Exploring Adolescent Lucid Dreams: A Pathway to Learning, Growth, and Mental Well-Being

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Abstract

In addition to being aware of being in a dream, dreamers in a lucid dream can sometimes also intentionally execute predetermined actions and manipulate the dream's narrative. These features open the opportunity to use lucid dreaming (LD) as a recreational, therapeutic and skill acquisition tool. This study conducted semi-structured interviews with nine adolescent lucid dreamers to gain insight into their LD experiences and the role these play in their waking lives.

Reflexive thematic analysis revealed that LD provided participants with a space where they felt safe to explore movements and behaviours without the repercussions they would experience if they were awake. During LD they trained motor skills, addressed emotional conflicts, prepared for difficult waking life situations, and engaged in fun activities. These experiences promoted motor learning, self-efficacy, personal growth, and mental well-being. This study also highlighted that training motor skills in a lucid dream may at times heighten waking self-efficacy but not necessarily motor performance. LD brought participants a sense of freedom, liberation, and empowerment, alongside positive emotions, and a temporary release from the burdens of their waking lives. Advanced dream manipulation skills may not be mandatory for benefiting from LD, suggesting that LD may be a valuable tool for novice lucid dreamers and those with limited dream manipulation.

Adolescence is a period marked by self-evaluations and the development of one's own identity. LD may be a valuable tool to support these developmental processes and adolescents' well-being.

Keywords: lucid dreaming, motor learning, psychological well-being, self-efficacy, adolescents

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Well-Being

In addition to being aware of being in a dream, dreamers in a lucid dream can sometimes also intentionally manipulate the dream's surroundings and narrative, consciously make decisions, and execute predetermined actions (LaBerge, 1985). These features provide practitioners with a unique opportunity to use lucid dreaming (LD) as a recreational, therapeutic, and skill-acquisition tool. Lucid dreamers predominantly seek pleasure in their lucid dreams (Bonamino et al., 2024; Schädlich & Erlacher, 2012; Stumbrys & Erlacher, 2016). However, LD can also be used for more practical ends, including reducing nightmare frequency and intensity (Ouchene et al., 2023), creative problem-solving (Stumbrys & Daniels, 2010), and practising waking skills (Bonamino et al., 2023; Peters et al., 2023). LD may also support mental well-being (Wessling, 2023), personal growth (Konkoly & Burke, 2019), and treatment of clinical depression (Sackwild & Stumbrys, 2021).

Dreamers can at times encounter difficulties within their lucid dreams that may impair their experiences. In an interview study exploring the use of LD for practising sports skills, Schädlich and Erlacher (2018b) reported that LD may not always work as planned. For instance, participants described experiencing difficulties with executing intended movements, unexpected changes in the dream plot and environment, training equipment, and other dream characters. Dream problems may hinder LD practice (Schädlich & Erlacher, 2018a, Schädlich & Erlacher, 2018b) and have repercussions on subsequent motor performance (Schädlich et al., 2017).

Lucid dreams often originate spontaneously (Stumbrys et al., 2014), but can also be intentionally induced via induction methods (Stumbrys et al., 2012; Tan & Fan, 2023). Compared to adults, children and adolescents tend to experience higher LD frequencies (Saunders et al., 2016). Evidence on LD behaviours in younger populations is comparatively

limited. A questionnaire study indicated that adolescent lucid dreamers use LD for a variety of purposes, including having fun, nightmare treatment, and practising waking skills (Bonamino et al., 2024). Furthermore, a greater proportion of those who practiced sports during LD reported improved waking self-efficacy compared to sport performance, potentially indicating that the confidence gained during LD motor practice may not always translate to enhanced motor execution. Building on these findings, the present study undertook a qualitative approach and used semi-structured interviews to explore the purposes and activities younger populations regularly engage in when LD, how these experiences are perceived, and how they affect their waking lives. The present interview study was guided by the following research question: how do adolescents use LD and how do these experiences subsequently impact their waking lives?

