Study of technical condition through the notions of "functioning relationship" and "appropriation" of technical elements

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Abstract

In this work we propose a study of technical condition, understood as the instrumental subsidiary capacity of the human being to alter their world environment, from themselves and for themselves, by introducing the notions of "functioning relationship" and "appropriation" of technical elements within this relationship. The functioning relationship expresses the intertwining between the body and the environment through the network of functionings that are realisable in this environment. Realisation of functionings can be influenced by the presence of barriers or facilitators. Appropriation of technical elements takes into consideration this influence and expresses the significant presence of such elements in the functioning relationship through the effectiveness of their technical action on effective realisation of the functionings. We will pay attention to a broad notion of prosthesis and its restricted expression in the difference between the processes known as "incorporation" and "extension", linked to the use of external tools. We will show the possibility of considering these two processes jointly in the notion of appropriation, referring to each technical element, prosthesis, and tool within the structure of the functioning relationship. As an implicit process in this relationship we consider, based on appropriation of technical elements, the process of transference of their technical action to the environment and modification of this environment upon integrating these elements and their actions into it as transformations of its material culture.

Key words: appropriation; body; disability; environment; prosthesis; functioning relationship.

1. Technical considerations in the field of disability

Historically, the "independent living movement", which started in the United States and advocated equal opportunities for persons with disabilities in exercising their civil rights, became aware that the design of environments was a key element on the road to this equality.[1]

[1] In order to have greater clarity of exposition, but without this implying a loss of generality, as we will see, disability will have a leading role in some of the topics discussed in this article. Through our attention to disability, we also intend to give visibility to the *Convention on the Rights of Persons with Disabilities* (CRPD; UN, 2006), in particular to Articles 4 (General obligations), 9 (Accessibility), 20 (Personal mobility) and 26 (Habilitation and rehabilitation).

In the 1970s, emphasis began to shift from specific technical solutions, such as special adaptations aimed at certain people, to the more general idea of normalisation and adaptation of environments to people's needs through design. The terminology used has varied over time, from the initial "barrier-free design" and "accessible design" to the current "design for all" or "universal design".

Broadly, "accessibility" can be understood as the possibility for people to access goods, products, and services, taking into account their specific needs. Accessibility mainly has to do with the elimination of barriers that may prevent use by people with physical, sensory, intellectual, behavioural, etc., differences (see CRPD; UN, 2006: Arts. 4 and 9). As an example, for a wheelchair user an "accessible" lift must have a wide enough door and buttons at a suitable height for them to be of use; for a person with visual limitations, the same lift must include Braille on the buttons and an audible warning when the floors are reached; for a person with an intellectual disability, it must have adapted pictograms that are easy to understand; for a person with hearing impairment, the presence of light-signalling and information in sign language will be necessary. If all these elements are present, this lift can be considered accessible to this group of users.

One of the traditional debates in the reflection on technics within disability studies refers to the relationship between solutions based on material modification of the environment: "barrier-free design" directed toward the goal of its accessibility and the introduction of "technical aids" to improve people's possibilities of functioning. Barrier-free design as well as technical aids have advantages and disadvantages in finding answers to their needs.

As an idea, barrier-free design has, at least in theory, simplicity and ease when it comes to being understood by designers and new purveyors. This approach involves reorienting the traditional way of thinking about design as a key factor that affects people's functional requirements (Goggin, 2008). A major challenge and limitation for design-based solutions has to do with, precisely, the wide diversity of functional characteristics inherent in every human condition and circumstance (as in the elevator example).

In this regard, it is important to note that different disability profiles may end up conflicting in regard to their particular design requirements for environments. Thus, for example, a wheelchair user may find wide spaces more suitable while a blind person may feel uncomfortable in them, as they provide a less contained frame of reference. Each disability profile has specific requirements that, in practice, must be met in a way that does not create conflict.

