

Are You Dreaming? A Phenomenological Study on Understanding Lucid Dreams as a Tool for Introspection in Virtual Reality

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ABSTRACT

Virtual reality (VR) is resurging in popularity with the advancement of low-cost hardware and more realistic graphics. How might this technology help others? That is, to increase mental well-being? The ultimate VR might look like lucid dreaming, the phenomenon of knowing one is dreaming while in the dream. Lucid dreaming can be used as an introspective tool and, ultimately, increase mental well-being. What these introspective experiences are like for lucid dreamers might be key in determining specific design guidelines for future creation of a technological tool used for helping people examine their own thoughts and emotions. This study describes nine active and proficient lucid dreamers' representations of their introspective experiences gained through phenomenological interviews. Four major themes emerged: sensations and feelings, actions and practices, influences on experience, and meaning making. This knowledge can help design a VR system that is grounded in genuine experience and preserving the human condition.

Author Keywords

Virtual reality, design, lucid dreaming, introspection, well-being, positive technologies.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous

INTRODUCTION

Technology is becoming more and more ingrained in our every day lives, yet it is only recently that HCI researchers, technologists and designers have paused to think about how these technologies could be used to better our lives and increase our well-being [2,23,53,61]. While many mobile applications designed for this purpose exist [43], one area that is still largely unexplored is virtual reality (VR). VR offers a low-cost and high quality simulation of

environments and situations, which could be a powerful way to generate positive change in a non-threatening way because users can explore and play out situations they normally would not be able to do in real life. VR is unique in that it can completely immerse its users, that is provide the psychological experience of being completely absorbed in a physical or mental activity such that one loses sense of time and the outside world [32]. Immersion has been shown to increase presence, the physical feeling of being in the simulated environment, which in turn enhances the effectiveness of the experience [12,14,51]. However, the question remains how to design for an effective VR experience that can elicit positive mental well-being? There exists a real life phenomenon that takes people into a simulated world that feels completely real and might generate a sense of positive well-being: lucid dreaming. Lucid dreaming is defined as knowing one is dreaming while in the dream [39]. Once lucid, lucid dreamers have the ability to explore, shape, or create the environment as they see fit. Lucid dreaming, it seems, is the ultimate virtual reality in this respect because the lucid dreaming experience is only limited to one's imagination. As far as these authors could find, there does not appear to be any literature that focuses on lucid dreaming experiences specifically to inform the design of virtual reality experiences.

We conducted a phenomenological study of nine active and proficient lucid dreamers. We interviewed the lucid dreamers about their experiences of lucid dreaming particularly focusing on lucid dreams involving introspection in order to answer the following research questions:

Main question: What are people's experiences of introspection in lucid dreaming?

Sub-questions:

1. What images, sounds, and other sensory stimuli are present during moments of introspection in lucid dreaming?
2. What are their relationships to the "feeling tone" and intensity of the emotional stimuli?
3. How might these experiences inform the design of an immersive virtual reality introspective experience?

From these interviews, we drew four major themes that could inform the design of an immersive virtual reality

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experience involving introspection: sensations and feelings, actions and practices, influences on experience, and meaning making.

There are two main contributions of this work:

1. Design considerations for introspective virtual reality experiences;
2. Interviews with proficient lucid dreamers that ground technological systems in a human experience.

RELATED WORK

The work presented in this paper intersects multiple fields: it builds on positive technologies, focusing on virtual reality, and incorporates the real-life phenomenon of lucid dreaming in the context of introspective practices. These fields are briefly presented below.

Positive Technologies

There has been a recent importance put upon designing for increased mental health and well-being in the HCI community [23], with new research areas evolving such as *Positive Technology* [2,50] and *Positive Computing* [7,8]. Currently, there exists several overlapping well-being tech movements among designers and technologists, which Mossbridge [43] has summarized in a review of *Transcendence Technology*. One focus of this research is on user experience (UX) and recognizing the importance of considering the human condition when designing for technologies [23]. That is, how can we design technologies that actively support well-being and human potential?

In this study, we seek to ground design recommendations in real human experience through phenomenological interviewing of a very personal “virtual” world of lucid dreams.

Virtual Reality

Virtual reality is defined as the “model of reality with which a human can interact, getting information from the model by ordinary human sense such as sight, sound, and touch and/or controlling the model using ordinary human actions such as position and/or motion of body parts or voice” [27:31]. It has existed for decades, though it is only recently that the latest generation of head-mounted displays (HMDs) have become more affordable and accessible to the general public. Moreover, VR has the unique capacity to completely immerse its users in any environment, a component closely linked to presence or the feeling of being in the virtual space. Presence has been deemed central to a VR experience, often used as a “gold standard” or having validity. Some researchers have argued that presence is an important goal in transferring VR application data to the “real world” [42]. VR could act as a medium through which people can increase their mental well-being if there exist high levels of presence [20].

Already, VR has been used for therapeutic purposes, such as PTSD treatment [54], anxiety treatment [46,47], and pain management [25,60,66]. Moreover, VR has been used in a variety of stress-reduction and meditation or mindfulness-like applications [52,56,62]. It is clear that

there is potential for VR to support well-being. However, the way in which designers and technologists create these experiences while keeping the human condition intact remains an open question.

