Dreaming as a virtual reality delusion simulator: Gaining empathy whilst we sleep

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Summary. The conscious experiences we have during sleep have the potential to improve our understanding of and empathy towards those who experience delusions and psychosis by providing a virtual reality simulation of mental illness. Empathy for those with mental illness, in general, is lacking in society. Empirical evidence suggests that empathy, in this regard, has not increased in the last decades despite efforts made to increase awareness. Our lack of empathy may be due to an inability to accurately simulate what it's like to have cognitive disorders. Dreaming can help mitigate these deficits by placing the dreamer in a realistic virtual simulation of altered cognition and increase their capacity for empathy. Empathy is associated with reducing stigma and discrimination. Recent work suggests that virtual reality can increase empathy towards a variety of marginalised groups, however, this technology is limited in its ability to simulate mental illnesses such as delusions. Dreams, however, can replicate delusions and psychosis to a reasonable degree, and through these experiences, we can learn what it's like to have these conditions. It is essential that we recognise these experiences for what they are, attempt to remember and reflect on them. Instead of disregarding dreams due to their unusualness and bizarreness, we can learn from these experiences and expand our understanding of the human condition and its many forms.

Keywords: Delusions, dreams, empathy, mental illness, psychosis, virtual reality

1. Introduction

Dreams can improve our understanding of what it's like to have mental illness by replicating those very experiences. Dreams, therefore, have the potential to improve empathy for people with mental illness who are often stigmatised in society. Computer-generated virtual reality (VR) has shown some success in increasing empathy towards stigmatized groups, including those with mental illness, by simulating the perspective of individuals from these groups (Ando et al., 2011; Banakou et al., 2018; Hamilton-Giachritsis et al., 2018; Seinfeld et al., 2018). However, VR is limited in its ability to simulate experience. I argue that dreams can simulate a broader variety of experiences, namely, delusions, psychosis and altered states of consciousness, in a way that is more realistic and immersive. A lack of empathy may be due to an inability to accurately attribute mental states to others via inference making or an inability to simulate the experience of others via imagination. Although the term 'empathy' is vague and used in over 20 different ways in the literature with some definitions overlapping with the term 'sympathy', the focus here is that understanding what it is like to experience what another is experiencing can help reduce stigma. It is difficult to understand what it would feel like to undergo psychosis, and such an experience might even be classed as *transformative* – it cannot be conceived of

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until it is experienced first-hand (Paul, 2014). Dreaming can help mitigate these deficits, thus, dreaming can have both epistemic value and the potential to positively influence behaviour. It might be argued that empathy with a delusional person comes instead from knowing what it is like to live in a world where that particular experience is maladaptive for the individual, that is, to empathise with an individual situated in a world. There are certainly some limitations to any VR in this regard, but here I will outline reasons to believe that dreams can, to a reasonable degree, replicate the mental states experienced during delusions and psychosis, and through these experiences, we can gain important insight about what it's like to have these conditions.

If dreams are indeed virtual reality delusion simulators, they can show individuals what it is like to undergo delusions, but it is essential that we pay attention to these experiences, attempt to remember and not discard them as simply unusual or bizarre. While the dream world does not give individuals complete understanding of what it's like to live in the real world with these conditions, they give us an epistemic advantage in that we have undergone similar mental states.

Dreams have the potential to shed light on the experiences of those who suffer from mental illness if we adopt a reflective approach towards our memories of these experiences and acknowledge them as delusion simulations. Bizarre, delusional dreams are highly salient and less likely to be forgotten than mundane dreams despite being *less common* than mundane dreams. Early research found that in lab awakenings rated 10% of dreams as highly bizarre while another 15% included significantly bizarre elements (Snyder, 1970). This means that although bizarre dreams are not the norm, they are common. Unfortunately, in normal home settings, most dreams are forgotten whether or not they are bizarre (Domhoff, 2003; Hobson, 2005). Thus, improving our memory of dreaming gives individuals access to their own delusional experiences. This is important because there is

a limit to how well can we understand and empathise with those that experience changes in cognition that we have never experienced before. Lack of understanding of what it might be like to suffer from, for example, thought insertion delusion, the belief that one's thoughts were inserted or implanted by an external source, Capgras delusion, the belief that one's loved ones have been replaced by imposters, or somatopariphrenia, the belief that one's own limb is someone else's (Vallar & Ronchi, 2009), may limit our ability to empathise with people that have these disorders.

Common bodily illnesses and pains should not be classed as transformative; even lacking experience of that *specific* problem may not lead to an untraversable gap in knowledge if the experience is sufficiently analogous to another that has been experienced. We can accurately infer from one experience to a similar state. Such inferences are often automatic. Observing someone in pain, without reflection, causes mimicking of pain behaviour and simulation of what it would like to suffer from that pain (Sims et al., 2012). We may wince when watching characters in films get injured (Walton, 1990) or when simply imagining an injury. Evidence suggests mental illness, for many, is more difficult to simulate or understand. A common stigmatising response to those seeking help is the belief that the one with the condition should 'just get over it' (Griffiths et al., 2011). Research shows that empathy for those with mental illness is lacking and there has been little improvement in recent years (Angermeyer et al., 2014). Understanding altered states of consciousness may require more imaginative work than common pains or illness, and the further away from our lived experience the disorder is, the more difficult it may be to comprehend. However, dreams can simulate delusion, psychosis, and the experience of losing one's grip on reality. This is in fact a common feature of dreaming that occurs without any induction techniques. It is likely that everyone who experiences dreaming, which is nearly everyone, has also experienced several delusions whilst asleep. It may simply be a matter of remembering these experiences – what it feels like to be a delusional dreamer – and to reflect on the experience to increase your ability to empathise.

2. What is empathy?

There is much debate over exactly what 'empathy' is. The ambiguity of the term poses a problem for theorists who attempt to discuss the concept from philosophical or scientific perspectives. D'Arms (1998) notes that one reason for the ambiguity of the term is that it is often conflated with 'sympathy', which is itself ambiguous, and there is no consensus on the definitions of either of these terms.

