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Experimenting with phenomenology

Shaun Gallagher [a,*], Jesper Brøsted Sørensen [b]

[a] Department of Philosophy, Cognitive Sciences, University of Central Florida, USA
[b] Department of Psychology, University of Copenhagen, Denmark

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Abstract

We review the use of introspective and phenomenological methods in experimental settings. We distinguish different senses of introspection, and further distinguish phenomenological method from introspectionist approaches. Two ways of using phenomenology in experimental procedures are identified: first, the neurophenomenological method, proposed by Varela, involves the training of experimental subjects. This approach has been directly and productively incorporated into the protocol of experiments on perception. A second approach may have wider application and does not involve training experimental subjects in phenomenological method. It requires front-loading phenomenological insights into experimental design. A number of experiments employing this approach are reviewed. We conclude with a discussion of the implications for both the cognitive sciences and phenomenology.

Keywords: Introspection; Phenomenology; Neurophenomenology; Experimental design; Alien hand experiment

1. Introduction

We use the term *phenomenology* in its technical philosophical sense, following the broad tradition initiated by Edmund Husserl. In this sense it means a specialized study of experience or consciousness. Our title, ''Experimenting with phenomenology,'' is meant in two senses. First, we

* Corresponding author. Fax: +1 407 823 6658
E-mail addresses: gallaghr@mail.ucf.edu (S. Gallagher), broested@get2net.dk (J. Brøsted Sørensen).

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want to explore the use of phenomenology in experimental procedure and the design of scientific experiments. Second, however, the idea of using phenomenology in the experimental settings of natural science means that we are experimenting with the very concept of phenomenology. We want to argue that the use of phenomenology in psychological and cognitive neuroscientific experiments not only holds promise for advancing research in those fields, but also presents an opportunity for the development of a new understanding of phenomenology.

2. Using phenomenological methods in experiments

There has been a renewed discussion of the use of introspection as a psychological method (see e.g., Jack & Roepstorff, 2002; Schooler, 2002; and commentary by Frith, 2002 and Gallagher, 2002; Gallagher & Overgaard, in press; Price & Aydede, in press). Introspection, however, is not equivalent to phenomenological reflection, and it will be helpful, for the sake of defining phenomenology to make this distinction clear.

There are really two different procedures in the field of psychology that are termed 'introspection.' The first is introspection in a very weak sense, namely, the procedure involved in reporting one's experience as a subject in an experiment. When a subject is asked to report, vocally, or by a button push, for example, when they see a light come on, or when they hear a sound, this is sometimes referred to as an introspective report (see, e.g., Price & Aydede, in press). We can ask how precisely the subject knows what to report. Do they reflectively introspect on their experience, searching their consciousness for a particular mental state of seeing the light come on? More likely they simply see the light come on and report that fact. That is, they attend to the light rather than to their state of visual perception. Of course, *all* such reports given by subjects are, at least indirectly, about their own experiential (mental) states. If one instructs a subject to push a button, or say 'now' when they see the light come on, then the subject is reporting about the light, but also about their visual experience. This is true even if one instructs the subject in a way that carefully avoids mention of an experiential state: "Push the button when the light comes on." The only access that the subject has to the fact of the light coming on is by way of her experience of the light coming on. The fact that any report such as this depends as a necessary condition on the subject's first-person experience makes this the default report situation. Introspection in this very weak sense is commonly practiced in experimental science, and as Price and Aydede (in press) indicate, "the subjects' verbal reports [or non-verbal behaviors like button-pushes] about their own cognitive states have routinely been taken as evidence for the cognitive models postulated."

The weak concept of introspection differs from a stronger and more proper concept outlined by traditional introspectionists. When subjects introspect in this stronger sense, their attention is not on the stimulus (the light or the sound that they are to report), but on their own mental experience. "'Introspection' is usually defined in terms which are equivalent to the expression *consciousness scrutinizing itself*" (Dunlap, 1912, p. 404). It consists "in the direct examination of one's own mental processes" (Angell, 1908, p. 5), coming into "direct acquaintance with the state of our minds" (Stratton, 1914, p. 2). William James, who characterizes it as: "the looking into our own minds and reporting what we there discover" (1890, p. 185), citing both Mill and Brentano, distinguishes between an access to or feeling of our experience on which we can form an immediate report (what we have called introspection in the weak sense), and a more mediated process

of introspection that may involve memory or observation of consciousness (p. 189). The psychologist, according to James, must rely on this latter, which is a "difficult and fallible" form of introspection (p. 191).

