

FROM A SENSORIMOTOR ACCOUNT OF PERCEPTION TO AN INTERACTIVE APPROACH TO PSYCHOPATHOLOGY

Penultimate version of a paper, to appear in Gennaro, R. , *Disturbed
Consciousness*, MIT Press. Please refer to the published version.

Erik Myin, J. Kevin O'Regan and Inez Myin-Germeys

(erik.myin@uantwerpen.be, Universiteit Antwerpen; jkevin.oregan@gmail.com,

Laboratoire Psychologie de la Perception - CNRS, Université Paris Descartes);

i.germeys@maastrichtuniversity.nl, Maastricht University.

1. Introduction

According to the sensorimotor approach to perception and perceptual awareness, perceptual experience should be seen fundamentally as a way of interacting with the environment (O'Regan and Noë 2001), O'Regan 2011). What distinguishes perceptual experiences is the different ways in which a perceiver perceptually engages with the environment. What sets apart hearing from seeing, for example, are the differences between the patterns of auditory versus visual engaging with the world. Similarly, within a single (sub-) modality such as color vision, what sets apart an experience of red from an experience of green are also the differences in the modes of interaction with the environment that are involved. It has been argued by sensorimotor theorists that this relocation of emphasis from the brain to the interaction with the environment, or “going wide” (the phrase is from Hutto & Myin

2013, Chapter 8), offers a fruitful perspective on stubborn problems regarding understanding the nature of phenomenal consciousness.

After having reviewed the sensorimotor approach to perceptual experience, and what underlies its claims on allowing to understand perceptual consciousness, we will investigate a similar shift of emphasis away from an internal (or brainbound) to an interactive approach in the study of psychopathology. Indeed, such a shift is implemented in approaches to psychopathology which focus on the role of person-environment interactions in the study of the positive and negative phenomena of psychosis, by means of ambulatory monitoring (see (Myin-Germeys et al. 2009) below). Underlying such approaches is a view of psychopathology as involving altered ways of interacting with one's local context. In this paper, we will focus on the similarities between the sensorimotor view of perception and the interactive view to psychopathology. We will explore potential synergies and discuss the gains that could be obtained by turning one's view outward.

2. “Going wide” for perceptual awareness: the sensorimotor approach

2.1. The narrow take on consciousness

“What is consciousness?” remains to many a baffling question, especially if one considers the qualitative or phenomenal aspects consciousness. The experience of seeing a purple rose, the sensations of holding an ice cube or tasting vanilla seem, in all their subjective, phenomenal glory not easy to reconcile in a world made up of photons, quarks, waves and energy.

It is natural to frame questions about the scientific understanding of consciousness in terms of the potential of neuroscience to elucidate awareness, including its qualitative complexities and depths. The burden regarding consciousness then lies on neuroscience: it is the study of the brain which should bring the required scientific understanding of consciousness. It *should*, which means it also could fail. Theorists who focus on neuroscience as the place where the battle for consciousness should be decided are divided between optimists and pessimists. Optimists reckon that more closely studying the brain will unlock the secrets of consciousness. For example, in his book “The Quest for Consciousness: A Neurobiological Approach”, Christof Koch admits to be guided by “a hunch that the NCC [Neural Correlates for Consciousness] involve specific biological mechanisms.” (Koch 2004, 101). He looks for “particular mechanisms that confer onto coalitions of neurons properties that correspond to attributes of conscious percepts.” (Koch 2004, 103). Koch thinks the very nature of the branch of biology he pursues motivates his approach to consciousness:

“The specificity that is a hallmark of molecular and cellular biology suggests that the correlates of consciousness are based on equally particular biological mechanisms and gadgets, involving identifiable types of neurons, interconnected in some special way and firing in some pertinent manner.”

(Koch 2004,105)

Pessimists about the prospects of neuroscience, on the other hand, see the existence of consciousness as an indication of the limits of neuroscience and by implication of science in general. This position has been defended, famously, by Colin McGinn who

despairs of the possibility to intelligibly elucidating how “the water of biological tissue” turns “into the wine of consciousness.” (McGinn 1989, 348)

Despite coming to radically differing conclusions, the common platform for both optimists and pessimists is the initial assumption that one should turn to neuroscientific or brain-based properties if one wants to understand how consciousness in a physical world is possible. What splits them apart is a different assessment of whether this expectation will be met.

Enter the sensorimotor approach to perception and perceptual awareness. Crucially, it disagrees with both optimists and pessimists regarding their commonly held tenet that the secret to understanding consciousness lies in the brain. Sensorimotor theorists do agree with pessimists in holding that one does not have to expect that the links that will be found between brain processes and experiences will be enlightening or illuminating when it comes to understanding the phenomenal feel of experience. Unlike the pessimists, however, sensorimotor theorists do not see this lack of intelligible relation between brain processes and phenomenal consciousness as showing that neuroscience, or science in general, fails to reach a goal it could be reasonably expected to attain. The problem lies not with (neuro-)science, but with the expectation that the “laws” of phenomenal consciousness should be found in the brain.

For what would it mean that the “laws of phenomenal consciousness” (O’Regan and Block 2012) would be found in the brain? It would mean that some intracranial process could be intelligibly related to phenomenal feel. It would mean that through such neural-phenomenal laws, it could be shown how qualitative consciousness was ‘generated by the physical processes in the brain’ On the left hand side of such laws, one would find a neural process, on the right hand side a phenomenal feel, and the

laws themselves would make their correspondence intelligible. The example that has become iconic for the identity theory of the fifties and sixties, the philosophy which proposed that mental states are brain states, can still serve: C-fibers on the neural side and pain on the other side (Smart 1958). This example was scientifically simplistic both regarding the complexity and variety of neural processes underlying pain, as well as concerning the complexity of pain awareness (see Grahek 2007 for a philosophical discussion of some of these issues). However, what has been philosophically revealing about the example holds regardless of any complications of the left hand or right hand side of such a law. For it seems that, whatever brain process one substitutes on the left hand side and whatever feel on the right hand side, the relation between them remains brute and in itself unexplained, or unintelligible. Observation of this bruteness can drive theorists who set out from strong expectations regarding the brain in the two different directions corresponding to our optimist/pessimist division. Some might hope that despite first appearances, there might be deeper neural laws to be uncovered so that the left hand side will one day be filled in with a worthy candidate able to be revealingly related to feel and thus to its right hand counterpart. Yet it is hard to see how anything on the neural side might fulfill such a role. Whatever will be found, it will be some objective process, itself apparently lacking any of the subjective, qualitative feels present on the right hand side – the feel of red, sweetness, or pain... It is precisely the fact that there is a general issue about relating objective brain processes to phenomenal feels that drives pessimists to declare consciousness to lie beyond the limits of neuroscience – and when coupled with the expectation that neuroscience is the relevant science for elucidating consciousness, this conclusion transforms into a pessimist assessment of the potential of science itself regarding consciousness.

