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Walking in the shoes of others through brain-to-brain interfaces: a phenomenological approach to the generation of a collective living body

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This paper explores brain-to-brain interfaces (B2BI) as innovative human-technology interactions from a philosophical perspective to show how the implementation of this technology raises new philosophical questions about who we are and how we live in the world. More specifically, this text introduces the emergence of a collective living body through digital technologies from a phenomenological perspective to open the path to analyzing its effects on society. Few studies in the humanities have been focusing on how new human-technology interactions can connect several subjects into one living body by enabling subjects to literally "walk in the shoes of others". This novel ability radically reframes some philosophical assumptions about what individual subjects are and how to think of them since the boundaries dividing them seem to blur. The constitution of a new type of human-technology interaction changes who we are and how we live, and we need to focus on such a change to tackle the challenges we will have to face in how we think of ourselves and live with others.

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Introduction

This paper aims to show how new human-technology interactions developed by brain-to-brain interfaces can generate a collective living body by highlighting its effects from a phenomenological perspective and opening the discourse to the change in how we live together in society.

It is well known that digital technologies are providing novel ways to be "connected" and redefining how we look at ourselves and the way we are "together" in society (Verbeek, 2008b). One of the most common ways to use digital technologies is to provide a connection between individuals by enabling them to exchange messages and pictures (Counts, 2007; Ritchin, 2010). However, this connection is not limited to visual exchanges. People can exchange taste sensations since the taste can be generated through electrodes placed on the tongue of a person, so a person can make the other person taste something by sending the correct input to this device mounted on the other's tongue (Cheok et al., 2013; Karunanayaka et al., 2018). People far apart can even exchange sexual intercourse since teledildonics can physically connect the genitalia of the lovers (Balistreri, 2018; Liberati, 2017, 2021; Saadatian et al., 2014; Samani et al., 2012).

Moreover, there are specific digital technologies moving this connection among subjects a step forward by aiming to "merge" people together, such as brain-to-brain interfaces (B2BI) (Nam et al., 2021). As we will highlight later in the text, such novel technologies provide the ability to literally "walk in the shoes of others" by generating a new "collective living body" that people share and live. Even if this novelty clearly touches upon important topics in the generation of collective subjects, which many authors and traditions have already studied, there have been no works focusing on the generation of a "collective living body" through digital technologies.

We follow the methodology presented by postphenomenology and broadly used in this field (Rosenberger & Verbeek, 2015, pp. 30–39). This methodology is developed in two main steps. The first step introduces the phenomenological and postphenomenological framework and the tools useful to address the topic. The second step introduces a technology, showing how much such a technology challenges the framework and perspective assumed from a philosophical perspective. This final step is based on finding a way to shape the philosophical framework according to the novelties implemented by the new technology studied. As stated by Verbeek and Rosenberger, postphenomenological methodology "does not merely "apply" philosophical analyses to science and technology, but it investigates the implications of such practices and artifacts for philosophical conceptualizations." (Rosenberger & Verbeek, 2015).

Following this structure, the present paper focuses on the first step through the use of two sections by highlighting the elements in phenomenology and postphenomenology that help address the collective subject and the body. The first section focuses on the works tackling collective subjects in phenomenology in order to show some of their constituting elements, such as the founding elements of collective subjects and the role of individuals. The second section focuses on the body in relation to technologies by introducing the concepts of the living body in phenomenology and the embodiment relations in postphenomenology in relation to the part body and technologies have in the constitution of the subjects. The second step is developed in the third section. This section introduces the new human-technology interactions generated by B2BI to show how the body of different subjects can be merged from a phenomenological and postphenomenological angle. Especially the third section shows how B2BI can generate a collective living body shared by multiple subjects and the philosophical questions such a possibility opens.

A phenomenological perspective on collective subjects

Studies on collective subjects frame a significant part of the current philosophical landscape since this topic has been addressed in contemporary social ontology (Gilbert, 2014; Lawson, 2012; Schmitz, 2017; Tollefsen, 2017), phenomenology (Brinck et al., 2017; Dan & Felipe, 2016; Schmid, 2016; Zahavi, 2021), and related fields within contemporary philosophy (Bratman, 1999; Strawson, 1999; Searle, 2010).