The best alternative to reach this objective probably involves an optimal combination of barrier-free design and technical aids, the latter when deemed necessary and it is determined that they will add additional utility for specific users (Aslaksen et al., 1997; Mueller, 1998; Vanderheiden, 1998). In any case, progress should continue in both directions, considering the debate mentioned between barrier-free design and technical aids as a fruitful dialogue between possibilities that are complementary, not exclusionary. In this sense, Article 2 of the CRPD

(UN, 2006) refers to "universal design" as "the design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialised design. 'Universal design' shall not exclude assistive devices for particular groups of persons with disabilities where this is needed".

2. Ability vs. Functioning

In terms of the power of the body, we propose, as an alternative to the usual idea of "ability", the notion of "functioning". Functioning, unlike ability, comes up as an emerging element in the relationship between the body and the environment in which it is situated. This means that possibilities of functioning are equally related to the body's abilities and to the characteristics of the surrounding environment.

A basic idea that underlies our approach considers, therefore, that body, functioning, and environment are three closely related entities; thus, when the body is placed in a particular environment, its relationship with it is established through the set of functionings it can carry out and perform in that environment. We, therefore, consider functionings as mediations between the body and the environment, and in this respect it should be noted that, as mediations, functionings are not located in the body, nor in the environment, but rather in the relationship between the two.[2]

An important aspect to keep in mind in the relational concept of functioning is the way in which it differs from the usual attributive concept of ability. According to this concept, abilities are attributed to the body and have their "place" in it, whereas, conversely, functionings are not located in the body or in the environment but between them, delocalised but at the same time emergent in their relationship. The attribution of abilities to the body contrasts with the mediating and relational character of functionings.

We note that when abilities are attributed to the body, there will be a time or moments in life when the body is injured, or ages, or faces circumstances in which such abilities are affected or lost. The latter is reflected, for example, in the condition called "becoming disabled", as a kind of general (dis)functional destination. If, on the contrary, a gaze or mediating and relational approach were adopted, such as the one suggested by functionings, any natural or accidental bodily changes could immediately be correlated with the necessary environmental modifications aimed, precisely, at optimally preserving effective realisation of the functionings (Toboso, 2018).

It is important to note, in relation to the presence of disability in this article, that the influence of environmental characteristics on the possibilities of effective realisation of functionings concerns us and is a question for everyone, not only, as is usually believed erroneously, people

[2] In a broad sense, functionings refer to relevant practices for the subject, who gives them value (importance) and pursues their realisation in such environments, which we will therefore interpret as spaces of practices or functionings environments, with a notable axiological dimension.

whose bodies and functionings differ from the main normative patterns: persons with disabilities, older people, people who are injured, or children.

When we construct social reality or the surrounding world through questionnaires and questions that have to do with ability, such as: “Are you able to do A... do B... do C...?”, the results from such questionnaires classify people in terms of ability or disability. On the contrary, if, considering the mediating nature of functionings, we ask alternative questions, paying attention to the importance of their relationship with the configuration and design of environments: “Do you consider that the characteristics of the environment are suitable for A… for B... for C...?”, instead of classifying people we would classify environments and we could say, for example, that this or that environment is functional or dysfunctional instead of saying that this or that person is an able person or a disabled one.

3. The functioning relationship. Barriers and facilitators

In relation with the body, the environment offers a set of possible functionings that give entity to what we are going to call the “functioning relationship”. This relationship, in which body, functionings, and environment blend and intertwine, will be an object of primary attention in our exposition. The functioning relationship incorporates the set of relevant functionings considered valuable by the subject, which come from the relationship between their body and the environment and likewise will correspond, depending on the degree to which such functionings are effectively realised, to a certain “degree of functioning”.

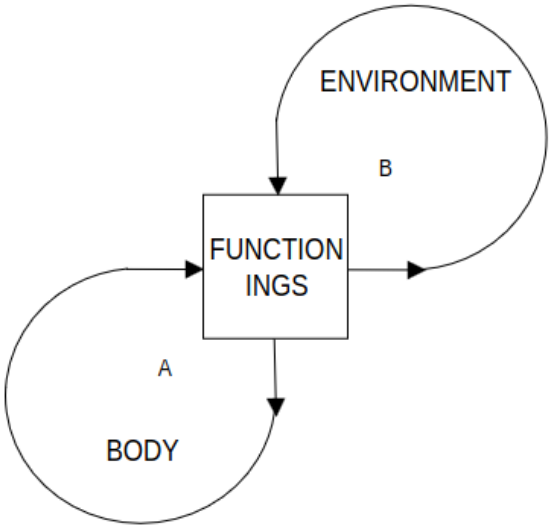

Figure 1: The functioning relationship

The functioning relationship can be favourable, as in the case of a person who, walking, approaches a staircase and goes up it, or unfavourable, if the person approaching the staircase does so in a wheelchair. But in any case, it is important we bear in mind the presence and influence of the environment on the functioning relationship: if, in the second case, a technical

