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HOW PIANOS SHAPE THE MIND: THE PIANO AS A LIMIT CASE OF THE EXTENDED MIND

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Abstract
Musical artistic research literature has repeatedly borrowed the extended mind theory, applying it to music pedagogy and implying that an analogy can be drawn between Clark and Chalmers's coupling and the musician–instrument relationship. The question that arises is: can a musical instrument truly be considered part of a musician–instrument coupling? Can this analogy provide a framework for probing the operational limits of the theory itself? To this end, the premises of the theory are analyzed and applied to a case where, instead of Otto, Inga, and the notebook, there are pianists with their instrument. The conclusion that emerges is the impossibility of reducing the coupled pianist–piano system to the functionalist criteria of coupling proposed by Clark and Chalmers.

Keywords
Piano, Extended Mind, Embodied Cognition. Coupling, Enactivism

Introduction

Musical artistic research since the 2000s has drawn significantly on the tools of the philosophy of mind, frequently invoking the paradigms of 4E cognition theory. Concepts such as 'Embodied' or 'Extended' mind have rapidly populated the literature.[2] In the relevant literature, the possibility of an analogy with extended mind theory is often taken for granted or

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[2] See, for example, Krueger (2014), Clarke (2005), Schiavio, van der Schyff, Cespedes-Guevara, Reybrouck (2016), and Cox (2016).

validated because it is read in its radical interpretation.[3] The exercise proposed here is to return to Clark and Chalmers's foundational paper 'The Extended Mind', exploring whether it is truly possible to draw a parallelism between extended mind theory in its original form and the use of the piano as a coupled system. The essay thus fits into an established theoretical framework, and its significance lies in using the piano as a limit case to test extended mind theory. To this end, Section 1 presents the key points of the theory; Section 2 retraces Clark and Chalmers's line of argument, replacing it with a piano analogy from which the essay's conclusions are drawn. The thesis proposed is that the pianist case calls into question the sufficiency of the functional criterion in identifying an extended cognitive system.

1. The Extended Mind

Extended mind theory has been the subject of a very broad debate.[4] For the purposes of our thesis, however, it is sufficient to summarize its structure and main points, as the purpose of this essay is not so much to probe subsequent interpretations and/or critiques as to remain faithful to the paper as originally conceived. Nevertheless, in the course of the discussion it will become increasingly evident why, in artistic research literature, it was necessary to re-read the theory in a radical version without adhering strictly to the original version. Let us therefore examine its main features.

Extended mind theory takes its departure from the internalist thesis of classical cognitivism, according to which the mental states of a human agent are located exclusively within the activities of the central nervous system.[5] Clark and Chalmers direct their line of thought in opposition to the internalist thesis, defining their position as active externalism, taking off from the 'passive' alternatives of Putnam (1975) with the Twin Earth case and Burge (1979, 1982).

The preliminary concept addressed is that of epistemic action. Epistemic action is described as an alteration of the world intended to aid and improve cognitive processes such as recognition and search.

A central passage is where they state that:

> Epistemic action demands spread of epistemic credit. If, as we confront some task, a part of the world functions as a process which, were it done in the head, we would have no hesitation in

[3] See Zipoli (2016), pp. 133–134, and Zipoli (2014), pp. 196–212.

[4] For a deeper analysis of this topic, see Menary (2010).

[5] Zipoli (2016).

> recognizing as part of the cognitive process, then that part of the world is part of the cognitive process.

In these cases, the human organism creates a feedback loop with an external entity, creating a coupled system. A critique that might be raised is that of the 'naked mind'—namely, that in cases of external supports such as a notebook, they could be decoupled too easily. To this critique, the proposed answer is that the portability of an instrument is not all that decisive: if we accept, for example, that counting on one's fingers is part of a cognitive process, then we can extend this reasoning to someone who always carries a calculator. The true discriminant is the reliability of the coupling with the instrument—that is, whether it is there when needed.

The theory is pushed further with the case of Inga and Otto. In Inga's case, the belief is within her mind: she wants to go see an exhibition at the Museum of Modern Art and remembers that it is on 53rd Street. In the case of Otto, who suffers from Alzheimer's disease, he wishes to visit the same exhibition and, unable to rely on his memory, notes the street address in a notebook. From this example, it emerges that beliefs can also be partially constituted by elements of the environment, as in both cases the information is non-conscious (A-conscious)—that is, available when needed: in the first case through an internal medium, memory, and in the second through an external one, the notebook, which nonetheless fills the same functional role.