2.2. Why and how the sensorimotor approach goes wide

From the sensorimotor approach comes a different proposal: instead of aiming to find intelligible physico-phenomenal laws inside the confines of the cranium, one looks elsewhere. In particular, if one wants to find an intelligible relation between the phenomenal and the physical one must look at the interactions between an organism and its environment. In other words the sensorimotor approach proposes to “go wide” when looking for the laws of qualitative consciousness instead of “narrowly” peeking inside the brain.

Tactile examples have served the sensorimotor approach well to illustrate the strategy of going wide. Consider the qualitative experience one has when pressing something hard, like a piece of marble. A narrow strategy would expect to find the secret of the particular quality of hardness by considering the brain processes involved in the experience. As pessimists will be keen to point out, it looks like no properties likely to be encountered in the brain – be they neural firings, neural connections, electricity, chemistry or quantum mechanics—will ever connect intelligibly with hardness. But prospects change, so the sensorimotor approach insists, when one turns to the pattern of interaction which a perceiving agent will enact when it experiences something as hard. Typically, the agent will push or press, and encounter resistance. Even under more forceful pushing, the hard object will not yield. In general, so the sensorimotor account proposes, perceptual experiences are constituted by interactions characterized by precise patterns of ways in which worldly stimulation changes with specific actions on the part of the perceiver, so-called patterns of sensorimotor contingency (O’Regan & Noë 2001, O’Regan 2011). Having a certain perceptual experience with

a certain phenomenal quality corresponds to embodying or enacting an interaction characterized by a specific pattern of sensorimotor contingencies. According to the sensorimotor approach this account for perceptual feel works across the board. It doesn't apply accidentally only to touch, but to all of the sensory modalities. Seeing and having the phenomenal experience of a color too consists, according to the sensorimotor approach, in embodying a pattern of interaction typical for a certain color. This color pattern consists of such facts as that moving in such and such a way with respect to a surface will change the light reaching the eye in such and such a way. Though the example of color undoubtedly has less intuitive appeal than a tactile example, pursuing this sensorimotor approach in the context of color has led to striking empirical results. For example, it has been shown to be possible to account for the special role that the "focal colors" red, yellow, green and blue play in perception, in terms of the finding that surfaces of these colors have the particularity that they alter incoming light in a simpler way than other surfaces (Philipona & O'Regan 2006, p. 336), and thus allowing different interactions, rather than, as is usually done, in terms of the structuring of experience by the peculiarities of neurophysiological processes, in particular the opponent channels (Degenaar & Myin 2014, p. 395).

The sensorimotor approach not only casts light on the specific feel of experiences within a modality, such as the phenomenal experience of hard or red, but also on the phenomenal quality of the different sensory modalities. Having a visual experience, as opposed to having, for example, an auditory experience, should, according to the sensorimotor approach, also be understood by "wide laws" of interaction. In a visual experience, moving or closing the eyes will have certain effects on how one's visual system is stimulated, whereas it will have no such systematic effects on input from the

ears. A sensorimotor account has also been offered of the specific perceptual quality of experience. Perceptual experiences are different from thoughts because only the perceptual organism-environment interactions have features like “bodiliness” and “grabbiness” (O’Regan, Myin & Noë 2005; O’Regan 2011). “Bodiliness” concerns the fact, characteristic of perceptual interactions, that movements of the perceiver will have systematic changes on the incoming stimulation. “Grabbiness” refers to complementary typical aspect of a situation of perceptual interaction: that certain changes in the perceptual environment –such as a sudden flash of light or a loud sound will tend to attract perceptual attention and/or cause bodily reorientation. It is because of bodiliness and grabbiness that a perceiver is “immersed” in a perceptual situation. Conscious thinking about something has neither bodiliness nor grabbiness. Even if what you are thinking about would suddenly cease to exist, in most cases, this would have no immediate effects on your thoughts about it. These differences in the laws governing interaction with the environment, so the sensorimotor theory defends, hold the key to the phenomenal difference between thinking and perceiving.

The sensorimotor approach has often been taken to reserve a primordial role for action in perception. No doubt, such understanding has been promoted by the rhetorics which helped the approach to secure a prominent place in recent discussion, as in the phrase that “visual consciousness” “is something we do” (O’Regan & Noë 2001, 970), rather than “something that happens to us, or in us” (Noë 2004, 1). It needs to be kept in mind, however, that the primary aim of the sensorimotor approach is to tie perception and perceptual awareness to an organism’s interaction with its environment. Interaction with an environment involves both affecting the environment and being affected by it — as is clear from the discussion of the concepts of bodiliness and grabbiness above. So, even if some formulations might suggest

otherwise, the sensorimotor account does have room to accommodate those aspects of experience which have primarily to do with how an organism is acted upon, or affected by the environment (Hutto 2005).

Why is “going wide” a better strategy for attempting to understand consciousness than looking for narrow neural-phenomenal laws? A first consideration is that “going wide” connects with how we already understand awareness in our everyday speaking and writing, in literature, but also in science. Take the famous way of speaking about phenomenal consciousness as the “what it is like” aspect of experience (Nagel 1978). If we ask “what it is like “ to enter an airplane, to feel something hard, or see a bright red, the answers refers to the situations in which we have those or similar experiences. We might say that “what it is like to enter an airplane” is like entering a tunnel, that “feeling something hard” is like pushing something that resists, or that “seeing bright red” is like seeing an over-illuminated surface of glossy red plastic. Even experiences which don’t involve much actual interaction, like dreams or near death experiences, are described in terms of doing things in, and being affected by, an environment.