These two forms of introspection have two different purposes within experimental settings. The weak form of introspective report is often used to get at something the subject is *not* aware of, e.g., reaction times, or accuracy of judgment or memory. In such cases, the scientist is not at all concerned about what the subject's experience is like. Using the second, stronger form of introspection the scientist may indeed be attempting to capture what a given individual is currently experiencing. In the remainder of this paper, we will use the term *introspection* to mean this strong sense of introspection, unless otherwise noted.

This more proper form of introspection is often identified with the phenomenological method practiced by Husserl and his followers (see, e.g., Dennett, 1991). Phenomenologists, however, distinguish between introspection and phenomenological method. If introspection is taken to mean a mental operation that allows one to report about one's current mental state, then "it is not at all claims of this type that phenomenology is concerned with, and more generally speaking, phenomenology is not at all interested in establishing what a given individual might currently be thinking about. The phenomenological field of research does not concern private thoughts, but intersubjectively accessible modes of appearance" (Zahavi, 2003, p. 54). In other words, the phenomenologist isn't interested in the subject's experiences qua their own private and subjective (psychological) experiences; rather he/she is interested in them, and in their structures, only insofar as they are representative of common experiences. More specifically, the concern of phenomenology is not with how a subject reacts to a stimulus, or with what a subject might be experiencing in a particular experimental setting, but with the invariant self-organizing structure of the experience.

The difference is subtle, especially since Wilhelm Wundt (1832–1920), for whom *introspection* was *the* method of investigation, trained subjects to discard subjective interpretations and instead describe the 'pure' perceptions as they appeared in subjects' consciousness, and this directive comes close to a phenomenological procedure. In related approaches, the Copenhagen School of Phenomenological Psychology (E. Rubin, 1886–1951; F. From, 1914–1998; E. Tranekjaer Rasmussen, 1900–1994) stressed that in order to perform proper psychological science, it was important to study the phenomena as they appear to the subject, and on this basis formulate psychological theories of human perception.

> [. . .] one of the most important methods of investigation is that of phenomenological description, in other words, the description of what we experience. . . In order to gain knowledge about the experienced situation we must hold ourselves to what is present in consciousness, must describe the 'phenomenological' situation as we say (Tranekjaer Rasmussen, 1953, p. 2–3).

An integral methodological part of this type of investigation was introspection in the strong sense, the subjective report collected either from subjects during an experiment or from the researcher himself. Pierre Vermersch (1999) also associates phenomenology with introspection, and suggests that introspection can be improved by following phenomenological method. In practice one can find uses of introspection that come close to the practice of phenomenological method, and other uses of introspection that involves no phenomenological method at all. Yet it is still possible to

offer several distinctions that would allow us to pick out a genuinely phenomenological set of procedures that are not always followed in experiments that involve introspection.

One distinction to be made here is between heteronomous and autonomous methods. Many uses of introspection rely on heteronomous methods. If subjects are instructed or trained prior to the experiment about precisely what they should be looking for in their experience, then typically these are directions predetermined by the experimental design and by specific theoretical interests that inform that design. In this sense, such directions are based on categories or rules that have been predefined outside of the introspection itself. More importantly, concern for scientific objectivity motivates the experimenter to use objective methods to translate the first-person introspective report into results that are not only averaged, but laundered of first-person subjective factors. Introspective reports are statistically manipulated to wash out subjective factors that would compromise scientific conclusions. As Dennett has pointed out, this is good scientific practice. His own concept of heterophenomenology involves precisely these kinds of procedures (Dennett, 2003). The phenomena explicated in introspective procedures are displaced by the verbalized results of those procedures. ''For the latter are public, objectifiable; they issue from a piece of behaviour so everything is satisfactory, is scientific, even if one has lost an essential part of what takes place with the subject's (1999, p. 26). In effect, the way introspection comes to be employed in experimental situations is, as much as possible, to transform it into the weak sense of introspection, with attention given only to the verbal reports.

