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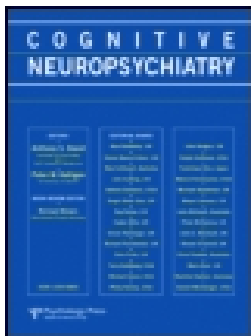
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Explaining body size beliefs in anorexia

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ABSTRACT

Introduction: Cognitive neuropsychiatry has had much success in providing theoretical models for the causal origins of many delusional beliefs. Recently, it has been suggested that some anorexia nervosa patients' beliefs about their own body size should be considered delusions. As such, it seems high time the methods of cognitive neuropsychiatry were turned to modelling the false body size beliefs of anorexics.

Methods: In this paper, I adopt an *empiricist approach* to modelling the causal origins of false body size beliefs in anorexia. Within the background of cognitive neuropsychiatry, empiricist models claim that abnormal beliefs are grounded by abnormal experiences bearing similar content.

Results: I discuss the kinds of abnormal experiences of body size anorexics suffer from which could ground their false beliefs about body size. These *oversized experiences* come in three varieties: false self-other body comparisons, spontaneous mental imagery of a fat body and distorted perception of affordances.

Conclusions: Further theoretical and empirical research into the oversized experiences which anorexics suffer from presents a promising avenue for understanding and treating the disorder.

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Anorexia nervosa; body representation; empiricist; delusion; oversized experiences

Introduction

Delusional beliefs are found in multiple disorders. Patients with Capgras delusion believe a loved one has been replaced by an imposter. Asomatognosia patients believe one of their limbs does not belong to them. Cognitive neuropsychiatry has had much success in modelling the causal origins of these bizarre beliefs. However, it has yet to properly investigate the beliefs of individuals with anorexia nervosa. This is likely because few classify anorexia patients as delusional—the disorder is traditionally associated with *overvalued ideas* rather than delusional beliefs (McKenna, 1984). That said, there is a growing consensus amongst researchers that at-least a sub group of anorexia patients should rightly be classified as delusional. Given this trend, it seems high time the methods of cognitive neuropsychiatry were turned to modelling these subjects' beliefs.

This paper presents a preliminary attempt at this task by offering an empiricist model of the false body size beliefs held by some anorexia patients. Within the background of cognitive neuropsychiatry, empiricist models claim that clinical patients' abnormal beliefs are caused by *abnormal experiences* bearing related content. I claim that many anorexia

patients suffer from abnormal experiences of their own body size—*oversized experiences*. These oversized experiences come in three varieties: false self-other body comparisons, spontaneous mental imagery of a fat body and distorted perception of affordances. I further claim that, contrary to most empiricist models, these oversized experiences may only play a role in *maintaining* patients' abnormal beliefs, though the issue needs further empirical exploration.

Anorexia and body size beliefs

Anorexia is a devastating affliction, with the highest mortality rate of any mental disorder (Arcelus, Mitchell, Wales, & Nielsen, 2011). This is likely exacerbated by a general lack of success in formulating effective treatments—clinicians know it as “one of the most frustrating and recalcitrant forms of psychopathology” (Vitousek, Watson, & Wilson, 1998, p. 391). Clearly, there is a dire need for new approaches to understanding and attempting to treat the disorder.

One potential avenue is to try to explain the irrational body size beliefs held by patients. While it is often been assumed that anorexia patients have false beliefs about their body size, these beliefs have only recently gained empirical scrutiny; researchers have traditionally focused on subjects' attitudes of dissatisfaction with their own body size, rather than their beliefs *per se*. However, it is fair to assume that a low satisfaction with body size is at least indicative of the belief that “I am not my ideal size (i.e. thin)”. Some tests of body satisfaction are even framed in belief like terms. For example, in some questionnaires, participants will be presented with statements such as “I think my abdomen is too large” and asked to respond with a measure of agreement or disagreement with the statement (Garner, Olmstead, & Polivy, 1983).

