

Chapter 15

Unusual experiences, reality testing and delusions of alien control

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(with Raben Rosenberg)

Preview

Some monothematic types of delusions may arise because subjects have unusual experiences. The role of this experiential component in the pathogenesis of delusion is still not understood. Focussing on delusions of alien control, we outline a model for reality testing competence on unusual experiences. We propose that nascent delusions arise when there are local failures of reality testing performance, and that monothematic delusions arise as normal responses to these. In the course of this we address questions concerning the tenacity with which delusions are maintained, their often bizarre content, the patients' inability to dismiss them, and their often circumscribed character.

Chapter 15

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1. Introduction

There may be an experiential component in the formation of many delusions (e.g., Jaspers, 1963 [1923], Maher, 1974, 1999, Davies et al, 2001). In the formation of the Capgras delusion that a close relative is an impostor (Capgras and Reboul-Lachaux, 1923), the experiential component may be the unusual and disturbing experience of recognising the face of one's spouse but not having the usual emotional response to him or her (e.g., Ellis and Young, 1990). In delusions of alien control (a first rank symptom of schizophrenia, Schneider, 1959), patients believe that their bodily movements are initiated by some kind of alien agent, and they say, for example, 'My grandfather hypnotized me and now he moves my foot up and down', 'They inserted a computer in my brain. It makes me turn to the left or right', 'The force moved my lips. I began to speak. The words were made for me', 'It's just as if I were being steered around, by whom or what I don't know.' (Frith et al, 2000a: 358). In these delusions, the unusual experience may be that, even though one intends to perform the movement, it is experienced the way movements initiated by other people are experienced (Davies et al, 2001; Frith et al, 2000a; Blakemore et al, 2002).

The class of delusions with a hypothesised experiential component includes some rare conditions, such as Cotard's delusion, and some much more frequent ones such as those associated with the passivity experiences of schizophrenia. They are in general monothematic and sometimes relatively circumscribed, in contrast to the more florid delusional systems also seen in schizophrenia. Here, we shall mainly discuss cognitive neuropsychiatric aspects of the pathogenesis of delusions of alien control in schizophrenia. We give a cognitive account of the route from delusional experience, over delusions in their nascent state, to delusions in the clinical sense of false beliefs that are firmly sustained in spite of what everyone else believes.

The precise role of the experiential component in the pathogenesis of monothematic delusions, such as the delusion of alien control, is not yet understood. Not only is it extremely difficult to test various hypotheses in experimental conditions, most hypotheses in the area also invoke deep and poorly understood conceptual issues concerning rationality, experience and belief-formation in normal subjects. (For reviews of studies and discussion of conceptual issues, see Garety and Freeman, 1999; Blackwood et al, 2001; Blakemore et al, 2002; Jeannerod, 2003; Davies and Coltheart, 2000; Davies et al, 2000; as well as contributions to Coltheart and Davies, 2000.)

Suggestions about the role of the experiential component can be assessed in several dimensions. First, monothematic delusions may arise when the response to an unusual experience lies within the normal range of reasoning processes (see Maher, 1974, 1999, 2003) or when the response to the unusual experience lies outside the normal range of reasoning processes (see Garety and Freeman, 1999, Howard et al, 2001 for reviews, and Davies et al, 2001 for further discussion). Second, the delusional belief may arise

when an explanation of an unusual experience is accepted, or when the delusional experience is simply taken as veridical (see Davies and Coltheart, 2000; Gold and Hohwy, 2000). Third, the content of the unusual experience may have a relatively poor ‘as if’-content (e.g., it is as if someone else initiated my movement) or it may have a richer content (e.g., someone else—God, for example—is initiating my movement) (see Davies et al, 2001).

In general, most proposals along these three dimensions are caught between two implausible commitments. Proposals that do not posit a deficit of reasoning seem committed to the implausible prediction that normal healthy subjects will develop delusional states whenever they have any kind of unusual experience, such as seeing illusions. Proposals that do posit a deficit of reasoning (e.g., in terms of reasoning or attributional biases) seem committed to the prediction, which straight off seems implausible, that delusional patients will develop delusions whenever they have unusual experiences, such as seeing illusions (Davies et al, 2001).

One recent interesting proposal (Davies et al, 2001) is that there are two factors in the formation of monothematic delusions. The first factor is a ‘neuropsychological anomaly with some manifestation in the experience of the subject’ (Davies et al, 2001: 147) that produces an unusual experience with a rich content (e.g., that some other agent initiates my movement). The second factor is what causes this experience to be taken as veridical: it is a general lack of inhibition of what the authors term ‘the pre-potent doxastic response’. This is the cognitive mechanism that allows normal subjects to form beliefs directly on the basis of what they experience, and that in normal subjects is inhibited in the case of unusual experiences. Delusions arise because a deficit to the

normal inhibition of the doxastic response means that the patients cannot help coming to believe what the unusual experience tells them. This proposal seems promising, but it also has the unwanted prediction that patients will develop delusional beliefs when they have all sorts of unusual experiences (Davies et al, 2001: 153).

We propose to treat the lack of inhibition of the pre-potent doxastic response as a localised performance failure of that cognitive mechanism in specific circumstances, rather than as a general competence failure (see also Gerrans 2001). Our proposed model therefore avoids the unwanted prediction but takes on an obligation to explain why the failure is specific to those circumstances.

To accomplish this, we first explore the content of the unusual experience that leads to the delusional belief in alien control. In section 2, we suggest that these unusual experiences seem most directly relevant to the formation of nascent delusions, that is, delusions of control in their initial phases and before the delusions develop into the types of beliefs that typically present in the clinical setting. Next, in section 3, we explore the notion of the pre-potent doxastic response and employ a commonsense, or folk epistemological, notion of reality testing to demonstrate how and why there could be a failure of inhibition of the pre-potent doxastic response for these particular experiential contents, and not for other contents. In the course of this we answer the following questions (discussed for example in Davies and Coltheart, 2000): Why do subjects form the delusional belief? Why do subjects accept the belief? Why do subjects maintain the belief instead of dismissing it? Why do subjects form bizarre beliefs rather than more mundane beliefs? Why don't subjects develop delusions every time they have unusual beliefs? How come some monothematic delusions are relatively circumscribed?