Empathy has been described as an ability to *simulate* what the other is experiencing (Coplan, 2011; Goldie, 2002), make theoretical inferences based on behavioural evidence (Stich & Nichols, 1992), a combination of both (Engelen & Röttger-Rössler, 2012) or a broad range of mental processes used to gain knowledge of another's mental state (D'Arms, 1998). Empathy may be related to mirroring processes, in which neural patterns between two individuals are matched by way of unconscious processing of facial expressions, or an effortful constructive process known as reconstructive empathy (Goldman, 2011). It has been linked with the reward system in the brain, as the spontaneous mimicking of facial expressions associated with empathy is linked with activity in the brain's pleasure center – the ventral striatum (Hsu et al., 2017; Sims et al., 2012). A reduction of such mimicking

capacities has been linked with a reduction in empathetic processing (Cattaneo et al., 2007; Oberman et al., 2005). The reward system response may be related to the ability to learn appropriate social conduct. Reduced motivation to pay close attention to facial expressions has been proposed as an explanation for the developmental delays in children with autism, a condition marked by social impairments including verbal and non-verbal communication skills (American Psychiatric Association, 2013). In this view, mimicking doesn't stimulate pleasure as it does for children without autism, which slows the development of empathy (Sims et al., 2014). This suggests that motivation and interest in understanding others is likely key to developing empathy. Improving empathy may depend on a general willingness and interest in empathising and understanding others.

Battaly (2011), in an attempt to categorize the disagreement in this field, describes three main positions regarding the definition of empathy: a sharing of *experience*, a *cognitive process* of gaining knowledge through inference making, and an intermediate view that involves both experiential and inference making components (see Zahavi, 2017). Batson (2009), in contrast, taxonomises 8 main categories that appear in the literature. In different contexts, it has been used to refer to a type of knowledge about another person's internal state, a process of matching another's posture and neural activation, feeling what another feels, projecting oneself into another's circumstance, imagining another's experience or imagining how they themselves would feel in another circumstance. Alternatively, it might refer to one's own response to another, such as feeling distress about another's suffering or, more generally, 'feeling for' someone else. For my purposes here, the important disambiguation is that empathy is a type of knowledge that an 'empathiser' gains about another's mental states, call them the 'empathisee', that allows the empathiser to understand what it's like to be the empathisee in their particular context. This may require inference making, simulation and contextual understanding in order to understand another's experience. My hypothesis, however, specifically rests on the claim that for the empathiser, empathising requires, or at least is enhanced by, knowledge gained by having experienced something similar to what the empathisee is experiencing. This requirement should not be overly contentious. This is because, excluding implausibly narrow views of empathy that just describe mimicry, all accounts of empathy require that some information about the mental state of the empathisee is shared with the empathiser, whether unconsciously or consciously, be they experiential or other cognitive states.

The ability to understand another's experience requires some kind of base knowledge – having had some similar experience that can be simulated or extrapolated from. Complex mental states of the empathisee may be difficult or impossible for the empathiser to understand if they have never had a similar experience. Empathy is a complex process with an essential social role. Measuring empathy using facial mimicry or other simple measures goes some way towards helping us understand and do empirical research, but here the focus is our ability to respond appropriately to another individual's situation, which involves more than mimicry. I can empathise with someone who has been tortured to a certain extent despite never having experienced torture myself, inferring from my experience of pain and imagining it being amplified. But my ability to accurately simulate or appropriately empathise is limited due to my lack of expe-

rience and understanding of states that are entirely unlike what I have experienced.

It should be noted that empathy is not seen as universally beneficial nor is it used only for improving our ability to help others in need. There is reason to think that empathy can be used in acts of deception and manipulation and can enhance an empathiser's ability to harm others. Bubandt and Willerslev (2015) note that individuals can use empathy to "vicariously take up the viewpoints of others in order to trick them" (p 5). Empathy can be harmful due to biases, such as feeling more empathy towards those who are closer and more similar to ourselves (Prinz, 2011). However, it is unlikely that the understanding gained by dreaming would be used to manipulate people. Further, despite bias, evidence suggests empathy generally acts as a prosocial motivator, although it is unlikely to be the sole motivator for ethical behaviour (Hoffman, 2001). A lack of empathy is likely related to discrimination and stigmatisation (Jorm & Reavley, 2013) and increasing empathy may decrease these social problems.

We could question whether a state that has never been experienced before can be accurately simulated or understood by cognitive means at all. This particularly applies if no analogous state has been previously experienced, rather than, say, a more extreme or modified version of a previous experience. For example, a person with congenital insensitivity to pain doesn't know what it's like to feel pain (Swanson, 1963). It is likely that pain is something one must undergo to understand another's painful experience. Further to this, without an understanding of the nature of the experience, the person with pain insensitivity may not be able to empathise with the pain others feel when they break a bone. We can compare the inability to understand pain with the inability to understand delusions. There is reason to think that at least some delusional or psychotic experiences may fall in the category of transformative experience: one must undergo the experience to know what it is like.

Delusions and psychosis are difficult for neurotypicals to comprehend. The odd inferences that a delusional person makes, and the unusual experiences of psychotic episodes might be beyond an inexperienced person's comprehension. The complexity of cognitive factors that occur during these altered states of consciousness may make comprehension and empathy more difficult. Delusions are difficult to comprehend because they involve altered cognitive features including, at least under the two-factor theory of monothematic delusions, unusual perception followed by an irrational assessment of what might be causing that sensation (Davies et al., 2001). For example, Capgras delusion may involve an initial lack of the normal affective response to the loved one followed by confabulatory reasoning to explain the experience (Coltheart et al., 2007). There are competing single-factor theories (Bortolotti, 2018), but if monothematic delusions *can* be broken down into two factors, the empathiser must infer or simulate *two* cognitive alterations to be able to understand the appropriate mental state. Patients with delusions are resistant to evidence that contradicts their delusional beliefs. Perhaps I can empathise with the confusion or fear that I would expect to feel during such an experience, but beyond such generalities, my capacity for understanding may be limited.