Lucid Dreaming

Lucid dreaming, “dreaming while knowing one is dreaming” [37], is one phenomenon that we can draw parallels to a VR experience. It is a genuine human experience that places a person in a “virtual” reality, i.e., their dream, which feels just as real as their waking reality. At the same time, lucid dreamers are aware that they are in a dream and that nothing in the dream has real-life consequences, much like that of a VR experience. Some researchers have dismissed the validity of lucid dreams, stating there was no evidence lucid dreams were distinct from rapid-eye movement (REM) sleep [41]. However, several behavioural studies have since provided evidence that lucid dreams were possible [28,35,38,39]. More recently, technological advances have allowed researchers to record lucid dreaming with EEG, EMG, EOG, and fMRI [17].

Psychophysical studies [17,42] support the view that what people experience during REM sleep and lucid dreaming is the same as if actually experiencing it during waking life. This means that lucid dreaming could be used as a therapeutic tool because one can essentially do anything within the limits of their imagination, and that experience will have similar effects as if one experienced it in waking life. The parallels of lucid dreaming and VR are uncanny; by learning what enables lucid dreamers to have such powerful introspective experiences, we might also learn some valuable guidelines for recreating similar experiences in VR.

Introspection

One way lucid dreaming, and thus VR, could be used as a therapeutic tool is for introspection – the examination or observation of one’s own mental and emotional processes [5]. Introspection can provide privileged access to our own mental states – including sensory, bodily, cognitive, and emotional – that are not mediated by other sources of knowledge, so that one’s experience of the mind is unique; and this can be beneficial in a clinical and general sense [34]. Moreover, introspection can increase the quality and quantity of information people have about themselves and break down the barrier of the ego that affects how people process information about themselves [9].

Many dreamers report that they use lucid dreaming for introspection, such as dealing with psychological issues or spiritual growth [55]. And, researchers have suggested that applications of lucid dreaming could include nightmare reduction, treating depression, and rehabilitation [59]. However, learning the techniques of lucid dreaming takes time and discipline, and one may not even experience a lucid dream until a month into keeping a dream journal, setting an intention each night to lucid dream, and doing reality checks – such as checking how many fingers you have sporadically throughout the day [36]. Additionally, many people still feel skepticism towards lucid dreaming because of dream report inaccuracy [41] and its ties to spirituality.

One could potentially induce lucid dreaming through frontal low current stimulation of gamma activity. A

research group stimulated a certain area of the brain with transcranial alternating current and it was effective ~70% of the time in giving naïve participants lucid dreams [63]. However, the mere induction of lucid dreams ignores the many benefits that surround the practice of lucid dreams and the ultimate goal of being present or aware of your surroundings and ego in waking life [36]. Approachable ways to introduce the concepts of introspection are important in generating true and genuine experiences with technology so that we can keep the human condition and experience intact.

We propose investigating the experiences of introspection in lucid dreaming so that we can inform the design of an immersive technological system (VR) that can be used as a tool for introspection in order to help people explore or understand their internal states, ultimately creating a more positive sense of mental well-being.

STUDY METHODOLOGY

The goal of this phenomenological study was to describe the essence of what it is like to introspect in lucid dreams. The experiences gleaned from describing what it is like to introspect in lucid dreams and its context could be useful for designing a similar experience in the format of an immersive technological system in virtual reality.

Participants

We interviewed nine participants who are currently active and proficient lucid dreamers. LaBerge [37] recommends the following when selecting lucid dreamers as participants:

(1) verify that informants understand the concept of lucid dreaming by requiring the inclusion of a recognition phrase in a sample lucid dream report and

(2) use highly trained participants who are skilful and accurate observers of their conscious experiences.

In an entrance survey, we determined that the average time participants have been actively lucid dreaming is 20 years, and the average frequency of lucid dreams is 1 per week. Participants (6F, 3M) were the age of majority where the research was conducted, with an average age of 35 years (19-57 years range). We posted online advertisements on social media groups (e.g., Facebook and Twitter) and lucid dreaming forums. Participants for this study were naïve to this study and did not have prior relationships to us in order to decrease any potential power imbalances and increase the validity of their reports.

Research Site

The interview took place in a quiet and undisturbed place, where there were little distractions and the participant could focus on the interview. The interview was in a neutral location as to not create an imbalance of power between the researcher and the participant. If possible, the interview was conducted at a place where the participant was comfortable and relaxed, in order to create an environment that allowed them to open up about their experience. Some interviews were conducted over online video conferencing for the participant's convenience.

Data Collection

From a quantitative perspective, researchers are concerned with discovering facts about the phenomenon and assume a fixed and measurable reality. However, the nature of dreams, especially the content of dreams, is dynamic and a negotiated reality; this is much better suited to qualitative methods, which are more concerned with understanding human behaviour from the informant's perspective and does not assume a fixed reality [11,44]. It is very difficult to conduct research relating to dream content for a variety of reasons, most notably is that we cannot watch dreams while they are happening and the dreamer cannot report them while the dreams are happening. Therefore, there is no way to have objective evidence concerning the content of the dreams. Some quantitative researchers have used neuroimaging techniques, such as EEG and fMRI, to study which areas of the brain are active during dreams [17,29,64]. However, one could argue that this is fundamentally different than collecting data on what the dreamer actually perceives. Most dream researchers believe the best way to study dreams is through content analysis of dream reports, which can be from sleep laboratories, psychotherapy relationships, personal dream journal, and anonymous reports [15]. In order to gain a rich understanding of the phenomenon, this research needs to emphasize the context in which introspection in lucid dreaming occurred and the meanings of these lucid dreams for participants.