2. The Content of Unusual Experiences that Occur in the Pathogenesis of Delusions of Alien Control

In delusions of alien control in schizophrenia, the hypothesised unusual experience is as of another agent initiating one's bodily movement. An influential cognitive account of this experience begins with the observation that humans are able to distinguish whether movement is self-generated or externally produced (Frith, 1992). Influential developments in motor control theory may throw light on the computational principles underlying this ability (Wolpert and Ghahramani, 2000, Frith et al, 2000b). On the basis of an efference copy of a given motor command, a forward output model predicts the sensory consequences of the movement and the prediction is used to attenuate the sensory consequences of the movement. The sensory consequences of identical, but externally produced movement are not predicted and therefore not attenuated. The result is that externally generated movement is experientially salient, when compared to self-generated movement (Blakemore et al, 1998, 2000, 2003). An impairment in forward modelling leads to a lack of attenuation of the consequences of self-generated movement, indistinguishable from externally generated movement: One's own movements are experienced similarly to how one experiences externally generated movement. The suggestion is that it leads to delusions of control (Frith et al, 2000b). At a pathophysiological level, brain-imaging provides evidence that patterns of deviant interconnectivity between the cerebellum and areas of the parietal cortex are implicated in these experiences (Spence et al, 1997, Blakemore et al, 2001, Blakemore et al, 2003), possibly involving frontal areas too (Spence et al, 1998).

A recent study that reports the somewhat similar experience of *passivity* may illuminate delusional beliefs in relation to one's own actions. Blakemore and colleagues (2003) hypnotised 6 highly susceptible healthy subjects and scanned their brains with a view to isolating activity associated with the feeling of voluntariness from activity associated with motor control. In one condition, subjects were asked to move their arm up and down, they complied, and experienced the movement as self-generated (the Active Movement condition). In another condition, they were given the hypnotic suggestion that their arm would be moved up and down by someone else when in fact it wasn't; instead, they moved it themselves, but experienced the movement as externally generated (the Deluded Passive Movement condition). Thus, movements were identical in these two conditions, but were attributed to different sources. In a third condition, the subject's arm was moved up and down by the experimenter (via a pulley system), and the subject experienced the movement as externally produced (the Passive Movement condition) (Blakemore et al, 2003: 1059). This study confirmed that the feeling of involuntariness is correlated with specific patterns of activity in the cerebellum and regions of the parietal cortex.

Notice that the phenomenology of the experience reported in this study differs from the type of experience hypothesised to play a role in delusions of alien control. In the first case it is the experience of passivity, that is, of something else (e.g., a pulley) initiating one's movement; in the latter case it is the experience of another *agent* initiating the movement. What explains this difference? Subjects with delusions of control have intentions to move and know their intentions (see, e.g., Spence et al, 1997; Frith et al, 2000a, 2000b). Since their movements are consistent with a known intention, the ensuing

experience is as of a movement initiated by another agent. In contrast, the hypnotised subjects were unaware of their intention to move when they acted because of the hypnotic suggestion. Since intention was missing, the ensuing experience was of passive movement (Blakemore et al, 2003: 1065). Though these two types of experience have much in common, the experience of alien control would presumably be comparatively more unusual and disturbing than the experience of passivity.

Our hypothesis is that delusions arise when unusual experiences are taken as veridical. We have now specified the content of the unusual experience, viz. as of one's movement being initiated by another agent. If taken as veridical, the result is the belief that one's movement is initiated by another agent. It doesn't produce the non-delusional belief that it is *as if* another agent initiates the movement, but neither does it produce the belief that it is a specific alien agent (e.g., God, spirits, or one's therapist) that initiates the movement. That is, it doesn't produce the more elaborated delusional beliefs that clinicians confront in daily practice. At best, then, this hypothesis can account for the formation of nascent delusions, before they get elaborated.

Interestingly, this insistence on the existence of nascent delusions seems to accord with Jaspers' classic discussion of delusions where he stresses the role of primary delusional experiences (1963 [1923]: 96, 98), before they get elaborated in more florid delusional terms. He acknowledges that '[o]nce we are clear that the criteria for delusion proper lie in the *primary experience of delusion* and in *the change of the personality*, we can see that a delusion may be correct in content [i.e., true, as may happen in for example delusions of the jealous type] without ceasing to be a delusion' (1963 [1923]: 106, emphasis in original).¹ We now turn to our account of the cluster of

cognitive questions surrounding what Jaspers terms the ‘decisive criterion [of delusion proper]’, that is, the mentioned ‘personality change’ that Jaspers explains as ‘the maintaining of what is evident to the patient in the face of subsequent reflection and external criticism.’ (1963 [1923]: 105).

3. Selective Performance Failures of Reality Testing

Nascent delusions of control arise when rich, unusual experiences are taken as veridical as a result of a lack of inhibition of the pre-potent doxastic response. Now we will develop this hypothesis further. In particular, we shall interpret the lack of inhibition as the manifestation of a reality testing performance failure in specific circumstances, rather than as a general reality testing competence failure.² If we succeed in this strategy, then we avoid having to make the unwanted prediction that patients (e.g., patients with monothematic delusions) will develop delusions in response to *all* sorts of unusual experiences.

The pre-potent doxastic response takes experiences and turns them into beliefs. The idea behind this mechanism is that it seems rational to respond to experience with default acceptance. We believe what we perceive, though normally this response can be inhibited, for example when there is incongruity with prior beliefs or other experiences.³

The prepotent doxastic response is a hypothesised competence, and it remains an open question what mechanisms and circumstances can influence its inhibition. In a series of steps, we shall use a commonsense notion of reality testing to propose a more substantial model of these mechanisms and circumstances.