Lacking the ability to understand or simulate these experiences might also partially explain the reduced empathy commonly felt for those with psychiatric disorders, mental illness, and other cognitive issues. Empathy for someone suffering from injury, pain or discomfort is often automatic and we can infer what their experience is like from our own past experiences. Not so for mental illness. Evidence of discrimination and stigmatization of people with mental illness suggests a lack of empathy towards people with these conditions (Angermeyer & Dietrich, 2006).

3. Lack of empathy, stigma, and discrimination

To give an anecdotal account, I recall as a teenager first revealing to a friend that I was suffering from symptoms of depression. My friend couldn't understand. In her view, because we both lived comfortable lives, had friends, no physical disabilities and many opportunities in life, there was no 'reason' for depression. This response was, on reflection, entirely understandable; she was drawing on her own experience and inferring about my mental state. She couldn't conceive of mental problems with no clear cause. However, her response altered my help-seeking behaviour – feeling depressed was shameful so I didn't seek help elsewhere. Although this case is only an anecdote, empirical evidence suggests that this type of interaction is widespread and can be harmful.

Individuals tend to act more empathically towards bodily ailments rather than mental or psychological issues. People with depression or other mental illnesses often face stigma rather than empathy, thus suffering not only from their symptoms but also from discrimination (Jorm & Reavley, 2013). Some victims of such discrimination internalize these negative attitudes, leading to further harm such as lower self-esteem and depression (Corrigan & Watson, 2002).

Angermeyer and Matschinger compared early 1990's survey results from Germany (1997) with a similar survey carried out a decade later (2004) to ascertain changes in attitudes towards people with mental illness over the decade. Participants were asked to self-rate their responses towards people with mental illness, including empathy, pity, fear, and other factors using a Likert scale. The first survey found that people suffering from depression are usually met with discrimination, stigmatization, and a lack of empathy. When the experiment was repeated a decade later, there was little if any change in attitudes. Although there was an increase in pity and a very slight increase in empathy and desire to help people with depression, participants were just as fearful and more likely to react aggressively towards those with the condition. In a later study, Angermeyer and colleagues (2014) found that in the decade following 2001, people generally *believed* there was less stigma in society towards those with mental illness than those who participated a decade earlier. For example, people interviewed in the second survey believed that having a mental illness wouldn't affect an individual's ability to be hired as much as those interviewed in the first survey. However, despite such beliefs, people's emotional reactions to those with depression had only slightly improved, whereas their reactions towards people with schizophrenia and alcohol dependence specifically had gotten slightly worse.

Similarly, Reavley and Jorm (2012) found that in Australia between 2003 and 2011, although some attitudes towards people with mental disorders had changed for the better, this wasn't true across the board, and it is unclear if empathy had increased. An improvement had occurred in the respondents' self-reported willingness to decrease social distance from people with mental illness – for example, will-

ingness to hire or have a person with mental illness join the family through marrying one of their relatives. Fear, however, had *increased*, including the belief that people with mental illness are dangerous and unpredictable. In a survey of people with mental illness, Lasalvia and colleagues (2013) found that 79% of respondents experienced discrimination and many stopped themselves from doing something they found important such as starting an intimate relationship (37%), applying for work (25%) or applying for education or training (20%) because of fear of being discriminated against. Since public awareness of mental illness is increasing, it is surprising that there has been so little apparent change in empathy. Therefore, increasing awareness, perhaps, is insufficient for increasing empathy.

The link between empathy, stigma and discrimination is not obvious and we should not assume that stigma or discrimination will in all instances correlate with lack of empathy. One could, for example, stigmatise another despite empathising with them: an employer who has had a psychotic break might not want to hire someone with the same condition. In contrast, an employer might have no bias against hiring someone with a mental condition but, because of lack of empathy, have no regard for the personal challenges they face at work. Generally, empathy is likely to decrease when the empathiser considers the empathisee as 'the other'; someone who is unknowable, entirely unlike the empathiser or, at worst, an object rather than a subject (Håkansson Eklund, 2006). Increasing empathy towards others might decrease stigmatization and discrimination in such cases. There is also reason to think that violent perpetrators lack empathy towards their victims (Blair, 1995). Increasing empathy in these individuals may decrease their violent acts (Jolliffe & Farrington, 2004; Van Langen et al., 2014) so increasing empathy towards people with mental illness would likely decrease discrimination. Evidence from virtual reality experiments suggests that empathy can be increased by putting the empathiser in the shoes of the empathisee.

4.   VR and increasing empathy

Using virtual reality to increase empathy is consistent with the constructivist approach to learning, that direct experience enhances our ability to make sense of new events more than learning second-hand information from a teacher (Saunders, 1992). Applied to empathy, this view suggests that putting the empathiser 'in the shoes' of the empathisee is a more reliable way of increasing empathy. Research suggests that empathy training involving watching videos and imaginative perspective taking gives abstract knowledge about appropriate responses to stigmatised groups (Teding van Berkhout & Malouff, 2016), although this approach may not be as successful as direct experience (Seinfeld et al., 2018). VR has been used to provide active engagement and learning in a variety of contexts, including learning about mental illness (Papert & Harel, 1991).

