consciousness leading to a conscious entity. A process of integrating the information and the memory coming from all the brain areas may be the efficient cause of our experiential richness. In fact, we have sufficient evidence that compels us to abandon this simplistic view of a compartmentalized brain, with modern neuroscience thinking more in terms of network science, in which several brain regions are highly interconnected and interdependent. No brain region does only one thing, and no neurons supposedly have only one function. Most neurons have several functions, not a single purpose. It turns out that whenever we hear a sound, have a visual experience, have feelings or emotions, or perform a motoric task, the whole brain is involved. Even such an apparently highly specialized brain region as the primary visual cortex carries out information processes related to hearing, touch, and movement (Merabet et al., 2008; Liang et al., 2013). The reason why we nevertheless tend to associate specific brain regions with specific cognitive, sensorial, or motoric functions is that brain scans show only a temporal snapshot of the brain's most intense activity. We are seeing only a few 'tips of the iceberg' and missing the overall activity in the

noise. When studies are conducted using less noisy but much more expensive and complicated detection methods, most of the brain's activity becomes visible (Gonzalez-Castillo et al., 2012). Therefore, it would seem plausible that if consciousness arises from the activity of a complex aggregation of neurons, at least some brain areas must work together in a unified whole via thalamic activity.

However, how far these conjectures align with reality is questionable.

Because a natural question could be that of asking if and how a subjective feeling of selfhood changes if someone were to split your brain into two parts? Would you feel somewhat less conscious and less 'yourself'? As is well-known, this is a very real surgical procedure performed since the 1940s: the corpus callosotomy (although used only rarely nowadays). It is performed to treat the worst cases of epilepsy (patients having up to 30 seizures a day) that did not respond to medical treatment. In this procedure, the corpus callosum, the nerve tract connecting the left and right brain hemispheres, is severed (in part or, in some cases, entirely), thereby avoiding the spread of epileptic activity between the two halves of the brain (Figure 2). Its natural function is to ensure communication between the two cerebral cortexes of the two hemispheres to integrate and coordinate motor, sensory, and cognitive functions, such as moving left and right limbs, the visual integration of the left and right sight, etc. Because most of the brain's activity is distributed throughout both hemispheres, with no indication of one or the other part being responsible for generating our sense of 'self,' one must wonder how the patients who have gone through such an acute surgical intervention feel. Do their split brains 'generate' a dual consciousness and split personality?

Disagreement exists about whether in these patients a subject unity is present or if they display any signs of multiple first-person perspectives (De Haan et al., 2020). They deny being a different person from what they were before surgery, and close relatives who knew the split-brain patients before and after surgery do not notice any personality change (Bogen et al., 1965; Sperry, 1968, 1984; Pinto et al., 2017),

Of course, there can be more or less severe drawbacks. In some cases, the so-called 'alien-hand syndrome' can take over, in which one hand appears to have a mind of its own. This occasionally happens when the two hemispheres' representations of reality come into conflict and one wants to override the other. In these instances, decision-making and volition between the two hemispheres clash. An example is the patient's struggle to overcome an antagonistic behavior, such as knowing what cloth they want to wear, while one of their hands takes control and reaches out for another cloth they do not want at all. However, this should not be confused with two personalities competing against each other (as in the case of dissociative identity disorders), as split-brain patients identify with only one body and perceive their disobedient limb as being subjected to annoying motoric misbehavior; they do not report any sensation of some other internal personality taking control. The brain–or, more precisely, our two brains–tell us two different 'stories.' Split-brain patients seem to identify with one of the stories–that is, consciously access one of its interpretations–and keep the other in a subconscious or subliminal awareness, what the American cognitive neuroscientist Michael Gazzaniga used to call the 'left-brain interpreter.'

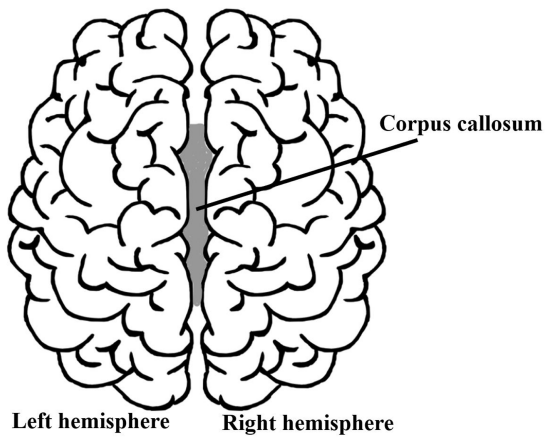


FIGURE 2
Does brain-splitting cause 'self-splitting'?

Recent investigations also question the canonical textbook findings (Pinto et al., 2017, 2020). While it is confirmed that a corpus callosotomy splits the visual perception of the environment in two, several patients can nevertheless see them both and report it to the outside world–that is, they can access their language centers. Moreover, there is no evidence for memory loss (Forsdyke, 2015).

In my view, confusion surrounding split-brain psychology arises only if we conflate the 'unity of mind' with a 'unity of consciousness' and sense of selfhood. If we do not confuse mental states as being the origin or efficient cause of consciousness, then any apparent paradox dissipates. Split-brainers may have two (eventually even conflicting) hemispheric and motor-sensory mental states (something not entirely unusual in healthy subjects) but even if one argues and provides evidence for a 'two-minds' model, that would not imply a split sense of identity or self-awareness. One can consciously and subliminally be aware of a plurality of experiences, yet retain the experience of singularity. There can be several experiences and representations generated in a brain, with or without a representational unity, which, nevertheless, belongs to and is experienced by one subject [for a more detailed analysis of this point see (De Haan et al., 2021)]. A 'split subjective identity' resulting from split-brain in the sense of a symptomatology similar to what we know from dissociative identity disorder characterized by the disruption of identity in two distinct personalities, differing not just in sensory-motor functioning or depersonalization disorders, but also each with two psychological behaviors, characters, affects, social preferences, and experienced as alternating 'possessions' with cognitive discontinuities and different memories of autobiographical information, as observed by others and reported by the (alternating) subjects themselves, is not observed.

So, if our subjective and conscious experience is generated by the integrated activity of the whole brain, why does not such a radical bisection lead to any modification of our state of awareness? Given the severing of the corpus callosum of a brain, one would expect a loss or at least a diminishing of conscious awareness because there would be a loss of working memory and information integration. However, nothing like this happens. The 'unity of consciousness' remains unaffected and, thereby, unexplained.

To save the paradigm, those who endorse the view that in such brain condition consciousness can no longer be 'integrated', point out that in not all documented cases was a complete transection of the corpus callosum performed. The truth, however, is that in several

cases, the complete sectioning was performed and even confirmed by MRI imaging or radiological means (Gazzaniga, 1985).

Yet, one may still point out that a complete transection still leaves some residual subcortical structures intact, which allows for some communication between the two hemispheres, potentially maintaining the 'self' of the patients.

To further substantiate the contrary hypothesis, one could mention cases in which there is no second hemisphere to communicate with in the first place. To treat epilepsy, the most extreme surgical intervention is to remove an entire brain hemisphere, that is, by hemispherectomy. Usually, this is done only in childhood because, supposedly, young brains can rewire themselves much more efficiently than older ones. Figure 3 shows the fMRI in a sample of six rare high-functioning patients after partial or complete surgical removal of one cerebral hemisphere.

Interestingly, Nature seems to take the left/right distinction and early plasticity hypothesis not so seriously. That the left–right brain task distribution is not an inescapable neurological dogma is testified to by people born with only one hemisphere. For example, while in healthy subjects the left visual field is represented in the right hemisphere and vice versa, someone born with only one hemisphere can develop maps of both visual fields in it (Muckli et al., 2009). Hemispherectomy on adults older than 18 years turns out to be just as safe and effective as in early childhood (McGovern et al., 2019). Even in the case of a left hemispherectomy, Broca's language area–which in normal conditions is in the left hemisphere–can be recovered in the right part of the brain (Vargha-Khadem et al., 1997). Further evidence reports of subjects in whom the frontal lobe was missing from childhood without any measurable linguistic impairments, as shown by the case of a woman who grew up without her left temporal lobe but speaks in English and Russian (Tuckute et al., 2022; Figure 4). This does not mean that persons missing a hemisphere do not suffer consequences–there is suboptimal word and face recognition (Granovetter et al., 2022) but whether it plays a role in the unity of consciousness remains to be seen.

A possible explanation is that because these patients already had severe seizures originating in one of the hemispheres, the functional rewiring on the other hemisphere began before the surgery. The findings tend to disconfirm this easy way out. Though interconnectivity inside the brain networks increases, interconnectivity between brain regions with the same function after hemispherectomy does not differ from that of two hemispheric control subjects (Kliemann et al., 2019). That plasticity alone can explain this state of affairs is far from proven (more on this later).