modification is introduced in the environment and the staircase is replaced, for example, by a ramp, the initially unfavourable relationship is again favourable. Thus, the effective realisation of functionings requires conditions that refer both to the body and to the characteristics of the environment, which can make this realisation difficult and prevent it (due to the presence of "barriers") or, conversely, favour it (thanks to the presence of "facilitators").

In relation with the body, the environment offers a set of possible realisable functionings. Among such functionings, there will be those whose effective realisation is fulfilled to various degrees. When taking into account the presence of barriers and facilitators in the functioning relationship, we will address not only the effective realisation of the functionings but also, simultaneously, the importance and value given to them (axiological dimension).

We will say, then, that a barrier (to functioning) acts on a particular functioning when the importance attached to its realisation is high and the evaluation of its effective realisation is, on the contrary, low (barrier: importance of functioning high, but effective realisation low). Similarly, a functioning will be facilitated by conditions in the environment when the importance of its realisation is considered high and the evaluation of its effective realisation is equally high (facilitator: importance of functioning and effective realisation both high).

The presence of barriers and facilitators in the environment thus conditions the functioning relationship. We say that the functioning relationship will be optimal in situations without barriers, which favour effective realisation of functionings, and we will assume that a high degree of functioning will correspond to these situations. Conversely, the presence of barriers in the environment, acting on particular functionings, which we will call "problematic", whose effective realisation will therefore be affected, will also negatively affect the degree of functioning.

4. Problematic functionings and technical elements

Let's assume that in order to promote the effective realisation of a functioning evaluated as "problematic", which we will denote as f, a technical element, t*, is introduced into the functioning relationship. The introduction of this element will modify the initial functioning relationship, giving rise to a new relationship that will include the presence of element t* associated with its action on particular functioning f. The objective of this technical action is to make the degree of functioning of the new relationship greater than that of the initial relationship, since it is expected that the technical element introduced will eliminate the effects of the barrier limiting effective realisation of this functioning.

The possibility of this occurring, in addition to requiring the presence and effectiveness of the technical element on the problematic functioning, will depend critically on the introduction of such an element not bringing with it additional barriers to the functioning relationship. In order to address this issue, we must keep in mind that this technical element, like any other artifact, is planned, designed, and developed in a certain social, economic, productive, and

cultural context. So, in addition to its instrumental aspects (material and operational), such as its simplicity, accessibility, usability, ergonomics, safety, quality, utility, or efficiency, attention should also be paid to the contextual aspects of the technical element in question, such as its availability, price, brand, or appearance.

All these aspects should be evaluated within the functioning relationship that the technical element forms part of, in order to determine which appear as barriers and which as facilitators, following an evaluation procedure similar to that which determines the presence of facilitators and barriers on the set of functionings. The condition for technical element t* to not introduce additional barriers in the functioning relationship is that it provides favourable responses to the evaluation of all its aspects (instrumental and contextual) that are considered important in the relationship.

Examples of such potential barriers could be the lack of usability or ergonomics of the technical element (as types of instrumental barriers) or the lack of availability or affordability (as barriers arising from their contextual aspects). On the contrary, favourable evaluations on the same aspects mentioned above are useful as examples of facilitators: usability, ergonomics, availability, and affordability of the technical element considered.

In the following we will only address issues related to the instrumental aspects of technical element t*, leaving its contextual aspects aside. Without denying the importance of these aspects which, as we will see, play an important role in conditions of appropriation of the technical element, we understand that contextual aspects do not intervene relevantly in the two evaluation processes, instrumental and functional, that are carried out within the functioning relationship to detect the corresponding barriers and facilitators.