Seinfeld and colleagues (2018) placed male domestic abusers in a virtual female body that moved synchronously with the participant's own movements. In the VR, a male character entered the room, verbally abused the participant, invaded their personal space, and threw a telephone on the floor. The participant could look down and see their own (female) body and see their reflection in a mirror. Before the VR, these participants were on average less able to recognize fear in women's faces than controls and were more likely to interpret a fearful woman's face as happy. Their ability to recognize fear improved after the VR. Since the ability to recognize facial expressions is necessary, although not sufficient, for empathy, this suggests that being embodied in a simulation can increase empathy in domestic abusers. Hamilton-Giachritsis and colleagues (2018) created a VR simulation in which mothers were embodied as a four-year-old child avatar. The participant's movements were matched with the movements of the VR child and they interacted with a 'mother avatar' which responded to the 'child' either negatively or positively. Participants who experienced the negative behaviour showed increased levels of empathy, where empathy was classified as "the ability to identify with and understand another's situation, feelings and motives" (p 2). Empathy was measured using a parenting empathy test and a "mind in the eyes" test, where participants describe the emotional state of a person based on an image of their eyes. Similar increases in empathy occurred for participants using VR that changed their race (Hasler et al., 2017) or age (Banakou et al., 2018). It should be noted that different research groups use different empathy measures. Seinfeld and colleagues (2018) note that self-reported questionnaires can be unreliable as participants answer in a manner they think would be viewed favourably by others. However, importantly, a wide variety of research groups and measurement instruments have found positive effects which give strong evidence that VR can be a valuable tool in empathy training.

Certain aspects of mental illness, such as auditory and visual hallucinations, can be simulated relatively easily using VR (Penn et al., 2010) simply by altering the sound or visual stimulus. These types of VR are somewhat successful in increasing empathy towards people with schizophrenia (Formosa et al., 2018), however, they also have the negative effect of increasing participants' desire for social distance (Ando et al., 2011). Undergoing a visual hallucination while being told that this is what a person with schizophrenia experiences may cause fear along with empathy. Currently, VR is mostly limited to sight and sound. Other modalities, including taste and smell, cannot be simulated. VR is also limited regarding emotions. Although emotions are evoked via visual or sound stimuli, VR cannot, for instance, replicate depression or mismatched emotions.

Virtual reality can help increase empathy, however, due to limits of the technology, it cannot fully induce the experience of mental illness. Mental illness is more complex than disturbed visual or auditory experiences. However, important aspects of delusional experience can be simulated when we dream, and such experiences are relatively common during sleep. Further to this, dreams are far more immersive and unlike with VR, the dreamer usually believes it is real. Dreaming, I argue, can offer a realistic delusional experience.

5.   Dream as delusion VR

It has been argued that dream cognition is delusional (Hobson & Kahn, 2007; Wilkinson, 2015) or a form of psychosis (Scarone et al., 2007). We have reason to believe that dream cognition is highly varied and should not be classed as *essentially* delusional, psychotic or bizarre (Rosen, 2018a, 2019). A strong case for non-delusional dreaming is lucid dreaming, when the dreamer realises they are dreaming (Kahan & LaBerge, 1994; LaBerge & Rheingold, 1991). Despite this, the experience of altered cognition is certainly common in dreams (Hobson & Schredl, 2011), if not a constant

feature, and delusions can carry over from waking life to dream experience (D'Agostino et al., 2013). Dreams can be convincing, embodied, three-dimensional 'world models' or virtual realities (Windt, 2010; Windt & Metzinger, 2007), with the main difference between dreaming and technological VR being that dreams are generated by the dreamer's own mind. Even when dreams are bizarre, irrational, and unusual, they can still be immersive, three dimensional and multimodal. For this reason, I argue, dreams at times provide an immersive VR of delusional or psychotic experience.

Empirical research has shown that dreams, psychosis and drug-induced hallucinations share similar phenomenal, cognitive, and behavioural attributes regarding experience of time, visual stimuli, the confabulatory bringing together of elements and disorientation (Hobson, 1997). These similarities may be due to similar neurochemistry and neuro-activation between these states (Jacobs & Trulson, 1979). This includes dorsolateral prefrontal deactivation, an area associated with higher cognitive processes such as rationality and metacognition (Gottesmann, 2006). Impairments in metacognition and other cognitive features in dreaming that relate to psychosis are mostly associated with non-lucid dreaming – dreams in which we do not realise we are dreaming (Dresler et al., 2015), with lucid dreams being far less likely to include these impairments (Voss et al., 2013). Dreams are often described as hallucinations and involve a subset of the same neural networks as waking hallucinations although dreams are more immersive and isolated from real stimuli (Waters et al., 2016). Analysis of artificial neural networks suggests that the commonly reported bizarreness in dreams may be related to "uninhibited neural network responses to pedunculopontine-occipital input due to failure of aminergic modulation by the forebrain." (Keshavan & Sudarshan, 2017). Some researchers describe dreams as "virtual realities" (Hobson et al., 2014; Revonsuo, 1995) or intensified mindwandering that simulates embodied experience (Domhoff & Schneider, 2018) that we usually experience as real (Domhoff, 2011). Despite being realistic, delusional experience frequently occurs (D'Agostino et al., 2013; Gerrans, 2014).

In the following, I argue that particular dreams can be classed as specific monothematic delusions, such as Fregoli, Capgras, and alien limb syndrome. This suggests not just that dreams can be bizarre or unusual, but that they can replicate specific delusions. While a large proportion of dreams are likely to be mundane (Domhoff, 2007; Rosen, 2018a; Snyder, 1970), unusual, bizarre and delusional dreams are experienced by most individuals and are more likely to be remembered than mundane dreams (Foulkes, 1999). These experiences are usually dismissed as simply random and bizarre yet paying more attention to the specific similarities between dreams and delusions could give us a better understanding of mental illness from a first-person perspective.