However, it is, most patients become seizure-free, and their cognition is relatively unchanged after surgery (some motoric and cognitive functions decrease but others improve). Overall, these patients appear to be 'normal.' Cognitive measures typically changed little between surgery and follow-up (Pulsifer et al., 2004), and in everyday life, one could not tell the difference between humans having a whole brain or only half of one. And, most notably, the subjects report no 'half-self,' 'half-awareness,' or 'half-consciousness.'

If the mind-brain identity theory is correct, and consciousness emerges as an integration of functional centers, with no particular 'seat of consciousness,' then only one brain hemisphere must be sufficient to accomplish the task.

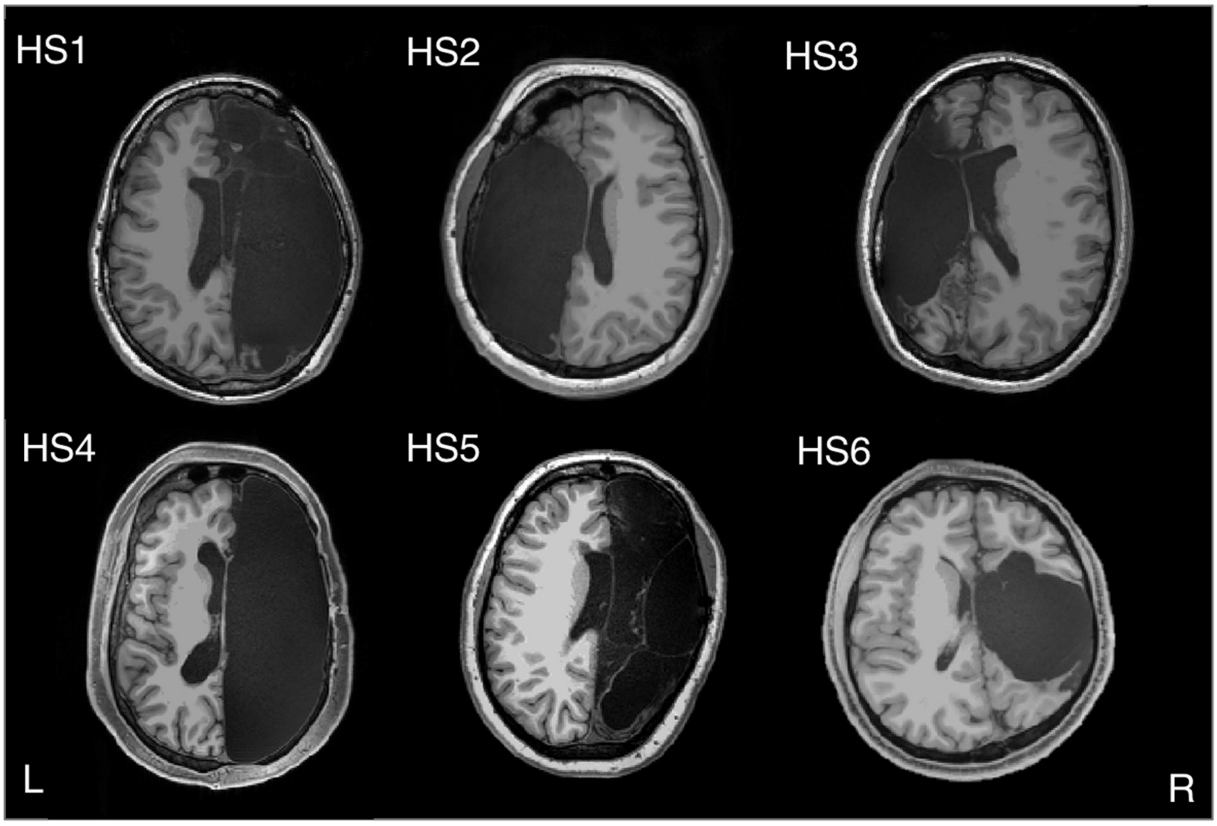


FIGURE 3
Hemispherectomy Brain Anatomy - Six adults with left (HS2 and HS3) or right (HS1, HS4, HS5, and HS6) hemispherectomy. Credit: Kliemann et al. (2019). Reproduced under the terms of CC BY NC ND.

But instances are found in which both hemispheres are severely damaged and there is not much left to integrate. Worth a reminder is how, in 1980, the British pediatrician John Lorber reported that some adults cured of childhood hydrocephaly had no more than 5% volume of brain tissue with a cerebral cortex as thin as 1 mm (Lewin, 1980). While some had cognitive and perceptual disorders and several developed epilepsy, others were surprisingly asymptomatic and even of above-average intelligence.

Then, in 2007, in Marseille, France, a 44-year-old man complaining of weakness in his left leg submitted to an MRI brain scan (Feuillet et al., 2007). As Figure 5 shows, the skull was abnormally filled with cerebrospinal fluid, leaving only a thin sheet of actual brain tissue. As an infant, he'd had a shunt inserted into his head to drain the fluid but it was removed when he was 14. Evidently, the cerebrospinal fluid build-up did not stop and ended up reducing the brain's size to 50–75% compared to its normal volume. Though he had a below-average IQ (75/100), this man had a job, a family, and a normal life.

Another example that should raise doubts is the cases of children in a developmental vegetative state–that is, what the American Academy of Neurology (as declared in its guideline report in 1995 and confirmed in 2018) officially considers as being a neurovegetative state in which there is *"no evidence of purposeful behavior suggesting awareness of self or environment"* (Giacino et al., 2018). In other words, a universal rule reduces them to unconscious children who cannot suffer because this supposedly requires a functioning cerebral cortex.

Nevertheless, only one case showing the contrary should be sufficient to disprove a universal rule. Four such cases were brought to light in 1999 by a group led by Shewmon et al. (1999). They studied the states of awareness in congenitally decorticate children–that is, the cases of four children who were almost completely lacking cortical tissue and were neurologically certified as being in a vegetative state. Yet, the loving care of their mothers (or of someone who adopted them and bonded with them via dedicated full-time caring) could gradually 'awaken' in them a conscious awareness. From an initially unresponsive state, they showed clear signs of having developed auditory perception and visual awareness (despite the total absence of the occipital lobe that, in normal conditions, hosts the visual areas). For example, they tracked faces and toys, looked at persons they recognized, could distinguish between their mothers or caretakers, listened to music for which they manifested preferences with their facial expressions, including smiling and crying, and, at least in one case, gave clear indications of self-recognition in a mirror. Shewmoon notes: *"Were they* [the decorticate children] *not humans studied by clinicians but rather animals studied by ethologists, no one would object to attributing to them 'consciousness' (or ability to 'experience' pain or suffering) based on their evident adaptive interaction with the environment."*

These cases seem to contradict the prevailing theory, according to which the cerebral cortex generates consciousness.

One can still point out that the children were not completely decorticated, as some cortical tissue was still left. Figure 6 shows that a remnant of the frontal lobe is still present, possibly producing the conscious awareness. But that neural mechanisms of conscious function cannot be confined to the cerebral cortex alone is becoming much more plausible (Merker, 2007).

In fact, other speculations now retire to the last cerebral bastion for the seat of consciousness: the brainstem (Solms and Panksepp, 2012). Indeed, its stimulation can trigger intense emotions and feelings. But the question is: What property of a neural circuitry dedicated to the most physical and basal control of cardiac, respiratory, and homeostatic functions, containing mainly neurons for motor and sensory tasks, can also give rise to such an apparently immaterial and completely different and unrelated 'function' or 'property' as a conscious experience? We do not know. However, this is yet another fact telling us that we have the right, at least hypothetically, to assume that they do not and are equally allowed to study these facts in the light of a different paradigm than that of a mind-brain identity.

Overall, the cases mentioned above (except for those of the congenitally decorticate children) of people who have undergone corpus callosotomy or hemispherectomy, or people suffering from hydrocephalus, cerebellar agenesis, or several other types of brain damage, show how surprisingly intact their higher cognitive functions remain. One would expect that the first victims of such invasive neurological changes or surgical interventions would be the complex and high-demanding cognitive functions so characteristic of the mind, such as intellectual skills, abstract thinking, decision-making, reason, logically and willfully planning actions, and so on. Instead, it turns out that even if large brain masses are injured or absent, the cognitive skills of the subject remain substantially unaltered. Further empirical inquiry is needed to show if the same holds for the integrity of subjective experience and no altered states of consciousness or qualitative changes of sensory perception arise.