Recently, researchers have begun to directly explore anorexia patients' beliefs, using the Brown Assessment of Beliefs Scale (BABS) (Hartmann, Thomas, Wilson, & Wilhelm, 2013; Konstantakopoulos et al., 2012; McKenna, Fox, & Haddock, 2014; Mountjoy, Farhall, & Rossell, 2014). The BABS is a semi-structured interview for assessing beliefs in terms of delusionality (Eisen et al., 1998). It begins with a clinician establishing relevant belief content with a subject through interview; the beliefs are then rated according to multiple dimensions of delusionality. Konstantakopoulos and colleagues describe the content of some of their participants' beliefs:

“I am not thin now at 42kg (height 170cm, BMI = 14.5); I do not need to gain any weight” or “If I gain 2kg and weigh 45kg (height 165cm, BMI = 16.5), I will have a pot belly and look awful” or “I am fat now at 49kg (height 162cm, BMI = 18.7) and I must lose 5kg (BMI = 16.8) to regain a normal weight”. (2012, p. 483)

When looking at this content, we can note that these patients appear to hold true beliefs about *how much* they weigh—the (seeming) irrationality comes into play in the way they use evaluative labels such as “fat”, “thin”, “awful [looking]”, “normal weight”. There is also some variance in the specific content of anorexia patients' beliefs—not all reflect the content “I am fat” so much as “I am not thin” or perhaps even “I am not *excessively* thin”. Nevertheless, these and other anorexia patients clearly have false beliefs about their own body size. Explaining the causal origins of these body size beliefs will be the central focus of this paper.

Prima facie, this seems like a promising approach to treatment. After all, the harmful behaviour we are attempting to target is weight loss behaviour and the beliefs pertain to body size. With what we know about the relationship between beliefs and behaviour, it seems fair to presume there is a causal connection between the two. However, caution needs to be taken in assuming how applicable this approach will be to the broader class of individuals diagnosed with anorexia. Anorexia is an incredibly complex eating disorder, with multiple biological, psychological, developmental and socio-cultural aetiologies (Rikani et al., 2013). Further still, it is becoming increasingly clear that many anorexia patients do not hold false beliefs about their body size. In fact many patients' harmful dieting behaviour is not associated with a fear of gaining weight at all (Lee, 2001). Thus, we are likely to see heterogeneity amongst patients in regard to the causes of their harmful eating behaviour. Nevertheless, the research discussed does seem to suggest that many patients believe they are fat, or at the very least, not excessively thin. Consequently, understanding how these false beliefs arise will at-least unlock one piece of the puzzle. Given the complexity of the disease, this piecemeal approach seems like the best available option.

Explaining belief content

Rationalism or empiricism

I start by considering a broadly *rationalist* explanation of anorexic body size beliefs. As Campbell explains, "The key question [for rationalist accounts] is whether the deluded subject can really be said to be holding on to the ordinary meanings of the terms used" (2001, p. 95). On the rationalist account, the implausible content of abnormal beliefs arises from a fundamental shift in the meaning of the words a subject uses to describe those beliefs.¹

There is a compelling rationalist story to tell about how anorexics' body size beliefs arise—from a fundamental difference in the meaning of evaluative terms such as "fat" and "thin". One might hypothesise that anorexics' standards for what constitutes a thin body are so extreme that even their own bodies do not qualify. Under this model, the meaning of the words "fat" and "thin" would fundamentally differ from their regular use, explaining the incomprehensibility of this belief content.

However, the available empirical evidence does not support the view that anorexics' false beliefs about their own body size can be attributed purely to extreme evaluative standards. Anorexia patients do not appear to have extreme visual standards for what qualifies as a thin body (Alleva, Jansen, Martijn, Schepers, & Nederkoorn, 2013). Research also suggests that when picking out visual exemplars of their ideal bodies, patients do not even aspire to *excessive* thinness (Moscone, Amorim, Le Scanff, & Leconte, 2017). As such, the incomprehensibility does not seem to arise from extreme standards for what constitutes "fat" but rather the (mis)application of this label to the object under question (the subject's own body).