In contrast, phenomenology specifies autonomous methods. Subjects are not asked to adopt predetermined descriptive categories but to develop their own descriptions. The subject performs a phenomenological reduction, a methodological step that requires the subject to direct attention exclusively to the subject's own experience of the world, and its conscious appearance, and to exclude all beliefs, opinions, and theories about what that experience is including naïve metaphysical (and introspectivist) views about the nature of the mind or even that there is something called the mind to introspect. This method attempts to preclude descriptions that are biased by either the subject's or the experimenter's particularistic interests. Furthermore, the task of the subject is not to determine whether something is really the case. The task is not to determine whether the stimulus really occurred, or whether one's experience is veridical (Did the light really flash or did I just imagine it?). The subject is asked simply to attend to the subject's own experience and to describe it, but to avoid formulating a theory or opinion about it. The first-person data that are collected in this way are not then averaged out by statistical methods and reduced to third-person quantitative data. Rather, descriptions of one subject are compared to descriptions of other subjects, and the attempt is made to find the common qualitative features, the invariant structures of experience under the specific conditions of the experiment. As Zahavi indicates, this intersubjective dimension of phenomenological procedure is an essential feature, a point on which Rasmussen cited Merleau-Ponty: ''... the qualitative knowledge is not subjective, it is intersubjective. It describes what can be observed by all'' (Rasmussen, 1996, p. 61). In a further step, however, the phenomenological data may be correlated with other objective measurements generated in the experimental condition, e.g., the data of brain imaging, EEG, behavioral responses, etc.

There are two positive ways to integrate phenomenological procedures in scientific experiments on consciousness. The first is based on Varela's notion of neurophenomenology and involves the training of experimental subjects (Varela, 1996). Following this approach, phenomenological

methods have been directly and productively incorporated into the protocol of experiments on perception in Lutz, Lachaux, Martinerie, and Varela (2002), and on epilepsy by the Le Van Quyen–Varela group (Le Van Quyen et al., 1997a; Le Van Quyen, Martinerie, Adam, & Varela, 1997b; Le Van Quyen, Martinerie, Baulac, & Varela, 1999; Le Van Quyen et al., 2001a; Le Van Quyen, Martinerie, Navarro, Baulac, & Varela, 2001b). Such procedures hold great promise for specific types of experiments, including those that use neuroimaging. A second approach may have wider application and does not involve training experimental subjects in phenomenological method. It requires front-loading phenomenological insights into experimental design (Gallagher, 2003).

3. Neurophenomenological experiments

The experiment by Lutz et al. (2002) has been widely discussed (see e.g., Bayne, 2004; Gallagher, 2003; Jack & Roepstorff, 2002; Overgaard, 2004). Here, we will simply summarize the features of this experiment that make it phenomenological, or more precisely, neurophenomenological.

Lutz et al. (2002) investigated the variability of cognitive parameters defined by the subject's attentive state, spontaneous thought-process, and strategy decisions for carrying out experimental tasks. The *subjective experience* associated with this variability includes distractions, cognitive interference, and so forth. These parameters are usually classified as unintelligible noise (Engel, Fries, & Singer, 2001) and are typically factored out by a method of averaging results across a series of trials and across subjects. Lutz combined a phenomenological approach to first-person data and the specific third-person methods of dynamical analysis of EEG data to study subjects exposed to a 3D perceptual illusion. Subjects were instructed to press a button with their right hand as soon as a shape had completely emerged on a computer screen. After the button push, the subjects gave a brief, but phenomenologically informed verbal report of their experience.

The phenomenological part of the experiment involved the development of descriptions (refined verbal reports) of the subject's experience using a series of preliminary trials. In this preliminary training subjects focused on their own experience, defined their own descriptive categories and reported on the presence or absence or degree of distractions, inattentive moments, and cognitive strategies. These descriptive categories were used to divide the trials into phenomenologically based clusters, which represent the intersubjective invariables. For example, subjects reported in their own terms that they were 'ready,' 'present,' 'here,' or 'well-prepared' when the image appeared on the screen and that they responded 'immediately' and 'decidedly.' These descriptions were then defined as a state of *Steady readiness.* In other instances subjects reported that they were unprepared or that they saw the 3D image only because their eyes were correctly positioned. They reported that they were 'surprised' or 'interrupted' by the image in the middle of an unrelated thought. These descriptions were defined as a state of *Unreadiness.* These and similarly intersubjectively determined categories were then used for reporting during the main trials when the experimenters also recorded the subject's electrical brain activity and measured reaction times. This combination of phenomenological report, EEG recording, and behavioral measures revealed correlations between experience (attention level), reaction times, and dynamic descriptions of the transient patterns of local and long-distance synchrony occurring between oscillating neural

populations, specified as a dynamic neural signature (DNS). Lutz et al. were able to show that specific experiences described in the subjects' trained phenomenological reports, translate into distinct DNSs just prior to presentation of the stimulus. For example, characteristic patterns of phase synchrony were shown to depend on the degree of preparation as reported by subjects.