5. The “appropriation” of technical elements

Let’s assume that element t* is introduced into the functioning relationship in the form of a technical aid (imagine the case of some simple glasses used for visual functioning or a wheelchair used for motor functioning). The technical action of element t* will be aimed at increasing effective realisation of the problematic (visual or motor) functioning f, and this functioning, due to the presence and action of the technical element, will be modified in the form of “technically mediated functioning” f* (seeing with the help of glasses, moving with the help of a wheelchair). We interpret f* as the functioning resulting from the technical action of element t* on initial problematic functioning f.

In order to decide on its effectiveness in the realisation of technically mediated functioning f*, technical element t* should be evaluated in two different areas: on the one hand, the presence of possible barriers and facilitators in its overall instrumental aspects that are considered important will be evaluated. On the other, technical element t* will be evaluated favourably (facilitator) or unfavourably (barrier) depending on its influence on the effective realisation of technically mediated functioning f*.

A favourable incorporation of element t* into the functioning relationship requires that neither of the two evaluations shows barriers that may prevent technically mediated functioning f* from achieving greater effective realisation than that of initial problematic functioning f. If this is the case, the condition of possibility is available for "appropriation" of technical element t* within the functioning relationship. Such a condition of possibility arises as a result of its significant presence in this relationship, through which it exercises its favourable technical action on the effective realisation of functioning f*.

The absence of barriers, both in the instrumental evaluation of technical element t* and in effective realisation of technically mediated functioning f*, emerges as a condition of possibility for "appropriation" of such an element in the functioning relationship. This is a necessary, but insufficient, condition that informs us about the significant (and effective) presence of the technical element in this relationship. Additional conditions of appropriation have to do with the absence of barriers in contextual aspects of the technical element, as well as with the possibility that the functionality that enables its technical action on the initially problematic functioning f can be transferred to the environment, becoming incorporated into the environment as an element of its functional material culture.

In the example of the glasses, applied to visual functioning, this regards being able to transfer their technical action to the environment, intervening on the design of its visual elements to increase their accessibility by means of appropriate modifications: increasing text size in posters and advertisements, improving contrasts, and accessible spatial placement of messages so that they do not have to be searched for but rather are "easily visible". With regard to the wheelchair, applied to motor functioning, the transfer of functionality to the environment will necessitate the elimination of barriers present in it, such as steps and gaps, the introduction of viable ramps and lifts, attention to the width of doors and crossing points, or the reservation of specific spaces in public places or transportation, keeping in mind that a person using a wheelchair travels with their own seat (see CRPD; UN, 2006: Arts. 9 and 20).

These examples give us important information: The technical elements that reach a significant presence in the functioning relationship, like enablers (linked to the body) for problematic functionings, provide the possibility to transfer the functionality they enable through their technical action to the environment. This entails modification of the environment, stemming from incorporation into it of technical elements for accessibility and of barrier-free design that make effective realisation of technically mediated functioning possible. We see, therefore, that by virtue of the functioning relationship, the technical actions that take place in "proximity" to the body (by means of the glasses and wheelchair considered), aimed at enabling problematic functionings), can have an impact on the functional material structure of the environment if the technical actions of the enabling elements are transferred to it, causing the barriers affecting effective realisation of these functionings to disappear.

Based on the structure of the functioning relationship, this transfer process expresses the connection between zones A and B, represented in Figure 1, which results in modification of

the material elements of the environment (zone B) correlating to the enabling action of technical element t* acting in proximity to the body (zone A). Thus, the possibility arises that the functionality enabled by technical action t* on the initially problematic functioning can be transferred to the environment (transfer from zone A to zone B) and becomes incorporated into the environment as an element of its functional material culture.

6. A broad understanding of the notion of "prosthesis"

In their article "Body-extension versus body-incorporation: Is there a need for a body-model?", Helena De Preester and Manos Tsakiris examine the basis on which to distinguish between the "extension" of the body and the "incorporation" of non-corporeal external elements into it, taking into account the role of a supposed pre-existing "body-model" that would serve as the basis for such a distinction (De Preester and Tsakiris, 2009: 307). Below we are going to explore their exposition in some detail, considering some of the ideas they raise in direct relation to the ideas we have been addressing here.