Using qualitative methods to study lucid dreams and their experiences with introspection, we intended to discover from the participants what kinds of sensations, feelings, and experiences they had during introspective lucid dreams, as well as the setting and conditions that lead to their experiences. Fallman argues for a philosophy of technology in HCI, building on Ihde's phenomenology of relations between humans, artifacts and the world, and Borgmann's suggestion to rethink the relationship and correspondence between "useful" and "good" technology [18,19]. In this same line of argument, we sought to give a new lens in which to provide guidance concerning how to incorporate specific values, namely introspection, in designing VR experiences. Phenomenology in particular has direct relevance to design [24]; several researchers have shown how phenomenology has been and can be used both as a theoretical stance and as a research approach [10,16,31,65].

We used semi-structured interviews that lasted 25 minutes to one hour in order to discover what participants have experienced in terms of introspection in lucid dreaming and what contexts or situations have typically influenced or affected these experiences. This phenomenological interview consisted of three main domains: contextualization (natural attitude and life world), apprehending the phenomenon (modes of appearing, natural attitude), and clarifying the phenomenon (imaginative variation and meaning) [1].

Interviews were audio recorded using the “Voice Recorder” app on a Samsung Galaxy S6 smartphone or Quicktime built-in audio recorder in order to be as unobtrusive as possible. It is important that the tone and feeling of the participants’ experiences also be taken into account when analyzing the data due to the very personal nature of the phenomenon. We wrote a reflection and debrief after each interview in order to capture any behaviours, tone, feeling, or impressions from the interview. Video recording could also serve the same purpose, though it is unclear if a visual component will add anything to the data and, given the personal nature of the study, a camera can feel more intrusive. Audio recordings of the interview and interview’s notes were imported into NVivo 11 for Mac, a qualitative data analysis software, and transcribed to text.

All interviews were kept anonymous. Contact information was stored on the university’s server. The university’s Institutional Review Board approved this study, and the participants signed informed consent forms. A demographic questionnaire was administered online using *Fluidsurveys* and was completed before the interview.

Data Analysis Methods

The method of analysing phenomenological data mentioned in Creswell’s *Qualitative Inquiry and Research Design* book [11] was used for this study, which is essentially a synthesis of Moustakas’ and Giorgi’s “psychological phenomenology” [26,44]. Here, we identified the main categories or meaning units and composed a textural description to capture what the experience of introspecting while lucid dreaming is like for participants, a structural description of the phenomenon, and a description capturing the essence of the phenomenon. Finally, we used these descriptions to inform design recommendations for introspective experiences in virtual reality. Quotes are followed by P#, where # denotes the participant’s ID.

RESULTS

From nine verbatim transcripts, four main categories or themes emerged across participants: sensations and feelings, actions and practices, influences on experience, and meaning making. Next, we will discuss our findings for each of these four main themes where we will highlight key insights.

Sensations and Feelings

Experiences of bodily sensations were prevalent in lucid dreams relating to introspection. These senses mapped closely to what participants had experienced in waking life, such as touch, smell, taste, sound, vision, and sense of space. There was a sense of clarity and heightened awareness of the environment when participants became lucid in their dreams. Lucid dreams were described as visually vivid, intense, bright, and graphic. One participant even likened their dreams as better than *Avatar*, a film renowned for its cutting edge visual effects and psychedelic qualities:

“It’s better than Avatar... the thing I love about it the most is that it’s just I get to see the environment that I love. So, really rich, thick kelp forests with sea dragons and cuttle fish and octopus, fishing, glowing neon lights.” –P8

Visuals seemed to be the primary sense in which participants experienced their lucid dreams, and even without any other sense present they still felt like they were immersed in the dream. In terms of other senses, lucid dreamers could smell, taste, and touch as if their dreams were real. There was a sense of complete immersion in the dream and at the same time lucid dreamers knew it was not actually real. In fact, even though there were many inconsistencies in the lucid dream, such as flying without wind, sound without a source or hands with too many fingers, this did not deter participants from accepting those inconsistencies and still having the feeling of presence as if in the real world. There too were senses that could not be explained in terms of our everyday experiences, or rather our language could not account for such an experience that is outside the realm of anything we have experienced before:

“...you don’t use your senses in your dreams. You have an impression of what the senses are like. Like a really distorted thing is vision; you can get into it, you can get lucid and you look out and you see something... so that the sense are, uh, I suppose the only way we know the world now. So, in a lot of dream states are the only way you can reference it. You want to see this and touch that and taste that and feel it.” –P1

Though some sensations cannot be described, the sensation around transitioning into the lucid dream straight from a waking state was described in detail by P9. They were able to witness and remember the transition into sleep with all the bodily sensations that come with that experience. Here they describe imagining being on a boat in the sea and remaining conscious of their bodily state while at the same time transitioning into this other world:

“In those 20-30 seconds... I could actually I started to hear the waves crashing on the boat and it just became more and more clear and I could sort of feel the boat moving in the sea and I could start to see all the mountains appear, but it was weird because I also felt my body on the couch, so it was like I was between two worlds. And slowly, as time passed... I could feel the vibrations, I sort of feel myself on the couch but it was just drifting away and my awareness started shifting into the boat and before I knew it, in maybe a minute or two, I was in the sea. Like it was clear as day. It was like the real world but I was actually just sitting on my couch.” –P9

The feeling of realness and presence existed even with knowing they were still actually on their couch. Visuals and vibrations were not immediately thrown at this participant, but rather there was a build up and an easing into the dream

space. This way of transitioning was so powerful for the participant that they felt in awe of the experience once they were in the lucid dream. Their imagination had come to life before their eyes.

In terms of emotions and affective states, many participants reported positive feelings of bliss, happiness, freedom, peace, lightness, and childlike-wonder and playfulness. This is particularly prevalent in lucid dreaming experiences of flying. In fact, almost all participants reported that they often flew in their lucid dreams because it was a fun experience, something they could not do in real life, and provided a means of letting go of any frustrations or worries:

"I also have these feelings of intense happiness and bliss and peacefulness and also exhilaration. I love flying and I love being out of control in my environment." –P8

Flying brought about feelings of both peace and excitement, perhaps from the flowing feeling from physically gliding through the air paired with the exhilaration of a superhuman like experience. These lucid dreamers liked to push the boundaries of what is possible and, in doing so, could experience something otherworldly; that experience was so powerful that it could have a positive influence on lucid dreamer's affective state.

Another feeling lucid dreamers seem to experience often was a sense of control over everything, omnipotence, empowerment, and limitlessness. Participants reported that they could move objects with their mind and that feeling of control gave them a sense of power:

"I just wake up going like I'm omnipotent! I love the telekinesis because it just feels so effortless as well." – P7

Because lucid dreamers could control and manipulate the dream environment with their will, they could create or mould the experience to their liking, which was very empowering. The experiences that lucid dreamers tended toward were often magical or living out a fantasy, whatever that may be. For one participant, this meant going to a grocery store and gorging on their favourite foods or foods they would normally restrict in real life:

"I can eat whatever I want. I went to the freezer section because I wanted a freezer cake, not like a regular cake but a whole thing of freezer cake. And then, someone had bought a calzone but then didn't want to eat it so it was like in front of me. So, I ate a whole calzone. I ate mac and cheese. There's always mac and cheese at Whole Foods. When I was eating a bunch of stuff and I woke up and I was like that was so exciting, like that's something I wish I could do; everything's free in Whole Foods and the carbs don't affect my blood sugar and whatever. So, I had a field day." –P2

From this account we can see that lucid dreams were a way for them to experience something they would not normally

be able to in real life, which may sometimes be due to physical restrictions. Moreover, any experience in a lucid dream does not have real world physical consequences, such as caloric intake, falling from a great height, or swimming with whales. Lucid dreams provide a safe and private space for people to explore different sensations and feelings without fear of judgment, and this allows them to really let go and find a sense of peace and state of non-suffering.

Actions and Practices

Participants reported acting within their lucid dreams by exploring, creating, playing, problem solving, and interacting with dream objects and characters. Exploring often involved nature, such as rocketing into outer space or swimming with dolphins:

"I think for me especially the ocean it speaks volumes to me for reasons I've spent a lot of time in and around the ocean and exploring it as a child. And I love it. I mean, to start off, I'm an ecologist, so I love the environment. I love nature and I explore the terrestrial environment all the time, but the ocean is one that I can't really get to in my waking life." –P8

Lucid dreamers could manipulate the dream space so that they could explore facets of the world unknown or unreachable to them. But it was not only physical spaces that lucid dreams could explore; they could also explore the nature of their own minds. One participant, P9, recounted a lucid dream in which they attempted to push the limits of what was possible in a lucid dream by counting down from ten in order to "go deeper" in the lucid dream. What they found was a dream scene of greater perceived "realness". The "realness" of the dream within a dream seemed to truly stay with this participant because, as they explained, it felt like a deeper level of being. Going even deeper, this participant found themselves in a dream scene of blood, gore, and violence, which they interpreted as going deeper into sub consciousness to the more primitive parts of human nature. It appears that exploring both physical and conceptual spaces is a large part of the experience of lucid dreaming for these participants.

Some participants would also create in a lucid dream. For example, one participant described walking through a gallery in their lucid dream and seeing all these beautiful paintings they could not have possibly created themselves, but in actuality it was their own mind that created them:

"I can't paint. I can't paint whatever, hopeless. But, there was a period of time when in my dreams when I said, you know, I want to go into a gallery and I want to see paintings in that gallery. I want them to be abstract. I want them to be beautiful... So, I wander through this gallery and I see all these paintings. I'm sure if I could have painted them, I'd be probably one of the most successful painters on the planet, but they're absolutely incredible. My mind has put them together for me; they

didn't exist until I saw them in the gallery and asked for them to be there when I went and saw it.” –P1

It is incredible what the mind is capable of when we test its limits and are in a space where we believe anything is possible, such as in a lucid dream. One could be the next Picasso or Cezanne if they were given the space to explore and create without the limitations and impositions commonly placed on them in real life. There was a magical quality to being in the lucid dream space, where the lucid dreamer was aware that it is all a dream and at the same time still received the psychological benefits as if having actually done or experienced those things in the dream.