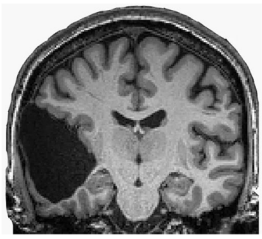

FIGURE 4
Speaking without the brain's language area. Credit: Tuckute et al. (2022). Copyright 2022, reproduced with permission from Elsevier.

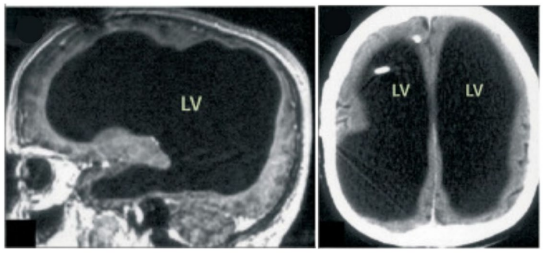


FIGURE 5
MRI image of a hydrocephalus brain. Credit: Feuillet et al. (2007). Copyright 2022, reproduced with permission from Elsevier.

## 2.2. Further questions on the mind-brain relationship

These remarkable cases also confirm that brain size and the number of neurons in a brain do not (or, at least, do not necessarily)

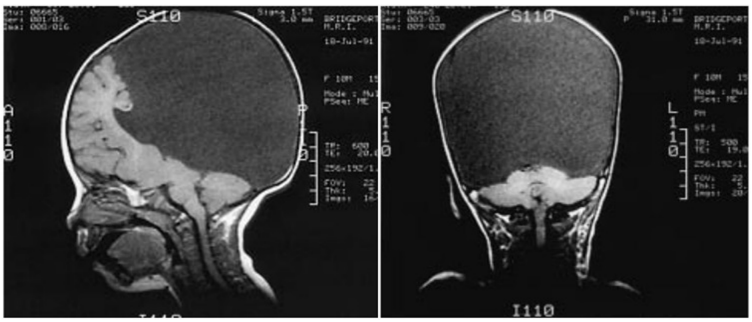


FIGURE 6
Congenitally decorticate children MRI brain scan (midline sagittal and posterior coronal plane). Credit: Shewmon et al. (1999). Reproduced with permission from Wiley.

indicate one's intelligence. Size matters for manipulative complexity, such as the more complex hand movements in primates, which humans can develop superbly (think of the hands of an expert musician playing piano; Heldstab et al., 2020). However, a direct correlation between brain size and mental skills is not that straightforward. We like to believe that our brain size makes us human but rarely do we question what one means by 'size.' The number of neurons? The weight of the brain? Its brain-to-body ratio? Or its volume? Humans do not have the largest brain size in any of the aforementioned senses. The human brain has about 90 billion neurons, weighs *ca.* 1.1 to 1.4 kg, and has a volume of 1,300 $cm^3$. However, the brain of an elephant has three times the number of neurons we have, and the weight and volume of the brain of a sperm whale are six times as much. Meanwhile, ants have a six times larger brain-to-body-mass ratio. A bit of an extreme example showing how cognitive skills and brain size are decoupled is the case of mouse lemurs, whose brains are 1/200th the size of monkeys' but that perform equally well on a primate intelligence test (Fichtel et al., 2020) Therefore, brain size alone does not make for a more developed mind, either while brain size does not scale with memory information content (Forsdyke, 2014; Forsdyke, 2015). Then what does?

It is plausible to assume that a certain degree of complexity is a mandatory factor for a brain or whatever material structure to display a form of intelligence and cognitive skills. One could think of a measure of 'brain connectivity'–that is, the number of wirings between neurons (through their axons, dendrites, and synapses) and the speed at which they transmit and receive signals–as an indicator of its complexity and see if it somehow scales with the cognitive functionality. However, MRI studies reveal that all mammals, including humans, share equal brain overall connectivity (Assaf et al., 2020). The efficiency of information transfer through the neural network in a human is comparable to that of a mouse. It is independent of the structure or size of the brain and does not vary from species to species. So, things cannot be as easy as that.

However, what the above-mentioned clinical cases have in common is the presence of the cerebral cortex. In fact, some neurologists or cognitive scientists conjecture that phenomenal consciousness resides in the cerebral cortex. This belief is not unproblematic either.

First of all, because the neocortex exists only in humans and other mammals, one must conclude that birds, fish, octopuses, amphibians, and reptiles are, per definition, all 'unconscious' and incapable of having some more or less elementary form of conscious subjective experience. There is no sentience; they do not feel pain, fear, or pleasure or have whatever feeling. They are considered Cartesian automatons or philosophical zombies.

But evidence is beginning to emerge that, for example, the neural correlate patterns of sensory perception in a corvid bird aren't substantially different from the neural correlate patterns in humans having a similar sensory conscious subjective experience (Nieder et al., 2020). Moreover, one wonders how some birds can also perform amazing cognitive feats despite their forebrains consisting of lumps of gray cells. It turns out that cortex-like circuits in avian birds exist that are reminiscent of mammalian forebrains, and the idea that advanced cognitive skills are possible only because of the evolution of the highly complex cerebral cortex in mammals is becoming less plausible (Stacho et al., 2020). Sufficiently strong evidence concludes that both cephalopods and crustaceans are sentient (Cox et al., 2021). This is unsurprising: Common sense does not really need any scientific proof to accept that ravens, crows, octopuses, or lobsters are sentient beings.

All these findings require an explanation from the physicalist viewpoint, which identifies the mind and consciousness with the brain.

Of course, one could resort to the usual conjecture that neural plasticity explains all things. Neural plasticity certainly plays a role and undoubtedly has its explanatory power. However, in most cases, it remains conjectural and is invoked to fill the gaps that save the paradigm. Some caution would be appropriate. For example, a recent study challenges the idea of adaptive circuit plasticity, according to which the brain recruits existing neurons to take over for those that are lost from stroke. Definitive evidence for functional remapping after stroke remains lacking. Undamaged neurons do not change their function after a stroke to compensate for damaged ones, as the conventional re-mapping hypothesis believed (Zeiger et al., 2021).

Moreover, it is observed that when a brain injury occurs, causing some form of amnesia, what was thought to be lost forever may reemerge into awareness, sometimes after years. Those whose loved ones suffered from dementia may have noted how memory and clarity of thought suddenly and quite surprisingly reappeared in a brief moment of lucidity, called 'paradoxical lucidity,' or even 'terminal lucidity.' Sometimes, bursts of mental clarity occur shortly before people die. Credible reports document cases in which people with dementia, advanced Alzheimer's, schizophrenia, or even severe brain

damage suddenly return briefly to a normal cognitive state [for a review, see (Nahm et al., 2012); for some more recent findings, see (Batthyány and Greyson, 2021)]. It is hard to recast these brief episodes of lucidity, which last less than 1 h or even a few minutes, by resorting to brain plasticity.

One might also question if, besides the spatial distribution or localization of the neural correlates of consciousness, the intensity of its metabolic activity plays a role in generating a conscious experience. For example, it is well known how the practice of meditation or psychedelic drugs can change our brain chemistry and give rise to the dissolution of the sense of boundaries and intense subjective experiences, respectively. From the perspective of the material monist, which equates mind and brain as being one and the same thing, one assumes that the intensity of 'mind-expanding' psychedelics must be directly proportional to an increase in neural activity and connectivity. A dead brain is the cessation of any cerebral activity, in which case we assume there is no consciousness left, while an intensely subjective experience presumably involves high neural activity. One would, therefore, expect to find that the subjectively felt intensity of a hallucinogen proportionally correlates with neuronal activity.

However, the contrary turned out to be the case. A BOLD-fMRI study reported a significant decrease in brain activity–that is, decreased blood flow and venous oxygenation as being inversely proportional to the intensity of the subjective experience reported by the test subjects (Carhart-Harris et al., 2012). The authors of this research remark how this fact is reminiscent of Aldous Huxley's 'reducing valve' metaphor in the brain that acts to limit our perceptions in an ordinary state of consciousness [see also Koch's take on this (Koch, 2012)]. These findings were later confirmed by further studies with other hallucinogenic drugs such as LSD and ayahuasca (Palhano-Fontes et al., 2015; Carhart-Harris et al., 2016; Lewis, 2017). For a more detailed analysis of this rationale see (Kastrup, 2016). Kastrup also notes how several brain function impairments are accompanied by richer and more intense subjective experiences of self-transcendence (e.g., near-death-experiences associated with dramatically reduced brain function; Kastrup, 2017).

Williams and Woollacott point out how the idea of brain processes attenuating or filtering out mental acuity and broader perceptual awareness is consistent with the literature on meditation studies and Indian non-dual philosophy derived from spiritual practices: Reduced brain activity induced by reduced conceptual activity results in increased cognitive clarity, perceptual sensitivity and awareness expansion (Williams and Woollacott, 2021), suggesting that domains of awareness exist that do not depend upon brain functions.