3.1. Under What Conditions are Beliefs Maintained Tenaciously?

If, on some occasion, a subject fails to inhibit the pre-potent doxastic response when having the unusual experience as of alien control, then the subject acquires a rather unusual belief in alien control. But this is not sufficient to constitute a delusion, since nothing tells us that the belief would be maintained tenaciously.

We therefore need to ask what conditions would lead the subject to hold tenaciously to the unusual beliefs? In terms of the current proposal, what conditions lead people to continue to take the unusual experiences of alien control as veridical? What conditions lead to sustained lack of inhibition of the pre-potent doxastic response?

Maher has suggested that unusual experiences lead to psychotic states because they are much more intense and prolonged than the similar experiences that may occur in the non-clinical population (Maher, 1999: 566). Davies and colleagues (2001: 146–7) persuasively argue that intensity and prolonged duration are not necessary for formation of monothematic delusions. For example, against the suggestion that the experiences need to be prolonged, they argue that delusions may be present very shortly after the onset of damage that leads to having the unusual experience.

A different version of Maher's suggestion seems more plausible. It is not a question of prolonged or intense unusual experience, it is the *recurrence* of the unusual experience that makes patients maintain the beliefs tenaciously. For example, if schizophrenic subjects with passivity experiences repeatedly manipulate a joystick, then they will repeatedly experience alien agency, fail to inhibit the pre-potent doxastic response and thus they cannot avoid acquiring the delusional belief (the joystick case is

from the paradigm in Spence et al, 1997; other scenarios could concern the attempt to lift an arm, or, in the case of Capgras, seeing a loved one's face).

On this view, the tenacity with which these delusional beliefs are held is not a reflection of a stubborn attitude towards a past unusual experience, it is a reflection of attitudes towards more occurrent, repeated experiences of the same unusual type. The experiences are inescapable, not in the sense that they are intense or being constantly present, but in the sense that when the subject undergoes a certain process in certain conditions, the same experience recurs, and on every occasion this experience is taken as veridical. In between experiences, the subject's belief may waver but it will be fully reinstated when the experience recurs. The clinical manifestation is then that patients maintain the beliefs tenaciously: when given multiple opportunities to reality test, they fail.⁴

Before we proceed with the main argument, some comments on the phenomenology of agency and movement are needed. We agree with Frith and his colleagues (2000) that the unusual experience arises when there is a failure of forward modelling and attenuation of the neural activity related to it, but we do not wish to commit to a particular view of the sufficient pathophysiological conditions for such failure to occur. The clinical picture of patients with schizophrenia suggests that these conditions may involve various aspects, and may vary from patient to patient as well as over time. In particular, patients do probably not experience all their movements as externally caused. We speculate that patients need to attend to their movement, or to their intention to move, in order for the experience of agency to be a candidate for doxastic response. We take our cue from the Spence et al (1997) study in which patients with

positive symptoms were simply asked to manipulate a joystick and, while they did this, they had delusions of control. The contrast could thus be between relatively novel movements and more automatic, unattended movements, and there could be an attentional factor inasmuch as the patients probably did attend to their movements ('am I moving the way I was instructed to?'), or their intentions to move ('what should I do next?') in this experiment (we thank Chris Frith for discussion of this option).

Actions are of different types. Sometimes moving a limb is itself the goal of the action (e.g., lifting the arm, as in Blakemore et al, 2003), but sometimes movement of the limb is a means for achieving a different desired target (e.g., moving the hand in order to produce a straight line on a screen, as in Fournier and Jeannerod, 1998, Nielsen, 1963). It seems plausible that it is more natural for subjects to attend to experiences of control of movement when the movement and desired target coincide. In contrast, when movement and desired target do not coincide, attention may naturally be more focused on whether the target is achieved, rather than the initiation of the movement itself. This may play a role in modulating the experience of control, and we therefore speculate that the type of movements that patients tend to be deluded about is where the subject's attention is directed at the movement itself because it is the desired target, rather than at a different desired target.

Returning now the main line of argument, the suggestion so far is that unusual beliefs can occur when unusual experiences are taken as veridical as a result of lack of inhibition of the pre-potent doxastic response. Delusions in their nascent state arise when recurrent unusual experiences are taken as veridical in this way.

When and how do nascent delusional beliefs become monothematic delusions? Revision of such a potentially delusional belief often involves exposing oneself again to the situation that produces the unusual experience—this is at least how we test that the belief has indeed been revised—but since these are precisely the experiences that produce the unusual beliefs, the beliefs may be unrevisable. Even if patients were prepared to say that the belief as such is highly improbable (as happens in some cases of monothematic delusions), it will re-occur next time the experience occurs. The clinical picture will then be that the belief is unrevisable (we return to revisability in 3.5).

3.2. Reality Testing and Inhibition of the Pre-potent Doxastic Response.

However, this suggestion predicts that healthy subjects will develop nascent delusions *whenever* they have recurrent unusual experiences, such as when repeatedly seeing an illusion like the Ames room or the Müller-Lyer illusion. But, even though subjects are initially taken in, they quickly realise that it is only an illusion. That is, normal healthy subjects have no problem inhibiting the pre-potent response. We cannot respond to this problem by saying that only delusional patients lack the inhibition of the response; not only would this be *ad hoc*, it would also create the equally implausible prediction that patients, even those with only monothematic delusions, acquire delusions in response to repeated exposure to all sorts of visual illusions (see also Davies and Coltheart, 2000: 26).

To address this issue, we first appeal to what might be called folk epistemology and exploit its intuitive notion of reality testing of experience-based belief (that is, beliefs that are initially generated by experience). Then, in section 3.3, we give an account of

how there is something special about the content of the experiences that leads to delusions of control, such that they elude this type of reality testing.

