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Protention, schizophrenia, and gesture

Shaun Gallagher

Philosophy and Cognitive Sciences

University of Central Florida

gallaghr@mail.ucf.edu

Visiting Professor

University of Copenhagen

Danish National Research Foundation *Center for Subjectivity Research*

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“...when a man stands motionless upon his feet, if he then extends his arm in front of his chest, he must move backwards a natural weight equal to that both natural and accidental which he moves towards the front.” (Leonardo da Vinci 1498)

This kind of anticipation happens in all sorts of intentional movement and is a general rule followed by the sensory-motor body (Berthoz 2000; Haggard & Eimer 1999; Haggard & Magno 1999). In hand to mouth motor patterns in the newborn the mouth anticipates the hand as it opens to meet it (Butterworth). When I reach to pick up a glass, before I reach the glass, and outside of my awareness, my hand anticipates the best possible grasping shape for purposes of picking up the glass -- a different object or a different purpose elicits a different grasping shape.

(Jeannerod). Not only in motor action, but in all kinds of experience -- including cognitive and communicative -- this kind of anticipation is ubiquitous. Specifically in regard to how gesture works, McNeill's model of the growth point is a good example: in communicative/ expressive action, gesture formation anticipates and is initiated just prior to the relevant part of the speech act.

This anticipatory structure of movement and experience is complemented by a retentive structure that maintains the just past aspect of experience within the (specious) present. This retention of the past can be found in descriptions of body schematic control of movement. The body schema dynamically organizes sensory-motor feedback in such a way that the final sensation of position is 'charged with a relation to something that has happened before' (Head 1920: 606). Head uses the metaphor of a taximeter, which computes and registers movement as it goes. Merleau-Ponty, borrows Head's metaphor and associates it with temporality -- movement is organized according to the 'time of the body, taximeter time of the corporeal schema' (1968: 173). And this

includes a retentional component: 'At each successive instant of a movement, the preceding instant is not lost sight of. It is, as it were, dovetailed into the present [Movement draws] together, on the basis of one's present position, the succession of previous positions, which envelop each other' (1962: 140).

The anticipatory aspect of movement and the retentional aspect are normally integrated: reafferent information (sensory feedback) about current (just attained) posture has to be represented in a forward model for motor preparation. In preparing to reach, for example, the motor system needs to register current hand position, and it has to keep track as the reaching movement develops. The same kind of integrated structure is found in sentence construction and comprehension. One has to retain the beginning of the sentence in mind, and anticipate where the words are going in order to make sense of the sentence as a whole.

Husserl's analysis of time-consciousness is a good model of this ubiquitous temporal structure (see Figure 1). At every moment (in every now phase) consciousness has a three-fold structure: primal impression, retention, and protention. As I listen to a melody, for example, retention retains not only the sense of the past notes of the melody, but also the sense that I have been listening to these notes. Retention gives me the sense that this experience is mine -- that I am the one listening to the melody. I am not only aware of the melody, I am implicitly self-aware of being aware of the melody. This concept of retention explains how consciousness can be pre-reflectively aware of itself in its continuous experience. Likewise, protention gives me a sense not only of where the melody is heading, but an anticipatory sense that these will be experiences for me.

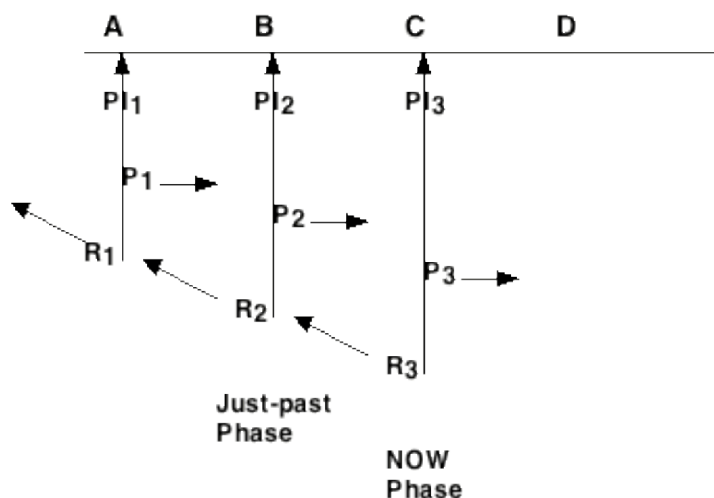


Figure 1: Husserl's model of time-consciousness. PI = primal impression; R= retention; P= protention.