The article's "Introduction" (De Preester and Tsakiris, 2009: 307) offers a broad interpretation of the notion of "prosthesis", understood as any artifact which does not belong to the biological body but co-constitutes the world inhabited by humans (the surrounding world), in line with the proposal by Bernard Stiegler (1998) to think of prostheses as something that inherently belongs to human life and which would define human beings as essentially prosthetic. This broad notion of prosthesis can be regarded as synonymous with technics, artifact, instrument, tool, etc., and points to the idea that culture is only possible thanks to our interrelationship with artificial elements on which we often off-load physical and cognitive work by designing or preferring environments that can take on this load, or that can hold and even process information for us (Clark, 1999).

This broad notion of prosthesis is applicable not only in its usual rehabilitative sense, as "incorporation" of an external element that replaces an amputated or missing part of the body, but also in an enabling sense, as in the case of writing, libraries, or the "extension" offered by a technological environment with environmental intelligence to tasks of physical, sensory, or cognitive functioning (see CRPD; UN, 2006: Art. 26).

7. Restriction of the broad notion of prosthesis prompts the difference between processes of incorporation and extension

In the section entitled "Incorporation versus extension/body-part versus tool?" (De Preester and Tsakiris, 2009: 309), the authors move, however, toward a much more restricted notion of prosthesis, toward the usual notion in its rehabilitative sense. They also begin to closely relate, on the one hand, this restricted notion of prosthesis to the incorporation process and to the notion of "parts" of the body, while, on the other, they relate the extension process to the idea of using external tools: "When we look at these two different classes of experiences,

prosthesis use and tool-use, it is not easy to maintain an adequate conceptual distinction between *a tool that extends the body*, and *a prosthesis that is incorporated into the body*." (De Preester and Tsakiris, 2009: 309, our italics).

This difficulty they note has at least part of its origin, in our thinking, in not considering the relation and difference between the functional and morphological (anatomical) dimensions of the body, which is constant throughout their article. If such dimensions are introduced into the exposition, some explanations seem to gain clarity and, in the case of the preceding quotation, it might be easier "[…] to maintain an adequate conceptual distinction between *a tool that (functionally) extends the body,* and *a prosthesis that (morphologically and/or functionally) is incorporated into the body*." (De Preester and Tsakiris, 2009: 309, our italics and parentheses).

The functional and the morphological are two dimensions of the body, different although closely related. Similarly, we note that evaluation of the functionality of technical element t* on functioning f*, on the one hand, and evaluation of its instrumental aspects, on the other, although different, are also closely related. We think, for example, that the relation with an external technical element can be highly functional (absence of functioning barriers) without this element coinciding morphologically or anatomically with the corresponding part of the body. On the other, the morphological or anatomical coincidence of a technical element with the corresponding part of the body (absence of instrumental barriers) does not necessarily guarantee its functionality, as its adaptation may be more aesthetic and normative than functional.

Thus, for example, as Gregor Wolbring recounts, children affected by thalidomide and their parents were confronted with a highly normative medical approach, whose priority was to give children "artificial limbs" without exploring other possible forms of functioning, such as crawling when you have no legs or eating with your feet when you have no arms. The doctors insisted on this normative approach, despite the fact that the artificial limbs were not very functional and were merely cosmetic. It is no wonder that most people who were affected got rid of their artificial legs and arms as soon as they were old enough to stand up to their parents and doctors. The reality was that they did not see their bodies as deficient, nor the artificial legs and arms as an appropriate form of functioning (Wolbring, 2002).

8. Two complementary ways for appropriation of technical elements

8.1. Appropriation by "transparency" (absence of instrumental barriers)

The relation between the notion of prosthesis and that of body-parts narrows as the article progresses, with prosthesis coming to be regarded as an added external object that must be incorporated and become a part of the body (De Preester and Tsakiris, 2009: 307). The possibility of the prosthesis becoming a part, although limited, of the body should not be excluded, they point out, as the experience may be to perceive its limits but also to perceive its

absence from the user's field of attention, which translates into a feeling of "transparency" of this artificial element: "The absence of explicit experience of the limb, or rather the experience that the artificial limb has become transparent..." (De Preester and Tsakiris, 2009: 307).