In other words, when we talk about our experiences in non-theoretical or non-philosophical contexts, we do so by invoking the kinds of interactions the experiences normally arise in. ‘Going wide’ and referring to interactions is the natural way to talk and therefore think about experience. The narrow approach, on the other hand, at least allows —and arguably even *dictates* — that the wide laws are only contingently related to the phenomenal feels. That is, on the narrow view, there is no fundamental connection to the interactions a certain feel is associated with and the “what it is like” of the feel. From the point of view of our pre-theoretic understanding of phenomenology, this narrow focus, or disregard of the wide interactions, is puzzling. It directs us away from the circumstances under which experiences normally happen,

towards “pure” experiences, unrelated to the worldly engagements such experiences normally form part of.

Of course, congruence with pre-theoretical understanding shouldn't carry too much weight in arguing for a theoretical stance towards anything, including experience. A second basis for support for the sensorimotor approach lies in scientific advantages. In particular, sensorimotor theorists claim their approach provides new insights and initiates new experimental paradigms in fields such as vision with distorting goggles, sensory substitution, neural plasticity and change blindness (O'Regan & Noë 2001, Hurley & Noë 2003, O'Regan 2011). The pattern which sensorimotor theorists discern in this research is that what one perceptually experiences is determined by how one interacts with the world, rather than by how sensory input is oriented, where it is received on the body, and which are the brain areas most involved in enabling the experience.

A third set of considerations for going wide is philosophical. They can be introduced by stating a standard countermove to the thesis that the laws of phenomenology are wide (Block & O'Regan 2012)). A common reaction met by the sensorimotor approach is that it cannot be a correct approach to consciousness because the laws of phenomenology *must be* narrowly brain-bound because of the (alleged) fact that one can have perceptual awareness without involvement of the wide laws. In dreams, paralysis, or stimulation of the brain under experimental or medical conditions, experience can supervene on the brain and on the brain *only*, irrespective or independent of any interactive situations or surroundings. In a further step one can then reason that, if the phenomenology can supervene on nothing more than the brain in non-interactive situations, then one can conclude that also in interactive situations it supervenes on the brain only. Finally, one can conclude from such “narrow

supervenience” that the laws of phenomenology are narrow too (see Ned Block’s parts in O’Regan & Block, 2012, for a clear formulation of this way of reasoning)

From an interactive perspective, this standard line of reasoning is not as solid as it might prima facie look. In the first place, one can question the assumptions made about supervenience of experience on the brain only. Philosophers often assume that a mere mention of the existence of dreams, hallucinations, or even the possibility thereof, or thought experiments about brains-in-vats establish brain-bound supervenience for experience in general. Philosophers of a different persuasion have recently raised serious challenges about these standard moves regarding supervenience. Cosmelli and Thompson (2010) have argued in great detail that everything we know about biology implies that the brain needs a body and some form of interaction with the environment in order for it to maintain a stable and continuous form of experience. Ken Pepper (2014) has raised the issue whether one can validly draw inferences about what experience “really is” by setting out from experience under abnormal conditions (as in dreams), rather than from experiences under standard conditions.

Even if one leaves aside such worries about the starting assumptions of the standard reasoning, additional problems can be raised about the inference from narrow supervenience to narrow laws of phenomenology or narrow physico-phenomenal laws. These problems concern the very idea of a narrow law of phenomenology. In order to be genuinely narrow, such a law would have to make reference only to narrow, and thus non-interactive properties. On the “physico”, or brain side of the law, one can easily envisage how this could be done. It could be done, among other possibilities, by referring to the kinds of neural properties mentioned in the above quotes by Christof Koch. In order to keep the “phenomeno”-side properly narrow, it would

have to contain a description of experience, in which experience is characterized in a way which did not contain any reference to interactive situations in which the experiences often or even only occasionally figure. The description serving in the experiential part of the law would require that a pure and self-contained “atom” of sensation could be distilled and described (Cooke and Myin 2011).

Such genuinely narrow experiences would by their very (narrow) nature only be contingently or nonessentially connected to, or associated with, behaviors, actions, and interactions. If the bonds between experiences and interactions became tighter, the experiences would stop being genuinely narrow. That is, narrow experiences might have typical causal links to (inter-)actions, but those links would not affect the phenomenal character of the experience. In principle, a particular narrow experience might have causal links to (inter-)actions entirely different from those it is normally causally linked to, without any change in phenomenal feel. For example, one would have to hold that it was at least conceptually coherent, and possibly empirically possible, to “swap” phenomenal feels inter- and intramodally. Where person A would have normal colour experiences when being visually confronted with a coloured world, person B would under the same circumstances have no colour but olfactory experiences. Some philosophers embrace these consequences and think that only a concept of phenomenal feel that leads to these consequences will be satisfactory. Opposed to this, theorists of sensorimotor persuasion will point out that these consequences are unpalatable and in fact show the untenability of the concept of phenomenal experience that lies at their basis (see Dennett 1988, Cooke and Myin (2011) and Myin, Cooke and Zahidi (in press), for arguments to this effect, supported by thought experiments).

A fourth and final consideration in favour of wide laws is practical: whatever the philosophical niceties, in fact, even if it were be granted that some narrow conception of phenomenality might be tenable, it remains the case that in any practical context, we go wide or operate on a wide conception of phenomenality. That is, when we want to intervene on phenomenal feels, in the large majority of cases, we intervene on interactions. If we want someone to experience the taste of a delicate dish, we feed them that dish instead of directly intervening on the brain. In other words, if there was a case to be made for metaphysically narrow laws, it would still not matter for any other purpose than metaphysics (on a certain –not unchallengeable conception of metaphysics). We would still continue in any practical context to deal with consciousness in our usual wide ways.

3. “Going wide” to understand psychopathology

3.1. The primacy of interaction, once more

In the previous sections, we have given reasons for skepticism about the prospects of a strictly narrow account of the feel of perceptual experience. The core consideration we relied on concerned the nature of experience. Experience, so we defended, fundamentally concerns interactions: how a subject (or organism) interactively affects its environment, and is affected by its environment. As a consequence, an understanding of experience always involves relating experience to the interactional context, which it normally arises in – even when one considers experiences that occur outside of their standard interactive context. None of this leads to deny the role brain factors play in experience, but it does imply that brain factors will not provide a “deeper” understanding of experience – a kind of understanding that is more profound

than the one that is offered by considering experiences in their normal interactive contexts. The outlook is that we will make sense of the contribution of brain factors to experience by seeing the way the brain enables interactions rather than by understanding interactions in terms of brain factors. To return to the “phenomenal redness of red”: this will not be more deeply comprehended by seeing how it derives directly from a brain mechanism. Rather, brain mechanisms involved in the experience of red are understood as such because of their direct, or derived, role in the kinds of interactions typical for “red”.