Methods

Philosophical Orientation

This study adopted a constructivist-interpretivist paradigm and an ontological relativist and epistemological constructivist approach to study and uncover the meanings participants held of their LD experiences and influence on wakefulness. According to the constructivist-interpretivist framework, the understanding of the world occurs through the subjective lenses and experiences of each individual (Henderson, 2011; Levitt et al., 2017; Schwandt, 1994). Thus, reality is not viewed as single, objective entity, but rather as multiple, subjective realities that are socially constructed, context-dependent, and shaped by the individual's personal experiences (ontological relativism) (Guba & Lincoln, 1994). From an epistemological-constructivist perspective, the understanding, interpretation, and meaning are constructed by individuals based on their experiences and interaction with the world and others (Guba & Lincoln, 1994; Schwandt, 1994). This approach was relevant to this research as it provides a framework that can help explain how differences in phenomenological experience can induce individual and subjective perceptions, through which one's interpretations, beliefs, and

meanings of the world are constructed (Henderson, 2011, Guba & Lincoln, 1994, Schwandt, 1994). Participants in this study thus played the role of the protagonist in their own LD narratives attributing distinct and unique meanings to their experiences based on their subjective perspectives. This highlights that LD experiences are not universal but are instead shaped by individual, social, and contextual factors, resulting in unique and personalized interpretations. This perspective on LD informed this study's data collection, analysis, and establishment of rigour procedures.

Participants

Nine adolescent lucid dreamers (six male, three female) aged 18.44 ± 1.33 years (range: 17-21 years) who regularly experienced at least one lucid dream per month were interviewed (participant characteristics depicted in Table 1). Participants were from Australia (7), New Zealand (1), and India (1). Although all participants experienced naturally occurring lucid dreams, only two regularly applied induction methods. Six participants were recruited from a previous study (Bonamino et al,, 2024), two through word of mouth, and one from a Brisbane-based sporting organisation. Overall, six participants regularly engaged in sports during wakefulness, four of which did so competitively.

<center>[Table 1 near here]</center>

Interview guide

The interview guide was developed by the first author (see Appendix). The guide was based on Schädlich and Erlacher (2018b), an interview study investigating the use of LD for practicing sports-related skills, which was expanded to also explore alternative uses of LD (e.g., having fun, simulating conversations, preparing for waking life events) and their perceived impact on wakefulness. Some questions were based on previous findings. For instance, a survey study indicated that LD motor practice may promote waking self-efficacy more frequently than sports performance (Bonamino et al., 2024). Thus, participants in this study

were specifically asked about self-efficacy and motor performance following LD motor practice. During the interviews, the question order mostly followed the guide. However, deviations occurred whenever participants spontaneously prompted discussions of new topics or issues.

Procedure

Participants attended a single, one-on-one semi-structured interview. Semi-structured interviews were selected as they provided an opportunity for open-ended discussions and in-depth exploration of participants' experiences. Signed consent was obtained prior to each interview (with parental/guardian consent also obtained for underage participants). Interviews were conducted by the first author in English, between 30-01-2021 and 14-06-2022, either in-person (recorded using a Sony Stereo IC recorder, ICD-UX200F) or online on Zoom (recorded using Zoom's recording feature). After the interview, participants received a pre-paid gift card valued at AUD 50.00. On average, interviews lasted 98.55 ± 35.95 minutes (range: 38.32 – 147.67 minutes) and were transcribed verbatim by the first author. When passages or their interpretation were unclear, participants were contacted for clarification (this happened on three occasions, with Participant 3 [P3] P3, P4, and P6). The study was approved by QUT Human Ethics Committee.

Data Analysis

Data analysis was guided by Braun and Clarke's (2022) six-phase reflexive thematic analysis (RTA). As per Braun and Clarke's (2022) guidelines, while the general framework of the six-phase RTA was followed, the steps were adapted to fit the specific needs and context of the research, allowing for a tailored approach to analysing the data in line with the research question. RTA's flexibility allowed for an experiential and inductively oriented approach, 'giving voices' to participants' perspectives and experiences with LD, whilst capturing pattern meanings and interactions between their experiences. The analysis involved a non-linear and

multi-directional approach, which prompted recurrent movements across the six phases of the analysis, particularly the coding, theme-generating, and reviewing stages. For instance, as the understanding of the data developed and patterns across the dataset emerged, the codes, clusters, themes, and interactions between these also evolved.