Furthermore, a neurophenomenological study in the meditating brain showed that the reduction of beta band activity is related to a decreased 'sense-of-boundaries'–that is, to self-dissolution states giving rise to non-dual awareness (Dor-Ziderman et al., 2016). Similarly, Katyal and Goldin found that deeper meditation experiences are accompanied by increased alpha oscillations (closely linked to inhibitory processing and are often related to the suppression of distractors during attentional cognitive processing) and suppressed theta oscillations (potentially indicating reduced self-monitoring) (Katyal and Goldin, 2021).

Long-time meditators report a state of 'minimal phenomenal content', or as a 'non-dual awareness' of 'pure consciousness', and that could be posited as 'consciousness as such.' Investigations on Buddhist meditation suggest distinct correlates of nondual states exist but describe it as 'non-representational' awareness (Josipovic, 2014; Josipovic and Miskovic, 2020). Metzinger, instead, conjectures that it could be related to some neurological representational model realized in some brain region with some specific physical properties or neural signatures and correlates that have yet to be discovered Metzinger, 2020. While Katyal argues that the phenomenology of nondual meditative states suggests that a purely non-representational conscious state–that is, a 'transcendental' state beyond conscious experience–may transcend any such neural signatures altogether (Katyal, 2022).

## 2.3. The search for the neural correlates of memory

There remain other aspects to explain but that escape a materialistic paradigm with a strikingly similar pattern to that of consciousness and mentation: the neural correlates of memory. Also, in this case, one thing is certain: Memory is not stored in a specific brain area like it is on a digital computer. More than a century of research into the biological foundation of memory has not led to tangible results providing convincing evidence that such substratum exists. This is not a new issue. It dates back to Henri Bergson's opposition to a reductionist understanding of memory (Bergson, 1896/1912). Bergson considered memory to be of an immaterial and spiritual nature rather than being stored in the brain.

One might assume that information content should somehow scale with brain size. This is not observed, however (Forsdyke, 2014), (Forsdyke, 2016). For example, hemispherectomy in children does not lead to memory impairment (Tavares et al., 2020). How can it be that someone without half of the brain has no measurable memory impairment? We could explain this by resorting to the plasticity of the brain or the functions of residual brain tissues. Or, we could conjecture that memory is stored in both hemispheres; therefore, if one hemisphere is lost, the other remains unimpaired (a hypothesis that could also fit well with supposed evolutionary advantages). Or because it is the diseased hemisphere that is removed in all these cases, Nature might have provided a mechanism that transfers the memories to the healthy hemisphere before surgery. However, we should be aware that these are conjectures, hypotheses, and speculations, not scientifically established truths. Memory storage and retrieval in biological brains remains a largely unexplained mechanism, and no conclusive evidence exists that proves it to be of a physical nature.

Other research that might suggest how and where memories are stored in brains comes from experiments performed on freshwater flatworms called planaria. These creatures can be trained to associate an electric shock with a flash of light. Therefore, one might expect that they must have encoded the experience in their brains.

Flatworm planarians have an incredible self-regeneration ability (Ivankovic et al., 2019). If this worm is cut in half, each amputated body part regenerates as two new fully formed flatworms. Not only does the part with the head form a new tail but the remaining tail also forms a new head with a brain and eyes. In 1959, James V. McConnell showed that the newly-formed planaria with a new brain also maintained its conditioned behavior (McConnell, 1959). The newly-formed living being never received the electric shock and light flash of the training phase and yet it reacted as if it had a memory of the training it had never received.

Memories, if physical, may be stored not only in the brain but also throughout the body, in non-neuronal tissue.

McConnel's idea was that RNA molecules could transfer memory from one planarian to another as a "memory molecule." Motivated by this idea, he injected worms with RNA taken from those trained and reported that the training had been transferred. However, further research could not convincingly reproduce McConnel's experiments.

In 2013, Shomrat and Levin vindicated McConnel's first experiments by using computerized training of planarians, replacing manual procedures that caused previous test attempts to fail (Shomrat and Levin, 2013). Then, in 2018, Bédécarrats showed how the extracted RNA from a long-term trained sea slug, the aplysia, can induce sensitization in an untrained aplysia (Bédécarrats et al., 2018). This is taken as evidence for the molecular basis of memory and the hypothesis that RNA-induced epigenetic changes lead to the protein synthesis required to consolidate or inhibit memory. These local translations into synaptic proteins determining the neural structure of memory are actually the mainstream engram model.

However, the problem with this hypothesis is that the fastest protein synthesis causes cellular changes in timescales of minutes. How could it possibly be responsible for our ability to store and recall memories almost instantaneously?

Moreover, the still common idea that long-time memory is mapped as synaptic connectivity is challenged by the fact that it is possible to erase synaptic connections while maintaining the same conditioned behavior in the aplysia. Long-term memory and synaptic changes can, at least in some cases, be dissociated (Chen et al., 2014). It has also been shown that the brain tissue turns over at a rate of 3–4% per day, which implies a complete renewal of the brain tissue proteins within 4–5 weeks (Smeets et al., 2018). If the synaptic trace theory is correct, and since synapses are made of proteins, how can, in the presence of this turnover, long-time memory consolidation be achieved in synaptic strengths and neural connection patterns? Notice how the fact that proteins have short lifetimes is in line with the volatility of synaptic connections. How can considerably volatile changes in synaptic connections underlie the storage of information for long periods (even in the absence of learning; Trettenbrein, 2016; Mongillo, 2017)? If memory is physical, other physical repositories must be viable (DNA, cellular organelles, etc.), or a paradigm shift is necessary.

The search for engrams–that is, the group of neurons supposedly responsible for the physical representation of memory–resorts mostly to the correlation between the memory evaluation based on fear conditioning behavioral tasks of rodents and its presumed associated neural changes. For example, in a series of articles the group of Tonegawa claims to have discovered engram cells (Liu et al., 2012; Redondo et al., 2014; Ryan et al., 2015; Roy et al., 2016). They show how light-induced optogenetic reactivation of mice hippocampal neurons that were previously tagged during fear conditioning, induces a freezing behavior characteristic of fear memory recall. While the same activation of cells in non-fear-conditioned mice, or fear-conditioned mice in another context, did not elicit the same freezing behavior. Therefore, the activation of these context-specific neurons seems to suggest that they act like memory engrams of the specific fearful experience.

However, unclear is what really motivates the freezing behavior. The question is whether the cells' activation led to the memory retrieval of the fearful experience leading to the freezing behavior, if it activates the fear-like emotional state first before any memory retrieval, or if the mice might stop simply because they perceive an unexpected stimulus that might not be related with any fear or remembrance. Only the first case could potentially support the engram hypothesis, but lacking a first-person account, we will never know. While, on the contrary, the second case would only show that the activation of those cells triggers an emotional state that precedes the memory retrieval, and thus, the activated cells would not represent memory engrams (after all, we know that in humans also, stimulation of specific brain centers can lead to panic attacks associated with traumatic events, but these are not necessarily considered as the physical repository of the trauma memory.) While the third case questions whether mice freezing behavior correlates with fear perception in the first place. A lack of motion could be due to many things, not just fear. Moreover, besides the hippocampus, it is possible to induce freezing by activating a variety of brain areas and projections, such as the lateral, basal and central amygdala, periaqueductal gray, motor and primary sensory cortices, prefrontal projections, and retrosplenial cortex (Denny et al., 2017). It is not clear what the freezing behavior is really about.

This, again, shows how the correlation-causation fallacy based on a loss-of-function lesion rationale should be seen with a more critical eye.

Meanwhile, we are also allowed to speculate about a third complementary alternative. Memories associated to physical cues and lower cognitive processes and computational tasks for deductive, inferential, syntactic, predictive optimization problem-solving are material–that is, implemented in a synaptic and molecular basis for consolidation of learned behavior, fact learning, pattern recognition, recording and retrieval of representational content, external sensory cues and other physical information [e.g., see (Gershman, 2023), and that is also an interesting account of the puzzle of the biological basis of memory]. While other memories may be associated to higher cognitive functions involving inductive, non-algorithmic tasks and conceptualizations–that is, memory consolidation and recall of abstract thoughts, semantic categories, and non-representational forms of introspective intuitive cognition and creative expressions that may go beyond a Turing-machine-like information processing [e.g., see (Marshall, 2021), or, for alternatives such as 'extracorporeal information storage', see also (Forsdyke, 2015)].