The subjects in this experiment were trained in phenomenological method. In developing their descriptions they effected a phenomenological reduction by bracketing their ordinary attitudes and shifting their attention from *what* they were experiencing to *how* they experienced it. The procedure followed Varela's (1996) definition of three steps in phenomenological method:

(1) suspending beliefs or theories about experience;
(2) gaining intimacy with the domain of investigation;
(3) offering descriptions and using intersubjective validations.

The reduction can be guided by the experimenter through open questions—questions not directed at opinions or theories, but at experience (see Vermersch, 1994 and Petitmengin-Peugeot, 1999). These are questions that do not impose pre-determined theoretical categories. Rather than asking "Do you think this experience is like X or Y or Z?" the open question asks simply, "How would you describe your experience?" By posing open questions immediately after the task the experimenter helps the subject attend to the implicit strategy or degree of attention that is implemented during the task. Thus subjects are trained to gain intimacy with their own experience in the domain of investigation. The descriptive categories are then intersubjectively validated in the determination of the phenomenological clusters. They are scientifically validated by their correlation with objective measurements of behavior and brain activity.

Using similar methods of phenomenology and neurodynamics, the Le Van Quyen–Varela group in Paris (Groupe de Neurodynamique, Laboratoire de Neurosciences Cognitives et Imagerie Cérébrale, CNRS UPR 640, Hôpital de la Pitié-Salpêtrière) has studied the correlations between the experiential aspects of pre-seizure states in epilepsy and the neuronal dynamics of the electro-clinical onset of a seizure (see Le Van Quyen et al., 1997a, 1997b, 1999, 2001a, 2001b). Epileptics often have specific aura experiences at the beginning of a seizure. These experiences sometimes involve visual and auditory modalities in the form of hallucinations in which the patient may see a particular familiar scene or fact, or hear a voice or music (Gloor, 1990). In the case of temporal lobe seizures memories may invade the subject's experience and cause a *déjà-vu* illusion. The patient is usually aware of the illusionary nature of his experience (Le Van Quyen & Petitmengin, 2002).

The group studied preictal brain and experiential events (that is, those that precede the seizure). Questionnaire studies have shown that approximately 50% of epileptic patients experience warning symptoms (or prodomes) before their seizures. These symptoms may include depression, irritability, nausea, or headache. In 42% of the cases there may be an interval of 5 min or more between the warning symptom and the onset of the seizure. In addition, EEG studies have characterized preictal states several minutes prior to seizure onset indicating specific dynamical states clearly different from normal ongoing activity (see Le Van Quyen et al., 2001b for a review). The question is whether it is possible to precisely describe invariant patterns of subjective experience of epileptic patients just prior to seizure. In medical practice it is assumed that seizures cannot be anticipated nor influenced by the patient, and the result is that the language used to describe

seizures is inadequately developed. For this and several other reasons, it has been difficult for patients to recognize anticipatory signals (Le Van Quyen & Petitmengin, 2002).

The Paris group use phenomenological methods to help patients become aware of their preictal experience, and to describe it. These include a self-report in which patients complete a log form with questions that help them attend to the different aspects of their preictal experience. This is followed by an interview, which enables patients to explicate their experience in three stages. (1) In a controlled situation, the experimenter guides the patient "towards the concrete evocation of a particular preictal experience from the past, by helping him to rediscover, in a very precise manner, the images, sensations, sounds, etc., associated with his experience, until he feels that he is 'reliving' it" (Le Van Quyen & Petitmengin, 2002, p. 176). (2) The patient is asked to run through the experience in slow motion, focusing on the internal process and specific aspects of the experience. (3) The patient is asked to describe the experience with the help of open questions. The experimenter then analyses each description to identify the variable and invariable aspects of its structure.

In their ongoing studies, and in experimental contexts of specific perceptual tasks, the first-person data are then correlated with the neurodynamics found in EEG recordings. The theoretical–empirical task is to capture the patterns of dynamical changes in the brain that lead to epileptic seizures and to show that these are not random. In this regard, the experimenters are exploring a model that maps out the relation between the large-scale integration of neural synchrony, that is, an integration of brain activity mediated by neuronal groups that oscillate in specific bands and enter into precise phase-locking over a transient period of time (Varela, Lachaux, Rodriguez, & Martinerie, 2001) and local brain activity. In one patient, analysis revealed that changes in the internal structure of the epileptic spike patterns co-varied with specific experiences, and that that there is a 20 ms shift of rhythmic patterns along the diagonal, that is, modulations in the gamma frequency range (30–70 Hz). These data suggest that local neuronal activity is transitorily modulated by gamma activity associated with the subject's cognitive states (Le Van Quyen & Petitmengin, 2002). The perceptual tasks of the experiment contributed, in a highly specific manner, to move the neural activities towards particular unstable patterns. This is characterized as a 'downward' (global-to-local) causation (Thompson & Varela, 2001) and it suggests possible 'cognitive' interventions for the control of epileptic seizures (see e.g., Birbaumer, Elbert, Canavan, & Rockstroh, 1990; Schmid-Schönbein, 1998).