Assume we have a pre-potent doxastic response, that is, that we are disposed to take experience as veridical. The proposal is to conceptualise the normal mechanisms for inhibiting the response as reality testing mechanisms that operate when there is incongruity with other beliefs.⁵

Both intra-modal and inter-modal reality testing mechanisms can operate. Intra-modal reality testing occurs when we have a closer look, feel more carefully, or listen more intently. Inter-modal reality testing occurs when other sensory modalities are recruited to test a belief such as when we look for something we think we heard, listen out for something we may have seen, feel for something we think we heard fall to the ground. If these reality testing procedures all lead to the same result, then we generally come to believe the experience in question. If not, then we generally reject it as non-veridical or suspend judgement for the moment.⁶ Reality testing is not guaranteed to give the right result. Sometimes we form a true belief, decide to test it because there is perceived incongruity, but reality testing may be unreliable in the circumstances and give the wrong result. In that case we acquire a false belief as a result of reality testing, and must await further perceived incongruity and iterated reality testing to rectify things.

We thus propose that it is intra- and inter-modal reality testing that can inhibit the pre-potent doxastic response to believe what we experience, and when such reality testing procedures are exhausted, nothing else will on its own inhibit the pre-potent response.

We now discuss some potential problem cases.

If the subject has exhausted intra-modal and inter-modal reality testing of the types discussed above, then there are some more complex candidates for sources of inhibition: either (1) the subject's own or other subjects' purely theoretical beliefs (e.g., beliefs concerning mathematics or formal logic), or (2) other people's beliefs that are wholly or partially based on their experience, or (3) the subject's own or other people's background beliefs or beliefs about explanations of phenomena. Below we discuss these three types of cases, and argue that either these sources cannot inhibit the pre-potent response or they are place-holders for the subject's own inter- or intra-modal reality-testing.

Case 1. Purely theoretical belief. It is difficult to see how *purely* theoretical, non-experiential beliefs could be relevant as sources of reality testing of very many experience-based beliefs. Non-veridical experiences normally concern at worst what is nomically impossible (e.g., the experience of people levitating), not what is logically or mathematically impossible (can you for example have the experience as of a square circle?)

Case 2. Other people's beliefs. Imagine a subject experiencing the lines in the Müller-Lyer illusion to be of unequal length. Other people's belief that they are of equal length would normally inhibit the subject's doxastic response to this experience only if it is plausible that they are observing, or have observed, the lines in better conditions (e.g., they are measuring the lines). That is, inhibition occurs only if their experience can be a place-holder for the subject's own inter- or intra modal reality testing. If this were not plausible (e.g., if subjects are observing the lines in the same conditions), then the doxastic response would normally not be inhibited.⁷

Case 3. Background beliefs, and explanations. Often we must *actually* perform reality testing in order to revise an experience-based belief. But sometimes our prior beliefs about the subject matter are so strong that their application in reality testing does not require actual sensory calibration—it is sufficient that we could test in principle. For example, imagine that the subject experiences the moon as bigger when near the horizon than when high on the night sky, but the doxastic response to this experience is inhibited because there is a *background belief* that large objects do not vary in size depending on their proximity to the horizon. It seems plausible that this background belief is itself partially sourced in intra- and inter-modal reality testing of a very basic kind: mostly, when we have similar experiences with other objects we have found that on closer inspection there really was no change in size, and we could even have tested it for the moon itself, by viewing the horizon-moon through a little piece of pipe that obscures the distance cues provided by the terrain. Alternatively, the subject may inhibit the belief about the size of the moon because she possesses an *explanation* of the moon illusion (e.g., in the rather counterintuitive terms of how increased apparent distance, which depends on cues in the terrain, increases perceived size (Kaufman and Kaufman, 2000)). Here, two scenarios can be distinguished. (i) The subject believes that it is *as if* the moon varies in size, where the ‘as if’ character could be based on background beliefs of the type discussed above. In this case the explanation directly supports inhibition: given that it is only *as if* the moon varies in size, an otherwise coherent cognitive explanation of the occurrence of this experience is very likely. (ii) The subject has no background beliefs of the above sort, so she comes to believe that the actual moon *really* varies in size. She is then presented with the apparent distance explanation. But this explanation will not

immediately inhibit belief that the moon is really varying in size. The reason is that the cognitive explanation is relatively improbable, given that, as the subject believes, the moon really is varying in size. An explanation concerning our cognitive machinery is simply irrelevant to the astronomical facts about the moon's size (an explanation about, say, the physics of the density of matter would be more relevant). Here, the route to inhibition seems to go through a more complex competition of beliefs. On the one hand, there is some, initially low, degree of belief in the cognitive explanation, and, on the other, a larger degree of belief that the moon really varies in size. As more evidence for the explanation is presented, there will normally be a higher degree of belief in it. What does it take for the balance to tip? We think it matters that, in the case of the belief that the moon really varies in size, independent avenues of intra- and inter-modal reality testing are not yet exhausted (i.e., we can imagine various ways to test the belief, for example, by investigating whether astronauts return to Earth crushed to death or unharmed). That is to say, this belief is not as firm as it can get, and the explanation exploits this by making it more probable that, should such reality testing occur, it would go against the belief that the moon varies in size. On the other hand, if all independent avenues of reality testing were exhausted and the belief therefore was as firm as it can get, the explanation couldn't work like this, and it is difficult to see how it could then inhibit belief formation. Therefore, our view is that this type of explanation-based inhibition only works by invoking further avenues of reality testing.

The picture that emerges is that, in the core types of cases that we discuss here, pure theory, background beliefs, explanations, or other people's beliefs can help inhibit

the pre-potent doxastic response only when they serve as place-holders for, or invoke, actual or in-principle intra-modal or inter-modal reality testing.

3.3. Performance Failures in Reality Testing Lead to Selective Lack of Inhibition of the Pre-potent Doxastic Response.

The next step in our argument is to show how the experiences that form the basis for the nascent delusional beliefs of alien control are beyond intra- and inter-modal reality testing, and that the pre-potent doxastic response to these experiences therefore cannot be inhibited.