Data analysis was conducted by the first author and without the use of any computer-assisted qualitative data analysis software. The analysis began with data familiarisation and immersion (phase 1). Transcripts were coded twice to ensure a systematic, coherent, and robust set of codes (Braun et al., 2016) (phase 2). Codes were clustered into candidate themes (phase 3) which were holistically reviewed to ensure that the analysis 'fitted well' with the data set, and that the data coherently addressed the research question (Braun et al., 2016) (phase 4). Lastly, themes were finalised (phase 5) and the analysis written-up (phase 6). Phases 4 and 5 were conducted by the first and third author. The first author presented the original themes to the third author. For instance, initially, codes relating to participants' "adaptability" were grouped under the sub-theme "ideal lucid dreaming conditions". Through the theme reviewing (phase 4) and redefinition (phase 5) phases, "adaptability" emerged into a distinct sub-theme. For a detailed description of the data analysis procedures see Bonamino (2024).

Establishing Rigour

Qualitative rigour was addressed through member reflections and critical friends. Member reflections were used to increase the findings' credibility. They involve co-participatory dialogues between researchers and participants, aiming to explore gaps and consistency within the findings to gain further insight (Smith & McGannon, 2018). At the end of each interview, the first author summarized the major points discussed to the participant to prompt further reflection and insight. The goal was not to establish an objective truth, but to collaboratively discern meaning of the findings, thus aligning with a relativist ontological approach (Smith & McGannon, 2018). From member reflections, more insight emerged

regarding the importance of LD to participants, specifically concerning the sense of freedom and empowerment they obtained from LD.

Critical friends promote reflexive dialogue that challenge the interpretation of the findings through critical feedback (Smith & McGannon, 2018). Although the first author led the data analysis, findings were discussed with the third author who acted as a critical friend. The aim was not to establish inter-rater reliability, but to promote reflexive discussions through constructive and critical feedback. The rejection of reliability is consistent with a constructivist epistemological paradigm (Smith & McGannon, 2018). For example, one of the provisional themes that initially emerged from the analysis, "varying performance outcomes", illustrated participants' waking experiences of executing motor skills practiced during LD. Discussion with the third author led to a recategorization of codes. The sub-themes "structured practice" and "self-efficacy vs performance" emerged and were regrouped under a new lower-order theme, whilst the provisional theme was removed. This process introduced a more accurate portrayal of the complex relationships between the waking and LD experiences regarding the use of LD for motor learning and skill refinement purposes.

Results

Two higher-order themes emerged from the analysis: learning and growth through lucid dreaming; and optimizing lucid dreaming experiences (Table 2).

[Table 2 near here]

Learning and Growth Through Lucid Dreaming

The theme *learning and growth through lucid dreaming* encompasses a core concept expressed in various ways across the dataset – that adolescents benefit from LD by improving waking skills or obtaining psychological gains. One aspect was that LD provides ideal conditions where adolescents feel safe to step out of their comfort zones and push their limits without the repercussions they would experience if awake. This concept was articulated well

when participants described practising motor skills during LD and was broadly characterised as the lower-order theme "skill familiarisation and refinement". The other main expression of learning and growth was captured by the sub-theme "psychological uses and gains", which reflect the psychological gains that participants obtained from LD, and that they subsequently applied to varying aspects of their waking life.

Skill Familiarisation and Refinement

Six participants used LD to rehearse motor skills and experienced varying successes with their practice.

Structured Practice.

With respect to rehearsing motor skills, the concept of a structured practice emerged from the analysis. Four key elements were identified: motivation; task familiarity; complementing LD with physical practice; and frequency of LD practices. Although the greatest benefits appeared to emerge when all elements were combined, motor learning gains were sometimes also achieved with individual elements. For example, P3 surfed and skateboarded during LD as way of having fun, rather than to seek skill improvement. He reported refinement in the waking execution of tricks he was already able to perform and regularly practiced during wakefulness but perceived no improvement in those he less frequently attempted when awake or was unable to execute in the first place. P8 suggested that a single LD motor practice may not be sufficient for substantial motor learning gains: "It has varying successes … but that could also just be because like I don't give it too much of a chance to work straight away." [P8]. For example, after practicing a new poi spinning[1] trick during one lucid dream, he was still unable to successfully execute the trick the following morning.