A lucid dream also provided the space for problem solving or taking action in the dream to change it into a more positive experience. For a few participants, it was common to have nightmares. But rather than become frightened, they became lucid and realized they could take control of the situation to either escape or make it into a less frightening scene. There was a confrontation with the dream space itself, and a conscious decision to change their own mind into a more positive state:

“I think it was a couple years ago it was a zombie dream. I was watching a lot of Walking Dead, so it started off as a nightmare and then it became kind of fun. I realized that I could hover above it and I wasn't in danger and I could kind of watch it as if it was happening – like sometimes the dreams turn into kind of like I'm watching a movie or something. It's entertaining and I don't want to wake up.” –P4

What participants do or how they interact in their lucid dreams showed that they had some agency and sense of control that was both empowering and fun. Lucid dreams were a playful space to explore and experiment within the safe confines of one's own mind. And, it was not only the contents of the lucid dream that seemed to be important, but also the practices surrounding lucid dreams. Almost all of the participants reported some sort of practice in attempting to increase their lucidity. This included more systematic and scientific approaches such as reality checks, continuously questioning the nature of reality in real life in hopes that when you were in the dream space you would do the same and realize you were dreaming, taking supplements, keeping a dream journal, and tracking bodily states. Reality checks were important to establishing lucidity for participants because it was one way of being certain they were dreaming, e.g., plugging your nose and attempting to breathe (P2). There were more spiritual and ceremonial approaches as well, including lighting incense, opening oneself to the experience and letting go of the ego through meditation or yoga, and focusing on the breath through mindfulness practices. Many of these practices, mentioned by participants, have been demonstrated to help achieve lucidity in the literature [21,36]. Whichever method of helping to induce lucid dreams, it is clear that there was some preparation or ceremony surrounding the

practice. One participant spoke to the importance of ceremony going into a lucid dream:

“I think ceremony is probably most specific because it [lucid dreaming] doesn't mean anything if you're not using it for a certain reason, right? So... getting into the state of ceremony because I think ceremony teaches us how, and that's I guess probably even with technology, like even just turning on, having to make your bed or something like that, having time to lay down, having cushions, be comfortable, all sorts of ceremony, right? So, those states of taking the time to do this, to get ready, so that we are ready and we can get into the state. [Ceremony] just tells your mind, like I'm getting into the state now, something different, it's not the regular; pay attention and allow our spirit to show up.” –P6

Setting an intension and focusing attention seem to have a profound impact on the level of lucidity, and ultimately the outcome of the lucid dreaming experience. It is rare that a lucid dream will occur at all if one is not creating a habit or ritual around it, much less the fanciful awe-inspiring ones experienced by the most dedicated and experienced lucid dreamer.

Influences on Experience

Self-awareness and Focused Attention

Lucid dreaming and the practices surrounding it have commonalities with other introspective methods, and often participants would be using these other introspective methods in tandem with lucid dreaming. A common practice reported amongst participants was meditation:

“10-15 meditations that are like a body scan or deep relaxation type of thing, that's like you know, relax your head, relax your shoulders, doing that type of thing... I tried one... Bilateral stimulation. So, that's what this is called, it's like a ticking or beat that alternates between your ears and its supposed tone, it's used as a treatment for people with, who have experienced trauma, like helps people work through or heal trauma or something... I felt more aware of my dream and I don't know if it's linked to that or because I thought it would impact them or something. I don't know if it did. But, I could remember specifically, the morning dream that I had after listening to that meditation, I felt more aware of it.” –P5

Being aware of the present moment and focusing on the body is the most commonly reported type of meditation amongst these lucid dreamers. The practice of lucid dreaming was about being aware of reality – what was real and what was not – in order to gain lucidity and control over what was happening in the dream space. So, these two practices compliment each other: both attempting to achieve greater awareness of what was happening in the environment and the self. One participant even mentioned a practice called Dream Yoga – an extension of lucid dreaming only more of a spiritual practice, founded in

Buddhism, where one studies the mind using the medium of dreams [30]. Lucid dreaming, on the other hand, does not have as many spiritually oriented methods and, thus, might appeal to a wider audience. One type of meditation P5 mentioned is bilateral stimulation, which could involve listening to tones that alternate between the left and right sides of the head, and is reported to decrease physiological arousal and increase attentional flexibility [13]. Decreased arousal and increased attention could be linked to this participant's lucidity in dreams, though they profess to not be sure if this was a placebo effect or not.