5.1. Misidentification delusions

Dreams commonly display *binding failures* (Revonsuo, 1999; Revonsuo & Tarkko, 2002; Wilkinson, 2015). Binding is the coming together of aspects of one or more sense modalities, such as texture, shape, colour, auditory stimulation, and emotional response. Failed binding leads to odd mismatches between features; your mother having cat's eyes or feeling nostalgic about a frightening object. Binding failures may be caused by increased independence of

neural processing of modules which fail to produce unified perceptual concepts, leading to bizarreness and mismatching features (Revonsuo & Tarkko, 2002). Similar binding failures also occur during delusional waking experience, sharing similar neural underpinnings (Ramachandran & Blakeslee, 1998). For example, dream reports suggest similar forms of misidentification to Fregoli delusion, the belief that a person, often a stranger, is a familiar person in disguise. "I was with my wife (who is now dead). The curious thing is that she looked very young, but she looked different than I had remembered her" (Sleepanddreamsdatabase.org Dream Text: Most Recent Dream - Q15, 59 words, krippner_survey1:kargm52[Answer Date Unknown]). Capgras-like experience also occurs in dreams. "I am at one of those mad bidding auctions, where someone starts bidding on an object that they are not too keen but gets carried away and very much into it. It seems that the person bidding is my father, but it really isn't" (Sleepanddreamsdatabase.org Dream Text: Most Recent Dream - Q15, 217 words, krippner_survey1:kengm71[Answer Date Unknown]). Often, people with this delusion have a specific theory or belief about who their loved one has been replaced by – perhaps a robot or clone – and for what purpose – for example, aliens have been sent to earth to observe human behaviour (Coltheart et al., 2007). This is similar to the confabulations and irrational reasoning common in dreams (Hobson, 1997; Hobson et al., 2000; Metzinger, 2004).

Misidentifications of persons and places are very common in dreams (Schwartz et al., 2005). Self-misidentification also occurs. Dreamers may believe they are someone else with a different gender, job, life, personality and memories. In these *vicarious dreams*, it is unclear whether the dream 'protagonist' is the same person as the waking individual (Rosen & Sutton 2013). Losing touch with reality and your own personal identity may be akin to *reverse intermetamorphosis*, the delusional belief about "a physical and psychological change of oneself into another person" (Breen et al., 2000, p. 75) or grandiose delusion, the false belief of being famous or powerful (Knowles et al., 2011).

While patients with delusions resist evidence that contradicts their delusion, it is not clear whether this applies to dreams. The dream scenario may provide evidence for the dreamer's otherwise irrational beliefs and perhaps no dream characters contradict them. Since dream content is generated unconsciously by the dreamer's own mind, it is unclear what is required to be rational when, say, contemplating one's abilities (Rosen, 2021a). However, reduced rational capacity and inability to reflect on bizarre occurrences in non-lucid dreaming are well documented (Kahan & LaBerge, 2011) and the similarities between dreaming and delusion are sufficient to give us a reasonable first-hand experience of at least some misidentification delusions.

An area of dream research that has received little attention is the sense of agency – the feeling of being in control of movements and thoughts. Interesting alterations to the sense of agency (SoA) occur in dreams that reflect some specific delusions of agentive experience.

5.2. Delusions of control

Recent work suggests that dreamers may experience specific alterations to the SoA that occur in people with schizophrenia. Changes to the SoA and self are quite common in dreams (Rosen, 2018b, 2021b). Dreamers undergo paralysis (Schredl, 2010), being a passive observer of dream

events (Occhionero & Cicogna, 2011; Rosen & Sutton, 2013), and feeling as if their dream-body is moving on its own (Rosen, 2015). Nightmares in which dreamers attempt to run or shout but are unable to are especially common in children (Nielsen & Zadra, 2011). Paralysis, however, may be somewhat less common than dream reports lead us to believe since it is highly salient, likely to wake us up and be remembered (Robert & Zadra, 2014). Despite this, their memorability makes these types of dreams particularly useful for research. Passive dreams in which the dreamer simply observes what is going on around them are common. Sometimes, the dream scene is passively observed from above, known as the observer perspective as opposed to the normal field perspective (Wollheim, 1984). Real events are sometimes also remembered from this observer perspective (Sutton, 2010), so this feature is not entirely outside the realm of waking experience. In contrast, SoA can be greatly increased in dreaming, which might at times replicate delusions of grandeur (Knowles et al., 2011). Increased SoA is common in lucid dreams (Windt & Voss, 2018) although such dreams are less likely to be delusional (Rosen, 2021b) since lucidity is often associated with increased metacognition and rationality along with increased control (Dresler et al., 2016; Pålsson, 2018).

A rare example is the experience of one's body being 'taken over' by some force or external controller (Rosen, 2015). These particular experiences may allow a neurotypical person to feel what it's like to have *passivity symptoms* such as anarchic limb syndrome, the feeling that one's limb is moving on its own, or alien limb syndrome, the belief that one's limb is controlled by an external source (Frith & Done, 1989; Spence, 2002). Whereas anarchic limb syndrome itself may not involve delusional thinking, simply the experience of the limb being out of control, alien limb delusion involves an irrational attribution of the movement to a specific entity. In alien limb-like dreams, the dreamer may attribute their movements to an external force, such as a demon or alien, with specific characteristics and intentions. While understanding what it feels like for one's limb to rise on its own might be difficult, the delusional element adds further complexity and 'otherness' that could be dissipated by having such a dreamed experience.

The following reports give a strong suggestion of similarity between dreams and alien limb delusions. The first reports are from patients with schizophrenia.

I felt like an automaton, guided by a female spirit who had entered me during [the arm movement].

I could feel God guiding me (Spence et al., 1997, p. 2001)

The following reports are taken from an online dream database (sleepanddreamdatabase.org) and the Barb Sanders dream series (Domhoff, 2003), respectively.

I stand there for a second and suddenly there's this great big power that takes over. It's kind of like a hurricane force, it keeps me standing still and I can just barely move with a great effort. (Alta: a detailed dreamer: #200 (10/3/87))

A she-devil comes and tells me she's got total control of me, or soon will, so I might as well stop struggling. I feel her mind take over mine and I feel angry and helpless. I struggle. She laughs and lays me down […] Barb Sanders: #1776 (02/10/91).