## 2.4. Cognition without a brain

As a concluding note, it is worthy of mention that an increasing body of evidence shows that an at-least elementary form of cognition is already present and working in multicellular and single-celled lifeforms, without any neural substrate. Research in plant biology demonstrates how vegetal and cellular life shows elements of cognitive behavior that were not suspected or were simply considered impossible without a brain. There is extensive literature now that, especially in the last decade, has consistently shown how plants change behavior and adapt, respond predictively, possess some form of memory, resort to air and underground communication systems based on chemical, visual, and acoustic signals, have learning abilities and can evaluate their surroundings, make decisions, and have a cooperative behavior. It is not inappropriate to speak openly of a

'minimal' or 'proto-cognition' of cells, what is now called 'basal cognition'. For some reviews see Trewavas (2017), Gershman et al. (2021), and Lyon (2015).

Some climbing plants exhibit an anticipatory prehensile mechanism and able to purposefully plan its movements by an 'approach-to-grasp' behavior *before* having any physical contact with a support (Guerra et al., 2019). Other aspects could be mentioned, such as plants' adaptive changes that reflect developmental decisions based on 'root-perception.' Having no central nervous system or information processing centers, roots are, nonetheless, *"able to integrate complex cues and signals over time and space that allow plants to perform elaborate behaviors analogous, some claim even homologous, to those of intelligent animals,"* as Novoplansky describes it (Novoplansky, 2019).

Several experiments with unicellular creatures have made it clear that conditioned behavior in single cells exists as well and is comparable in its complexity to that of plants.

An example could be the evidence of conditioned behavior in amoebae. It could be shown how the motility pattern of the *Amoeba proteus* under the influence of the two stimuli is consistent with associative conditioned behavior (De la Fuente et al., 2019).

A quite surprising 'brain-less problem-solving' was (re-) discovered in another protozoan. In 1906, the American zoologist Herbert Spencer Jennings noted how the Stentor roeselii could escalate actions to avoid an irritant stimulus by a complex hierarchy of avoidance behaviors in which the protozoan first enacts a strategy, sees if it works, and if not, resorts to another strategy in a series of attempts to solve a problem. One hundred and 13 years later, in 2019, Jennings' observations were confirmed (Dexter et al., 2019).

Another notorious example of non-brain-centered cellular cognition is that of the *Physarum polycephalum*, a large amoeba-like slime mold plasmodium that exhibits several skills and behavioral patterns that could be labeled as 'proto-intelligent'. For example, it can find the minimum length between two points in a labyrinth, and minimize the network path and complexity between multiple food sources (Nakagaki, 2004). Learning processes of habituation with anticipating conditioned behavior was shown as well (Saigusa et al., 2008). For an in-depth review on slime molds see also (Reid, 2023).

Finally, worth a mention is the behavior of the simplest life form, namely, bacteria. These also can sense the environment, actively move within it, target food, avoid toxic substances, and meaningfully change their swimming direction. Most evident is this behavior when they come together forming a bacterial community that shows surprising problem-solving abilities. Bacteria communicate with each other and coordinate gene expression, which determines the collective behavior of the entire community to achieve a common goal with collaborative problem-solving abilities [for a review of bacteria's behavior see (Lyon, 2015)].

If and how this basal cognition may also imply instances of phenomenal consciousness–that is, some form of more or less 'basal sentience'–is debatable but can be substantiated by arguments that aren't exclusively philosophical (Segundo-Ortin and Calvo, 2021). More recently, Parise et al. reviewed the ecological literature, suggesting the existence of an "extended cognition"–that is, a paradigm where one no longer considers the brain as the exclusive seat of cognition, but generalizes it to environmentally extended cognitive processes (Parise et al., 2023).

## 3. Discussion

The paper presented a series of neurological and biological observations whose implications remain controversial. This overview started by questioning the assumption of a lesion-based sufficiency criterion that identifies the causal relationship between the impairment of a specific cerebral area and the, thereby, assumed suppression of phenomenal consciousness and/or cognitive processes, as proof of a material monistic mind-brain identity interpretation. Motivated by this assumption we asked whether the idea of a specific brain area, structure, or its related activity, as being responsible for the qualitative and subjective experiences is consistent with the evidence, and pointed out the lack of conclusive evidence that the phenomenal dimension and singularity of the sense of self-hood, together with its higher cognitive functions is disrupted despite large impairments, suggesting that the hypothesis of a (local or global) brain-based 'seat of consciousness', if not inconsistent, must be too simplistic.

Some other neurological aspects of the mind/consciousness-brain relationship were investigated, such as the non-trivial scaling between cerebral size and neural complexity with intelligence, the hypothesis of the cerebral cortex as a center for subjective experience, by comparing it in humans and in other non-mammals, and we examined if and how far neural plasticity alone can be invoked to explain the recovery of cognitive functionalities. Of particular interest is the fact that, contrary to expectations, an inverse relationship between brain activity and conscious experience exists. Reduced brain activity leads to increased cognitive clarity and awareness expansion, seemingly suggesting that at least some aspects of our conscious experience do not depend upon the intensity of brain activity.

The now more than a century longstanding search for the physical basis of memory and memory engram cells was examined. While the predominant paradigm favors the engram hypothesis, here we highlighted how several findings challenge the conventional materialistic view. Observations like memory retention in hemispherectomy cases and planaria's regenerative memory, along with the limitations of protein synthesis as an explanation and volatility of synaptic connections raise doubts about synaptic trace theory.

Finally, emerging evidence in plant and cellular biology challenges the assumption that all cognition requires a neural substrate. Plant and cellular lifeforms exhibit forms of basal cognition, with abilities including adaptation, memory, communication, learning, decision-making, and problem-solving. Notable instances include the slime mold intelligent behaviors (Reid, 2023) and bacterial communities' coordinated problem-solving abilities, demonstrating that cognition is not exclusive to organisms with brains (Dinet et al., 2021).

Overall, these findings do not support the mind-brain identity ontology so straightforwardly as is commonly believed. The much too often unquestioned assumption that sees the nervous system as a sine-qua-non condition for conscious experience and cognitive behavior is challenged and we are equally allowed to consider cognition and sentience, not as emerging epiphenomena but as inherent 'pre-neuronal' aspects of life.

Of course, 'pre-neuronal' does not necessarily mean 'pre-physical.' These findings do not refute physicalism in and of themselves. Each of the cited neurobiological facts, when considered separately, may still be saved by several speculations inside the limitations dictated by

material monism. The left column of the following table summarizes the findings discussed. The right column furnishes the possible interpretations that could, in principle, save a material monistic paradigm.

| Apparent lack of mind-brain identity correlations | Possible interpretations that could save the mind-brain identity theory |
|---|---|
| Corpus callosotomy and hemispherectomy keep selfhood unified. | Residual subcortical structures may connect the two hemispheres preventing 'self-splitting'. |
| Cerebellar agenesis leads to only mild or moderate motor deficits. | Neuroplasticity: The remaining hemisphere takes over the tasks of the missing one. |
| Hydrocephalus can be quite extreme without necessarily leading to mental impairment. | Neuroplasticity again: Brain tissue may not be lost but only compressed maintaining its functionality. |
| The hypothesis of the cerebral cortex being the 'generator' of conscious experience is contradicted by research on congenitally decorticated children and non-mammalians. | What do we know about what it is like to be a bird? |
| Thalamus stimulation acts as a 'gate of consciousness', not as its 'generator.' | The thalamus is a hub that 'modulates' consciousness; it does not 'generate' consciousness. |
| Brain size (nr. of neurons, mass, volume) does not correlate with cognitive skills. | A minimal nr. of neurons is necessary, then size does not necessarily scale with intelligence. |
| The brain's complexity (connectivity, efficiency of information transfer) does not correlate with cognitive skills. | Complexity is more than connectivity and information transfer. |
| Evidence for engram cells remains debatable, and no memory loss was observed in hydrocephalus or hemispherectomy. | Progress has been made, it is only a matter of time before we will discover the physical basis for memory. |
| The intensity of psychedelic-altered states of consciousness inversely scale with network disruption. | Maybe psychedelic experiences are unfolding in the brain all the time in the form of unconscious processes. Psychedelics may present it to the surface awareness. |
| Basal cognition exists without a brain, like in plants and cells. | Will sooner or later be explained away by complicated cell signaling adaptive processes. |

However, taken together the lack of these correlations, if we see things jointly in a wider context, that is, without selectively limiting our attention to the single phenomenon seen in isolation, and by taking a coherent integral view in which each phenomenon is seen collectively as the expression of a deeper causal principle underlying the entire pattern, another ontology that does not need such a plurality of physical interpretations is possible. A non-physicalist standpoint that sees mind and consciousness not as an epiphenomenon of matter but, rather, fundamental primitives that manifest *through* the material substrate (e.g., by what James called a 'transmissive' rather than 'generating' function) in line with a dualistic, idealistic, or other post-material worldviews. A viewpoint, that does not assume a mind-brain identity as a given apriorism but rather sees consciousness and mind as fundamental, with the brain a 'physical mind' that mediates information from and to a non-physical mind, could accommodate the above-listed lack of correlation between neurological and experiential/cognitive phenomenality inside a paradigm that does not need all these mechanistic conjectures.