Negotiating with Reality

Other experiences that seemed to be linked to participants' lucid dreams, but were distinct experiences, were the following: out of body experiences (OBEs), astral projections, and false awakenings. OBEs are defined as perceiving the self outside one's body, often from a distance and are involuntary. Astral projections are like OBEs, except they are voluntary. Finally, false awakenings are vivid and convincing dreams that feel as if one has awoken, yet the dreamer is unaware they are still dreaming. This is in contrast to lucid dreaming where dreamers are aware they are dreaming while in the dream. All of these experiences seemed to be either extensions or side effects of lucid dreaming practices. That is, when one plays with perception and consciousness in lucid dreaming practices, sometimes the mind can turn that around and give the impression of leaving one's body or that one is awake when still dreaming. Furthermore, when one is an experienced lucid dreamer, they can push the boundaries of the dream further and do things like go out of their own (dream) body:

"There's a point where you can become body-less, you can extend beyond yourself, you can lose your concept of self, you can dig deeper... There's a place which I call the void and you go in a dream, and go from one dream to another through a mirror into another one. And you get into what I call a pillar state where you'll have, as if it's a whole lack of imagery but it's a lot deeper. I say your watching thought before it's formed up into anything, just raw thought." –P1

Setting an Intention

In addition to these related practices to lucid dreaming, these participants would often use psychology treatments or conditions to enhance or make sense of their lucid dreams. One practice, already previously mentioned by P9, was to count down from ten, similar to hypnosis – a state of consciousness where a person is more suggestible. P2 explicitly said they used hypnosis as a way to *"hack your thoughts, to make yourself think how you want to think in order to increase your confidence or feel better"*. These practices of introspection, like hypnosis, seemed to help with lucid dreaming because of an ability to be in a more suggestible space and suspend disbelief in order to experience or accomplish the impossible. Cognitive behavioural therapy (CBT) was another psychological treatment mentioned by a participant that complemented

lucid dreaming in its ability to look at a situation or thought more logically:

"It was like the breaking down of the disillusion in CBT and looking at things more logically, [that] kind of felt like how I dealt with my dreams. You know, when you're not lucid everything is an illusion and you're not in reality until you think about it logically. You realize... everything is a figment of my imagination." – P2

Gaining Control

They were able to use the techniques from CBT to bring about a sense of clarity and heightened awareness in their lucid dreams, and in doing so had a much richer and meaningful experience. In terms of psychological conditions, one participant likened lucid dreaming to psychosis – a mental condition characterized by losing contact with external reality:

"You're in this state where you can't, like with psychosis, see reality and you can't snap out of it. But then that rational part of your mind can be reasoned with a bit. So, I've tried to be like [this], you know when you're dreaming and you can suddenly realize you can control it." –P4

P4 was describing the struggle of becoming lucid in a dream, where they were fighting their own mind to take control of the dream space. They equated this struggle to psychosis because their sibling experiences psychosis sometimes and perhaps it was a way for them to relate to and understand that condition, but also a way to conceptualize what lucid dreaming was like – namely, it was partly a negotiation for control and knowing what was real.

All of these experiences were separate from lucid dreaming, but were nonetheless both related to and had an influence on lucid dreams. In understanding these influences, we can begin to determine what enhances the experience, what are the prerequisites, and what are its limitations. From the accounts of these nine participants, it seems like focused attention and self-awareness both help to enhance lucid dreams. Setting an intention, negotiating with reality, and gaining control appear to be integral aspects of lucid dreaming. Finally, lucid dreaming can be used to experience your wildest fantasies, it can be used to rehearse situations, or solve problems. However, it is limited in its ability to go deep and connect with the most inner aspects of being; for that you have meditation, dream yoga, or astral projecting.

Meaning Making

Though lucid dreams cannot reach the deepest and most secret parts of being, they can still bring about authentic experiences and meaning. It was the case for all participants that they experienced some sort of introspective experience, shift or change in perception, connection to self or others, or self-growth from lucid

dreaming. Lucid dreaming for some participants could be a way to gain access to sub consciousness because their waking body was asleep. P3 described interacting with dream characters where they would ask these dream characters who they were and what they represented to them in the dream. Often, there would be no answer or the character would represent an internal conflict or aspect of the self. Other participants reported interactions with dream characters as well. P2 told a story about a lucid dream where they confronted a dream character about why they felt sad and received a response that they felt was a reflection on their own state of being; and the act of acknowledging those feelings actually helped them to feel better:

“I asked her what she felt bad about, and she said inferiority. I said what would make you feel inferior? She said other people. I asked her if she didn't feel inferior when she was alone? She kind of fell over sad and didn't answer. The whole thing made me sad especially because why would this person who's a movie star feel bad or inferior to other people? I felt like crying a few times. So, I guess [this was] someone who I think is really great but at the same time they feel inferior. And... I think it's like the part of me that feels like it struggles between feeling really good and feeling really bad about myself.” –P2

These dream characters did not only have to be human either. P8 talked about communicating and making friends with animals in their lucid dream. Speaking with these animals was a way for this participant to connect on a deeper level, *“as if speaking to their best friend”*; in doing so might create a sense of positive well-being. Another participant, P6, also experienced animals as dream characters. However, in this case, it was not so much about being able to connect in a different way as in the previous example, but more an allegory for their mother's passing:

“My mom was sick so I had her dog for a while. And I had lucid dreams that this beautiful lady was kissing me and it would mean that my dog would have to go pee. I saw this lady that I encountered that was very beautiful and she was wrapped in chains and she was saying let me go [P6], let me go... And I watched her cross the street, she got hit by a car, her guts were like all wrapped around her... it took me a little while [to know what] that vision was about here because I forgot that I see her [the mother] as that lady who I had been seeing, not the dog. I feel like she was telling me to let her go, but I think I held on a little bit longer.” –P6