In the past, phenomenologists like Husserl (Husserl, 1973a, 1973b), Heidegger (Heidegger, 1996), Scheler (Scheler, 1954), Walther (Walther, 1923), Otaka (Otaka, 1932; Uemura & Yaegashi, 2016) already showed that it is possible to think of subjects that are composed of multiple subjects, and they highlighted some constituting elements. For example, Husserl's theory has raised broad debates among other philosophers and phenomenologists. Husserl refers to this problem in section 56 of the *Fifth Cartesian Meditation* (Husserl, 1963, pp. 156–159), where he speaks about 'personalities of higher order,' that has led to an important discussion in phenomenology (Schütz, 1967). According to Husserl, it is possible to attribute personal characteristics to social groups of various types. More importantly, in volume 14 of *Husserliana* (Husserl, 1973b), Husserl describes these 'personalities of higher order' by using such terms as 'unity of consciousness' and 'corporality' (Carr, 1987, p. 267).

The generation of collectivities and collective subjects is still active in contemporary phenomenological research in the "west" (Magrì, 2018; Salice, 2020; Szanto & Moran, 2015; Zahavi, 2015, 2016) and in Asia (Hye Young, 2017; Otaka, 1932; Zhang, 2020). Researchers highlighted that groups generated through empathic relations and through the existence of an organization show collective intentionality (de Vecchi, 2014; Gilbert, 2007; Searle, 1990, 2010; Schloßberger, 2016; Tollefsen, 2017) and, for someone, a mind of its own (Pettit, 2004, 2014). Studies also show how group members develop collective bodily memories, collective moods (Fuchs, 2017; Trcka, 2017), and emotions (Venier, 2016) just because of their membership.

A very relevant element of the discussion underlying the generation of collective subjects can be framed by the so-called 'Central Problem' (Schweikard & Schmid, 2021). This 'problem' focuses on the opposition between two main perspectives on the role of the individuals within a group: the 'irreducibility claim' and the 'individual ownership claim'. 'The irreducibility claim' proposes that collective intentionality cannot be reduced to a simple sum of individual intentions in question (Searle, 2010). For example, the representatives of this claim, like Max Scheler, would see two parents sharing the same grief because of the death of their child (Scheler, 1954, p. 154). Scheler claims it is impossible to 'split' the collective intentionality into its individual components, so there is a unity binding the members sharing the collective intentions. The 'individual ownership claim' arises from the intuition that it is hard to believe that all participants of the collective intentionality somehow lost their individual intentions and completely merged into one collective intentionality. In this sense, the 'individual ownership claim' states that collective intentionality consists of individual intentionalities where each individual has their intention without completely 'merging' with the intentionalities of others (Bratman, 1999; Gilbert, 2014).

In these approaches, individuals generating the collective subjects have been taken as the smallest unit of the collectivity. As Szanto highlights (Szanto, 2015), both approaches follow an "atomistic" perspective where the single individual is the smallest building block of the system. Even the irreducibility claim, which is the closest to address the merge among subjects, claims that parents mourning their son have collective intentions, but they are still separated individuals with clear borders defining where

one subject ends and the other begins. Thus, these approaches do not tackle the possibility of not having such clear boundaries defining individual subjects. Moreover, there is no focus on the technologies used by the subjects.

Following Husserl's texts, Mathiesen started to consider the technologies by focusing on the Borg in the *Star Trek* imaginaries. The Borg is an alien race in Star Trek that "assimilates" single individuals from other races through the use of technologies that enable them to share experiences, feelings, and thoughts in real-time. The Borg "individuals" are called "drones", and they cannot be considered individuals anymore since they are merged at different levels with all the other drones alive in the community (Arras, 2009; Consalvo, 2004). The subjects are merged into one "collectivity," where what is felt by one individual is felt by the entire collectivity[1]. Whatever a drone perceives, it is perceived by everyone and vice versa (Liberati, 2020). Mathiesen noticed that phenomenology defines the subject by the unity of the flow of consciousness, so a group of subjects sharing the same flow of consciousness has to be considered one subject by definition (Husserl, 1963, pp. 122–124). Thus, according to Mathiesen, a drone is not a single subject and cannot be taken as an "individual" since it shares the same "unity" of the flow of consciousness with the other drones.

The analysis presented by Mathiesen tackles the possibility of a merge among individuals, but it still does not focus on the role of the body as a collective entity shared by the collectivity, and, more importantly, it does not focus on the technologies used to achieve such a merge in detail since these technologies look too futuristic and the production of science-fiction stories (Danaher & Petersen, 2020). However, in recent years, technologies opening the path to the ones described in these imaginaries have been designed, and so it becomes essential to study such novel human-technology interactions to think of their effects.

Embodiment in phenomenology and postphenomenology

Before analyzing the new technologies, it is important to provide some elements to address the constitution of the subject in relation to the "body" from the phenomenological and post-phenomenological perspectives.