It seems plausible that not all types of experience are equally accessible to the normal procedures of reality testing. This holds, for example, for the experience of emotion and affect, for the experience of introspection of thought, and, importantly for our case, for some of the internally generated experiences associated with sensorimotor feedback (such as of limb movement and speech production).

Thus, in the case of emotion and affect, there is no parallel to inter-modal reality testing; you do not use visual or tactile procedures for finding out whether you really feel fear, or envy. Likewise, there is no obvious intra-modal reality testing for emotion as we cannot 'feel' things from another perspective, feel 'harder' or some such (we can of course focus attention in an attempt to find out how we feel, but this does not of itself amount to reality testing; to compare, we can focus visual attention on something without that amounting to reality testing). All you can do is experience what you feel. Similarly, other people's beliefs cannot be placeholders for your reality testing because they are beliefs about different matters of fact, viz. their own emotional states (though other

people may on occasion make you realise that you feel a certain way). This is comparable to a case where you see the Müller-Lyer illusion and believe the lines to be of unequal lengths, and someone else observes some *different* lines, and believes that they are of equal lengths. Their beliefs are inconsequential to your belief. Lack of reality testing for this type of content may have serious consequences for belief formation since some affective states are used to bolster cognitive mechanisms of recognition and memory (e.g., in the recognition of loved one's faces; and social decision making).

Crucially for our case, it is also plausible that reality testing is severely limited for the experiences relevant to delusions of control. According to our cognitive model, a subject's basic method for establishing whether or not her body's movement is initiated by someone else is in effect to notice whether the reafferent sensory signal is cancelled or not (we say 'in effect' because the mechanism is subpersonal, and you are only aware of its product in the shape of the experience of self- or other-initiation). It is difficult to see any possibility for intra-modal reality testing here; there seems to be no analogy to 'getting closer', or 'seeing from another perspective'. Likewise, it appears you cannot switch to another sensory modality in order to test whether you initiated a certain movement. Remember, the unusual experience is not that subjects feel someone else grabbing their arm and moving it, in which case there might be other routes for reality testing, such as looking at one's arm, or introspecting one's intentions. The unusual experience is that the intended movement is initiated by someone else. Therefore it is to no avail to test the belief about external initiation against visual feedback since, in the case of delusions of control, the visual feedback of the moving arm is consistent with the known intention to move. On the other hand, if the visual feedback had been inconsistent

with the known intention to move, then the belief in this exact type of external initiation of intended movement would have been disconfirmed.

This can usefully be contrasted with the anarchic hand sign where patients have a hand that moves ‘of its own accord’ without the will of the patient (Marchetti and Della Salla, 1998). Frith and colleagues (2000: 1777) account for this condition in terms of another malfunction in the network that realises the computational model that accounts for the unusual experience in delusions of control. They explain that ‘the movements of the anarchic hand occur because the effects of the affordances supplied by the immediate visual environment are no longer inhibited by the currently intended action [the lesion is hypothesised to affect action controllers by damaging the path between the intended state and the specification of the movement]. However, the rest of the system is intact. Representations of the intended and actual positions of the hand are available, so that patients know that the behaviour of the hand does not conform to their intentions’. This condition gives rise to a very unusual and unsettling experience: the experience as of one’s hand making controlled movements that appear to be of the intentional type, but that go against one’s intentions. This produces the belief that the hand moves of its own accord. This belief is roughly true, though it may misdescribe the neurophysiological facts suggested by Frith and his colleagues (it is not that the hand has its own intentions, but that one’s own intentions fail to inhibit the effects of affordances). Here reality testing using visual feedback *is* to some avail because the intention to move is known and the movement does not conform to it. So the roughly true belief is confirmed. On the other hand, if the movements had been consistent with the known intentions, then there would have been reason to think the belief is false.

Whereas the belief in external initiation appears to be beyond reality testing, we do not think it is plausible to say that *all* beliefs based on experiences associated with reference, efference copies and the motor control system are beyond reality testing. This complicates the picture because it seems the mechanism that causes the trouble in delusions of control (that is, the mechanism that compares predicted and actual sensory feedback in order to cancel the sensory consequences of self-generated movements) is itself a mechanism for reality testing, albeit at a subpersonal level. It is a mechanism that tests whether movements that are consistent with your intentions in fact are your movements or whether they are externally generated.

In the particular case of nascent delusions of control, the suggestion is therefore not that there are no procedures for reality testing whatsoever, but that the unusual experiences occur at a processing stage where there are no *further* procedures for reality testing. It is, so to speak, the end of the reality testing line when the sensory consequences of one's movements are not cancelled and the movement corresponds to one's intentions: using the available methods of reality testing keeps giving the same result, and there are no other avenues of reality testing available (in the sections below we discuss how other people's beliefs, background beliefs, and explanations also fail to aid reality testing).

So far, the suggestion adds up to this: unusual beliefs arise when unusual experiences are taken as veridical because they occur in sensory modalities or at processing stages where application of the available reality testing procedures keeps giving the same result and where further intra- or inter-modal reality testing cannot be performed. These performance failures happen even though the patient does not have a

deficit of reality testing competence, that is, even though the patient is able to inhibit the pre-potent doxastic response for other experiential contents. Tenaciously maintained monothematic delusions in their nascent state arise when these experiences recur. On this suggestion, these precursors to full-blown delusions arise as the result of rational, normal responses to unusual experiences. The systematic pathology in the formation of these delusions lies in the prior production of the unusual experiences, and it is thus a contingent fact that the experiences occur such that no reality testing is possible.