4. Phenomenologically informed experimental design

Just as experimental designs can be informed by specific theories, experiments can also be informed by phenomenological insights—that is, insights developed in independently conducted phenomenological analyses, or in previous neurophenomenological experiments. In such cases phenomenology is "front-loaded" into the experimental design, and there may or may not be any phenomenological method, or even introspection in the strong sense, explicitly used in the experiment itself (see Gallagher, 2003).

Good examples of phenomenologically informed experimental designs that do not involve phenomenological or introspective procedures can be found in some recent neuroimaging experiments. A number of experimental studies (Charminade & Decety, 2002) have been designed to

test out the concept of a sense of agency which was originally described in a phenomenological analysis that distinguished between the sense of agency and the sense of ownership at the first-order experiential level (Gallagher, 2002).

In a phenomenological act of reflection on involuntary movement one is able to distinguish two aspects that in the normal experience of intentional action seem to be indistinguishable. If someone moves my body I sense that it is my body that is moving—it is *my* movement and I experience ownership for the movement—but I do not experience agency for the movement (I have no sense that I intended or caused the movement). This first-order experiential sense of ownership versus agency needs further to be distinguished from the attribution of ownership or agency at a higher-order cognitive level. It is possible to make the distinction between attributions of ownership and "attributions of agency" on the level of higher-order, reflective or introspective report (e.g., Graham & Stephens, 1994; Stephens & Graham, 2000). This is not the same as experiencing the difference at the level of first-order phenomenal consciousness (Gallagher, 2000, 2005). That is, in the case of involuntary movement, I have an immediate, first-order experience of the movement as happening to me (sense of ownership), but not as caused by me (no sense of agency). The senses of ownership and agency are implicitly integral to experience, not only for movement and action, but for thought processes as well (and they are subject to dissociation in schizophrenic symptoms of thought insertion). In phenomenological terms, they characterize our pre-reflective (non-conceptual) self-awareness implicit to the experience of action and cognition.

Using this distinction recent neuroimaging fMRI studies have set out to determine the neurological processes responsible for generating the sense of agency. Specifically, guided by the phenomenological evidence that indicates this is a first-order experiential phenomenon rather than a higher-order cognitive attribution, the experiments have looked for, and have identified the relevant neuronal activity in a set of primary processes that are associated with motor control mechanisms rather than in areas that may be responsible for higher-order cognitive processes. Specifically, Farrer and Frith (2002) distinguish the neural correlates of the sense of agency for one's own actions (self-agency) in contrast to the sense that the action belongs to someone else (other-agency).

For example, in Farrer and Frith (2002) subjects manipulate a joystick to move an image on a computer screen while fMRI brain images were taken. Although in each case the subject moves the joystick appropriate to the movement on the screen, in some trials the subject causes the screen movement and in others the experimenter causes it. This allows for a separation between the sense of agency and the sense of ownership since the subject moves in all trials and the sense of ownership for that movement is not differentiated in the imaging contrasts. The experiments find the neuronal correlates for the sense of agency in the contrasting activation in the right inferior parietal cortex for perception of action caused by others, and in the anterior insula bilaterally when action is experienced as caused by oneself (see Gallagher, 2003 for further discussion).

The subjects in these experiments, in contrast to the neurophenomenological experiments cited above, are not trained in phenomenological method and they are not even required to give an introspective report of their experience. Rather, phenomenology comes into the picture by contributing to the experimental design, by providing clear phenomenological distinctions, which also inform part of the analytic framework for interpreting the results.

A good example of a phenomenologically informed experimental design that does involve introspective procedures is a recent "alien hand" experiment (Brøsted Sørensen, 2005). This is an experiment informed by the Copenhagen school of phenomenological psychology, but it also involves a front-loading of phenomenological distinctions.

5. The alien-hand experiment

The alien-hand experiment (TAHE) originated with Nielsen (1963) and involves a mirror illusion in which subjects believe they see their own hand, when in fact they are looking at an 'alien hand' (the experimenter's hand). Subjects are told they are participating in an "experiment that investigates subjective experience during line drawing exercises." Information about the mirror illusion and the alien hand is left out of the instructions given to the subjects. Full information is provided to them after the experiment has been carried out, which includes eight trials of line drawing.