Oversized experiences

In contrast to rationalism, I offer an *empiricist* account of anorexics' body size beliefs. The main tenet of empiricist approaches is that, rather than arising from a fundamental shift in

meaning, the content of abnormal beliefs arises from abnormal experiences (Bayne & Pacherie, 2004a). Bayne and Pacherie refer to this as the bottom-up aetiology thesis, where “the proximal cause of the delusional belief is a certain highly unusual experience” (2004b, p. 2). I will spell out the kinds of unusual experiences anorexics suffer from which could serve to ground body size beliefs; I call these *oversized experiences* (Gadsby, 2017a). Oversized experiences can be grouped into three categories: false self-other body comparisons, spontaneous mental imagery of a fat body and distorted affordance perception.

Self-other body comparisons

One diagnostic criterion for anorexia is a “disturbance in the way in which one’s body weight or shape is experienced” (DSM 5). Following Bruch (1962), this experience is referred to as a “body image disturbance”. Although there are multiple components of this body image disturbance (Gaudio & Quattrocchi, 2012), the perceptual component is what is relevant to the issue of oversized experiences. Following Schilder, anorexia researchers have adopted the following definition of the perceptual body image: “the picture of our own body which we form in our mind, that is to say the way in which the body appears to ourselves” (Schilder, 1935, p. 11; Smeets, Smit, Panhuysen, & Ingleby, 1997, p. 79). This mental picture is said to be disturbed by representing the body as larger than reality.

Evidence of this disturbed (oversized) mental image of the body comes from body size estimate tasks. These involve a variety of techniques such as modifying the distance between light points on a wall to match the width of one’s body, drawing one’s body size on a wall or selecting a silhouette that best matches one’s body size (Skrzypek, Wehmeier, & Remschmidt, 2001). Traditionally, researchers have focused on how this distorted mental picture arises (i.e., through top-down or bottom-up effects) (Smeets & Panhuysen, 1995). However, the important focus for the empiricist approach is the experiences caused by this distorted mental image.

One kind of oversized experience arising from perceptual body image distortion involves *self-other body comparison*. When one compares a visual image of another body in order to assess whether it is larger or smaller than them, this relies on the dimensions of the perceptual body image (Longo, 2014). Although I am unaware of any empirical studies asking patients to compare their bodies with other peoples’, the stimuli used in many body size estimate tasks are either silhouettes or computer-generated images of bodies (Cornelissen, Bester, Cairns, Tovee, & Cornelissen, 2015; Moscone et al., 2017; Skrzypek et al., 2001). Evidence of patients’ misjudgments when comparing their bodies to these pictures suggests a similar misjudgment could occur when the stimulus is the sight of another person’s body. Furthermore, it has been shown that comparing one’s body size with others is a behaviour that anorexics regularly engage in (Alleva et al., 2013, p. 99; Corning, Krumm, & Smitham, 2006; Espeset, Gulliksen, Nordbø, Skårderud, & Holte, 2012, p. 524; Hamel, Zaitsoff, Taylor, Menna, & Le Grange, 2012).

There are preconditions for this kind of distorted experience to ground false body size beliefs. To start with, the body being compared to must be thinner than the subject’s *represented* body size i.e. thinner than their perceptual body image; only then will she judge the person to be thinner. Furthermore, the body being compared to must either meet, or be larger than the subject’s *ideal standards* for thinness i.e. she must desire to be *as thin as*, or *thinner* than the body she is looking at.² This way the subject sees a body she thinks is

either ideal thinness or larger and judges that she is larger than this body (therefore not yet meeting her ideal thinness).

When these conditions are met, self-other body comparisons might ground beliefs with content such as “I am not thin”.