Anyway, a future direction of systematic research that does not always assume the mind-brain identity as a given fact and leaves doors open to other perspectives, would be sufficient to potentially lead to powerful new insights that were previously overlooked. A possible future generalist approach, that does not necessarily impose one or another metaphysical worldview but starts with the assumption of a 'post-material psychology', could be a line of research (Beauregard et al., 2018). The mind–body problem and the hard problem of consciousness remain controversial issues more than ever, but non-physical ontologies of mind and consciousness are far from having been expunged by science. We have the right to explore these as a viable option not despite but, to the contrary, because of neuroscientific evidence that has been selectively dismissed for too long but cannot be ignored forever–if we can connect the dots.

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

## Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

## Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Publisher's note

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# Neuropsychological assessment methodology revisited: metatheoretical reflections

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Theory building in neuropsychology, similar to other disciplines, rests on metatheoretical assumptions of philosophical origin. Such assumptions regarding the relation of psychological and physiological variables influence research methodologies as well as assessment strategies in fields of application. Here, we revisit the classic procedure of Double Dissociation (DD) to illustrate the connection of metatheory and methodology. In a seemingly unbridgeable opposition, the classical neuropsychological procedure of DD can be understood as either presupposing localizationism and a modular view of the brain, or as a special case of the generalized neuro-lens model for neuropsychological assessment. In the latter case, it is more easily compatible with a perspective that emphasizes the systemic-network, rather than the modular, nature of the brain, which as part of the organism, proportionately mediates the situatedness of the human being in the world. This perspective not only makes it possible to structure ecological validation processes and give them a metatheoretical foundation, but also to interlace it with the phenomenological insight that the laboratory as one context of empirical research may be analyzed in terms of situated experience. We conclude with showing that both the localizationist and the system science approach can agree on a view of the brain as a dynamical network, and that metatheory may thus offer important new perspectives of reconciliation.

KEYWORDS

**neuropsychological assessment, lense model paradigm in neuropsychology, philosophy of science, phenomenological psychology, metatheory, ecological validity, modularity, neural networks**

## The problem of consciousness and neuropsychological methodology

The contemporary discourse surrounding the issue of low replicability rates in psychology (Open Science Collaboration, 2015) posits that such rates can be attributed, at least in part, to deficiencies in theory building (Muthukrishna and Henrich, 2019; Oberauer and Lewandowsky, 2019; Witte, 2022). Therefore, the validity of empirical research is contingent upon the soundness of scientific theory. Scientific theories encompass convictions pertaining to the subject-matter under investigation, as well as the interrelationships between the various entities or attributes being examined

(Borgstede and Eggert, 2022). To the extent that these are metatheoretical or ontological, they also belong to the scope of philosophy (cf. Hastings et al., 2020). However, it should be noted that a metatheoretical framework differs from a specific scientific theory in that it can structure competing concrete individual theories (Muthukrishna and Henrich, 2019). Metatheoretical frameworks that belong to the relation of psychological and physiological variables are coherently also found in psychology, physiology, and cognitive neuroscience (cf. Marom, 2020; Pauen, 2021). These disciplines thus take a stance toward a problem which philosophers call the mind-body problem or problem of consciousness (see Pauen, 2021; Schleim, 2022). Yet, throughout history, philosophers could not achieve a consensus on the *solvability* of this problem. In 1872, Du Bois-Reymond gave a series of lectures on the limits of scientific explanation, one of these limits being the problem of consciousness (Du Bois-Reymond, 1872; see also Schleim, 2022). In 2013 Kügler has regarded the "ever-shifting problem" of consciousness as an unsolvable riddle (Kügler, 2013; but see Pauen, 2021). Regardless of matters concerning the solvability of the problem, recent work in theoretical psychology and neuroscience has emphasized that philosophical positions or metatheoretical frameworks, such as the postulate of neuropsychological reducibility or the postulate of psychophysical causality may influence theory-building, research methodology, as well as diagnostics or even therapeutic interventions (see Fahrenberg, 2013, 404; Fuchs, 2017; Marom, 2020). Explicit metatheoretical frameworks for the subject-matter of these sciences are, for instance, biological naturalism, which regards mental phenomena as properties of the *brain* (Searle, 1992), or enactivism, which holds them as emergent properties of an *organism* in a dynamic-reciprocal interplay with its environment (see Lee, 2023). Krakauer et al. (2017) have claimed that cognitive neuroscientists and psychologists, while guided by philosophical beliefs, implicitly adumbrate the lack of an *explicit metatheoretical or conceptual framework* when they use filler terms. Without such a framework, statements like "The circuit X is *involved* in behavior Y" (ibid., 485) would be a mere restatement of the correlative or causal relation and would not (further) contribute to any explanation. The lack of explicit metatheoretical frameworks coincides with the notion of a neglect of (formal) explanatory theory in psychology (Teigen, 2002; Oberauer and Lewandowsky, 2019; McPhetres et al., 2021; Borgstede, 2022; Wendt and Wolfradt, 2022). We wish to call attention to the influence of different metatheoretical frameworks, as it may be the case, that a single empirical finding can be accounted for by multiple explanatory frameworks. The recourse to parsimony to justify the primacy of framework x over framework y is only logically permitted if it is not made unreflectively based on framework x, otherwise one would be committing the fallacy of a *petitio principii*.

In light of the broad array of philosophical views concerning the problem of consciousness, we do not commit ourself to any particular one. This article investigates the metatheoretical beliefs regarding the relation of physiological and psychological variables, which beliefs inherent to different neuropsychological assessment procedures, such as double dissociation and the concept of reverse experimentation (see Kadlec and van Rooij, 2003).

Our intention is to assert that metatheoretical stances may stimulate improved approaches for addressing specific methodological requirements in neuropsychological research, such as internal and ecological validity. To achieve this objective, we draw upon a phenomenological orientation which can be found in 20th century psychology (Lewin, 1936; Herzog, 1992; but also see Wendt, 2022), philosophy (Gurwitsch, 2010), as well as neuropsychology (Goldstein, 1995; Frisch, 2014a).

## The entanglement of metatheory and methodology in neuropsychological assessment

Our endeavor commences with an analysis of a widely used neuropsychological practice known as double dissociation (DD). The rationale of DD holds that, if a brain lesion *A* leads to the impairment of the psychological function *1* but not of function *2* and a brain lesion *B* leads to the impairment of function *2* but not of function *1*, a relative functional independence of the two brain areas can be assumed (see, e.g., Stone and Davies, 1993, 594). A prototypical example is the dissociation of speech production, impaired in patients with lesions in Broca's area, and the impairment of speech comprehension, impaired in patients with lesions in Wernicke's area (see Gazzaniga et al., 2014, 472–474).

One classical presupposition regarding DD is that its validity rests on the metatheoretetical assumption of modularity, eventhough this assumption was subject to extensive critique (Shallice, 1988; Plaut, 1995). It should be emphasized that multiple accounts of modularity exist (cf. Gottschling, 2020). For instance, Shallice (1988, 20) discusses Fodor (1983), whose account of modularity defines a module as a subsystem exhibiting specific characteristics, including domain specificity, innate specification, indecomposability into basic elements, hard-wiredness, computational autonomy, information encapsulation, and a distinctive pattern of development. Fodor argues that modules are "computationally autonomous" in the sense that they operate independently without relying on general-purpose processes from other modules. "Informational encapsulation" refers to the limited access of a module to a specific subset of information within the overall system (Shallice, 1988, p. 20). Shallice critically contends that this conceptualization of modularity may be excessively rigid, considering the subject-matter of neuropsychology. Because of these concerns Shallice adheres to the concept of functional differentiation in regard to subsystems. In accordance with Tulving (1983), Shallice asserts that two subsystems exhibit functional dissimilarity when one system functions independently but potentially less efficiently without the support of the other intact system. In the case of functional dissimilarity, enhancements or suppressions in the operations of one system do not necessarily impact the other system in a similar manner. Accordingly, this functional disparity indicates that the systems operate differently and are governed by distinct principles, at least partially (Tulving, 1983, p. 66). However, it is still common to interpret double dissociation as methodological correlate of the metatheoretical assumption of modulartiy [see for a critique (Shallice, 1988; Plaut, 1995)]. Still, it must be noted, that the concepts of modularity and functional dissimilarity bear relevant similarities. When we speak of 'modular' we will adress this wide sense of modularity.