The paper on which to draw is placed in a fixed position in a box on a scaffold (see Fig. 1). Each piece of paper has a preprinted straight line (L) on it. Subjects (S) are instructed to wear a glove,

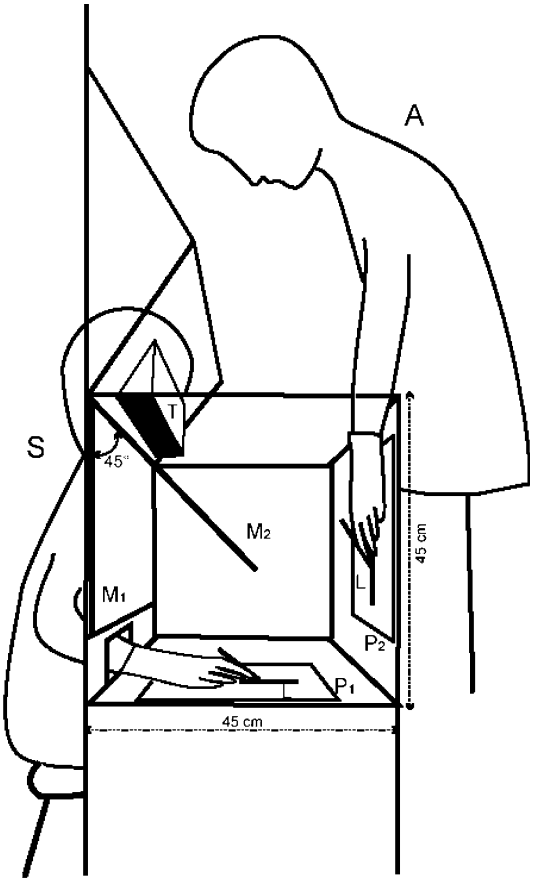

Fig. 1. The alien-hand experiment (Nielsen, 1963).

stick their drawing hand through a slot at the bottom of the box and look through a tube (T) at the top. The secret mirror can be placed in one of two positions: M_1 in which case the subject will see his or her own paper (P_1) or M_2 in which case the subject will see a piece of paper (P_2) (similar to P_1) in a fixed position at the back of the box. Also wearing a glove the experimenter (A) is placed behind the box and visually hidden from the subject by a curtain. Initially there's no light in the box, but during each trial the experimenter will turn on a light inside the box and a timer will then switch it off after two seconds. During the two seconds of light subjects are instructed to quickly trace a line on top of the preprinted line with a normal pencil. If the mirror holds the M_2-position the experimenter (the alien hand) will simultaneously and with the same tempo as the subject draw a line on P_2. But the experimenter will deliberately draw off target, i.e., away from the preprinted straight line (at angles of 10–30 degrees). Since the subjects are unaware of the mirror and of the fact that the visual input is the alien hand, the scene is set for subjects to believe that they see their own hand performing unintended actions.

After each of the eight trials (a fixed sequence of M_1 and M_2 positions) subjects are encouraged to verbally report about their subjective experience through open questions like: "Please describe your experience during this trial. Feel free to mention anything that comes into your mind about this. Don't leave anything out."

Originally, Nielsen used the experiment (and other similar experiments) as the basis for a theoretical model concerning human acting (Nielsen, 1963, 1978).

Obviously, body experience plays a key role in TAHE and the recent experiment was informed by specific distinctions between body-schema and body image and between sense of agency and sense of ownership worked out in previous phenomenological analyses (Brøsted Sørensen, 2005). The concepts of sense of agency and sense of ownership have been outlined above. The concept of body schema refers to a system of sensory-motor capacities that function without awareness or the necessity of perceptual monitoring and the concept of body image denotes a system of perceptions, attitudes, and beliefs pertaining to one's own body (Gallagher, 1986, 2005; Gallagher & Cole, 1995).

The literature on body experience (especially regarding body image) pays special attention to eating disorders (e.g., Fisher, 1986; Rosen, 1990). Since TAHE offers a unique opportunity to investigate body experience through the first person perspective, three groups of subjects were included: A group of men, a group of women, and finally a group of female bulimics [diagnosed using The Eating Disorder Examination (Cooper & Fairburn, 1987)].