Does it make sense to adopt a wide approach in the study of psychopathology too?

Much of the research in the last 20 years aiming at a better understanding of psychopathology has had a narrow orientation. Just like the brain has seemed the obvious place to turn to when one wants to answer questions about the phenomenal feel of consciousness, so the brain has seemed to many the obvious place to turn to when one wants to make sense of psychopathology. Thus, most research of psychopathology in the last two decades has been devoted to a closer investigation of the brain. But is this narrow focus more appropriate when it comes to studying psychopathology than when it comes to understanding the phenomenal feel of consciousness?

A way in which this narrow orientation often finds expression in the characterization of psychopathology as a “brain disorder”, or “brain disease”. Thomas Insel states in a TEDx presentation at the California Institute of Technology that the problem is that we call these “brain disorders” mental or behavioral disorders (T. Insel 2013). The idea of psychopathology as a “disease”, or the “disease model” (Borsboom & Cramer 2013) is predicated on a difference between a disease-specific set of symptoms and an underlying cause from which those symptoms flow forth. This underlying cause is

necessarily independent of the symptoms, and ideally, but not necessarily unitary: it then is a robust phenomenon, which can be characterized and manipulated on its own, irrespective of the symptoms, which can show variety.

The disease model seems to be appropriate in some cases of somatic pathology, when a single underlying factor, such as the presence of a virus, can lie at the basis of a multitude of specific and related symptoms. One can treat the disease by going after the virus: once that has been removed, the symptoms will subside, whereas interfering with (some of the) symptoms, will not necessarily affect the virus (Borsboom & Cramer 2013).

But it remains an open question whether the disease model applies to psychopathology. In order to tackle this question, it pays off to start by having a closer look at the actual phenomena of interest. Most research on psychopathology has been devoted to understanding the neural underpinnings of psychiatric conditions such as major depression, bipolar disorder or schizophrenia. However, the validity of these diagnostic categories has been questioned (van Os 2009, 2010), given that there is no symptomatic specificity - e.g. depression is common in Major Depressive Disorder, Bipolar Disorder and Schizophrenia -, no etiological specificity – e.g. there is genetic overlap between schizophrenia and bipolar disorder-, no prognostic specificity nor treatment specificity that can distinguish one diagnosis from another. As a consequence, it seems that the most basic requirement coming from the disease model, namely that there exist identifiable and distinct diseases to begin with, is not met.

Furthermore, it has consistently been demonstrated that psychiatric symptoms are dimensional rather than categorical in nature. Symptoms of depression, anxiety,

bipolar disorder, autism and psychosis are all present at a sub-clinical level in the general population, and form a continuum with normal variation and clinical symptoms at the extreme ends (van Os, Linscott, Myin-Germeys, Delespaul, & Krabbendam 2009). Disregarding this continuous nature of symptoms and conceiving of psychopathological phenomena as distant from everyday mentality might have been another motivation for the search for narrow factors (neural, genetic or otherwise) outside of experience as the way of making sense of psychopathology.

One can also raise issues about the very idea of underlying causes. In order to be genuinely *underlying*, the phenomena which act as causes should be able to exist independently from the symptoms – just like a virus can exist independently of its pathological effects in a body (a similar point is made in Fuchs 2012). In the previous section, we saw that sensorimotor theorists defend that the way brain states or properties are characterized in perceptual terms —i.e. as visual, auditory, tactile— depends upon what kinds of perceptual person-environment interactions these brain states and properties are, or have been involved in. In other words, the criterion for deciding whether or not a brain area should be characterized in perceptual terms, is stated in terms of interactions (or wide, as we have said), and not in terms of non-interactively (or narrow) characterized brain properties. Exactly the same applies in the domain of psychopathology. For whether a narrowly specified property or feature is a valid candidate “underlying cause”, depends on wide —symptom-related— criteria. Whether some brain property can form (part of) the underlying cause for a certain form of psychopathology is determined by investigating how the property or feature correlates with symptoms. If the property or feature does not correlate with symptoms in some required way (however that is defined), it is discarded as a candidate underlying cause. Importantly, the reverse does not happen: symptoms are

not discarded as genuine symptoms when a correlation between symptoms and a narrow property turns out not to meet some requirement. That is, if a candidate for underlying property (narrowly described) is not correlated in the required way with symptoms, one retracts the assumption that the narrow property forms the underlying cause, rather than retracting the idea that the symptoms are genuinely symptomatic.

3.2 The interactive approach in action

The foregoing provides reasons to study psychopathology by studying symptoms, in an interactive framework. In an interactive, wide approach, symptoms constitute specific ways a subject interacts with his or her environment. Interaction in psychopathology is different from non-psychopathological ways of interaction, but it is at the same time deeply related.

It is by having a closer look at symptoms that one can discern how going wide, in contrast to taking a narrow stance, is both theoretically mandatory and practically beneficial. Let us start at the theoretical end first and ask what sort of results and what kind of understanding a wide approach in the study of psychopathology leads to. Psychopathological symptoms are natural experiences emerging in the realm of normal daily life. 'Taking a wide approach' thus involves the study of how these psychopathological symptoms arise and change in a person's interaction with her context. In order to grasp these interactions, one needs instruments to track them and chart their dynamics. Momentary assessment approaches using structured diary techniques, such as the Experience Sampling Method (ESM) (Myin-Germeys et al.

2009) or Ecological Momentary Assessment (EMA) (Shiffman, Stone, & Hufford 2008), allow to systematically study experiences, including psychopathological symptoms, in the realm of daily life. They make possible real-time monitoring of variation in experiences as well as the context in which they occur. Subjects fill out questionnaires regarding their current thoughts, feelings, psychopathological symptoms, as well as regarding the context (where the person is, what the person is doing, the company the person is with) and appraisals of this context. Participants fill out the questionnaire at semi random-time points, typically between 4 and 10 times a day, and this for a number of consecutive days. Earlier studies used paper-and-pencil approaches combined with a preprogrammed watch to provide the signal; currently Personal Digital Assistants and apps are available (Kimhy, Myin-Germeys, Palmier-Claus, & Swendsen 2012). This provides a number of consecutive data-points for each subject, allowing to study within-moment interactions as well as interactions over moments in time.