Starting from the example of Inga and Otto, several critiques and possible replies are outlined, summarized below:

1. Reliability critique: Inga's and Otto's cases differ because Inga has more reliable access to the information.
Reply: Even Inga's memory is unreliable in certain cases, such as when she has been drinking or while sleeping. What matters is that the information is accessible when the subject requests it.

2. Better access critique: Inga has more direct access because her central processes and memory are closely connected.
Reply: If instead of Inga we consider someone who processes information poorly, for instance due to a less standard biology, we could say that Otto has better access.

3. Type of access critique: Otto accesses information via perception, whereas Inga accesses it via introspection, making her access type more direct.
Reply: Even if there is a visual phenomenology associated with consulting the notebook, this does not impair the status of belief in the coupled system.

Clark and Chalmers then postulate four conditions that must be satisfied for an external memory device to be considered a standing belief. Let S be the subject and D the device in question: a) D must be constantly and reliably available and must be routinely used by S. b) The information contained in D must be easily accessible to S when required. c) S automatically accepts the information contained in D. d) The information is present in D because it was previously and consciously accepted by S in the past.
The argument rests on two central theses:

The first is defined as the Parity Principle: any item that plays the same causal-explanatory role as a standing belief is, in virtue of this, a standing belief.

The second concerns **Otto**: the information contained in his notebook plays the same causal-explanatory role as standing beliefs in his brain.[6]

2. The Extended Pianist

Let us now try to translate the key points of the theory into a hypothetical pianist–instrument coupled system.
We start by defining an epistemic action that could involve this system. One could reasonably assert that approaching a piano simplifies an internal process; consider, for example, the composer Clara wishing to choose the most pleasing sequence of notes. In this case, playing them on the piano serves to simplify a cognitive process. We are faced with a case of cognitive offloading in which part of the process that could be performed internally is delegated to the environment. The piano produces a sound event that Clara can perceive and evaluate. At first glance, it would seem that a parallelism with the theory is indeed possible. What will be argued, however, is that playing the piano constitutes an alternative way of making information available through the environment, creating friction with extended mind theory as conceived.

Let us return to Clara's case. We have established that in her case, wanting to create pleasing musical content on the piano presupposes a sonic response from it. But let us now hypothesize the existence of Roberto standing beside Clara. Roberto is an extraordinarily gifted musician with impeccable absolute pitch, capable of mentally anticipating all the possibilities that normally emerge from interacting with the piano—touch response, sound quality, pitch, and inter-note relationships. Moreover, he is already intimately familiar with the specific piano he is about to play.

[6] This outline is quoted from Alter (2024), p. 210.

The thesis argued here is that even if Roberto had all the information available dictated by previous interactions with the instrument, approaching the piano would generate a qualitative response that escapes prediction: every interaction creates new and contingent content, dictated by the psychophysical, emotional, and perceptual state of the pianist at the exact moment they touch the instrument—in what could be termed the topological contingency of the aesthetic (Matteucci 2019).

In this regard, Schiavio appears to reach a similar conclusion:

> Imagine a musician who is asked to improvise a short piece in order to familiarize herself with the characteristics of a specific instrument (for example, a new guitar fitted with a different type of strings from those she is used to).
>
> How would her experience change as she moves from concrete exploration of the instrument—through actually playing it—to a theoretical study of the guitar's features, for instance by reading a review written by another performer?
>
> We would expect her creativity to be somehow enhanced by her sensorimotor engagement with the guitar.[7]

It can thus be said that the two forms of mind externalization are distinct: in the first, content previously acquired by the subject is offloaded into the environment and subsequently retrieved as in Otto's case; in the second, interaction with the external device modifies the informational content, adding elements that were not necessarily determined prior to the interaction. This is the case with the piano.

It is therefore particularly difficult to apply the Parity Principle as conceived. If an external support is to be considered part of the cognitive process when it performs the same causal role that an internal element would have performed, we must clarify which internal element we are discussing in the case of the piano. In this instance, the parallelism is not straightforward, as the nature of the informational content does not seem to be presented in terms of beliefs or propositional content. To maintain consistency with Clark and Chalmers's framework, one might perhaps speak, in Clara's case, of internal auditory representations. Let us postulate that Clara mentally imagines an interval and then plays it to verify its aesthetic quality. In this case, correspondence between the imagined interval and the produced interval can be checked. However, comparing the imagined interval with the actually produced interval does

[7] Menin & Schiavio (2012) cited in Schiavio (2019), p. 96.

not exhaust the process in its function, since listening can alter Clara's initial evaluation and guide her toward a choice that was not previously determined. The piano thus seems to fulfill a role that exceeds that of a simple aid to cognition or memory. The response it provides is dynamic and is constantly modified during the interaction between pianist and instrument.