## Reflections on double dissociation

The explanatory paradigm of DD may be subjected to critique, for example, from the phenomenological standpoint of enactivism which has been advanced by Thomas Fuchs. In our view, DD is also consistent with a metatheoretical position Fuchs termed "biological epiphenomenalism". This approach regards consciousness as a "dispensable varnish" (2017, 227), i.e., views conscious experience as a causally ineffective byproduct of brain processes. DD's primary focus lies in investigating the influence of brain lesions on behavior or experience, specifically examining how physiological variables affect psychological aspects. However, it does not typically investigate the reverse relationship, where psychological factors affect physiological variables. Fuchs rejects the notion of a dualism between mind and brain that is implied by such perspectives. In his view, psychological variables are not separate from bodily processes. He regards psychological variables as abstractions used to describe properties of an *embodied mind*. For Fuchs, it is the conscious, living organism, which possesses causal power, not the abstraction (2017).

Marom (2015) largely agrees with Fuchses perspective (2015, pp. 49–68). For Marom, psychological and physiological variables are viewed as *categorically, but not necessarily ontologically* distinct (see Fahrenberg, 2013, 2015). It may be argued that DD does not adequately consider this categorical distinction. Furthermore, if DD is approached from a biological epiphenomenalist standpoint, it becomes challenging to reconcile certain empirical findings. Examples of such findings are that subjectively experienced stress is predictive of somatic health outcomes (Tsukerman et al., 2020), that meditation enhances hippocampal connectivity (Lardone et al., 2018), or that psychotherapy improves the linkage between the amygdala and the cognitive control network (Shou et al., 2017). The reason for this explanatory difficulty is that the conceptual framework of biological epiphenomenalism does not accommodate the effects of psychological variables on physiological variables. Enactivism, on the other hand, argues that through *downward causality*, psychological variables, as emergent properties of the *embodied* mind, can influence "simpler" biological variables (Fuchs, 2020). However, the potential for circular causality remains a subject of debate (see, for example, Lee, 2023), and for the purpose of our discussion, we remain true to the metatheoretical perspective by bracketing the decision for one or the other standpoint.

One of has summarized further arguments against DD in a previous article. On the one hand, the aforementioned concept of dissociation of function seems problematic due to a lack of factor independence. Additionally, DD has been subject to criticism for relying on non-experimental *ex post* facto data. Consequently, DD faces limitations in establishing causal relationships between neurobiological and mental phenomena. Moreover, it fails to demonstrate necessary identity between psychological and physiological phenomena on the ontological level due to the existence of an indefinite number of potential neural networks that can implement the same psychological function (Peper, 2018).[1]

Double dissociation but also its critical adversaries, are substantially influenced by their underlying metatheoretical pre-suppositions. This highlights the importance of methodological reflection, as it has the potential to facilitate metatheoretical reconciliation and potential improvement. In the following discussion, we will illustrate how a meta-model for neuropsychological assessment (Peper, 2018), as well as the phenomenological orientation in psychology (Wendt, 2018) and neuropsychology (Goldstein, 1995; Frisch, 2014a,b) might contribute to addressing the limitations of DD and potentially overcome its shortcomings.

## A lens type meta-model for neuropsychological assessment

Within neuropsychological assessment theory, one of us has put forth the *neuro-lens model* (NLM) which is a neuropsychological *generalization* of DD since the latter can be regarded as a special case of the former (cf. Peper, 2018). NLM's epistemological approach to relate distal and proximal entities draws on the metaphor of the lens (cf. Brunswik, 1952).

The NLM framework poses the following pre-conditions for inferring causal relations between psychological ($\Psi$) and physiological ($\Phi$) domains incorporates the following three pre-conditions: (a) the ability to experimentally manipulate the psychological and physiological variables of interest, (b) the identification of convergent and discriminatory correlations, which are indicators of validity, and (c) the investigation of both causal directions between psychological and physiological variables, that is, examining the influence of $\Psi$ on $\Phi$ ($\Psi \rightarrow \Phi$) as well as the influence of $\Phi$ on $\Psi$ ($\Phi \rightarrow \Psi$ ).

According to the logic of this so-called *reverse experimentation approach*, a psychological function of interest could be stimulated to show that a specific biophysical activation depends on that function, and not on another activation. For instance, a visual stimulus could be presented in an fMRI experiment to capture the neural correlates associated with visual perception.[2] In contrast, neural system manipulation could be utilized to demonstrate the modification of a specific psychological function while leaving others unaffected (Peper, 2018): transcranial magnetic stimulation (rTMS) could be applied, for example, to induce a temporary disturbance in the motor cortex (M1), selectively impacting

1 A note for the philosophically inclined: The argument of *ex post* facto data is especially relevant to non-identity theorists. The argument concering necessary relation is especially relevant to identity theorists. Pepers critique thus remains forceful from different metatheoretical standpoints.

2 It should be noted, however, that identifying the substrate, i.e., the correlating brain state of a psychological function, is a difficult undertaking. Every state of consciousness is accompanied by its neural enabling conditions, its neural substrate, and its neural consequences. de Graaf et al. (2012) argue that only enabling conditions and consequences can be separated from each other, while the assumed substrate of mental function always remains intertwined with one of the two and thus eludes identification in empirical analysis.

hand movement in one region and arm movement in another (Peper, 2018).

Methodologically speaking DD can be seen as a specific application of the NLM. The NLM offers methodological advantages, such as its hierarchical multilevel structure, which addresses the issue of factor independence in both mental and physiological variables. In addition to these methodological considerations, the NLM brings about a shift in the metatheoretical assumptions of neuropsychological assessment strategies. According to this, experimental manipulation can be applied to both categorical domains of neural and psychological phenomena. It thus captures the range of possibilities that have been developed within the field of neuropsychological assessment and research and offers a more comprehensive approach to exploring the complexities of brain-mind relationships.

Double dissociation and the NLM both describe methodological procedures, while e.g., epiphenomenalism or the system science/network view are metatheories. Yet, metatheory and methodology are not independent. Because DD (merely formally) can be seen as a special case of the NLM, one could employ DD's methodology while adhering to a metatheoretical network perspective. However, it is not possible to be a metatheoretical epiphenomenalist and simultaneously employ the NLM as methodological framework.

The generalization by the NLM encompasses methodological and metatheoretical perspectives concerning the context-dependency of psychophysiological variables. This context-dependency, however, may not be adequately addressed within the framework of classical discriminant diagnosis of which DD is an instance. This is particularly the case when this framework is approached from a modularist perspective, which according to Frisch (2014b) often assumes that knowledge acquisition occurs solely within standardized environments. However, methodologically there is no inherent reason why (experimental) research cannot be conducted beyond the confines of the laboratory (Fahrenberg et al., 2007). We therefore see that the metatheory associated with the NLM is preferable to one that does not consider the context and context-dependency of psychological, as well as physiological variables. The NLM emphasizes the context dependency of psychological and physiological attributes with regard to methodology and metatheory.

Concerning the issue of *ecological validity*, Peper follows Brunswik, in stating that "the conditions and materials of assessment should be representative of the environment of the person. Multiple interacting environments, for instance, shared or non-shared contexts of personal life events can be identified. Thus, different types of lens models are needed to improve ecological validity" (Peper, 2018, 272). This assertion seems especially important since the ability of some neuropsychological tests to predict the impairment of patients in their daily living environment appears to be limited (e.g., Peper and Loeffler, 2014; Suchy et al., 2022).

The concept of "ecological validity" has been criticized recently for conceptual vagueness and risk of antagonizing the "real world" and the "neutral lab" (Holleman et al., 2020). Consistent with Peper's assumptions of *differences in contexts,* phenomenological psychology's paradigm of *situation analysis* can shed light on the fact that the laboratory is *but one context of experience,* as one of us has argued (Wendt, 2018).[3] It is crucial to understand, however, that complementary to an understanding of the context of the "physical" environment of an organism, it is also necessary to assume a subjective experienced environment (in the sense of Umwelt the works of theoretical biologist Jakob Johann Von Uexküll, 1921). Among other reasons, because it is possible, that people situated within the same physical environment experience a different *Umwelt* (Gurwitsch, 1976), a *descriptive* approach to the assessment of the situation of an individual may contribute to neuropsychological procedures (cf. Frisch and Métraux, 2021). This perspective thus helps both to avoid the justified criticism by Holleman et al. concerning the antagonization of the "real world" and a supposedly neutral laboratory and to take different types of experienced situations into account (Wendt, 2018, 4). Striving for ecological validity makes it necessary to reflect on metatheoretical stances regarding the contextual nature of the human condition.