The suggestion predicts that nascent monothematic delusions will arise for contents in sensory modalities or at processing stages that plausibly are inaccessible to further reality testing. This seems *prima facie* plausible when we restrict the scope to the most discussed delusions with a hypothesised experiential component (we stress however that in each case, a more detailed story must eventually be told, based on good cognitive models). Thus, in the Capgras and Cotard delusions it is flattened affective response; in Frégoli it is heightened affective response; in reduplicative paramnesia it is heightened affective response or heightened personal significance attached to remembered events; in thought insertion it is, as in delusions of control, a loss of experience of self-initiation; in denial of ownership of a paralysed limb in unilateral neglect it is a loss of kinaesthetic and proprioceptive experience; and in mirrored self-identification the unusual experience of one's own face seen in the mirror.

In many of these cases, further questions arise. For example, why don't the Capgras and Cotard patients check the spouse's memory and the record of deaths, respectively? We think answers to these questions depend on the detailed story that must eventually be told about the prospects for reality testing, given the nature of the

grounding experience. Below we discuss delusions of control, and Capgras delusion, in more detail.

3.4. The Transition from Nascent Delusions to Delusions as They Present in the Clinical Setting.

Since we have so far only discussed nascent delusions of control, more is needed to arrive at the full clinical picture of delusions of control. Patients present with more bizarre beliefs than just that their actions are initiated by some other agent. They say things like: ‘I felt like an automaton, guided by a female spirit who had entered me during it [an arm movement]’; ‘I thought you [the experimenter] were varying the movements with your thoughts’; ‘I could feel God guiding me [during an arm movement]’ (Spence, 2001: 165).

On our account, these more bizarre contents are explanatory responses within the normal range that patients develop when they find themselves with the unrevisable and unsettling *belief* (i.e., the nascent delusion) that their action is really initiated by another agent: when there is a lack of inhibition of the pre-potent doxastic response to the experience of alien control, the result is the formation of a belief that there is alien control. Thus, the state that the patient is trying to explain is the world as the nascent delusion represents it, that is, the occurrence of real alien control of her movements. This is a central element of our account and is in contrast to the kinds of accounts where the formulation of these bizarre hypotheses come out as highly improbable and abnormal attempts to explain the occurrence of unusual *experiences*.⁸ We can therefore explain why it is not an option for the patients to form an explanatory inference to the less bizarre belief that something is wrong with their brains. Since they already have the unrevisable

belief that it was a movement initiated by another agent, they must ask: ‘which hypothesis best explains the occurrence of real alien control: the hypothesis that my brain is sick or the hypothesis concerning supernatural powers?’ The answer is that the latter hypothesis provides the best explanation of the occurrence of alien control: it is much more probable that there is real alien control if there are supernatural powers, than if there is brain pathology.

We can illustrate this further by considering what may happen in Capgras, where patients, as proposed by Ellis and Young (1990) and Ramachandran and Blakeslee (1998), experience their spouse in the same way as they experience strangers even though the spouse looks like their spouse. Since the damage involves emotional and affective processes, further reality testing is useless: if the affective response is needed to convince us that someone is not only NN, but NN-the-loved-one, then there is not much else one can do, if there is no affective response. The patients consequently acquire the belief that the spouse is really a stranger that looks like the spouse, and it is this belief that is being elaborated by the patient. The prior possibility that the spouse is an impostor of some sort is of course very low, but if this hypothesis best explains that (as the patient believes is true) the spouse is really a stranger that looks like the spouse, then it is very probable that the spouse is an impostor. In contrast, a hypothesis about brain pathology does not explain well how the spouse could really be a stranger that looks like the spouse. The causal chains leading up to brain pathology does not have much to do with the causal chains leading up to impostors really occurring in the world. The brain pathology hypothesis would only be relevant if the patient could accept that what needs explaining is the mere *experience* that it is as if the spouse looks like a stranger; it is not relevant if

what needs explaining is the real occurrence of a stranger looking like the spouse.

Similar kinds of considerations apply to the question why the patient doesn't check the spouse's memory of shared events in the past. Even if the assumed impostor can relay such events, the question from the point of view of the patient, who has the nascent delusion that the spouse is a stranger, would be how it can be that a stranger knows such things—this uncanny 'fact' about the 'stranger' could even help cement the psychotic nature of the belief.

3.5. Why do Subjects Not Simply Dismiss the Delusional Belief?

Why do subjects not simply dismiss the nascent delusions, or suspend judgment about them, irrespective of the fact that they cannot reality test any further? They are after all frequently *told* by carers and family that they are wrong. Here it is crucial to remember the grounding hypothesis that dismissing experience-based beliefs, or suspending judgment, would have to involve inhibiting the pre-potent doxastic response, and our proposal in 3.2. that inhibition of this response must somehow be sourced in inter- or intra-modal reality testing. If there is no method of further reality testing, then it may simply not be subjectively possible to inhibit the pre-potent response so as to dismiss the belief or suspend judgement. This may be so even though, at a more theoretical level, one is prepared to accept that the belief as such is highly improbable. (This is much more plausible for belief based on experience, than for beliefs that are not based on experience; you can easily dismiss the belief that aliens killed JFK, but not the belief that one line is longer than the other when you first see the Müller-Lyer illusion and before you think of reality testing.)

Of particular interest is the question why the patient cannot use *general plausibility considerations* to explain away the occurrence of external initiation of action, for example considerations based on the background belief that movements cannot in general be externally initiated. This would be analogous to using the background belief about the constant sizes of large objects to inhibit the belief that the moon varies in size depending on its proximity to the horizon (discussed in 3.2). We argued that such background beliefs are themselves sourced in basic forms of intra- and inter modal reality testing. This is unproblematic in the moon case, but creates problems in the delusion case. For the background belief that movements cannot be externally initiated is sourced in none other than instances of the exact type of belief under consideration. So it is indirectly the background belief itself which is under attack, and it is difficult to hold on to the background belief, and to use it to inhibit false beliefs about external initiation, when one repeatedly experience that there is external initiation. This is in contrast to the background belief that large objects do not differ in size depending on their proximity to the horizon. I am prepared to hold on to the latter belief, and use it to inhibit false beliefs about the moon, even though I experience that hot air balloons in fact increase in size as they go higher. The difference between the two cases is that further reality testing is possible in the balloon case (I can discover the relevant differences between balloons and moons), but not, as we have argued, in the delusion case.