But a tool can also feel as if it wasn't there. For example, during successful use of it, they claim, the tool can go completely unnoticed. Thus, just as with the incorporation of a prosthesis, the use of non-incorporated external tools can also result in a feeling of transparency toward them: "A tool can also feel close to not being there; for example, during successful tool-use, the tool is 'ready-to-hand', unnoticed too (cf. Heidegger's analysis of tools in his Being and Time)." (De Preester and Tsakiris, 2009: 310).

From the point of view of appropriation of technical elements within the functioning relationship, which we affirm, the two cases just described of a feeling of transparency toward each technical element – incorporation of a prosthesis, on the one hand, and tool-use, on the other – would together correspond to appropriation of such elements as a consequence of the absence of instrumental barriers in the respective functioning relationships that involve them.

8.2. Appropriation by "completion" (absence of functioning barriers)

De Preester and Tsakiris (2009: 317) point out that an important difference between the replacement of a body part by an external object and the extension of it by means of tools is the possible experience of "completion": not all prosthesis users experience a relation of completion with it, and this is often limited to a relation of addition or extension. But, ideally, it is assumed that the relation between a person and their prosthesis should be experienced as a relation of completion, forming a whole with the prosthesis that replaces a missing limb of the body or a part of it: "An important difference between extension of the body with a tool and replacement of a body-part with something non-corporeal, is the possible experience of completion... In other words, it is possible to make a whole with the prosthesis that substitutes a missing limb or part of it... We do not make a whole with tools in the same way. A tool does not feel as if it is completing us, but it rather extends bodily capacities." (De Preester and Tsakiris, 2009: 317).

Although they express their doubts about the experience of completion with the tools we use, not even in the satisfactory use of them, they do not rule out the possibility of verifying a relation of completion linked to the use of certain instruments. In this sense, they point out that some users of highly-specialized tools, much like musicians who are virtuosos, qualify the relation with their instrument as an experience of completion or wholeness (De Preester and Tsakiris, 2009: 318). Thus, inquiry as to whether a relation of extension can really be one of completion, like in the situation of a relation of incorporation, cannot be definitively resolved negatively.

Likewise, we consider that it is possible to apply to these two cases, linked to the experience

of completion, the approach we maintain based on the appropriation of technical elements within the functioning relationship: the relation of completion associated with the incorporation of a prosthesis, on the one hand, and the same relation linked to the specialized use of tools, which is mentioned, on the other, would together correspond to appropriation of each technical element as a consequence of the absence of functioning barriers in the respective functioning relationships that involve them.

9. The sense of body-ownership. The body-model as a normative codification pattern of body-parts

Given the lack of really decisive differences, in the section entitled "Body-ownership and a pre-existing body-model" (De Preester and Tsakiris, 2009: 312), the authors propose dealing with the differences between incorporation and extension through empirical evidence on the "sense of body-ownership", that is, the feeling that the body or a part of it belongs to the person: "One way to approach these questions is to consider the recent empirical evidence on the sense of body-ownership, that is, the feeling that a body-part belongs to me." (De Preester and Tsakiris, 2009: 312)

They consider that a viable way of studying a sense of body-ownership is through the experiment known as the "Rubber Hand Illusion" (Botvinick and Cohen, 1998; Ehrsson et al. 2004; Tsakiris and Haggard 2005). Participants in this experiment watch a prosthetic rubber hand being stroked at the same time as their own unseen hand is stroked. This multisensory stimulation (tactile on both hands, but visual only on the false hand) causes the rubber hand to feel like the person's own hand. Moseley et al. (2008) even showed that the sense of ownership over the rubber hand is accompanied by a significant decrease in the temperature of the real hand (De Preester and Tsakiris, 2009: 312).