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[1] Poi spinning or poi art is a performance art that involves spinning a set of tethered weights (i.e., the poi) around the body through a variety of geometrical patterns, specifically in a style known as international style poi spinning (Sirs & Meek, 2021).

Nonetheless, he still reported improvements in the execution and an enhanced understanding of the movement:

> I was able to like keep my hands moving in a solid motion instead of like shaking when I was doing it. … Before the practice I was trying to like really control the string and like wrap it around. But after the dream, I was able to relax my hand and let my hand follow it a bit more. … [And I had] the idea of what was going on a bit better … I was like 'Okay, the ball is gonna come up in front of my face, and then behind my back, like behind my shoulder'. And I was able to think through of like where it was gonna go. [P8]

P1 rehearsed the Olympic weightlifting snatch, which she also regularly practised during wakefulness, on a single occasion during LD. When executing it the following day at training, the lift was "smooth" [P1] and the technique "a lot more put together" [P1], when usually for her "it's a little bit jerky" [P1]. An example of when all structured practice elements were incorporated was provided by P8, who reported improved performance when complementing focused LD with physical practice of balisong knives spinning.

> "I was trying to do like one where the knife would run across my thumb ... erm I would not be able to do it awake. I went to sleep and the next day when I woke up I just did it first time … I probably did maybe twelve times (12 separate lucid dreams) and was also practising them for like erm six months (during wakefulness)." [P8].

High task familiarity supported P8's LD practice – "I found them really easy to practice … it was like really ideal for me [because of] my comfort with the balisongs and knowing how it felt." [P8] – as well as dealing with arising dream problems associated with the knives:

"I had like a really built-in memory of everything, of this one object … I just had a really good understanding of how the knives worked from like playing with them so much that it was a lot easier for me to adjust them, to work how they needed to be. And so, they were quite a bit more accurate." [P8].

Self-efficacy vs Performance.

Rehearsing motor skills during LD provided participants with an opportunity to "play it out, practice … and experience those things before you go and do them" [P3]. This 'I did it once so I can do it again' attitude was reflected by a perceived increase in waking self-efficacy, but not necessarily motor performance (reported by four participants). For example, when referring to surfing and skateboarding tricks he had successfully executed during LD, P3 stated: "I have a lot more confidence on trying the tricks … and then once I try them in my real life, once I go and try them, I'm like 'Wow, I still can't do them" [P3]. P4 was more confident in playing a song on the guitar and P2 approached swimming competitions with more confidence after simulating them during LD, despite not perceiving improvement in their performance. P7 was confident in attempting a volleyball jump-serve after having executed it during LD but was still unable to during wakefulness: "in the dream it feels great when you can do it. You go into training and it's like ah, it's not quite as easy as that … [it's] not quite there yet " [P7].

Ideal Conditions for Motor Practice.

In general, motor execution during LD was "perfect" [P3] or significantly improved compared to wakefulness. LD offered ideal training conditions, often not available during wakefulness. LD was perceived as safe and injury-free, where participants could comfortably explore movements without judgements ("there's no one that I'm thinking: 'What are they gonna think of [me]?' … There's no social pressure." [P3]) and "put as much energy and effort without getting injured" [P1]. P1 for instance highlighted that unlike real-life training, there was no need for warm-up during LD and fatigue from multiple training sessions was removed:

If you've trained days like Monday, Tuesday, and you are turning up to a Wednesday session, that's gonna be you know, hell mountain, right? … Whereas in the lucid world, I guess that element of your body and how it's feeling like sore-wise, joint-wise, isn't there. [P1]

Heightened kinaesthetic perception was reported, enabling participants to focus on movements and improve their understanding. For example, P7 and P8 could deliberately slow down their movements during LD, allowing them to be "more in tune with the feeling, … look at all the minute details" [P7] and "take in everything that was happening" [P8]. P1 also used third-person perspective to critique her practice and P8 rewound his lucid dreams to explore and play out different scenarios of opening a boxing fight he was preparing for.