Is it possible to identify specific patterns of interactions associated with psychiatric symptoms following this approach? Let's focus on one example here, that of psychotic disorder. Psychotic disorders are characterized by positive symptoms such as hallucinations (mainly hearing voices) and delusional ideas (such as paranoia or ideas of reference), and negative symptoms such as lack of motivation, anhedonia, and lack of social interaction. Several studies using Experience Sampling Methodology have been conducted in subjects with psychotic symptoms e.g.(Oorschot, Kwapil, Delespaul, & Myin-Germeys 2009 for overview).

A first finding coming out of these studies is that symptoms such as paranoid ideation or hallucinations show huge variation over time (Oorschot et al. 2012; Thewissen, Bentall, Lecomte, van Os, & Myin-Germeys 2008), meaning that the intensity of

these symptoms fluctuates highly from one moment to the next. The relevant question would then be whether we can identify interactional changes associated with these fluctuations over time. Both affective/subjective and situational factors have been associated with increases in psychotic symptoms. For example, an increase in anxiety and a decrease in self-esteem have been shown to precede an increase of paranoia (Oorschot et al. 2012; Thewissen et al. 2008; Thewissen et al. 2011). The experience of subjective stress has also been associated with increased levels of psychotic symptoms (Myin-Germeys, Delespaul, & van Os 2005; Myin-Germeys & van Os 2007). Both of these findings are found across the whole psychosis continuity, in clinical patients but also in persons with lower-level psychotic experiences (Lataster, Myin-Germeys, Derom, Thiery, & van Os 2009). Situational factors have been associated with psychosis as well. Sleep disturbances are associated with increased levels of paranoia (Freeman, Pugh, Vorontsova, & Southgate 2009) whereas cannabis use results in more intense hallucinations (Henquet et al. 2010). The social context has also been found to be of relevance. More paranoia has been reported when people are accompanied by strangers compared with times when they are with friends or family (Collip et al. 2011). However, at the upper end of the continuum—where the threshold of the symptomatic lies—this interaction changes. Patients with clinical levels of paranoia report high levels of paranoia irrespective of the company they are in.

Apart from allowing to track how psychotic symptoms vary in response to the context, ESM studies have established that people with psychotic experiences are in general more responsive to the environment. When persons with psychosis encounter stress – even minor daily hassles – they not only become more psychotic, they also show increased negative affect, thus overreacting to this negative environment (Myin-

Germeys & van Os 2007; Myin-Germeys, van Os, Schwartz, Stone, & Delespaul 2001). Interestingly, they also are more reactive to a positive environment. When they encounter positive events, they will gain more in the sense that their positive affect will increase more compared to control subjects (Oorschot et al. 2013). Similarly, they experience more positive affect from being in social company (Oorschot et al. 2013). Overall, there seems to be a higher responsivity to the environment compared to persons without these disorders. This has led to the proposition of renaming schizophrenia as “salience dysregulation syndrome” (van Os 2009), which would reflect a more accurate description of the changes in person-environment interaction defining its psychotic symptoms.

Let’s take a closer look at negative symptoms. Negative symptoms are among the most disabling psychopathological symptoms, they are poorly understood and hard to treat. What understanding of these negative symptoms does a wide approach provide? An interesting example is anhedonia, defined as reduced hedonic capacity, or the loss of the ability to enjoy things that were previously enjoyable, and considered a core feature of schizophrenia. Although patients with schizophrenia score higher on anhedonia, both with self-assessment scales (Blanchard, Mueser, & Bellack 1998; Cohen et al. 2005) and when questioned by trained interviewers (Earnst & Kring 1997), experimental studies with emotion inducing stimuli found no difference in positive affect between patients and healthy controls (Cohen & Minor 2010).

Experience Sampling Studies in real life, on the other hand, have found overall lower levels of positive affect in patients compared to controls (Myin-Germeys, Delespaul, & deVries 2000; Oorschot et al. 2013). What could explain these paradoxical findings? One explanation is related to the difference between anticipatory pleasure (related to future activities) and consummatory (in the moment) pleasure (Gard, Kring,

Gard, Horan, & Green 2007). One ESM study found that patients indeed had more difficulty with anticipatory pleasure, while their consummatory pleasure was intact (Gard et al. 2007). Second, it was investigated whether reduced positive affect in patients as measured in the ESM studies reflected diminished hedonic capacity or merely resulted from less pleasurable life circumstances (Oorschot et al. 2013). Indeed, patients reported less pleasant events, but when a pleasant event happened, they reported equal or even more positive affect compared to healthy controls. So combining both findings, patients are capable of experiencing pleasure in the moment. However, they may be less likely to seek out opportunities to engage in activities when their ability to anticipate which potential experiences will be rewarding is impaired (Oorschot et al. 2013).

The picture that emerges from the foregoing wide approach to psychopathology is that of psychopathology as a specific pattern of interaction, related to, but differing from non-pathological patterns of interaction. Crucially, the relevant patterns of interaction are thoroughly context-sensitive. The example of anhedonia just described illustrates this: anhedonia does not form a stable context-invariant building block of psychopathology, but it needs itself to be specified in terms of context-sensitive ways of affecting and being affected by a particular environment. This repeats, for symptoms, what we argued is the case for brain properties: how precisely they relate to psychopathology has to be established by inquiring which contextualized interactions they are involved in.

3.3 Practical implications of going wide: interactive therapy

The most important reason to improve understanding of psychopathology is the high

burden associated with psychiatric illness and the need for better treatment to relieve this burden. A recent study in Europe estimated that well over one third of the population in any given twelve month period suffers from a mental disorder, most of which are not treated (Wittchen et al. 2011). Furthermore, treatment prospects are minimal to modest. Despite enormous developments in pharmacological interventions, which are still the primary therapeutic approach for most psychiatric disorders, the morbidity and mortality rate associated with psychiatric disorders has not changed (T. R. Insel 2012).