Spontaneous mental imagery

Apart from causing faulty self-other body comparisons, there is another role distorted mental imagery of the body can play in oversized experiences. This relates to the phenomenon of spontaneous mental imagery. Spontaneous mental imagery is most commonly associated with social anxiety disorders (Hackmann, Clark, & McManus, 2000; Hackmann, Surawy, & Clark, 1998).³ Research shows that subjects with social phobia suffer from invasive recurrent mental images that bear content representing the subject's fears. One patient who feared sweating and (as a consequence) being considered inept described an image like so: “Can see self as being obviously uncomfortable, drenched in beads of sweat. Normal upright posture. Face is red. Worried look. Look of wanting to get out” (Hackmann et al., 1998, p. 9). Hackmann, Clark and McManus further note that these patients “appear to believe that the image is accurate at the time it occurs” (p. 602).

The same self-structured interview technique used to explore the role of spontaneous mental imagery in social anxiety was also adopted to explore its role in bulimia (Sommerville, Cooper, & Hackmann, 2007). This is of relevance to the case of anorexia as the two disorders frequently overlap (Vitousek et al., 1998, p. 396) and bulimia is also associated with perceptual body image distortion (Norris, 1984; Whitehouse, Freeman, & Annandale, 1986). Sommerville, Cooper and Hackman write:

Participants were asked to identify a recent time when they had worried about their eating, weight or shape. They were then asked if they had ever experienced any spontaneous images that had popped into their mind at such times ... Participants were asked if their images/impressions were recurrent, i.e. they had often experienced images with similar content.

Eleven out of 13 bulimia participants claimed to have experienced recurrent images (p. 440). A patient described one example of a spontaneous mental image which arose: “I see myself standing there naked except for my underwear. I can see rolls of fat around the back. Flesh spilling out over my underwear” (p. 44). Another study asked anorexia and bulimia patients to talk about the last time they felt worried about their eating, weight or shape (Cooper, Todd, & Wells, 1998). Seven out of 12 anorexia patients and 6 out of 12 bulimia patients reported mental imagery such as “Being fat, with a big body larger than any-one else” and “fat on stomach and thighs” (p. 220).

Although empirical research into this area is still in its infancy, it seems likely that many anorexics experience spontaneous mental imagery of a fat body. Whether spontaneous mental imagery can cause false body size beliefs largely depends on the phenomenological characteristics of this experience. Mental imagery, as a mode, has distinct phenomenological differences from regular perceptual experience, the most important difference being that it lacks a “sense of reality” (Dorsch, 2010). This is why, for most non-clinical subjects, mental imagery does not reinforce beliefs—it lacks a sense of reality, so subjects do not take the content to be veridical and it is not endorsed by the belief system.

However, what if, like Hackmann, Clark and McManus claim about social anxiety patients, anorexics really do take these mental perceptions to be accurate? Perhaps, due

to other cognitive factors, the mode of spontaneous mental imagery retains some sense of reality. If so, spontaneous mental imagery may play a role in grounding false body size beliefs. Only once we understand the phenomenological characteristics of this mode of experience (i.e. how real it appears to anorexics) can we determine the relationship between spontaneous mental imagery and false body size beliefs.

Affordance perception

It has recently been suggested that anorexics suffer from another kind of abnormal experience that could reinforce false body size beliefs (Gadsby, 2017a). This experience arises from distortion of a cognitive body representation known as the *body schema*. Although the meaning of the term body schema differs greatly among different fields and researchers, for current purposes, it can be defined as a cognitive representation of the body used for motor control and motor simulation (de Vignemont, 2010; Gadsby, 2017b).

It has been shown that anorexia patients' body schemas represent their bodies as larger than reality (Guardia et al., 2010, 2012; Keizer et al., 2013; Metral et al., 2014). Although patients do not directly experience these distorted dimensions, I have argued that they might *indirectly* experience them. This occurs through the perception of certain kinds of *affordances*. Perceiving an affordance involves perceiving the possibility to interact with one's environment (Gibson, 1979). For example, a chair affords sitting on—when I perceive a chair, I also perceive this “sitting on” affordance.