5.1. Sense of agency and sense of ownership

The verbal reports were recorded, transcribed and analysed in a number of ways. Insights from Nielsen (1963) and Jeannerod (1997) suggested that a loss of sense of agency was to be expected among the subjects in TAHE. Thus, the qualitative data was analysed to see if the subjects would lose their sense of agency in TAHE because of the induced mismatch between proprioceptive information from the subject's own hand and the visual input from the alien hand. The analysis soon revealed that a clearcut distinction between having a sense of agency and of not having sense of agency was not in good accordance with the verbal reports. A graduation of the sense of agency was a better way to analyse and describe the different subjective experiences in TAHE. Thus a five-point scale was used to rate every trial in the verbal reports according to the following labels:

1. Lack of sense of agency
2. Heavily reduced sense of agency
3. Ambivalent sense of agency
4. Lightly reduced sense of agency
5. Intact sense of agency

A rating of 1 was applied to statements like "The hand just did what it wanted to do. I was just a passive witness to it" (statement reported by a bulimic woman, M_2-trial). The subject thereby indicated that even though it was her body that moved (intact sense of ownership for her movement, which was felt proprioceptively), she didn't control its actions. The hand had a will of its own. She fully but mistakenly accepted the alien hand as her own hand performing unintended actions. Despite the proprioceptive information from her own hand below the mirror, the visual input dominated her body experience in this situation and she completely lost the sense of agency regarding the hand.

A rating of 3 was applied to statements like "It is as if it isn't my hand!" and "It is as if I can't control my hand!" (statements reported by a male subject, M_2-trials). His verbalized experiences characterized by the "*as if* " quality indicates that he had some doubt about the source of control for the action. Still, this was not a complete lack of a sense of agency. The as-if statements were interpreted as ambivalent statements.

A rating of 5 was applied to statements like "I didn't do that!" and "I'm not performing the action I'm looking at" (statements reported by a non-bulimic female subject, M_2-trials). She clearly discriminated between the visual and the proprioceptive information and thereby maintained an intact sense of agency regarding her own hand.

The rating scale application is *not* to be considered a naturalization of phenomenology. The numbers are merely used as a way of determining, e.g., possible intergroup differences, and presenting data in a systematic way. An inferential statistical analysis should be regarded as a supplement to qualitative analysis of the verbal reports. The quantitative analysis showed that the bulimic subjects participating in TAHE experience a significantly lesser degree of sense of agency compared to both men and non-bulimic women. Compared to the other groups, the bulimics very easily lost the sense of agency. Even though the opposite was predicted, a missing or diminished sense of ownership was very rare in TAHE. As presented above the concept of sense of agency was more meaningful as an analytical category (for more detailed analysis, see Brøsted Sørensen, 2005).

5.2. Body image and body schema

In TAHE subjects are urged to pay attention to their experience while moving. Since the concept of body image involves perceptual monitoring of the body and the concept of body schema concerns non-conscious motor behavior, one might expect that the design in TAHE aimed at some operational definition of body image and body schema. However, this was not the case. Instead the phenomenological distinction and conceptual definitions provided the very framework within which the experiment was executed. The phenomenological analysis had underscored a complicated interplay between non-conscious motor processes and conscious processes as an integral part of our body experience and self-awareness. This insight was used to set up an experiment

in which the interplay between motor behavior and body experience was studied and manipulated through the mirror illusion.

In this respect, the experimental design (including the data analysis) was informed by the insights, concepts, and descriptively based categories developed in both experimental and phenomenological analyses presented by Nielsen (1963), Jeannerod (1997), and Gallagher (1986, 2001). The experiment, however, offered new precision about these concepts, like the idea that the sense of agency is a matter of degree.

6. Experimental phenomenology

Experimenting with phenomenology in the sense of using phenomenological method or insight in scientific experiments also involves experimenting with the very notion of phenomenology as found in the philosophical tradition initiated by Husserl. In light of the actual empirical use that is being made of phenomenology there is an ongoing debate about how phenomenology can be naturalized (e.g., Braddock, 2001; Bayne, 2004; Overgaard, 2004; Petitot, Varela, Pachoud, & Roy, 1999; Zahavi, 2004). In this context we can ask whether it is necessary to conceive of phenomenology in a different way.

If the use of phenomenology in natural scientific experiments suggests a redefinition of phenomenology, we suggest that this redefinition involves, not a recasting of the phenomenological tradition, but an expansion of its borders, a redrawing of the phenomenological map (see Gallagher & Varela, 2001). For many phenomenologists the idea of naturalizing phenomenology seems self-contradictory. Phenomenology was originally defined by Husserl as non-naturalistic. At the same time, however, the very notion of "naturalistic" is open to redefinition as well (see Roy, Petitot, Pachoud, & Varela, 1999, for a more detailed analysis).