The most widely used psychosocial intervention is cognitive-behavioral therapy (CBT). Cognitive behavioral therapy is aimed at changing the thinking which is assumed to underly action and behavior. However, the results of CBT are mixed, with effects often in the “small” range (Cuijpers et al. 2014; Szentagotai & David 2010; Turner, van der Gaag, Karyotaki, & Cuijpers 2014). Furthermore, it remains unclear what the active component is in the therapy, and “how much of it is due to what was added to traditional behavior therapy” (Hayes, Villatte, Levin, & Hildebrandt 2011). CBT runs the risk of falling prey to an intellectualist and cognitivist view of mentality. According to this view, thoughts understood as attitudes to mental representations, play a key role in most aspects of human mentality. Emotions for example are understood as having self-related beliefs, taken to be propositional attitudes or attitudes-towards-a-propositional-content as core components. Therapy is then aimed at changing the mental representations or thoughts that are taken to drive dysfunctional mental life. Varga (2014) has argued in great detail how what he calls a “CT” (for Cognitive Therapy) view of mentality is problematic. He points out that many cases of thinking and emotion do not seem to be driven by explicit thoughts or

representations at all. He gives the example of moods, which have been analysed as embodied attitudes directly towards the world, rather than toward a representation of it (Ratcliffe 2008). “Feeling low”, for example, “is both characterized by the way in which the world appears, namely as lacking attractive ‘affordances,’ and the way the body feels: slow and heavy.” (Varga 2014, 182). This take on moods in particular and on thinking and mental phenomena in general obviously fits within the wide approach advocated here, as the focus fully comes to lie on contextualized patterns of affecting and being affected by one’s environment. Many of such patterns might not be mediated by thoughts —irrespective of whether they are taken to be “explicit” or “implicit”— or indeed by any representational contents (Hutto & Myin 2013). If such is true, any therapy that always aims for such explicit thoughts or contentful episodes as the place where to intervene will be inadequate.

Two caveats need to be made here. Of course, action and behavior (of humans *and* animals) is complex and rich, for example by being infused with ‘expectations’ or ‘suspicions’. What should be resisted is the temptation to model these expectations as explicit or content carrying thoughts. There is no logical need for this, as an expectation can exist as a sensitivity or adaptation to a particular context. An animal can be on alert when nearing a particular place because, based on its own history, it expects the presence of another animal at that place. But nothing logically requires that such sensitivity should only be explicable by a content-carrying inner episode, let alone one involving a proposition (Degenaar & Myin, in press). Second, nothing stands in the way of admitting that at least some human actions are mediated by episodes specifiable only in terms of content (which can only spelled out in terms of natural language). A youngster could start to smoke by having inferred that by doing so, she would look cool to another youngster. Even in such cases there remains the

question to what extent one can change the course of action resulting from the thought by intervening in the realm of thoughts. If our protagonist, at an older age, later comes to think she should not smoke, this change alone might have little behavioral effect. Of course, on the other hand, it should by no means be precluded that one can provoke important changes in a wide range of mental attitudes and the interactions related to them by changing content-involving attitudes, as the effects of propaganda testifies. Most importantly, however, whatever the extent and role of explicit thought in human action and behavior, it can't be assumed that contentful thought mediated action must be the model for all intelligent interactions, regardless whether they involve humans or animals.

The so-called third generation of contextualized cognitive-behavioral approaches may come closer to directly targeting the relevant patterns of interactions. Contextualized cognitive-behavioral approaches are set to be “particularly sensitive to the context and functions of psychological phenomena, not just their form, and thus tend to emphasize contextual and experiential change strategies” (Hayes et al. 2011). Hayes, the founding father of Acceptance and Commitment Therapy (ACT), distilled three common components in these contextualized therapies (Hayes et al. 2011). A first component relates to issues of acceptance, detachment, and emotion regulation. Rather than focusing on the content of thoughts or feelings, these therapies are aimed at the relation of the subject to his or her thoughts or feelings. Although this has been framed as a content-versus-context distinction, these therapies thus still seem to emphasize thoughts and feelings as central.

A second component Hayes identified is flexible attention or attention to the now. Most of these third-generation therapies include elements of mindfulness or

awareness toward the present moment, which may “increase one’s sensitivity to important features of the environment and one’s own reactions” (Hayes et al. 2011). We would claim that it is actually the changes in the person-environment interaction that form the crucial component of these therapies, whereas researchers so far have claimed their success lies in targeting and reducing maladaptive depressogenic cognitive processes such as rumination or thought suppression. Of course, this is not to deny that interactions might change as a result of changes in these cognitive processes, but only to emphasize one should not assume that interactive changes can only occur as a consequence of cognitive changes.

A final component in contextualized therapies includes meaningful action such as motivation to change and behavior activation (Hayes et al. 2011). This component may come closest to explicitly targeting person-environment interaction. For example, behavioral activation therapy uses activity scheduling and mood monitoring to alter the “enviroming contingencies influencing the client’s depressed mood and behavior” (Hayes et al. 2011). Using Experience Sampling Methodology, this approach could be taken one step further to directly target the way the person is interacting with her environment, as it occurs in real life. One study aimed to improve momentary positive affect by providing ESM-derived feedback on the association between positive affect and the context (Kramer et al. 2014). The therapy consisted of 6 consecutive weeks of ESM using a palmtop (three days / week) and additional weekly standardized feedback on personalized patterns of positive affect. In this feedback, participants received information on their level of positive affect over the 3-day period, on the amount of time spent in certain contexts and most importantly on the association between the two. For example, someone would get feedback that the highest level of positive affect was reached while being involved in active relaxation. However, the

actual amount of time spent in active relaxation may be very limited. Similarly, someone may experience higher levels of positive affect when in the company of friends, whereas this person may spend most of his time on their own. The standardized feedback did not include any directive on what the person should change, it only provided information regarding the contextualized patterns of positive affect. This randomized clinical trial in 102 depressed patients receiving anti-psychotic medication showed that the supplementary ESM derived feedback resulted in a significant and clinically relevant stronger decrease in depressive symptoms measured by a clinician (-5.5 point on the Hamilton Depression Rating Scale) as well as by self-report (Inventory of Depressive Symptoms) compared to the control condition of treatment as usual. This improvement was found up to 6 months after the end of the therapy (Kramer et al. 2014). The positive findings were not only due to the continual self-monitoring, since a semi-experimental group doing experience sampling without the weekly feedback did not show a similar improvement. This study is just one example. However, it shows that interventions directly focusing on person-environment interactions are feasible and indeed provide an added clinical value.