The overall perception of LD was realistic, yet often enhanced and involving all senses. There was no physical exhaustion and movements felt smoother, "more relaxed" [P3], or realistic. P8 even felt "lactic acid building" [P8] when rock climbing, though this was duller than in wakefulness. Temperature was perceived as "comfortable" [P7]. When surfing in the ocean, P3 felt "wet but warm" [P3], whilst P6 remained dry in the rain. Although mostly realistic, perception of gravity was sometimes stronger. Reduced gravity occurred when flying, "floating" [P6] down from jumps, and sometimes when walking or jumping ("I am like jumping a hundred meters in the air" [P4]). P3 felt lighter in his feet when surfing and skateboarding, helping him execute tricks. When doing the snatch, P1 described that "the weight was lighter" [P1], which made the movement "easier" [P1] and "smooth." [P1].

Muscle power was realistic, stronger, or varying. Balance was realistic, "perfect" [P1] or improved. For example, P8 "could hold a handstand for a long time" [P8] during LD but was unable to do a handstand in wakefulness. Two participants reported greater flexibility during LD. P8 could perform an axe kick during LD, but not in wakefulness. After doing the splits in a lucid dream, P7 woke up feeling "so flexible. And then I tried to do it on my bed,

and it was shocking, and nails" [P7]. Perception of pain varied. Six participants did not feel pain during LD. For instance, P5 described having his leg "chopped" [P5] but there was "no pain associated with it" [P5], while P6 felt "awful" [P6] pain when being stabbed in the back. P9 felt pain when being poked, but not when stabbed in the stomach. P8 generally perceived pain as realistic but had the ability to control whether he felt it. He used this skill to improve his comfort with pain during exercise:

> It was really useful to practice just being uncomfortable … I've been able to like tolerate it for longer [during wakefulness] on a plank where it's like really burning my core. Or just like to pull harder with like pull-ups. [During a lucid dream,] I can make the pain last longer without like worrying about it as much. [P8]

Psychological Uses and Gains

Participants also used LD for more psychological-based purposes. These were categorised as expressing emotions; preparing for waking life events; self-development; and having fun. The concept of LD as a safe and consequence-free environment was also relevant withing this sub-theme, allowing participants to comfortably step out of their comfort zones promoting a sense that "something is possible because it happened in the dream" [P6], enhancing self-confidence and personal growth.

Expressing emotions.

Three participants used LD to express emotions, confess feelings, or address conflicts with friends or family. In general, this helped them gain emotional relief and feel better about the situation. For example, P9 felt relieved after confessing his feelings to a girl he was attracted to. P4, unable to confront his peers at school, used LD to express his frustrations and "berate" [P4] them.

> There's just people that you, you just really wanna tell them what you hate about them. I take advantage of the fact that I know that I'm in a dream and I express to

them what I hate about them. Because I, I so desperately want to do it in real life

but I can't of course [P4].

He perceived this as a coping mechanism, "an outlet of getting things off my chest"

[P4]. Whilst the desire to berate his peers remained, LD brought some relief and "a bit of

closure" [P4]: "The hatred towards them is weakened … I can still operate with these people,

but it's just easier to do if I do that in my dream." [P4].

Preparing for waking life events.

Four participants used LD to prepare for waking-life events. P7 prepared for an

international beach volleyball tournament by envisioning how she "wanted everything to go,

and the kind of things I wanted to be doing, how I want to present myself." [P7]. She reported

that the experience increased her confidence and that she would have been "less prepared "[P7]

without it. Others simulated waking-life situations to gain insight on how people would

respond, guiding their behaviour in wakefulness ("I can influence what I am saying to them to

see how they respond … And I guess it gets me to empathise a bit more with that person if I

am not sure about them" [P1]). LD enabled participants to openly address difficult matters, and

to approach them with greater comfort and confidence when awake because they felt they'd

"gone through it" [P7] in their lucid dreams beforehand. P9 used LD to gain confidence

apologising to his friends. P7 explored ways to comfort her boyfriend after the loss of his

friend:

"It was more like a process of how to choose the right words or erm, I guess the

different actions so even just like sitting next to him or putting my arm around

him. Kinda like experiencing or going through how I could do it in real life. And

I was more comfortable when it came to it, knowing that what I was doing was all

right." [P7]

Self-development.