Other experimental results likewise suggest that multisensory stimulation intervenes in the sense of body-ownership, but the key question is whether it does this in a way that is necessary or sufficient (De Preester and Tsakiris, 2009: 313). In this respect, the effect of multisensory stimulation that contributes to the sense of body-ownership is not considered a passive conduction of stimuli, but rather depends on the modulating influence of postural, morphological, and visual representations of the body: the sense of ownership of the rubber hand does not occur if the false hand is placed in an incongruous morphological position with respect to the real hand, nor if the rubber hand has a different laterality from the real hand, nor if, instead of the false hand, an object with a non-body appearance is put there, such as a piece of wood (De Preester and Tsakiris, 2009: 313).

It is important to note that, when this does occur, the sense of ownership over the rubber hand does not cause the participant to feel they have three hands but rather that their own hand, hidden from sight, is replaced by the rubber hand they are seeing. Therefore, this is not a case of extension of the body to a third hand, but rather of incorporating the rubber hand as an external object in place of their own hand. In our approach, we would say that this is a case of

appropriation of the rubber hand derived from multisensory stimulation, which involves both morphological and functional aspects given in the form of the aforementioned morphological, visual, and postural representations, which will not provide barriers to appropriation regarding these aspects if they are "congruent".

Based on the aforementioned experimental evidence, Tsakiris and Haggard (2005) suggested that the sense of body-ownership would be the result of modulation of the multisensory stimulation on the framework of the bodily representations just referred to. Sensory stimuli would be processed and finally adjusted on a type of abstract body-model that would be in charge of maintaining a coherent sense of one's body and would include a description of reference of its visual, morphological, and postural representations (Costantini and Haggard 2007; Tsakiris and Haggard 2005). But more importantly for the sense of body-ownership, they point out, is that this body-model be prior to the sensory stimulation and have a normative character towards it, that is, its modulatory influence determines whether an external object (such as the rubber hand) can be experienced, or not, as part of the body: "[…] but what seems to be important for the sense of body-ownership induced during the RHI (Rubber Hand Illusion) is that the body-model operates off-line and more interestingly it seems to be normative for one's own body, because its modulatory influence allows for an external body-part to be experienced as part of my body or not." (De Preester and Tsakiris, 2009: 313)[3]

The possibility of incorporation of (or sense of ownership over) external objects requires that the multisensory stimulation coming from such objects be converted into visual, postural, and anatomical representations congruent for the body-model. This process of representation by the body-model, as if it were a "representational apparatus" nurtured by such stimuli, is what gives rise to the positive feeling of ownership over the external object. This is the case with the "Rubber Hand Illusion", as an example of incorporation of an external object.

As a system that codifies body-parts, the body-model guides the process of incorporating external objects as such parts. The "parts" of the body can therefore be thought to be assimilable (in analogy) to a system of "body coordinates" that would allow the representation, incorporation of such external objects. The body-parts codified in the body-model determine the external objects that can be incorporated.

As a normative pattern, the body-model is reaffirmed and strengthened by preventing the possibility of extension and limiting incorporation only to external objects assimilable to body-parts already codified in the model. The possibility of incorporation is therefore limited to "objects as parts" of the body already codified in that model, not providing the possibility of incorporating "objects as extensions" or new parts not codified in the body-model, which

[3] We note that the combination of the normative and pre-existing (pre-stimulation) character of the body-model implies argumentative "circularity", as it presents the body-model as being responsible for the fact (normative character) that only external objects can be incorporated that replace already codified body parts (pre-existing character) in that same model.

would mean its extension to them, as in the hypothetical case of incorporating the rubber hand (in the RHI experiment) as a third hand.

Although the body-model provides a coordinate system for the body, we see that the body taking part in the functioning relationship is more than this system. Through its relational intertwining with the environmental variables through mediation from the network of functionings and from the process of transference to the environment of the functionality, wich enables the action of the technical elements, already described, there are much wider possibilities for appropriation of these elements than the limited possibilities of incorporation of external objects (prosthesis) as parts constituing the coordinates of that system. In order to differentiate it, then, from the normative body resulting from the body-model, we will call the body involved in the relationship and network of functionings mentioned above "body-environment". The functionings, body and environment, intertwine in the body-environment, but we should not think the body-environment is distinct from this intertwining. From the perspective of the body-environment, the possibility of appropriation of technical elements will refer to external objects in general, not only assimilable to parts of the body but also to possible extensions that do not correspond only to incorporations, making aspects and characteristics intervene in the morphological as well as functional dimensions.