There are many complexities involved in interpreting the content of these dream reports (Rosen 2013, 2015). For example, in the latter, it is unclear if the she-devil is present in the narrative, or whether the dreamer simply feels that it is a she-devil controlling her. It seems likely that Barb is describing 'telekinetic' type control since she doesn't describe how the entity looks nor mention whether or not they are present, but it is possible that the entity is physically restraining her, which would not be a good analogy for alien limb syndrome. Vague descriptions are a limitation to the study of dream reports as subjects are generally not skilled at introspecting and unambiguously describing their phenomenal states. Also, when uncontrolled by experimental specificities, both dream and waking reports tend to focus on narrative elements rather than bodily sensations and thoughts. Carrying out microphenomenological interviews on dreamers, a method that involves researchers guiding subjects to focus on the specifics of their subjective experiences, could improve their ability to report such experiences with precision (Bitbol & Petitmengin, 2017; Petitmengin, 2006). Alternatively, clarifying which features the dreamer should focus on could achieve the desired end. However, such dreams, namely the alien limb type, are rare and may not occur in a small sample of lab participants, so such interviews would be difficult to carry out. For now, we must limit ourselves to analysing reports from large databases.

The aforementioned dream reports describe more detail about the surroundings and the context of the dream compared to the alien limb reports. This is understandable as the patients with schizophrenia have been tasked with reporting the specific experience of alien limb syndrome, whereas the dreamers are making freeform reports. In the first dream report, the controlling entity is only described as a 'big power', which is less specific than the reports from people with schizophrenia. However, the second report specifically describes a 'she-devil'. When focusing on the relevant aspects of the report, the similarity between dreaming and schizophrenia is striking. We could go so far as to say that Barb Sanders and the 'detailed dreamer' know what it's like to experience alien limb syndrome. There is also reason to think that thought insertion delusion can occur in dreams, another symptom experienced by some people with schizophrenia (Rosen 2015).

In general, cognitive features such as irrationality and poor inference making are common in both dream cognition and delusions.

5.3. Irrationality vs. lucidity

Non-lucid dream cognition often lacks metacognition, awareness, rationality, memory, focus and other features that are important for maintaining an understanding of reality (Desseilles et al., 2011; Hobson & Voss, 2011; Kahan & Sullivan, 2012). Dreamers often are unable to assess bizarre events accurately, instead, accepting them as commonplace. This is so common that almost everyone can report such an experience. Being unable to distinguish plausible from implausible thoughts or events is a common cognitive attribute that is also a symptom of delusional thinking. Delusional patients are unable to assess their own confabulations as implausible (Bortolotti, 2018). In contrast, lucid dreaming, where the dreamer realises they are dreaming (LaBerge, 1981) is less likely to be delusional due to increased cognitive capacities. Lucidity is commonly associated with improved metacognitive ability, rationality, and

is often brought about by a 'pre-lucid' stage, questioning whether a bizarre experience is real (Filevich et al., 2015; Pålsson, 2018). Lucid dreaming is, however, quite rare, with 50% of individuals being unable to remember *ever* having one (Appel et al., 2017). Interestingly, questioning whether the dream is real does not always bring about lucidity. The following *pre-lucid* dream demonstrates some rational capacity but is followed by irrational assessment.

The hotel building is large and there are three sets of elevators in it. I have the feeling that this is a dream I've had before—at least the elevator part [...] I remember asking someone else who was getting on [the elevator] at the same time, but they didn't know either (Dream Text: Last Night's Dream - last_nights_dream, 329 words, tad_series:tad[2012-04-26]).

Here, the dreamer questions whether they might be dreaming, but then asks another dream character for verification and fails to become lucid. If the dreamer had maintained normal waking cognition, they would have realised that this method of 'reality testing' is irrational. This display of altered cognition is a type of delusional confabulation.

Irrational cognition in non-lucid dreams is similar to the irrational thought processes underlying delusions. At times, we hold unusual and perhaps contradictory false memories (Horton & Malinowski, 2015). Confabulation is also common, similar to the delusional confabulation of those with Alzheimer's or dementia (Corlett et al., 2010). We are also prone to confabulating dream reports after waking (Parsons & Rosen, 2018; Rosen, 2013) suggesting there is a carry-over effect from dreaming to waking. This accounts for only a small subsection of delusional types of dreams, but the similarities between dreams and delusions are apparent.

5.4. Dreams as VR

Dream experiences at times involve delusional thought patterns. It is somewhat more difficult, however, to ascertain whether dreamers accurately experience what it's like to be a delusional person in the real world. For this to occur, the dream-self would need to be embedded and embodied in a hallucinated world model that not only replicates delusional thought processes but also what it is like for the waking delusional person navigating the waking world with the difficulties that entails. Having mental illness involves practical and social constraints as well as the experience of being seen as mentally ill. How well the dream world replicates the waking world differs depending on the theory of dreams. According to the 'received view', dreams are three-dimensional, immersive hallucinations that occur when we are shut off from the external world (Hobson, 2002; Hobson et al., 2003; Windt, 2010). Thus, dreams at least replicate what it is like to navigate some kind of virtual world (Revonsuo, 1995) possibly even *social* reality (Domhoff & Schneider, 2018; Revonsuo et al., 2015). However, if dreams are simply a form of imagination (Ichikawa, 2016) or unrealistic simulation similar to mind wandering (Noë, 2007), dreaming would not be a suitable VR simulation since, under this view, dreams simply involve bizarre, unusual thoughts occurring during mind wandering whilst asleep. There is reason, however, to think that dreams can indeed be convincing world replicas, and for this reason, it is also likely that delusional dreams can be realistic VR delusion simulators. Dreams reports suggest that at times, the dream world is highly realistic. While lucid

dreaming is less likely to simulate delusional experience, as previously argued, because of the increased cognitive capacity, lucid dreamers can pay attention to how vivid and realistic the dream world is. They often report that the dream world is quite vivid and convincing (LaBerge, 2000; LaBerge & Rheingold, 1991).