Some affordances are determined by the size of one's body. For example, the affordance for fitting into clothes one sees on others, or fitting in between furniture or people in crowded places. The perception of these kinds of affordances relies on motor simulation, which makes use of the dimensions of the body schema (Gadsby, 2017a). Because anorexics have oversized body schemas, they misperceive size-determined affordances.

This misperception of size-related affordances constitutes an oversized experience because it relays content such as “I couldn't fit into her top” or “I can't fit in between those chairs” (Gadsby, 2017a, p. 607). Perceiving affordances with this content brings to awareness (false) information about the body i.e. “my body is too big for *x*” (whereby *x* is an environment-focused action). When a patient perceives the affordance for *not* fitting into someone else's top, she erroneously becomes aware that her body is *too big* to fit into that top.

As in the case of self-other body comparisons, the context of faulty affordance perception determines whether it can play the relevant grounding role on false body size beliefs. In order to play this role, the environment-focused action must be one the subject believes an ideal sized body could accomplish. In the case of perceiving affordances for clothes wearing, this would mean the person wearing the clothes must be ideal sized (or larger). Likewise, in the case of fitting one's body in-between spaces in the environment, these spaces must be ones that seem passable by an ideally sized (or larger) body. When the right conditions are met, affordance-based oversized experiences could ground subjects' false body size beliefs.

Experiences and cognitive deficits

I have discussed three kinds of oversized experiences that might ground anorexics' false body size beliefs: faulty self-other body comparisons, spontaneous mental imagery of a

fat body and falsely perceiving one's body as too big for environment-focused, size-determined actions. This explanation steps away from most empiricist models, which generally indicate a *single* kind of experience grounding a clinical subjects' abnormal beliefs (Coltheart, 2007).

Nevertheless, while empiricist approaches are ostensibly focused on abnormal experiences, they operate within the background of cognitive neuropsychiatry. As such, they aim to explain delusions by tracing these abnormal experiences back to some identifiable cognitive deficit (Halligan & David, 2001); whether this deficit causes multiple kinds of experiences which share similar content is not ultimately important for the cognitive neuropsychiatric approach. Furthermore, it is not particularly problematic if more than one cognitive deficit need be posited. After all, many cognitive neuropsychiatric models of delusional beliefs (e.g., two-factor theories) posit the existence of multiple causally relevant deficits.

A complete picture of the underlying causes of oversized experiences is yet to be properly elucidated. Distorted self-other body comparisons and affordance perception are said to arise through perceptual body image and body schema distortion, respectively (Gadsby, 2017a). How this content becomes distorted is an open question, though there have been some early attempts to trace this distortion back to a single cause (Gadsby, 2017b). Very little is known about the cause of spontaneous mental imagery. Even in the study of social anxiety disorders, where it is most well-known, researchers have yet to properly question its cognitive origins. Nevertheless, it seems possible that, in the future, we might pin down the cause of oversized experiences to some identifiable cognitive deficit(s). There is a rich literature exploring differences in cognitive and neurological function between anorexia patients and healthy controls which could aid in this task (Braun & Chouinard, 1992; Gaudio, Wiemerslage, Brooks, & Schiöth, 2016) (Figure 1).

The origin of body size beliefs

In most empiricist models, abnormal experiences provide the content of delusional beliefs. Consider the case of Capgras (the delusional belief that a loved one has been replaced by a visual look-alike). The standard cognitive neuropsychiatric explanation posits a breakdown in the system responsible for the affective response to familiar faces (Ellis & Young, 1990). Prior to undergoing the experience of seeing their loved one without the usual affective reaction, the idea "this person is a stranger" has never occurred to the subject. In this, and other empiricist models of delusions, abnormal experiences *originate* the implausible content.

However, many anorexia patients report a time in their youth where social pressures prompt the belief "I am not thin", which then kick starts dieting behaviour, eventually culminating in disorder (Halse, Honey, & Boughtwood, 2008). In these cases, we might say that abnormal experiences do not provide the content of beliefs at all but rather only serve to *reinforce* or *maintain* previously formed beliefs.