On our view the question of experimenting with phenomenology (or naturalizing it) need not involve a large ideological controversy. It is rather a strictly methodological question. Can phenomenological method, or the results produced by following the phenomenological method, be methodologically integrated into experimental settings? That is, the question is not about phenomenological method, or phenomenology per se, but about the methodological procedures that would allow phenomenology to be used in the behavioral and cognitive neurosciences.

The answer to this question appears to be, in the colloquial phrase, and with whatever pun you like, a *no-brainer*. The issue phenomenology addresses in this context is that of specifying, in a scientific way, the meaning of the phenomenon under study. Even if introspection is not essential for a scientific study of consciousness (*pace* Price & Aydede, in press), even as scientists our familiarity with the phenomenon under study is certainly based on introspection. Furthermore, unless as scientists we are willing to allow non-scientific (in this case, folk psychological) concepts to guide our experiments, then we require some form of control over the introspection that we use to frame our *explananda*. This is precisely what phenomenology offers. It is, in effect, a way of introducing methodological control into the description of the phenomena (perception, memory, proprioception, action, etc.) that cognitive scientists want to explain.

There are important differences between phenomenology and folk psychology. The latter is generated without the use of methodological practices. Phenomenology, in its practice of phenomenological reduction, suspends the common senses attitude (the "natural attitude") of folk

psychology and aims to develop precise descriptions of experience as it is. In this sense phenomenological data are not simply anything that a subject happens to report. In certain types of experiments, where we do ask subjects to report about their experiences, the use of folk psychological concepts is clearly unscientific. As a result, the data are suspect. Dennett's (1991, 2003) notion of "heterophenomenology," which confuses phenomenology with folk psychology, in the name of objectivity, attempts to fix such first-person data by transforming them into third-person data through the means of scientifically appropriate (but heteronomous) procedures, such as statistical averaging. In effect, however, this laundering of the first-person data distorts the very phenomena that experimental science is trying to explain in these cases. If one starts by using uncontrolled introspection, infected with folk psychology, taking such corrective measures is perhaps the most scientific thing to do. But it is difficult to see why we should consider the results of this kind of procedure scientific at all, since the first-person data that start the process are not the product of a scientifically controlled process. Furthermore, in translating a subject's first-person experience into third-person data, precisely what categories or criteria should the scientist use? Obviously not the categories of folk psychology (which would simply reintroduce the biases that were to be eliminated). Should she use her own subjective experience as an interpretational guide? This would introduce a similar bias or distortion of the data being processed. A scientist would naturally resort to objective, formalized meanings established within the framework of behavioral science in order to properly interpret the subject's reports. In that case, however, one needs to ask where these formalized meanings originate. Previous science? But that just pushes the question back. At some point a controlled methodology is required to justify the formalized meanings used as interpretational guides. In effect, we suggest, an objective interpretational framework requires a reflective, methodically guided phenomenological analysis, without which the procedure may simply impose the results of previous uncontrolled and anonymous phenomenological exercises (see Gallagher, 1997; Gallagher & Varela, 2001).

The kind of scientific uses of phenomenology that we have outlined, as applications of phenomenological method, need not challenge the original scope of phenomenology. Husserl had defined phenomenology as a transcendental enterprise. That is, he proposed that through phenomenological methodology we could gain access to the necessary conditions of possibility for any consciousness whatsoever, rather than the psychological particulars of normal or abnormal experience. Although Husserl defined phenomenology as a non-naturalistic discipline in this sense, the idea that the results of his transcendental science might inform the natural sciences is not inconsistent with his own intent. He suggested, quite clearly, that "every analysis or theory of transcendental phenomenology—including ... the theory of the transcendental constitution of an objective world—can be developed in the natural realm, by giving up the transcendental attitude" (1970, p. §57). We regard this as an extension of phenomenology rather than a rejection of its original idea.

By using phenomenology in experimental science, the gains do not go to science alone. Rather, such experiments test and verify the phenomenological description and extend its application to related issues. For example, just as neuroscientific experiments on self-agency lead directly to issues concerning social cognition, the phenomenologist may be directed to investigate in innovative ways the phenomenology of this relationship. Since issues pertaining to social cognition and intersubjectivity are also of concern to phenomenology, this opens further opportunities for the interaction between phenomenology and experimental neuroscience. It is quite possible that experimenting with phenomenology will lead to a productive mutual enlightenment, where

progress in the cognitive sciences will motivate a more finely detailed phenomenological description developed under the regime of phenomenological reduction, and a more detailed phenomenology will contribute to defining an empirical research program.

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