Lastly, we do not think subjects could dismiss the nascent delusional belief by endorsing a *specific explanation* about brain pathology. Building on the discussion in previous sections, our answer to the question ‘brain pathology explains this unusual experience to the rest of us, so why not to the patient?’ has three parts. First, we appeal to

the commonsense fact that explanation is relative to epistemic context. What is an explanation to one subject, with one set of prior beliefs, may not be an explanation to another subject, with another set of prior beliefs (see, e.g., Bird 1998, Ch. 2). Second, the specific hypothesis concerning brain pathology does not provide a good explanation of the fact, for example, that one's spouse is really a stranger, though it would provide a good explanation of the fact that the spouse looks *as if* he is a stranger (compare, a hypothesis about the effects of alcohol consumption does not normally provide a good explanation of the fact that there is a pink elephant in my back yard, but it may provide a good explanation of the fact that it seems as if there is a pink elephant in my back yard).⁹ Third, as we acknowledged in 3.2., sometimes explanations can eventually inhibit the formation of experience-based belief but, as we said, only when all avenues of intra- and inter-modal reality testing haven't yet be exhausted. And it is part of our argument here that all avenues of such reality testing *have* been exhausted in the case of the nascent delusion of control. So the explanation cannot make it probable that further reality testing would tell against the delusional belief, and then it is difficult to see how it could eventually come to inhibit the doxastic response.

3.6. Can Subjects Have the Unusual Experience Without Having the Delusion?

Our suggestion also predicts that subjects cannot have these unusual experiences without having the nascent delusion. This is open to objection because, for many of the monothematic delusions discussed in the literature, there seems to be a corresponding condition where the subject has the experience, but not the delusion. For example, Davies and colleagues (2001: 145) point out that patients with depersonalisation disorder may

say that it is *as if* an alien agent is controlling their movements. The only way to defend the above account is to make it plausible that the experiences are not in fact identical in depersonalisation disorder and in delusions of alien control. That is, the experience in depersonalisation disorder is as if an alien agent is controlling their movements, and the experience in delusions of control is that an agent is really controlling their movements. (This creates the quite strong prediction that a schizophrenic patient with alien control experiences who is grouped with Spence's (1997) patients on the basis of neurological data, will have, not just the alien control experiences but also the alien control delusion.)

Currently, there seems to be little to decide between the claim that the experiences are similar and the responses to them different, and the claim that the experiences are different and the responses to them similar. The independent rationale for the second view is simply that there is much we do not know about the brain, so different types of damage or malfunction may produce different types of experience (see Gerrans, 2002, for this type of argument with respect to the differences between the unusual experience in Capgras and in Cotard delusions). Depersonalisation disorder is a very diffuse and ill understood disorder (Baker et al, 2003), and it seems plausible that, in the end, we may have to explain the two conditions differently and in that way make it plausible that they involve different experiences. (This possibility is hinted at in a recent review of 204 cases that concludes that depersonalisation disorder is better classified with anxiety and mood disorders than dissociative disorders, Baker et al, 2003.) If the malfunction that leads to the experience behind depersonalisation is earlier in the processing stream than the experience behind delusions of control, then the mechanism associated with forward

modelling and control may be spared and reality testing will be possible, and this would explain why reality testing is intact in depersonalisation disorder.

The most problematic case for this claim may be the Capgras delusion where some of the patients who lack the autonomic responses to familiar faces fail to have the delusion (Tranel et al, 1995). This is problematic because some of the main evidence for the hypothesis that Capgras delusion has an experiential component is that subjects with Capgras lack this response too. However, as Davies and his colleagues remark (2001: 145), there may be different experiences involved nonetheless as the delusional patients have different lesion sites than the non-delusional patients.

3.7. How can some Monothematic Delusional Beliefs be Relatively Circumscribed?

In some cases, monothematic delusions present as relatively circumscribed. Some Capgras subjects may for example fail to adjust their wider belief system and behaviour very much in an attempt to accommodate the disturbing belief that the spouse is an impostor. But belief contents are often held to be individuated in terms of their inferential relations to other beliefs (in such a way that belief contents are interdefined), so how can a circumscribed mental state count as a belief at all (Davies and Coltheart, 2000, Gold and Hohwy, 2000)?

We think there are three things to say. First, on our account, the underlying delusional belief is the nascent delusion that there is alien control, or that one's spouse is a stranger. This belief is then inferentially related to the belief that it was God or female spirits who initiated movement, or that the spouse is an impostor or a robot. So there is some degree of inferential relationality. Second, the inferential relations that individuate

belief may not need to be actual; it may be enough that the subject is disposed to form these links under normal conditions. The delusional subjects may be disposed like this, but they do not actually form the relations because conditions are not normal. In particular, they will often be strongly motivated to compartmentalize the delusional network of belief because they may be scared, for example of being sent to a psychiatric hospital (for the motivational factor, see also Davies and Coltheart, 2000: 28–29). Third, our background account of the formation of experience-based belief and the inhibition of the pre-potent doxastic response prioritises observational adequacy over a conservative drive for consistency with purely theoretical belief, and this predicts that experience-based networks of belief may compartmentalize relatively easily vis a vis theoretical belief systems that they are inconsistent with. It may be easy to insulate a given belief system against other belief systems that have no potential for inhibiting our tendency to form experience-based beliefs. (For an account that treats delusion formation as a competence failure in the priority of observational adequacy over conservatism, see Stone and Young, 1997.)

4. Conclusion

Generalising from our case-study of delusions of control, our proposal is this: unusual beliefs arise when unusual experiences are taken as veridical because they occur in sensory modalities or at processing stages where application of the available reality testing procedures keeps giving the same result and where further intra- or inter-modal reality testing cannot be performed, even though the patient does not have a deficit of reality testing competence. Tenaciously maintained nascent monothematic delusions arise

when these experiences recur. Full-blown monothematic delusions develop when the nascent delusions are rationally elaborated.