Interacting with dream characters was one apparent and bold way of seeking meaning in a lucid dream. Another was for one to use lucid dreaming as training grounds in order to build confidence in the real world. This could take the form of confronting a fear or escaping a nightmare. P4 and P7 both had lucid dreams with zombies, but were able to apprehend the scary situation by recognizing it as a

dream and laughing at it or flying away. P7 would use lucid dreams as a way to practice sports like snowboarding and try out different moves to gain confidence to do them in the real world. This practice worked because the lucid dreaming space felt so real, so it felt like they were there doing it. Another way to gain confidence was to do something in the lucid dream that one would not think was possible or that one had never done before; and through that experience, one could learn and grow, carrying that feeling of accomplishment over to the real world:

“I was sitting on this concrete thing in my kayak [attempting to get] over into the far pond and I had to jump. And I was like I don't know if I can do this. But then I just gave myself confidence and just kind of breathed with it and I managed to do this strange kind of jump. And it was such a moment that sat with me for like the whole next day... because I was like it's just that confidence, confidence to do it, you know, and actually hold that feeling.” –P7

Even though the dream space was not happening in reality, and the participant was aware of this fact in the dream, the experience still had an effect on their confidence long after waking. And, for a few of the participants in this study, it was a very powerful and overwhelmingly positive effect. They had the ability to take the dream for what it was, even with all its inconsistencies and bizarreness, and make what they could from it. Sometimes, though, diving into the depths of one's mind revealed some fairly surprising and frightening aspects. A few participants ventured to go into the deeper parts of their mind. P1 described a dream space that they called “the field”, which was an electrical field of energy that sent dreadful, terrible sensations down their spine. P2 was in a lucid dream and wanted to meditate, which to them meant getting rid of the entire external environment and focusing on themselves. However, this proved to be a very intense experience because it felt too black, too isolating, and too quiet. To be completely alone with the self is not really something most of us experience, and so when P2 encountered that it was too much to handle at the time. P9 also experienced a very intense lucid dream where they wanted to go deeper into their mind, like the dream within a dream idea popularized by the movie *Inception*:

“All around me was a lot of blood and gore and violence... my theory was that because I went a lot deeper into the subconscious it was sort of like I saw more primal parts of human nature and that was all the blood, gore and violence.” –P9

Lucid dreams were a chance for the lucid dreamer to actively search out experiences and draw meaning from them. These dreams could be symbolic or carry meaning depending on if one wants them to or not. Some of the participants were not interested in finding a meaning or purpose, but would rather have fun or be entertained. Others were very interested in figuring out what the feeling

in the dream represented or find answers to unlocking life's secrets. P5 acknowledged this difference of intent for lucid dreamers, reflecting that people's own dreams can mean something, not like a black cat means bad luck, but that dreams are very personalized and we can draw meaning from them if we wish or choose to say it means nothing at all. The point was that people make meaning, they choose to see something in a seemingly random and strange world of dreams. And, that is not nonsense; that is a real feeling that lucid dreamers take with them into real life.

DISCUSSION

The accounts of introspection described by lucid dreamers are consistent with the descriptions of control, self-healing, and self-awareness in the literature [22,36]. Here, we have identified four themes that center on the essence of what it is like to introspect in lucid dreams: Sensations and Feelings in lucid dreams involved what the lucid dreamer perceived and felt physically during their lucid dreams, as well as what they felt emotionally during their lucid dreams; Actions and Practices where ceremony was important surrounding the practices of lucid dreaming involving exploration, problem solving, discovery, and creation; Influences on Experience explained that many lucid dreamers had introspective practices and experiences such as meditation, connection to nature, and sense of curiosity that has helped them to gain greater awareness or agency in lucid dreams; and Meaning Making where lucid dreamers had the opportunity to go deep within themselves or analyse the content of their dreams to create their own meaning.

Essence Description

Lucid dreaming, according to the accounts of our participants, is knowing you are in a dream while dreaming, and then having the potential to take control of that dream and mould it to whatever fantasy, situation, feeling, or space one desires. In doing so, the lucid dreamer frees themselves from the laws and bounds of waking life, which feels *"very tranquil, blissful"*. In terms of introspection in lucid dreams, there is a vividness and clarity that surrounds the experience; the lucid dreamer can do as they please in a safe environment without judgement or repercussions imposed in the real world. There is a chance to explore one's thoughts and feelings, and uncover *"secret knowledge"* known only to that individual. Lucid dreaming is different and very personal for everyone, and at the same time the essence of the phenomenon is common across each of the participants here. For most of the participants interviewed here, it could be a connection, a lens, and a way of communicating with the self.

Design Implications

There exist studies that have described the nature of lucid dreaming, but unique to this study is the specific focus on introspection, whereas prior studies investigated experiences of lucid dreaming in a broader sense [22,36]. Having participants provide detailed and rich descriptions of their experiences with introspection in lucid dreams

provides data that can be utilized in generating design recommendations for a virtual reality system that helps people with introspection, with the ultimate goal of improving mental well-being.