Considered as a coordinate system for the body (the system of body-parts codified in it), the body-model does not have to be the only possible system: different systems and even the need to expand the dimension of the given system can be considered if the spatial dimension that accommodates it is extended, as is the case with the body-environment given the need to take into account its "externalisation" due to its relational aspects, which have previously been identified.

10. Conclusions

The broad notion of prosthesis, explained at the beginning of the article by De Preester and Tsakiris (2009: 307), does not make a strict differentiation between the notions of extension and incorporation of external elements to the body. We consider that this broad notion of prosthesis takes on full meaning in the structure of the functioning relationship, which likewise makes the notable difference between the processes of incorporation and extension established by the normative pattern of the body-model meaningless. As we conclude from the point of view of our approach, these processes can jointly be integrated into the notion of "appropriation" of external technical elements t*, linked to morphological and functional aspects within the functioning relationship.

On the one hand, the incorporation process refers to a part of the body replaced by an external technical element (prosthesis) that is incorporated. The question is, if appropriation by incorporation is optimal (transparency and completion), the element ceases to be an "external" element and becomes, strictly speaking, a "part" of the body. So, it could be said that these elements are not incorporated as external elements but rather as these parts. That is, something

initially given as an external technical element, through its appropriation, is incorporated as one of these parts.

On the other hand, the process of extension as a case of appropriation is analogous to the identification and use of "enablers" ("affordances"; Gibson, 1979) or appropriation of the technical element through the possibilities of functioning that the body-environment projects on it. "Functional knowledge" is expressed in the functioning relationship as access to genuinely practical information that allows such enablers to be detected and taken full advantage of (Vega and Lawler, 2005; Vega, 2009). This functional knowledge differs from mental, representational knowledge. It only makes sense for mental knowledge the notion of "object" as something outside, situated "out there", not immediate and separate from who represents it. However, when we relate functionally with an enabler, it is neither prior nor external to the functioning relationship but rather simultaneous and inherent to it, and only in abstract could we interpret it as a kind of "object" outside of the relationship. Therefore, when I appropriate an enabler, the enabler is already expressing appropriation of what could be considered only in abstract a technical element situated "out there".

Considered in terms of the functioning relationship, this conclusion refers to the possibility of appropriation of the technical elements necessary for effective realisation of the functionings involved in the relationship between the body and the environment.

We have previously addressed the existence of problematic functionings in the functioning relationship and the action on them from the corresponding technical elements. We point out that their significant presence in the relationship, expressed as the condition of possibility of their appropriation, can result in modifications to the environment that make barriers that act on problematic functionings disappear (technical solutions for accessibility and barrier-free design).

Technical elements specifically targeted at certain users may increase their degree of functioning in the given environment, for example, telephones for the blind, stairlifts, etc., but may not involve technical actions that are eventually incorporated into the environment if they are connected to very specific functionings of such users. If this is the case, we could say that these are elements that are "appropriable" but not "transferable". We conclude here that it is necessary, therefore, to study the conditions that make it possible to transfer such appropriable technical elements to the environment, which implies the possibility that they become part of the materiality of the environments, of their material culture, and from this incorporation they can increase the functionality of the environments; that is to say, increase the set of functionings that can be realised in them without barriers.

As we have explained in this work, the functioning relationship, which we suggest to interpret more as a relational structure than as a simple relationship, allows these processes of appropriation and transference to be taken into account. These processes also serve as a basis for the following idea and possibility, which we consider extremely important: the idea and the possibility that different people, different social groups, communities, etc., can, shall we

say, integrate their own functionings into the different environments, without this being a possibility exclusive to normative functionings. This is an idea that promotes expanding the set of functionings that are incorporated into environments so that different people can benefit from all these possibilities of functioning if they need to, as the greater the set of functionings available in a society's environments, the more inclusive it will be and will thus favour, to a greater extent, equal opportunities.

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