The loop that is created appears particularly tight and seems to reflect what Di Francesco et al. describe as a collective variable.[8] Clark himself described its characteristics through the example of pendulums interacting on the same wall (Clark 2013).

The problem, however, consists in establishing whether such coupling is sufficient to speak of an extended mind. Having established that it is already difficult to speak in terms of beliefs or propositions in Clara's case, let us nevertheless retrace the conditions proposed by Clark and Chalmers:

1. Availability and reliability. The first condition to consider is that of reliability. In Otto's case, Clark and Chalmers maintain that the information contained in the notebook must be constantly and reliably available. In the case of the piano, in certain respects the condition seems capable of being satisfied: an experienced pianist generally knows they can rely on the piano's response, and their relationship with the instrument can become highly automated. However, even in this first condition an application difficulty reveals itself. The reliability the pianist attributes to the piano does not exclusively concern the ability to retrieve information, but presupposes an interactional relationship with it; it concerns the predictability of the piano's response to the pianist's actions. Roberto, for example, has extremely precise expectations regarding the piano's response, unlike Clara. The instrument's reliability becomes in this case strictly interdependent, and is not so much a property of the piano as a emergent result of the overall system.[9]

2. Ease of access. The second condition appears easier to satisfy. In both Roberto's and Clara's cases, access to information is immediate whether it occurs in the mind or at the piano. The difference, as anticipated, lies in the discrepant result obtained from accessing the

[8] Marraffa, p. 185.

[9] A possible example in this regard was already contained within Clark and Chalmers's article itself: they discuss “socially extended cognition”. In such a case, the problem of interdependence arises analogously to the case of interaction with the piano, and the dynamic nature of the relationship between two different individuals becomes equally problematic.

information in Clara's case (who will play the piano) versus Roberto's (who will not).

3. Subject's willingness to accept the contained information. The third condition, according to which the subject must be disposed to automatically accept the information contained in the device, proves problematic. Consider Otto: when he consults his notebook, he accepts the information previously recorded and uses it as a guide for action. In the case of the piano, the sound produced by the instrument is not necessarily accepted as a correct representation of anything. A pianist may listen to the result of a gesture—performed on the basis of embodied and mentally 'annotated' information—yet judge it inadequate and reject it. One could even argue that for the pianist, this type of negative feedback in aesthetic experience is productive. The instrument's response is not static information; it is an element with which the subject interacts and in response to which they continuously modify their behavior.

4. Information was already accepted in the past. The fourth condition is probably the most problematic when applied to the coupled pianist–instrument system. We have already clarified how the informational content returned by the piano is not entirely predictable. The musician uses the instrument also to create informational content and to outline with the piano which sonic configuration is most convincing. It would therefore be an overstatement to assert that the information was already previously accepted, because the creative character remains ineffable and elusive under this type of formulation.

3. Conclusions

Extended mind theory in its moderate-ontological (and thus functionalist) version exhibits significant application limits in this context. Incongruities have emerged at multiple points between Clara's and Roberto's cases and Clark and Chalmers's theoretical project. It is thus argued that extended mind theory cannot be formally applied to the case of the piano.

The four conditions in their thesis were formulated to explain why an external device can assume the functional role of an internal memory. A musical instrument, on the contrary, can participate in processes in which information is not merely preserved or retrieved, but continuously produced through interaction between the individual and the environment. It has furthermore been demonstrated how difficult it is to retrieve a function clearly equivalent to that of an internal cognitive component.

The piano therefore represents a particularly interesting case because it occupies a hybrid position: on the one hand, its use allows the pianist to lighten certain processes that could be performed internally; on

the other, the piano is not a passive container of information, and its continuous feedback constructs the very process through which the musician evaluates and modifies their action.

The philosophical problem then consists in deciding whether this interdependence should be described as a true extension of the mind or through a different concept of coupled system. What emerges from the piano case suggests that coupling may be even more symbiotic and expansive than the cognitive extension hypothesized by Clark and Chalmers; indeed, it is interesting to note how, in the simultaneity of the pianist's action and the piano's response, the boundary between what the pianist does and what the instrument does becomes extremely blurred. The pianist's gesture cannot be fully described without considering the keyboard's response: sound production depends on the instrument's features, evaluation of the result depends on listening, and listening then modifies the subsequent gesture. Musical cognition thus appears distributed in a loop in which biological and environmental components are continuously mutually determined, rendering the notion of function insufficient to describe the process. This conclusion opens toward the possibility of an enactive perspective, in which cognition and meaning emerge from the dynamic relationship between individual and environment.[10]

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[10] On this point, see Malafouris (2013).

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