This ubiquitous retentional-protentional structure permeates experience, cognition, and movement, and shapes the sense of self. Phenomenologists define *ipseity* as the phenomenal sense of what it is like to be me, what it *feels* like to be me, generated in the retentional-protentional structure. This temporal structure is affected by the emotional dimension of experience, and reflects an “affective tonality,” so that affective disposition informs ipseity. Moreover, in regard to movement, since this experience is always the experience of a sensory-motor body, it includes aspects of the sense of ownership (that this experience or movement is happening to me) and sense of agency for intentional action (the sense that I am the author of this action).

There is good evidence that the *sense of agency for action* is based on pre-motor processes connected with movement preparation leading to motor command (Gallagher and Marcel 1999; Gallagher 2000; Marcel 2003; Tsakiris and Haggard 2005) – that is, the sense of agency is generated in precisely the processes that anticipate the action.

Voluntary actions have a distinctive temporal structure: generation of intention, “translation” of the intention to the motor command and the accompanying efference copy, execution, and perception of the effects (Tsakiris & Haggard 2005)

In the case of delusions of control, something starts to go wrong with these anticipatory/preparatory/ protentional processes (or in terms of motor control, the forward model). Normally, for example, we are not explicitly aware of the sensory feedback (in proprioceptive and visual modalities for example) that inform our motor control for intentional action – we do not normally monitor our actions in a conscious manner. This sensory suppression fails in the case of delusions of control, and the subject becomes hyper-reflexive (Sass) – that is, the schizophrenic becomes explicitly aware and concerned about what are normally the tacit aspects of bodily movement and sensation -- in terms of temporality, this is a hyper-retentionality -- the subject focuses on what has just happened, or the sensory feedback that registers his just-past movement.

Frith (1992) attempted to use the motor-control model to explain schizophrenic symptoms of thought insertion -- but I’ve suggested that are a number of problems with this proposal (Gallagher 2004). It’s not clear, for example, what components in the process of thinking would be equivalent to a motor comparator, or efference copy, or what precisely the concept of an intention to think would be. I won’t try to rehearse the critique here, but I do want to note that the more general model of time-consciousness – the retentional-protentional structure that we just described – can apply to both delusions of control and to thought insertion. Indeed, we work out an explanation of thought insertion in terms of an intrinsic problem with the retentional-protentional structure of experience.

In regard to moving or to thinking, protention is a necessary but not sufficient condition for the sense of agency. Passively listening to music is not self-generated; there should be no sense of self-agency for it, and normally there isn't, but it still involves protention – an expectation of the note to come. Likewise for listening to someone else speak. Protention is normally a constant feature of experience, even if the experience is of something that happens passively, without my agency. In some cases, protention is disappointed, in the sense of what we expected to happen doesn't happen, for example, as we are sometimes surprised. But think of what would happen if protention itself broke down or didn't work. Then even those things that we ourselves do and for which we are agents would come unexpectedly. This seems to be the case for some schizophrenics. Frith and Done (xxxx), for example, conducted an experiment in which schizophrenics suffering from delusions of control, pressed a button to cause a loud sound. Schizophrenic subjects, in contrast to normals, showed no anticipation for this self-generated sound – they were constantly surprised by it, and had no sense of agency for it.

This situation is consistent with numerous descriptions of schizophrenic experience as found in phenomenological account and in empirical studies:

- 'acts without concern for tomorrow', 'fixed acts', 'short-circuit acts', and 'purposeless acts', a sense of "absolute fixity" -- lacking mobility for the future (Minkowski 1933)
- difficulties in indexing events in time (Melges 1982; Melges and Freeman 1977).
- future time-perspective is curtailed (Wallace 1956; Dilling and Rabin 1967).
- difficulty planning and initiating action (Levin 1984) and
- problems with temporal organization (Klonoff, Fibiger and Hutton 1970; DePue, Dubicki and McCarthy 1975).
- 'impairment of self-temporalization' (Bovet and Parnas 1993: 584)