There is an interesting parallel to draw here with the abnormal beliefs of another group of clinical subjects. Many patients with hemiplegia after right-hemisphere stroke, develop anosognosia, where they maintain the belief that they still have full use of their paralysed limb. While there is still disagreement over what neuropsychological impairments underlie anosognosia for hemiplegia, it is clear where the belief content originates:

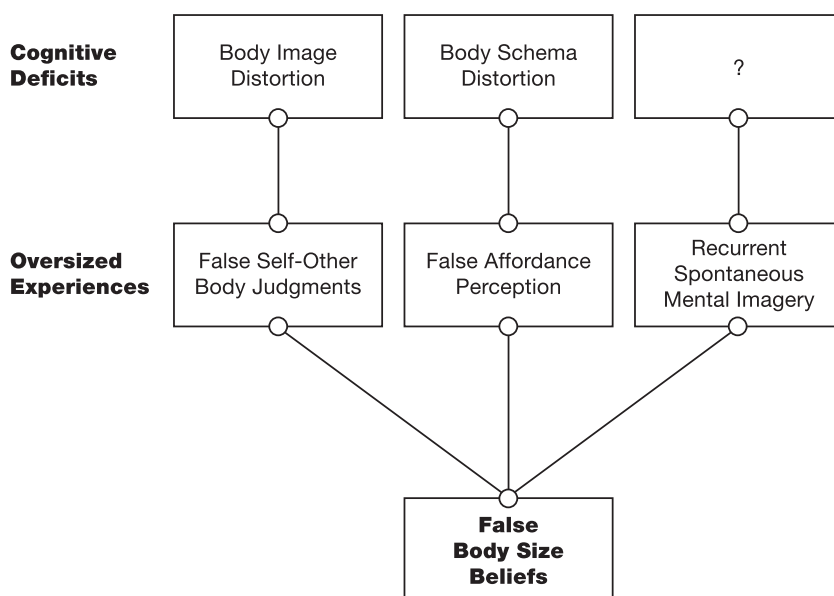


Figure 1. Oversized experiences and possible cognitive deficits.

The belief that there is no impairment is false—newly false as a result of the subject’s recent paralysis. But it is not bizarre or implausible in the light of the subject’s antecedent web of beliefs. On the contrary, it is part of that web. The subject has always believed that he could use his left arm and leg. However, even though the belief that there is no impairment is not implausible in the light of the subject’s antecedent beliefs, there is evidence that goes against it—evidence newly acquired, since the onset of the paralysis. This evidence calls for substantial revision to the subject’s antecedent web of beliefs and, in particular, it calls for the rejection of the old, now false, belief. The subject ought to acknowledge his impairment and accept that he is paralysed. But the old belief is not rejected; instead it is maintained in the face of all the evidence. (Davies, Aimola Davies, & Coltheart, 2005, p. 226)

So rather than arising from neuropsychological abnormalities, anosognosia patients’ abnormal belief content is already endorsed, prior to any impairment. This causal history may bear similarity to the content of many anorexics’ body size beliefs. Consider the example of Joe:

I was happy. I was healthy. I ate what I wanted. I exercised. I was sporty. Then, a stupid boy called me fat ... I got called fat at a time when you start to get conscious of your weight, around 15 or 16 years of age. To get called fat was a big blow. I took it really seriously and wanted to lose that weight and to get healthy and fit. (Halse et al., 2008, p. 96)

At a young age, Joe adopts the belief, “I am fat”, purely as a result of socio-cultural influence. This begins a trend of diet and exercise-induced weight loss. However, as Joe loses weight, she holds on to the belief. Although her weight loss should call for the rejection of the belief, she maintains it in the face of contrary evidence. In cases such as these, we might suppose that oversized experiences are playing more of a maintenance role. They impair subjects’ awareness of their own weight loss, causing them to hold on to their old beliefs.