I had a lucid dream. I was in a canyon, my mind told me it was the grand canyon, never been there but it was what my mind had depicted it to be. I just started floating over it, it was amazing, breathtaking and realistic. (Dream Text: Most Recent Dream - Q15, 49 words, harris_2013w:006522 [2013-01-01]).

Lucid dreamers' ability to pay attention to their surroundings and experiences means that it is not simply a lack of scrutiny that makes their dreams pass as realistic. Realistic 'false awakenings' are also a convincing example of how the dream world can replicate waking experience. They can be so realistic that the dreamer is unsure whether they had been dreaming after waking (Buzzi, 2011). Such false awakenings can quite accurately replicate the details of the real bedroom (McCreery, 2008). The dream environment can thus be a convincing virtual reality.

If the non-lucid dreamer can at times be embedded in a vivid and immersive yet bizarre reality while their cognitive capacities are altered, leading to experience of delusional thought or other mental disturbances, they will find themselves in a virtual reality that is similar to what it's like to have a waking delusion. An example of this would be Capgras-like experience in an otherwise normal dream setting. In the following report, the dreamer first describes a false awakening in which they 'wake up' to a normal setting, have a relatively normal discussion with their mother and then experience an odd misidentification of character.

[...] I also told [my mom] I had had a really odd dream, and that I always have odd dreams when I am napping. I found my clothes and got dressed. I walked out and there was Tabitha and Nelly the rap artist and one other dude all sitting on the floor watching TV. Although Nelly wasn't Nelly in the dream he just looked like him. (Dream Text: Last Night's Dream - last_nights_dream), 365 words, km2015:km[2003-04-17])

Although there is some vagueness as to the specifics of the delusion, the most plausible interpretation is that the dreamer is experiencing something similar to Capgras – seeing a person who looks like Nelly but isn't. An alternative that happens in some dreams is when the dreamer sees someone who doesn't look like X, but they know it is actually X, so a Fregoli-like experience. Dreams, I conclude, can be VR delusional simulations. They can inform us about what it's like to experience many of the cognitive features of waking delusions. That being said, dreams are not the only way to induce psychosis or delusions. Hallucinogenic drugs can replicate altered conscious experiences that occur in psychosis. Early research found that "severe disturbances in body image, affect, attention, and thinking which closely approximated the primary symptoms of schizophrenia" occurred during the use of psychotomimetic drugs (Rosenbaum et al., 1959). Preliminary results also suggest that psychedelic use in experimental conditions can promote wellbeing (Carhart-Harris et al., 2016; Gonzalez et al., 2021; Wießner et al., 2021). But psychedelic intake is not recommended for personal use and is potentially harmful.

Dreams are relatively safe and without negative side effects compared to drug intake. The viability of dreaming as VR simulation of delusions used to increase empathy, however, needs further assessment.

6. Using dreams to increase empathy

I have argued that nearly everyone experiences delusional dreams. It is plausible that the mechanism that leads to an increase in empathy after VR experiments is an increase in understanding of what it's like to undergo someone else's experience. If dreams can inform individuals of what it's like to undergo delusional altered cognition and consciousness but in a realistic virtual reality, then dreaming can potentially improve empathy for those who undergo delusions and psychosis. There are, however, some limitations.

According to the threat simulation theory, (Valli & Revonsuo, 2009) a plausible evolutionary explanation for dreaming is that they allow us to practise responding to dangers and threats, improving performance in waking life. Whether this is an accurate evolutionary explanation, there is evidence from several lucid dream studies that dreaming can improve motor performance (Erlacher et al., 2015; Schädlich et al., 2017; Stumbrys et al., 2016). As mentioned previously, lucid dreaming is not a suitable research tool for delusional dreaming, since they are less likely to be delusional, however, this gives some evidence that dreaming can improve performance in general. Dreaming might provide similar practise scenarios for social interaction (Tuominen et al., 2019) although whether dreams have a specific effect on empathy has not been tested. If gaining understanding about 'what it's like' is indeed what improves ability to empathise, then dreams should be able to serve this function for a broad range of mental illnesses. However, if such dreams are common, why aren't we more empathetic towards people with mental illness? One could argue that experiences can only improve performance if they are incorporated into autobiographical memory (Schacter, 1996) and most dreams are forgotten. Participants woken under ideal conditions for memory retention – in a dream lab during REM (rapid eye movement) sleep – report dreams 80-90% of the time (Domhoff, 2003). Since around five to six REM stages occur every night and more than one dream narrative can occur in a single REM stage, we can infer that most people have, and forget, multiple dreams per night (Hobson, 2005).

To learn from one's dream experience and use our knowledge to understand the plight of people with mental illness, a likely requirement is to remember such dreams. Increasing dream recall is possible, simply by thinking "I will remember my dreams" while falling asleep (Schredl et al., 1996). There are also a variety of apps that can wake dreamers during REM sleep, somewhat replicating lab conditions, which greatly improves recall (Ko et al., 2015). This technique disrupts sleep, however, so it is not appropriate for long-term use. An alternative that wouldn't disrupt sleep is to use an app to plan one's normal morning waking time to occur during the closest REM stage. Dreams can rapidly fade from memory upon waking but this can be counteracted by attempting to write or record the dream immediately upon waking. Remembering is the first step to using dreams to increase empathy. Lucid dreaming improves dream memory and can also allow the dreamer to control their dreams (Mallett, 2020), however, since dreaming cognitive capacity is generally improved or restored to waking levels (Stumbrys

et al., 2015; Voss & Hobson, 2014) bringing about lucidity lessens the chance of a delusional dream. Increasing lucidity for the purposes of bringing about a delusion-like experience might be counter-productive.

Not only are non-lucid dreams difficult to remember, but they are also difficult, if not impossible, to control. One cannot plan to have a Capgras-like dream in order to learn empathy from it. Scientists can't induce specific non-lucid dreams in experimental subjects to study their effects, limiting research on the effectiveness of such training. It is likely for such a dream to happen randomly – eventually. If most of us have at least once remembered a delusional dream, however, the question remains: why we aren't better at empathising? Beyond simply increasing recall, individuals need a better understanding of dream experiences.