Corroborated Results

The sensations and feelings of vividness and clarity generated through lucid dreaming practices could be applied to the context of VR, echoing prior work on VR recommendations. Our findings show that visuals are very important to the experience, especially ones that are vivid, because it immerses the user in the environment and ultimately creates the feeling of realness. Other senses such as sound, taste, touch, and smell all contribute to the experience, which is in keeping with previous research [33]. Yet, if any senses are missing or somehow different from those experienced in the real world, then that does not diminish the experience because there is an acknowledgement that this environment is not real and so the same affordances and laws may not apply. One implication of this finding might be that the strong focus on graphical quality in VR is perhaps not as important as previously thought [4,49]. Knowing that the environment is not real does not seem to be as important to the immersiveness of the experience itself. Moreover, accuracy of the environment does not seem to be necessary for the feeling of realness either. It is sufficient that there be awareness of the present environment. These findings are supported by previous work, proposing that a realistic experience is no longer immersive VR's sole goal [3].

In terms of what users might like to do in VR and how designers might approach introspection, the lessons from our lucid dreaming participants are to create experiences that give a sense of exploration and an open environment where there is the feeling of possibility. The experience should be fun, playful, and childlike in nature to encourage exploration and wonder. Designers should consider the medium of VR and think about what experiences people normally would not be able to do in the real world; this may look like something fantastical such as flying, as suggested by Mueller et al. [45,57], or seeing another part of the world people would normally not have access to. Our reports from lucid dreamers indicate that some people may wish to interact and change things in the environment and others may not. In any case, users should feel like they are in control of these interactions, which generates feelings of empowerment and confidence that can carry over into the real world. This benefit of bodily control was also found by Byrne and colleagues [6].

From our results, we found that the transitions and experiences surrounding a VR experience are important in creating a safe environment, without judgement or repercussions imposed in the real world, for its uses to explore the unfamiliar. This finding is supported by Patibanda and colleagues' recommendation to "ease-in" users for VR [48,58]. Just as our bodies are gently eased into sleep and into a lucid dream as a seamless experience,

so too should the transition into and out of VR. The user is aware that they are sitting on their living room couch or their office chair, but they are invited into another world where they must suspend their disbelief that this is all unreal and then be open to the possibilities that such a world might offer. To make this leap as easy as possible, as designers we might think about borrowing tools of introspection from other domains such as psychology, spirituality, and mindfulness. These introspective tools teach awareness, discipline, considering another perspective, loss of ego, and letting go of what we think we know is possible. If these aspects are incorporated into the design of introspective VR experiences, then positive and transformational outcomes like those seen from lucid dreaming might be possible. Therefore, when transitioning into VR, think about the surrounding environment – is there a seamless transition? Can the user feel safe enough to let down their guard and truly immerse themselves in the experience? When transiting out of VR, there is again the connection back to the real world that eases the user between worlds and allows space for reflection.

Nuanced Insights

Ceremony around an introspective experience in lucid dreaming helps to ease the transition into the dream space, so VR designers might also think about what ceremonies or preparations the users are undergoing in order to prepare for them for the virtual world. Ceremony seems to bring more meaning to the experience because the person going into it is more mentally and physically ready and open.

The space of the virtual environment itself might be quite abstract or feel empty and vast, like some lucid dreamers reported while they meditated in the dream. Nature is a theme in lucid dreaming and it also has close ties to human connection, so including those aspects can help in creating a sense of peace and awe. Furthermore, an abstract world gives space for the user to provide their personal meaning and interpretation, which is important in exploring one's thoughts and feelings or uncovering "*secret knowledge*" that is personalized to that individual. And, an environment where the user is bodiless can provide the right conditions for letting go of the ego, the outer sense of self and focusing inward.

These design considerations for introspective VR experiences taken from accounts of lucid dreaming are promising because they echo those considerations already put forth in the VR literature [23,33,40,43]. However, these design considerations we have presented here have not yet been put into practice. Though VR and lucid dreaming have many commonalities of user experience, it may be the case that there are other factors at play that VR cannot account for in providing introspective experiences. For instance, VR experiences are under complete control of the designer whereas lucid dreams ebb and flow on the spot depending on the dreamer's mental state. So, until we have reliable brain computer interfaces combined with VR, then that is one limitation of the technology. Further research is

required to test the validity of our design considerations and eventually put forth a more robust set of design guidelines for introspective experiences in virtual reality based on human experience. It is essential that this technology ground itself in genuine experience in order to preserve the human condition.

CONCLUSION

Virtual reality could be the platform that allows its users to explore introspection and have a positive impact on well-being because of its potential to provide an immersive space that feels real despite its user knowing it is not. A completely immersive VR experience draws many parallels to a real life "virtual" phenomenon people already experience, namely lucid dreaming. By using qualitative research methods to study introspection in lucid dreaming, we described the essence of this phenomenon as well as the context in which it occurs. The descriptions generated were used to develop design considerations for an immersive virtual reality system that will be used as a tool for introspection. From preliminary findings, there are four themes: Sensations and Feelings, Actions and Practices, Influences on Experience, and Meaning Making. Overall, it seems like lucid dreaming can be used as an effective tool for introspection and can be helpful as a new lens in which to look through in designing for introspective virtual reality experiences.

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