Husserl constantly refers to the double function of the body. The body of a person experiences the world as a "living body" [*Leib*], and, at the same time, the body is a thing in the world as a mere "object" [*Körper*] (Wehrle, 2020). A good illustration for our point can be found in a Husserlian example about 'touching-touched' sensation. In his *Ideen-I* (Husserl, 1950), Husserl analyzes the situation when the person touches his hand. From a phenomenological standpoint, Husserl claims, what happens at this moment is that we are both subject and object of tactile sensation. The hand is touching, and, at the same time, your body is touched.[2] This embodied way of experiencing the world directly relates to the constitution of the subject in many aspects since it provides the condition of possibility of the objects (Zahavi, 1994). For example, the living body offers the point of orientation of the subject [*Nullpunkt*] (Husserl, 1952; Summa, 2014), which localizes the subject in space and provides many other elements of the experiences such as the praxes, actions, feelings, and motivations a subject can have (Miyahara, 2021).

Postphenomenology moves the phenomenological work on the living body of the subject a step further by implementing the technologies a person can use as a constitutive part of what the living body is. Postphenomenology clearly shows that technologies are not neutral and affect how subjects live and people's values and meanings (de Boer, 2021; Liberati (2022a); Morrison, 2019; Mykhailov, 2020; Wellner, 2017). Most importantly for this article, postphenomenology shows how subjects can change their

bodily connotation by embodying technologies as part of their living body (de Preester, 2011).

Postphenomenology and posthuman theories have many elements in common since they both focus on how technologies shape the constitution of what is a subject, even if from different perspectives. These two perspectives clearly show how the technology is not "neutral." The posthuman approach delves into how much the border between technologies and humans can blur, while postphenomenology shows how the technologies shape who we are by being in relation to us[3]. Thus, they both focus on the co-constituting role of the technologies even if posthumanism focuses more on "humans" and postphenomenology focuses more on "subjects"[4]. Some posthumanist researchers, such as Braidotti, clearly work on this topic (Braidotti, 2006, 2013).

At the same time, scholars from the field of post-phenomenology show how postphenomenology and posthuman narrative can be relatable in terms of technological non-neutrality and the way our technologies are capable of changing our understanding of such topics as gender, equality, and fairness (Kinkaid, 2022; Lewis, 2021; G. P. Wellner, 2020; G. Wellner & Rothman, 2020).

The boundaries of a subject's body fluctuate and are shaped by the technologies used. The idea of the flexibility of the body's boundaries has been studied in postphenomenology from various perspectives[5]. More specifically, researchers showed how technologies can be part of the human body by being "embodied" when in "embodiment relations" with the subject (Ihde, 1978). In this relation, the subject's intentionality "flows" through the technology and is directly intentionated to the object. Thus, the type of human-technology interactions can make the technology part of the living body of the subject.

Subject→ Object

Embodiment relations: (S-Technology) → O

For example, the glasses a person uses become part of how the subject perceives themselves and the world around them, and technologies cannot be easily taken away without losing such perceptions.[6] Embodiment relations can be found in relatively simple technological artifacts like glasses and more technologically advanced devices such as brain-to-brain interfaces. However, relatively little research has been done to show how technologically advanced devices enable subjects to embody other subjects through their use.

New digital technologies and the application of phenomenological perspectives

Introduction of B2BI. As we have already introduced, new digital technologies have been designed to bridge the distance by physically connecting people, and B2BI are one of the most important technologies recently developed, which moves this connection a step further.

B2BI connects two brains into one system, and it is based on two main elements. Firstly, B2BI enables reading (or decoding) the information from the neural activity of the first brain ('sender') (Rao et al., 2014a).[7] Secondly, B2BI can also encode the neural activity in the brain of the second participant ('receiver'). These two components enable a direct signal transmission from one brain to the other. At the early stage of development, B2BI technology connected human brains to the brain of animals. For example, a study demonstrated how the human brain connected to the brain of the rat is able to control the rat's tail (Yoo et al., 2013), and another experiment shows how the human brain is able to control the cockroach's movements (Li & Zhang, 2016).

Different decoding techniques are currently in use. The most popular ones are functional MRI (Yoo et al., 2004), electro-encephalography (EEG) (Fabiani et al., 2004)), and

magnetoencephalography (MEG) (Mellinger et al., 2007). Through these techniques, scientists can get a signal from the brain and define if this signal is transmitting visual (Nishimoto et al., 2011), conceptual (Mitchell et al., 2008), or motor information (Collinger et al., 2013). After the information has been decoded, it has to be rendered and specified by a computer and encoded into the second participant's brain. In some experiments such as the one described by Rao (Rao et al., 2014b), the brain of the second participant is connected to the computer through transcranial magnetic stimulation (TMS) cable. The latter can stimulate a specific brain zone of the 'receiver' to create a concrete moving gesture (such as hand movements and finger movements). In other words, B2BI extracts neural content from a 'sender' brain, analyzes it, and sends it to a 'receiver.'