## Contextuality and metatheoretical dialogue

Metatheoretical reflections regarding the contextual nature of the human condition can be found in phenomenological psychology, which has a long tradition of emphasizing that human experience is situated (Lewin, 1936; Merleau-Ponty, 1962; Gurwitsch, 2010; Wendt, 2018). The observation that the laboratory, unlike many other contexts of human experience and behavior, is characterized by an elimination of many everyday stimuli does not contradict the observation that contexts outside the laboratory are heterogeneous. In shared work one of us has argued that

> [n]atural situations differ from lab situations in multiple ways as they require more complex planning, organizational and monitoring processes. In contrast, lab environments are typically void of distractors that divert the subjects attention from the task. Moreover, the test administrator, who structures the test session and supports the subject throughout the procedure, is not present in real life; thus, a crucial social agent that compensates for deficits and provides extrinsic motivation is absent (Peper and Loeffler, 2014, 233–234).

According to Eling (2015), the phenomenologically oriented physician Kurt Goldstein (1878–1964) spoke of some test situations as being "lebensfremd," (not true to everyday life) and of others as being "lebenswahr" (true to everyday life). Goldstein, together with the gestalt psychologist Adhémar Gelb (1887–1936), played a central role in the advent of contemporary neuropsychology. Goldstein's phenomenologically inspired positions can be understood as a metatheoretical or

3 The acknowledgment of the laboratory as a meaningful situation, governed at least partially by, among other experiential factors, social rules, and individual expectations, may create an opportunity to analyze, for instance, the Milgram Experiment as an investigation into the authoritative role of science in Western societies (see Haslam et al., 2014). Overlooking the fact that the act of entering a laboratory stimulates a distinct experience may result not only in an overestimation of the generalizability of experimental results but eventually also leads to impaired interpretations of empirical findings.

metascientific attempt at structuring the various schools of theory and methods presented here. Accordingly, Goldstein was an early critic of modularity, stressing that psychological functions can only be understood if the *whole organism* is taken into consideration (Gelb and Goldstein, 1920; Rimpau, 2009). This position possesses at least some similarity with enactivism which commonly regards psychological variables as properties of the entire organism (cf. Fuchs, 2017). Frisch (2014a) notes that Goldstein viewed practices contingent on some versions of modularity, as DD according to some authors (Warrington, 1981), as insufficient, because they do not consider that patients can partially regain psychological functions after brain lesion. The possibility of such recovery indicates that extended networks can realize the realization of a psychological function. Furthermore, the realization of a psychological function via a complex system can be disrupted if one damages a *part* of the system.[4] This does not imply that one can infer a localization of the function within the lesioned part.

Frisch argues, that the loss of a psychological function may be dependent on a situation. For instance, the recall of the same words may be disturbed in the symbolic context (naming) but not in the concrete-emotional context (scolding).[5] Lastly, Goldstein's clinical work indicated that brain lesions usually do not affect only a single function. Likewise, it would rarely be the case, that a psychological function is fully absent after lesion, with other psychological functions being completely intact (Frisch, 2014a,b). It seems reasonable to assume that these sophisticated aspects can be better addressed by the generalized NLM than by DD. Goldstein regarded the brain as a *network* (*Netzwerk*) situated within the organism which he again viewed as situated within its life and within a concrete situation (Goldstein, 1927, 1995; Frisch, 2014a,b; Frisch and Métraux, 2021).

The metatheoretical potential of Goldstein's position lies in the fact that it does not imply that we need to abandon any assumption of local specification at a particular time *t*. Equally, in our opinion, a view of the brain as a dynamic network nested in an organism which is nested in a world is also largely consistent with some versions of modularity. As we have noted, metatheoretical beliefs structure scientific theories; yet, they are not easily falsifiable. Since a lesion rarely leads to a complete loss of psychological function (cf. Frisch, 2014a), one can either argue that the case is not "pure" enough and therefore in favor of modularity or interpret the findings as evidence against modularity.[6] However, it obviously makes a difference whether the hippocampus or the PFC is affected by a lesion, whether this is due to the modular structure of the brain or to the fact that a part of a circuit has been damaged. Given that modularists must acknowledge the plasticity of the brain, the branch of modularity that seems largely consistent with a system science neuropsychological assessment strategy can be regarded as *dynamic* modularity. Furthermore, Frisch (2014a) emphasizes that Goldstein did not subscribe to equipotentialism, the idea that solely the size of the lesion was of functional importance. Moreover, some authors argue that a network approach to the brain is compatible with versions of modularity (Alexander-Bloch et al., 2010).

We need not settle the question of whether the modularity assumption holds, since, our aim is only to demonstrate that philosophical assumptions have the potential to shape both research and assessment in neuropsychology. In this context, Goldstein's belief that the brain is a dynamic and adaptable network, and that lesions have a comprehensive impact on the entire organism, which in turn adapts its *Umwelt* to cope with the new situation, aligns with various metatheoretical frameworks in neuropsychology. The adaptation of the organism encompasses not only physical aspects of the environment, but also subjective experiences structured by demand characteristics and affordances (cf. Lewin, 1936; Dings, 2020). By considering the contextual aspects of individuals and patients, both in terms of their distal environment (physical surroundings) and proximal environment (*Umwelt*), generalized lens models might help to effectively examine the relationship between proximal and distal aspects of the subject matter of neuropsychology.

## Conclusion

Our aim was to revisit the metatheoretical or philosophical beliefs that accompany neuropsychological research and assessment. Despite appearing to be in opposition, the classical neuropsychological approach of DD can be understood either as assuming localizationism and a modular view of the brain, or as a specific case of lens-type modeling approaches (NLM) to neuropsychological assessment. The latter interpretation more readily aligns DD with a comprehensive systemic view of the human brain as a network that, as part of the whole organism, mediates the situatedness of human beings in the world. These perspectives closely intersect with the empirical and theoretical work of early neuropsychologist Kurt Goldstein, who emphasized the situatedness of the organism within its *Umwelt* (subjectively experienced environment). Thus, both modularity and the system science approach sketched here, converge in Goldstein's claim that the brain is a dynamic and adaptable network, and that lesions impact the entire organism, which then adapts its *Umwelt* to cope with the new overall situation. This perspective not only enables the structuring of ecological validation processes through a metatheoretical foundation, but also aligns with the idea from phenomenological psychology, that the laboratory is only one of many situations. Lens-type models may provide a methodological framework to better adapt neuropsychological assessment strategies, that accommodate a minimal consensus among the different metatheories of neuropsychology. The analysis therefore shows that metatheory in neuropsychology is not in opposition to therapeutic practice and research. All three levels are in epistemic continuity and can complement each other in a substantial manner.

## Data availability statement

The original contributions presented in this study are included in the article/supplementary material,

4 It has been argued that this was demonstrated by von Monakow (cf. Frisch, 2014a).

5 According to Frisch (2014a), this was demonstrated by Hougling Jackson.

6 Van Orden et al. claim that the first interpretation leads to the iterative introduction of new modules, as there are no criteria for the acceptance or rejection of modules (cf. 2001).

further inquiries can be directed to the corresponding authors.

## Author contributions

JR developed the initial idea and wrote the first manuscript. AW and MP made substantial contributions to the text. JR, AW, and MP jointly finalized the manuscript. All authors contributed to the article and approved the submitted version.

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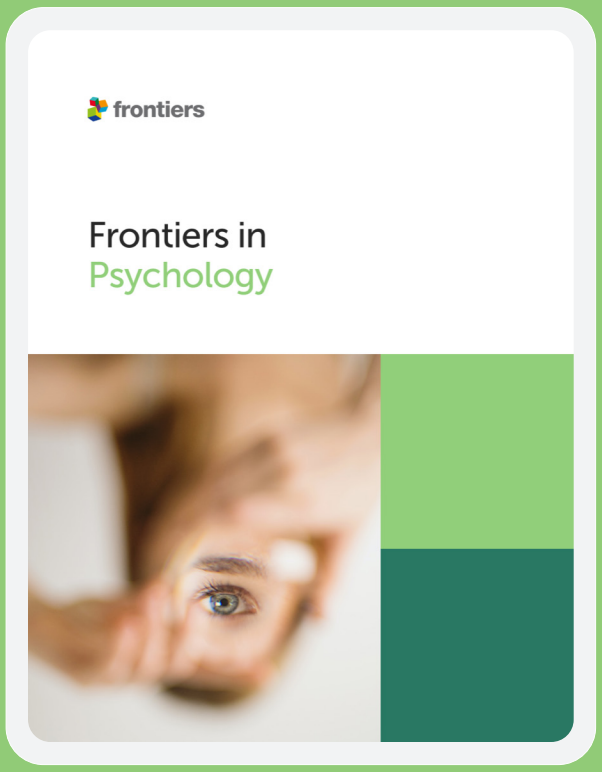


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