Another issue that clouds the question of content aetiology is that it is unclear *when* oversized experiences start to arise. In studying the neurological functioning of anorexia

patients, researchers recognise difficulties in determining whether differences are premorbid traits or caused by the illness (Hay & Sachdev, 2011). We face a similar problem when discussing the cognitive differences that lead to oversized experiences. Perhaps some subjects suffer from recurrent spontaneous mental imagery prior to any weight loss, with these experiences playing a relatively early causal role regarding belief content. However, an alternative possibility is that neurological damage resulting from the starvation and chronic stress associated with eating disorder behaviour underlies the cognitive malfunction responsible for oversized experiences (Riva, 2012, p. 256). In this case, oversized experiences would be restricted to the role of maintaining and reinforcing beliefs, much later along the disease timeline.

There is a tentative evidence in favour of the existence of oversized experiences in non-starvation cases. It has been shown that many healthy controls (especially those with high body concern) exhibit oversized perceptual body images (Baker, Williamson, & Sylve, 1995; McKenzie, Williamson, & Cubic, 1993; Plies & Florin, 1992; Taylor & Cooper, 1992). Similarly, in Sommerville, Cooper and Hackmann's study, they found that roughly 50% of their healthy controls reported spontaneous mental imagery of a fat body (2007, p. 439). However, more general population-focused research is needed.

The specifics of the causal relationship between oversized experiences and body size beliefs is a tricky area in need of further empirical exploration. It is partly confounded by a lack of available data on early onset anorexia patients and a lack of knowledge regarding the cause of oversized experiences. We might even expect to see variation between different patients, dependent on individual history. For example, one patient's body size belief content could originate from early socio-cultural influences, whereas for another it could be spontaneous mental imagery.

Conclusion

My goal in this paper has been to utilise cognitive neuropsychiatric methods of explanation, specifically the empiricist approach, to sketch a theoretical model of false body size beliefs in anorexia, based on the notion of oversized experiences. A full understanding of these oversized experiences could be useful for clinicians, who might prepare their patients to be wary of them, potentially tempering their role in reinforcing false body size beliefs. Nevertheless, before this clinical advantage can be gained, much work is needed.

The next step is to empirically verify different aspects of the proposed model. Before attempting to pin down the cognitive deficits responsible for these experiences,⁴ we must first verify that they are playing the role in belief grounding that I suggest—evidence of *how frequently* these oversized experiences take place is needed.

In this regard, the self-structured interview techniques used to explore spontaneous mental imagery should be adopted to further assess its frequency amongst anorexia patients. Similarly, questionnaires measuring the frequency of self-other body comparisons can be used (e.g., Schaefer & Thompson, 2014). Once evidence of the frequency of these two oversized experiences is found, we can search for correlations between frequency and the strength of false body size beliefs, using measures such as the BABS.

In terms of faulty affordance-based oversized experiences, verifying frequency may prove difficult. At this point, there is still uncertainty as to whether this faulty affordance

perception pervades everyday experience, rather being a phenomenon only present in the laboratory. A step in the right direction might be to design ecologically valid experimental paradigms, investigating the way in which patients move through cluttered environments and visually assess the size suitability of clothing. There is much work to do, yet the empiricist approach outlined shows promise for gaining real explanatory ground.

Notes

1. In fact, Campbell's rationalist theory involves the much more specific claim that the delusional beliefs of Capgras and Cotard patients can be regarded as Wittgensteinian framework propositions. Instead, I use this term more broadly to refer to any theory that posits a fundamental difference in meaning as an explanation for the content of delusional beliefs.
2. This condition is important. If a subject judged themselves as larger than someone they believed was "too thin", this likely would not reinforce "I am not thin/I am fat" beliefs.
3. See Osman, Coope, Hackmann, and Veale (2004) for an exploration of spontaneous mental imagery in body dysmorphic disorder.
4. Although, see Gadsby (2017b, pp. 30–31) for experimental suggestions for further exploring the deficits themselves.

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