Dreams are often dismissed as meaningless because they are bizarre. In VR empathy research, participants realise that they are being put into the shoes of another. Dreamers may not understand that they have experienced specific delusions. Increasing awareness that dreams replicate delusions could motivate individuals to attempt to use their dream experiences as VR. If we consider our own dreams as VR delusion simulators rather than simply unusual night-time hallucinations, we could realise that we have been in the shoes of those with mental illness. However, another limitation to dream VR is that it cannot replicate all mental illnesses.

Dreams as VR may not be suitable for improving understanding of depression, other long-term illnesses, or the discrimination people with mental illness face. Prima facie, the long-term nature of experiences cannot be replicated. While replicating the experience of being in the world while being delusional can broaden our understanding of aspects of mental illness, dreams can be as short as a few seconds or as long as 90 minutes, so the chronic nature of disorders isn't simulated. Symptoms of depression such as sadness, rumination, pain, discomfort and low self-worth can be stimulated, but the ongoing nature is a key element of what separates depression from sadness and low mood (Beck et al., 2014). One might argue, however, that false memories *can*, to an extent, simulate the belief that the condition is persisting. This, I believe, could simulate depression, under the right circumstances. However, it is unlikely for this very specific type of dream to occur often. Further, the variety of symptoms experienced by people with depression would not all occur simultaneously. For example, finding less enjoyment in activities, fatigue and rumination vary amongst individuals with depression (American Psychiatric Association, 2013) and it would be rare for such a broad variety of specific symptoms to occur in a single dream. It is also unlikely that all symptoms of depression such as change in sleep patterns and appetite *can* be replicated.

If an inability to extrapolate from one's own experience partly explains our lack of empathy for those with mental illness, it's not clear why empathy for depression is so difficult. As with empathising with a person in pain, most of us have felt extremely sad, ruminated on negative thoughts, and experienced at least some of the symptoms of depression. Why is it so difficult to imagine what it would be like to feel that way for an extended period of time? Similarly, people suffering from functional somatic syndromes such as chronic fatigue and fibromyalgia experience little empathy but significant discrimination and stigmatisation. We should be able to extrapolate what it's like to suffer long-term fatigue or pain. Perhaps 'what it's like' is not the cogni-

tive gap here, but rather we don't trust people's testimony, or we blame the individual, believing that the techniques we use to improve our mood should also work on a depressed person. Perhaps we *choose* not to empathise. Alternatively, perhaps there is something that can't be grasped by extrapolating "what would it be like to feel this way, but for longer". Perhaps the social stigma itself works against our desire to try to empathise in the first place. There may be bi-directional causation between reduced empathy and social stigma. Dreams may go some way towards making us more empathetic, but individuals must first trust the testimony of others and be willing to put in the mental effort.

7. An evolutionary adaptation?

According to the aforementioned hypotheses, dreams might have evolved to improve our ability to respond to threatening circumstances (Valli & Revonsuo, 2009; Valli et al., 2005) or interact socially (Revonsuo et al., 2015; Tuominen et al., 2019). Could improving empathy have been an evolutionary adaptation? One might argue that since some of us remember few or none of our dreams, this role would by necessity be limited, and there is no evidence to suggest that people who remember their dreams are more empathetic. Dreaming might, however, have unconscious effects that are not stored in autobiographical memory. If we indeed have multiple sessions of REM sleep each night, most of which include dreams, several hours of nightly dreaming could affect our waking lives. It is difficult to ascertain whether dreams assist with empathy development or, more specifically, impact the empathy we have towards those who are neuro atypical. Since nearly everyone dreams, it is difficult to compare dreamers with non-dreamers. This hypothesis is also perhaps less plausible when we consider how we lack empathy for those with mental illness.

Could dreaming, however, have a more general effect on empathy in that dreams allow us to enter social situations and practise social interaction? Again, this would be difficult to test but possible considering how common social interactions are in dreams (Domhoff & Schneider, 2018; Revonsuo et al., 2015; Tuominen et al., 2019). Dreaming may provide an opportunity to walk in another's shoes several times a night, which could provide benefit to the waking individual despite these dreams being forgotten. As an evolutionary explanation for dreaming, however, there is insufficient evidence and, at this stage, this is no more than speculation. It is also unclear how such a selective benefit could have occurred when it is likely that other species that can dream, including our primitive ancestors, lack cognitive features such as empathy (Springett, 2019). However, it would be interesting for future research to see if dreams can provide social benefit via empathy training as they have shown to improve motor skills.

8. Conclusion

Using dreams as virtual reality simulations of delusions and psychosis may be able to increase our empathy towards those suffering from mental illness similar to the way virtual reality simulators can increase empathy. However, such learning may be restricted by our motivation as well as our ability to remember these experiences, see them for what they are, and reflect on them. Research shows that we have insufficient empathy towards those with mental disorders. Digital virtual reality can increase our empathy towards indi-

viduals from stigmatized groups by showing the participant what it's like to be one of those individuals – to an extent. Dreams, however, can create VRs beyond our current technological capacities regarding multi-modality, embeddedness, and realism. They can also replicate a wider variety of experiences. Dreams can give us the emotional stimulation, alterations to cognition and other unusual attributes of delusions and psychosis that cannot be captured by modern VR technology. We usually believe we are awake when we are dreaming, and the experience is often highly immersive. What is required to increase empathy on an individual level is to attempt to remember and reflect on these experiences when they occur. It is unlikely that empathy generation is the evolutionary purpose of dreaming. However, insofar as delusions are transformative experiences, a type of experience that cannot be comprehended beforehand, dreaming as delusion simulation has epistemic value. Future research into the extent to which dreams can improve empathy would be a valuable pursuit and improving methods of remembering dreams could be a promising path towards reducing stigma and discrimination.

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