Usually, in the experiments, both participants have to accomplish a 'collaborative task,' meaning they have to work together to reach a specific goal. The idea highlighted by Rao (2019) is that the hand of the 'receiver' is controlled by the brain activity of the 'sender'. The latter knows where the trackpad should be pointed to win the game. The 'sender' can see the whole screen with the computer game, but they cannot move the trackpad and can only send a brain signal that will be transmitted to the 'receiver.' The 'receiver,' in their turn, can see only a part of the screen that is insufficient for accomplishing the task without the information provided by a sender. Through the TMS cable, the motor signal is transmitted to the receiver, and they push the button in the right place on the screen. In this sense, the 'sender' moves the 'receiver's' hand.

The experiment organized by Rao was the first experiment that connected two human brains invasively. There are further successful experiments that were able to connect the brains of three people (Jiang et al., 2019). These experiments are currently known as 'Brain-Net experiments,' which can create multi-person brain-to-brain interfaces. These experiments show that one brain is able to receive signals from several brains at the same time. For example, the experiment shows how two senders can send signals with 'conceptual' information in a Tetris-like game (e.g., whether or not to rotate a block) to one 'receiver' (Jiang et al., 2019). In this sense, the experiment clearly illustrates that a single brain can be successfully connected to two brains simultaneously.

Even if these technologies obviously are not the same as the ones used by the Borg in *Star Trek*, it is clear that they open the path to connecting subjects' bodies in a similar way since they enable people to live, experience, and get control through others' bodies. The moment another subject lives in a person's body, it becomes harder to define the limits and boundaries among individuals. More specifically, it becomes harder to clearly establish a sharp line defining the borders of 'atomic' elements of the collective subjects.

B2BI and the new possibilities for technological embodiment. As we have said, thanks to these technologies, the subjects "share" the same body, and they live through it. The senders act and live through the body of the receiver. In this way, the clear boundaries which defined the different individuals tend to blur thanks to the technology used since it is harder to define where the living body of a subject "ends" and the one of another "begins."[8]

Even if postphenomenology never takes into account the idea of sharing bodies, it clearly states that the subject is malleable through the use of technologies, and this element is enough to think of a subject embodying the technology and the subject connected to it. The "sender" embodies the technology and the "receiver's body." As shown in the case of brain-to-brain interfaces, subjects are using the technology and, at the same time, acting through the body of others. Thus, the embodiment schema should be changed into a new schema where the subject (S1) embeds not just a technology but the body of another subject (Liber ati, 2017).

Embodiment relations: $(S - T) \rightarrow O$

Brain-to-brain interface relations: $(S1 - T - Receiver) \rightarrow O$

Moreover, it is possible to think of many subjects imbued together and co-acting through another person's body, as the 'Brain-Net experiments' show (Jiang et al., 2019). In this sense, we can suggest that postphenomenology commonly used embodiment schema should be supplemented with a new schema, including the presence of different subjects.

Brain-net relations: $(S1/.../Sn - T - Receiver) \rightarrow O$

A new type of subjectivity has been created through the use of technologies, as in the case of embodiment relations in postphenomenology, even if now the subjects do not embed "merely" a technology but the body of another person. The moment a subject has access to the other's body, the other' body becomes part of the living body [*Leib*] of the subject, and so there is no distinction between the subject who shared the body and the subject living through it. In line with what Mathiesen suggested in the case of the Borg, the moment two or more subjects share the same "unity" which defines who they are, they merge into one, and it becomes hard to define the subjects in it as individuals. In the case of 'Brain-Net experiments,' the effect becomes even more pronounced since the receiver makes the body open to an entire community and collective. Thus, this "simple" novelty drastically changes the whole discourse related to collective subjects since it blurs the boundaries used to define the single individuals by introducing the possibility of having a collective living body shared and lived by multiple subjects.

Conclusions

This paper aims to show how new human-technology interactions developed by brain-to-brain interfaces can generate a collective living body by highlighting its possibility and its effects from a phenomenological perspective.

In the first section, the article introduces the studies on collective subjects in phenomenology to show how it is possible to think of collective subjects in the first place and highlight the atomistic perspective underlying some existing studies on it. More specifically, we show how these approaches do not tackle the possibility of having a collective body and the presence of technologies.