The suggestion encourages philosophical investigation of conceptions of belief formation, especially concerning the relation between experience-based and more theoretical belief. It also encourages an extension of the method of cognitive neuropsychiatry to the notion of reality testing; and assessment of our proposal will indeed depend on the further development of cognitive models of normal reality testing procedures and their scope with respect to different types of experiential content. At this stage the suggestion yields the following prediction. Unusual visual, auditory or tactile experiences with the representational content *P* can lead to the formation of the unusual belief that *P* in subjects in conditions where they have exhausted intra- and inter-modal reality testing. This happens even though figures of authority explain to them how *P* is false, and even though subjects have prior purely theoretical beliefs or background beliefs that *P* is false. Creating such experimental conditions will be difficult; to get a sense of the idea, imagine measuring the lines in the Müller-Lyer illusion with a trick ruler. Subjects may avow that they are trying to revise their beliefs, or that they can see that the belief is unusual, but if put in the same conditions again, they will again develop the unusual belief. Such recurrent beliefs will be tantamount to nascent delusions.

The proposal specifically concerns stages in the development of monothematic delusions, in particular delusions of alien control, with an experiential component. A wider story than ours must be told to account for other, e.g., persecutory, delusions, as well as for the more florid delusional systems found in schizophrenia (e.g., systems that involve beliefs such as that the Danish Queen mother transplanted dogs eyes into my skin

and has poured 30 tonnes of cement into my stomach, or that the mafia has put a horse in my tooth). If however a subject finds him- or herself with a whole range of nascent delusions encompassing multiple types of representational content, then we do not find it implausible that this could at least contribute to the development of such florid delusional belief systems. However, judgment on this would have to await the development of cognitive models for persecutory delusions, as well as for the formation of other types of unusual experiences (for a speculative attempt at extending the forward modeling account to other types of symptoms in schizophrenia, see Hohwy, 2004).

On this account, simply having the unusual experience in a sensory modality or at a processing stage where further reality testing is not available is sufficient for forming the delusion. However, multiple factors may go into the formation of the unusual experience itself. It may be abnormal top-down processes associated with the hypofrontality that may occur in schizophrenia (e.g., Spence et al, 1998, for discussion of the role of interconnectivity in schizophrenia, see Friston and Frith, 1995), or there may be more local damage to neural pathways that prevents normal patterns of activation at different processing stages. The content of the experience may be affected by these pathophysiological processes and types of damage.

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¹ Jaspers earlier follows orthodoxy and says that the term delusion applies, though, as he says ‘*vaguely*’, to false beliefs that are incorrigible and impossible (1963[1923]: 95–96, emphasis in original).

² We thus employ a general strategy akin to that of Gerrans (2001), who employs the Chomskian competence/performance distinction in the interpretation of delusions.

³ A number of studies concern belief formation specifically about agency and bodily movement, which is relevant for delusions of control (e.g., Wegner and Wheatley, 1999; Fourneret and Jeannerod, 1998). These studies often seem to involve situations where subjects have two or more discordant experiences of the same movement (e.g., when proprioception differs from visual feedback) that then compete for doxastic response. As

such, the studies may be interpreted in accordance with our proposal, namely in terms of different ways of inhibiting the pre-potent doxastic response.

⁴ Bermudez (2001: 477-8) makes a similar observation. Bermudez goes on to suggest that it is a necessary condition on the formation of monothematic delusions that there is an affective component to the unusual experience. This seems to create the prediction that subjects will form delusions in response to visual illusions with an emotional component (e.g., a loved one seen in the Ames room).

⁵ Notice that we use the notion of reality testing in a non-standard way. We focus on testing for truth, not only on the ability to distinguish personal, subjective experience from the reality of the external world, or the ability to tell whether a belief originates from an internal or an external source, see, e.g., Johnson, 1991.

⁶ This can be illustrated with cases of musical hallucinations associated with deafness, and of normal observers doing difficult psychophysics experiments. The experiencer tests the hallucination to *discover* if it is real or not (e.g., it moves with your eyes), and some hallucinations are more difficult to test than others. For example, Hammeke et al, (1983) report how a lady, on first experiencing vivid musical hallucinations searched her flat for the source.

⁷ This might be undermined in unusual conditions. Asch (1958) had single subjects, in the company of a group of confederates, compare the lengths of some lines. Subjects turn out to conform with the confederates' clearly erroneous judgements in about one third of the cases. Most subjects however reported that they were aware that the judgement was wrong, so they must have been able to perform some alternative kind of reality testing, presumably by looking for themselves. Subjects tend to trust their own judgement

because when allowed to write down their judgement, rather than saying it out aloud in the group, conformity rates dropped markedly. Also, though this is a striking finding, the conformity response is not entirely irrational in this case: even in what seems to be very clear-cut cases, appearances can be deceptive—as the Müller-Lyer illusion indeed teaches us. There is a further difference to the cases we shall discuss below since there the experiences are of private phenomena and as such not publicly observable. Much less conformity would presumably occur if each subject were looking at their own private set of lines.

⁸ For example, it is in contrast to one and two-deficit versions of two-factor accounts (e.g., as discussed in Davies et al, 2001) where the first factor is an unusual experience and the second factor is an attempt to explain this experience. (Though some two-factor accounts may also operate with a measure of further explanatory elaboration of the belief that is then formed in an attempt to explain the unusual experience, or that is formed as a result of a competence deficit leading to lack of inhibition of the pre-potent doxastic response.)

⁹ This reasoning pattern is frequently found, for example in patients with delusions of the somatic type, who may decline psychiatric treatment and avoid taking antipsychotic drugs, with explicit reference to the obvious fact that such things cannot help with their physical ailment such as, for example, a fishbone that has been stuck in the throat for years (Bjerg Hansen, 1976).