What could cause a disruption in the protentional process? First we should note that disruptions manifested in delusions of control or thought insertion are episodic and selective for specific content. In connection with the phenomenological concept of affective tonality, unruly emotions such as anxiety or fear, tied to the selective and specific circumstances, e.g., in the presence of certain significant individuals, or in a certain kind of situation, or confronted with a certain object, or in rehearsing certain thoughts, might trigger a disruption in protention. In such cases or similar circumstances, and in line with the episodic and selective nature of positive symptoms, a subject may then (but not always) experience thought insertion or similar loss in the sense of agency. This proposal is consistent with Varela's suggestion that *affective tonality* is 'a major boundary and initial condition for neurodynamics' (Varela 1999a; 1999b), and that disruptions to affective tonality can throw off the dynamics of the system. Affective tonality can manifest itself in forms of emotional dispositions, and these may be tied to more global neuronal dispositions, and may be disrupted by abnormal levels of neurotransmitters such as dopamine. Because of the ubiquity of the retentional-protentional structure in movement and experience, on the neurological level the sort of mechanism that underlies protention is more appropriately thought of in terms of widely distributed and dynamical processes than in terms of localized functions (Varela 1999a; Gallagher and Varela 2001), so a disruption to these dynamical processes may express itself in a disruption of protention. In this regard, the experiential aspects of delusions of control and thought insertion are not likely due to problems with comparator, central monitor,

efferece copy, etc. as in the motor control models -- but a more pervasive function such as problems with working memory. A disruption of dynamical processes in the neuronal mechanisms that underpin working memory could be responsible for the disruption of temporal (retentional-protentional) structures of experience -- the timing of action/ thought – and therefore disruptions in the sense of ipseity.

Such symptoms may lead to hyperreflective behavior, the fragmentation of meaning, to transformations of intentionality, to a lack of attunement with the world, to abnormal feelings of saliency, or to negative symptoms such as flattened affect. The question that I pose, as a way to introduce the following discussion by Duncan and Goss¹, is this: Can we use the same kind of explanation to explain certain kinds of abnormal behaviors in the speech and gesture patterns of schizophrenics or other pathologies?

¹ This presentation was part of a session at the 2nd Conference of the International Society for Gesture Studies (ISGS) INTERACTING BODIES - CORPS EN INTERACTION, in Lyon, France, with Susan Duncan and Jim Goss from David McNeill's research group on gesture at the University of Chicago. The session was entitled: Gesture, affect, and time in language : A neurophenomenological approach to psychotic and other non-aphasic language disorders. Here is the published summary. "Recent debates concerning the relationship between language and motor and cognitive dysfunction have implications for language theory. Gallagher extends Husserl's retentional-protentional model of time consciousness to account for cognitive and motor abnormalities in schizophrenia, formalizing our understanding of schizophrenic thought disorder. On the basis of discourse data from individuals with schizophrenia, Parkinson's Disease, bipolar disorder, and right hemisphere brain damage, we link the Husserl-Gallagher model to facts of on-line language processing. These are analyzed within McNeill's 'Growth Point' theory of language production to create a framework that accounts for a range of non-aphasic disorders of language use." Aktuelle Debatten, die sich auf die Relation zwischen Sprache und motorischen wie auch kognitiven Funktionen beziehen, haben Implikationen für die Sprachtheorie. Gallagher erweitert Husserls retentional- protentionales Modell zum Zeitbewusstsein, um kognitive und motorische Abnormalitäten in swe Schizophrenie zu erklären und formalisiert unser Verständnis von schizophrenen Gedankstörungen. Auf der Grundlage der Daten von Individuen mit Schizophrenie, Parkinson, bipolarer Störung und Schäden der rechten Hemisphäre, verbinden wir Fakten über on-line Sprachverarbeitung mit dem Husserl- Gallagher Modell. Diese werden mit Hilfe von McNeills "Growth Point" Theorie zur Sprachproduktion analysiert, um einen Rahmen zu schaffen, der eine Vielzahl von nicht-aphasischen Störungen der Sprachbenutzung einbezieht.