LD promoted self-reflection, insights, and new experiences, and helped participants cope with difficulties and trauma. P4 and P6 reported that LD prompted them to "contemplate" [P4] their behaviours and actions. For instance, P6 described:

> [Like] discovering things about myself that I wouldn't really think about. Erm, almost like yeah, giving insight into my own character and what I would do … [In a lucid dream] there's so much less thought going on, you don't really erm think about the actions you're doing, you're just doing what you want. Erm, there's not much like questioning 'Why would I do, why have I done this'. There's none of that. Sometimes I'll wake up and think 'Would I really do that?' Like, is that my character that would do that. [P6]

P9 experienced profound emotions ("Emotions of happiness, the happiness of love … I learnt emotions which I can't get in the real life" [P9]) and had new experiences like having a girlfriend for the first time. P1 worked on overcoming her discomfort with talking to others:

> In real life, I am a fairly introverted person but when I am in those situations I, I realise that there's no consequences, so I become a bit more extroverted. And that's when I realise I can test boundaries, not only with other people but with myself as well. So, like when I'm not sure if I should be speaking up in these kinds of situations … 'Do I step up and ask them questions, do I sit back and just, you know.' But usually, in those circumstances, I will take more risks than I would. … [And] I think it was huge confidence-wise like, if you compare me now, then if you'd interviewed me in first year of uni or even in high school. Huge, huge difference in terms of social stuff [P1]

P8 simulated past traumatic experiences during LD, which helped him "deal with them and accept them … [and] grow as a person" [P8]. He also described having "one last conversation" [P8] with a deceased friend which helped him cope with the loss.

Having fun.

Participants' main priority was to have fun. Using LD for other purposes was comparatively rarer and often due to a lack of interest ("I have many things to do, I have many places to explore. So, I don't practice anything [any motor skills]." [P9]) or a lack of dream manipulation and opportunity ("Rarely I do dream about erm like doing surf-life saving or swimming." [P2]). When having fun participants engaged in various activities including flying, jumping, "exploring around" [P9], or simply "enjoy just experiencing the dreams" [P7] with minimal to no interaction and "watch it like a movie." [P1]. P3, and occasionally P8, practiced motor skills as a way of having fun. P8 enjoyed experiencing nightmare-like narratives ("There's like a hit man coming to try and like kill me or something and it's just like a fun game of cat and mouse." [P8]).

Through having fun participants were able to engage in activities they enjoyed and undergo experiences that would be impossible or not easily accessible in wakefulness ("You can go and visit places that like you may not be able to. Especially … during COVID like we can't go travel and things like that. I can." [P5]). LD was seen as a "gift" [P9] and as "very special" [P6]. It prompted a "sense of freedom" [P4], empowerment, and control ("being able to have control over something that you usually won't have control over, it's pretty cool!" [P1]) which often transferred to participants waking life ("It helps me understand that I can control a lot of other things in the real life" [P6]). It brought positive emotions and provided participants with a "distraction ... a form of escapism" [P5] from waking life.

> "When I do lucid dream that's really good in a sense like, that's an escape from
>
> the same thing week in, week out. It's like I'm able to do like crazy stuff." [P4]

"I've used it to help calm me down before something will happen. … Like de-stressing before an exam, that's what I find like extremely helpful. Er so like de-stress, have a break, like step back from things. And I feel like it's just like a way to clear your mind and relax and erm you know just enjoy what it has to offer."

[P5]

Optimizing Lucid Dreaming Experiences

The theme *optimizing lucid dreaming experiences* explores the different approaches undertaken by participants to benefit the most from LD, whether applied during the lucid dreams themselves, or as a form of preparation when awake. One aspect was that every participant had at some point encountered challenges during LD but had often developed strategies to cope with these. This idea was expressed under the lower-order theme "problems and how to deal with them". The second sub-theme "dream manipulation skills" concerned participants' dream manipulation abilities and their influence on their LD experiences. A further aspect related to raising awareness about the possible approaches to enhance lucid dreams, and how this could shape the way adolescents approach future LD experiences. This concept was captured by the sub-theme "raising awareness".

Problems and How to Deal with Them

All participants reported having experienced problems in at least one of their lucid dreams. Often, but not always, they were able to deal with them or integrate them into their lucid dreams. The dream problems experienced by participants are summarised in Table 3.