4. Conclusion

We have suggested that just as a sensorimotor perspective on perception and awareness successfully goes “wide”, that is, incorporates person-environment interactions as fundamental to perceptual consciousness, so also should a successful approach to psychopathology. Indeed, we showed that an interactive approach fundamentally adds to our understanding of psychopathology. Furthermore, developments in current psychological therapies are now manifesting a shift towards impacting on person-environment interactions. Therapy components such as

mindfulness, behavioral activation and even acceptance and detachment may all impact on the specific person-environment interactions which constitute the symptoms. Still, this is mainly an implicit consequence rather than an active target of the intervention. We claim that explicitly targeting person-environment interactions, as has been done in the ESM behavioral activation study, presents a way forward to improve psychological interventions. Following a wide approach might thus not only prove theoretically fruitful, but might also have considerable applicable clinical benefits.

ACKNOWLEDGMENTS:

The authors wish to thank, besides the editor of this volume, in particular Sanneke de Haan and Lucia Foglia for excellent comments on a previous draft.

Erik Myin's research is supported by the Research Foundation Flanders (Research projects GOB5312N and GO48714N). J.K.O'Regan acknowledges the support of European Research Council (ERC) Advanced grant 323674 "FEEL". The research of Inez Myin-Germeys is supported by ERC Consolidator grant "INTERACT" (ERC-2012-StG – 309767).

REFERENCES

Blanchard, J. J., Mueser, K. T., & Bellack, A. S. 1998. "Anhedonia, positive and negative affect, and social functioning in schizophrenia." *Schizophrenia Bulletin* 24(3), 413-424.

Borsboom, D., & Cramer, A. O. 2013. "Network analysis: an integrative approach to the structure of psychopathology." *Annual Review of Clinical Psychology* 9, 91-121.

Cohen, A. S., Dinzeo, T. J., Nienow, T. M., Smith, D. A., Singer, B., & Docherty, N. M. 2005. "Diminished emotionality and social functioning in schizophrenia." *Journal of Nervous and Mental Disease* 193(12), 796-802.

Cohen, A. S., & Minor, K. S. 2010. "Emotional experience in patients with schizophrenia revisited: meta-analysis of laboratory studies." *Schizophrenia Bulletin* 36(1), 143-150.

Collip, D., Oorschot, M., Thewissen, V., Van Os, J., Bentall, R., & Myin-Germeys, I. 2011. "Social world interactions: how company connects to paranoia." *Psychological Medicine* 41(5), 911-921.

Cooke, E. & Myin, E. 2011. "Is trilled smell possible? How the structure of olfaction determines the phenomenology of smell." *Journal of Consciousness Studies* 18 (11-12): 59-95.

Cosmelli, D., and Thompson, E. 2010. Embodiment or envatment? Reflections on the bodily basis of consciousness. In *Enaction: Toward a New Paradigm for Cognitive Science*, eds. J. Stewart, O. Gapenne & E. Di Paolo, 361-385. Cambridge MA: MIT Press.

Cuijpers, P., Sijbrandij, M., Koole, S., Huibers, M., Berking, M., & Andersson, G. 2014. "Psychological treatment of generalized anxiety disorder: a meta-analysis." *Clinical Psychology Review* 34(2), 130-140.

Degenaar & Myin (2014). "The structure of color experience and the existence of surface colors." *Philosophical Psychology* 27(3), 384–400.

Degenaar & Myin (in press). "Representation-Hunger Reconsidered." *Synthese*.

Dennett, D. C. 1988. Quining qualia. In *Consciousness in Modern Science*, ed. A. Marcel and E. Bisiach, 42-77. Oxford: Oxford University Press.

Earnst, K. S., & Kring, A. M. 1997. "Construct validity of negative symptoms: an empirical and conceptual review." *Clinical Psychology Review* 17(2), 167-189.

Freeman, D., Pugh, K., Vorontsova, N., & Southgate, L. 2009. "Insomnia and paranoia." *Schizophrenia Research* 108(1-3), 280-284.

Fuchs, T. 2012, "Are Mental Illnesses Diseases of the Brain?", in *Critical Neuroscience: A Handbook of the Social and Cultural Contexts of Neuroscience*, ed. S. Choudhury and J. Slaby, 331-344. New York: Wiley-Blackwell.

Gard, D. E., Kring, A. M., Gard, M. G., Horan, W. P., & Green, M. F. 2007. "Anhedonia in schizophrenia: distinctions between anticipatory and consummatory pleasure." *Schizophrenia Research* 93(1-3), 253-260.

Grahek, N. (2007), *Feeling Pain and Being in Pain*. Cambridge MA: MIT Press.

Hayes, S. C., Villatte, M., Levin, M., & Hildebrandt, M. 2011. "Open, aware, and active: contextual approaches as an emerging trend in the behavioral and cognitive therapies." *Annual Review of Clinical Psychology* 7, 141-168.

Henquet, C., van Os, J., Kuepper, R., Delespaul, P., Smits, M., Campo, J. A., & Myin-Germeys, I. 2010. "Psychosis reactivity to cannabis use in daily life: an experience sampling study." *British Journal of Psychiatry* 196(6), 447-453.

Hurley, S. & Noë, A. 2003. Neural plasticity and consciousness. *Biology and Philosophy* 18: 131–168.

Hutto, D. 2005. "Knowing what? Radical versus conservative enactivism." *Phenomenology and the Cognitive Sciences* 4 (4): 389-405

Hutto, D.D. & Myin, E. 2013. *Radicalizing Enactivism. Basic Minds Without Content*. Cambridge, MA.: MIT Press.

Insel, T. (2013). Towards a new understanding of mental illness.

Insel, T. R. 2012. "Next-generation treatments for mental disorders." *Science Translational Medicine* 4(155), 155ps119.

Kimhy, D., Myin-Germeys, I., Palmier-Claus, J., & Swendsen, J. 2012. "Mobile assessment guide for research in schizophrenia and severe mental disorders." *Schizophrenia Bulletin* 38(3), 386-395.

Koch, Ch. 2004, *The Quest for Consciousness: A Neurobiological Approach*. Englewood, CO: Roberts.

Kramer, I., Simons, C. J., Hartmann, J. A., Menne-Lothmann, C., Viechtbauer, W., Peeters, F., Wichers, M. 2014. "A therapeutic application of the experience sampling method in the treatment of depression: a randomized controlled trial." *World Psychiatry* 13(1), 68-77.