The second section focuses on the role of the body and technologies by introducing the concept of the living body in phenomenology and embodiment relations in postphenomenology. It especially highlights how the body is a central element in the constitution of the subject and how technologies can be part of the living body of the subject with direct effects on its constitution.

The third section introduces brain-to-brain interfaces as a technology able to merge the body of people. It shows how these technologies enable the subject to embody technologies as part of their living body and to embody others' bodies as part of their own by connecting human brains. Thus, this kind of technology literally enables people 'to walk in the shoes of others' by providing them the ability to live and act through others' bodies.

This "simple" addition provided by new human-technology interactions challenges some of the elements founding phenomenological and postphenomenological studies. Phenomenology and postphenomenology take the subject as a relatively stable structure which clearly has boundaries although these boundaries are flexible and permanently shifting because of the usage of technology. Phenomenology and postphenomenology take the

subject as a relatively stable structure with clear boundaries. Even if the living body of the subject can fluctuate since it can embody technologies, the subjects are clearly defined as separate with distinct living bodies. These clear boundaries lead to talk about collectivities in terms of an atomistic perspective where the individuals defined by these boundaries are the minor units possible. However, technologies like B2BI clearly indicate that such a perspective is questionable since the subject can 'assimilate' other individuals by making them part of its flesh. Thus, brain-to-brain interfaces create a new type of human-technology relations, and, by doing so, they question the fundamentals of our knowledge about subjectivity and collectivity.

By introducing the emergence of a collective living body composed of the bodies of the single individuals and shared within a community, B2BI opens the path to further phenomenological investigations. Since, as highlighted, the body is an important element in the constitution of the subjects, the addition of this element to the collective subjects implies the possibility of reconsidering the generation of many aspects related to it, such as intentionality, motivations, and affections generated by the collective living body.

We are individuals living together in society. Once new human-technology interactions enable us to "walk in the shoes of others," we need to rethink what "living together" means in general and the philosophical questions underlying it.

Data availability

Data availability is not required for this paper because this work does not use experimental data.

Notes

1 This type of "subject" has also been studied in relation to the idea of the existence of a hivemind (Danaher & Petersen, 2020). Although a discussion about hivemind is out of scope for the present paper, it is worth mentioning here that this topic might have a particular interest for contemporary phenomenology especially in relation to the problem of collective subjectivity and novel technologies that highly increase connectivity between subjects.

2 Through this example, Husserl shows how the boundaries of the subject are constantly shifting, and even what is usually considered a living body [Leib] can become an object of perception and so a Körper (Moran, 2015; Slatman, 2009).

3 There are a lot of interconnections between postphenomenology and posthuman philosophy of technology, Donna Haraway's work in particular. For example, Don Ihde refers to Haraway's "A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century." in several of his works to illustrate one of the main ideas in postphenomenology, namely, human-technology relations, embodiment, and cyborg relations (Ihde, 2003a, 2003b). In this sense, we can see that the two schools of thought share many conceptual interconnections.

4 Following the phenomenological methodology, we focus on "subjects" and not just "humans." This difference is essential for our paper because the notion of "subject" is more fundamental and has a broader application than the notion of humans from a phenomenological perspective. As in the case of the touching-touched experience, the human being is simultaneously the subject and object of the action. Moreover, we can think of a subject that is not "human" acting in an environment as in the case of animals (Bailey, 2011; Vergani, 2021) or technologies (Mykhailov & Liberati, 2023).

5 One of the most prominent approaches has been provided by Peter-Paul Verbeek in his notion of cyborg relations (Verbeek, 2008a). While the discussion of Verbeek's ideas goes out of the scope of the present paper because he talks about technologies that are physically within the body of the subject, it is worth mentioning that, in cyborg relations, the boundary between subjects and technologies become either blurred or unrecognizable in principle.

6 Even the most common technologies actually change the way people perceive the world. For example, clothes clearly shape the identity of people, how subjects look at themselves, and how they relate to others (Entwistle, 2000, 2002; Liberati, 2019; Venkatesh et al., 2010). They can even generate a sense of being part of a group or a

society (Lunceford, 2010). The analysis can be easily extended to other technologies, such as canes, optical glasses, and digital devices (Mykhailov, 2022; Mykhailov & Liberati, 2022).

7 For example, this can allow people with certain medical conditions to type text without using their hands or interact with the other digital objects around, thanks to the fact they can control their hands just by sending inputs to the computer through brain signals (Collinger et al., 2013).

8 Even if these subjects can control their body individually while using B2BI - such as in the case a person decides to move their hand without any external input - the subject is still part of the collective body since this body is accessible and shared with everyone else in the network. Thus, subjects have to be considered individuals and collective at the same time.

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