Lataster, T., Myin-Germeys, I., Derom, C., Thiery, E., & van Os, J. 2009. "Evidence that self-reported psychotic experiences represent the transitory developmental expression of genetic liability to psychosis in the general population." *American journal of medical genetics. Part B, Neuropsychiatric genetics* 150B(8), 1078-1084.

McGinn, C. 1989, "Can We Solve the Mind-Body Problem?" *Mind* 98 (391): 349-366.

Myin, E., Cooke, E. & Zahidi, K. (in press), Morphing Senses, in *Perception and its Modalities*, eds. D. Stokes, M. Matthen & S. Biggs , New York: Oxford University Press.

Myin-Germeys, I., Delespaul, P., & van Os, J. 2005. "Behavioural sensitization to daily life stress in psychosis." *Psychological Medicine* 35(5), 733-741.

Myin-Germeys, I., Delespaul, P. A., & deVries, M. W. 2000. "Schizophrenia patients are more emotionally active than is assumed based on their behavior." *Schizophrenia Bulletin* 26(4), 847-854.

Myin-Germeys, I., Oorschot, M., Collip, D., Lataster, J., Delespaul, P., & van Os, J. 2009. "Experience sampling research in psychopathology: opening the black box of daily life." *Psychological Medicine* 39(9), 1533-1547.

Myin-Germeys, I., & van Os, J. 2007. "Stress-reactivity in psychosis: evidence for an affective pathway to psychosis." *Clinical Psychology Review* 27(4), 409-424.

Myin-Germeys, I., van Os, J., Schwartz, J. E., Stone, A. A., & Delespaul, P. A. 2001. "Emotional reactivity to daily life stress in psychosis." *Archives of General Psychiatry* 58(12), 1137-1144.

Nagel, T. 1978. "What Is It Like to Be a Bat?" *The Philosophical Review* 83(4): 435-450.

Noë, A. 2004. *Action in Perception*. Cambridge, MA.: MIT Press.

O'Regan, J. K. 2011. *Why Red Doesn't Sound Like a Bell: Understanding the Feel of Consciousness*. Oxford University Press.

O'Regan, J. K., and Block, N. 2012. "Discussion of J. Kevin O'Regan's *Why Red Doesn't Sound Like a Bell*." *Review of Philosophy and Psychology* 3 (1): 89–108.

O'Regan, J. K., Myin, E. & Noë, A. (2005), "Sensory consciousness explained (better) in terms of 'corporality' and 'alerting capacity.'" *Phenomenology and the Cognitive Sciences* 44 (4): 369 - 387.

O'Regan, J. K., & Noë, A. 2001. "A sensorimotor account of vision and visual consciousness." *Behavioral and Brain Sciences* 24: 939–1031.

Oorschot, M., Kwapil, T., Delespaul, P., & Myin-Germeys, I. 2009. "Momentary assessment research in psychosis." *Psychological Assessment* 21(4), 498-505.

Oorschot, M., Lataster, T., Thewissen, V., Bentall, R., Delespaul, P., & Myin-Germeys, I. 2012. "Temporal dynamics of visual and auditory hallucinations in psychosis." *Schizophrenia Research* 140(1-3), 77-82.

Oorschot, M., Lataster, T., Thewissen, V., Lardinois, M., Wichers, M., van Os, J., . . . Myin-Germeys, I. 2013. "Emotional experience in negative symptoms of schizophrenia--no evidence for a generalized hedonic deficit." *Schizophrenia Bulletin* 39(1), 217-225.

Pepper, K. 2014. "Do sensorimotor dynamics extend the conscious mind?", *Adaptive Behavior* 22: 99-108.

Philipona, D. & O'Regan, J.K. 2006. "Color naming, unique hues, and hue cancellation predicted from singularities in reflection properties." *Visual Neuroscience* 23: 331-339.

Ratcliffe, M. 2008, *Feelings of being: Phenomenology, psychiatry and the sense of reality*. Oxford: Oxford University Press.

Shiffman, S., Stone, A. A., & Hufford, M. R. 2008. "Ecological momentary assessment." *Annual Review of Clinical Psychology* 4, 1-32.

Smart, J.J.C. 1958. "Sensations and Brain Processes." *The Philosophical Review* 68 (2): 141-156.

Szentagotai, A., & David, D. 2010. "The efficacy of cognitive-behavioral therapy in bipolar disorder: a quantitative meta-analysis." *Journal of Clinical Psychiatry* 71(1), 66-72.

Thewissen, V., Bentall, R. P., Lecomte, T., van Os, J., & Myin-Germeys, I. 2008. "Fluctuations in self-esteem and paranoia in the context of daily life." *Journal of Abnormal Psychology* 117(1), 143-153.

Thewissen, V., Bentall, R. P., Oorschot, M., J, A. C., van Lierop, T., van Os, J., & Myin-Germeys, I. 2011. "Emotions, self-esteem, and paranoid episodes: an experience sampling study." *British Journal of Clinical Psychology* 50(2), 178-195.

Turner, D. T., van der Gaag, M., Karyotaki, E., & Cuijpers, P. 2014. "Psychological Interventions for Psychosis: A Meta-Analysis of Comparative Outcome Studies."

American Journal of Psychiatry.

van Os, J. 2009. "A salience dysregulation syndrome." *British Journal of Psychiatry* 194(2), 101-103.

van Os, J. 2010. "Are psychiatric diagnoses of psychosis scientific and useful: The case of schizophrenia." *Journal of Mental Health* 19(4), 305-317

van Os, J., Linscott, R. J., Myin-Germeys, I., Delespaul, P., & Krabbendam, L. 2009. "A systematic review and meta-analysis of the psychosis continuum: evidence for a psychosis proneness-persistence-impairment model of psychotic disorder."

Psychological Medicine 39(2), 179-195.

Varga, S. 2014. "Cognition, Representations and Embodied Emotions: Investigating Cognitive Theory." *Erkenntnis* 79: 165-190

Wittchen, H. U., Jacobi, F., Rehm, J., Gustavsson, A., Svensson, M., Jonsson, B., . . .

Steinhausen, H. C. 2011. "The size and burden of mental disorders and other disorders of the brain in Europe 2010." *European Neuropsychopharmacology* 21(9), 655-679.