[Table 3 near here]

General problems included unexpectedly waking from a lucid dream, often triggered by heightened emotions or self-induced pressure. P6 would regularly awaken soon after his vision became "hazy" [P6]. P1 and P6 often woke or lost lucidity when attempting to influence the dream or "shift too many things" [P1]. Doubt and losing focus impaired dream

manipulation or caused nightmares or bad dreams to develop. Participants also encountered difficulties executing intended actions or experienced issues with the dream environment, practice equipment, or other dream characters. When rehearsing a poi-spinning trick, P8 was unable to re-recreate the poi's desired weight and length. Nonetheless, practicing with the un-intended weight and length during LD, helped him adapt his movements in wakefulness when using unfamiliar pois. Gravity-related problems were common in participants who struggled to or could not fly, who often felt "an extra layer of gravity" [P2] when trying to do so. Nightmares and bad dreams were considered a type of dream problem as they impaired LD experiences and prevented participants from engaging in other activities. In general, participants successfully managed these negative dreams by transforming them into pleasant experiences or, as a last resort, by waking themselves up. Three participants reported recurring, yet rare, dysphoric LD experiences they struggled or were unable to overcome. For example, P3 recounted a distressing lucid dream in which he had to choose which of his parent would be murdered. Despite attempts, he couldn't wake himself up or manipulate the dream. He was forced to see it through until his alarm woke him, leaving him feeling deeply distressed upon awakening: "I just remember waking up and I went "oof" ... cos it was just terrible, tormenting." (P3).

Dream manipulation skills

Proficiency in dream manipulation varied. Whilst all could maintain agency and almost always control their actions, manipulating the dream settings was challenging for many, except for P5: "In order to manipulate the world it's literally just like thinking it … like I'll close [my eyes], picture it, then open it, and then I would be where I wanna be." [P5]. P8 had some influence over the dream settings, but often the resulting environment was distorted or flawed, holding him off from attempting to influence the dream: "Whenever I tried to create my environment myself then it looks like a two-year-old drawing or something. Everything just

doesn't feel right … [so] I don't try to do it as much" [P8]. Limited dream manipulation often confined participants to the settings their dreams presented them with, where "everything's like pretty determined" [P6]. For example, P8 couldn't go rock-climbing because there were "no real rocks or anything around" [P8], while P4 recognised that his lack of dream manipulation skills restricted his LD experiences:

> If I were to have more control, I think it would allow me to act out situations and like things in my own life that might be troubling me or having me stressed out, be able to approach it from a new and like creative way. [P4]

Some participants developed ways to make up for their limited dream manipulation abilities. P9, would search for objects in his lucid dreams or used intention and dream incubation techniques before falling asleep to dream about specific settings ("I just put it in my mind and when I'm dreaming it's erm naturally pop up in my mind, [in my dream]." [P9]). A recurring concept was the need for participants to maintain a sense of realism and that LD "has to make sense" [P6] or be somewhat based on waking life experiences ("Mine are all very very realistic … I've never been able to go: 'All right, let's trot through a marshmallow field or something like that'. That's just not gonna happen" [P1]). Some adapted to this need for realism. For example, P9 was unable to fly on his own during LD because he had never experienced it in wakefulness but could could fly using mediums such as magic brooms or flying carpets.

Raising Awareness

Participants proposed a variety of approaches to benefit the most from LD. These included relaxing before sleep, regular meditation, maintaining focus during pre-sleep affirmations, and planning activities to do in LD to increase its frequency. Regarding practicing motor skills, participants suggested that task familiarity, complementing LD with physical practice, and understanding that dream equipment may differ from wakefulness, can support

the efficacy of LD practice. When LD, participants recommended avoiding negative thoughts to prevent nightmares; taking advantage of LD to safely engage in activities that may normally be too dangerous or inaccessible; being persistent when developing LD and dream manipulation skills; being confident and believing in one-self ("If you have confidence in your dreams anything can happen … lucid dreaming is all about believing, if you believe you can do this, then you can do this." [P9]).

For most participants, participating in this study was the first opportunity they had to openly discuss their lucid dreams. Many hadn't considered or were unaware of the possibilities for manipulating certain elements within their lucid dreams. For example, P8 had never "even tried or … even thought of" [P8] observing and analysing his movements from a third person's perspective during motor practice. Another participant discovered it was possible to practice motor skills during LD only while participating in a previous LD research study. Overall, the interviews prompted self-reflection, allowing participants to assess their own dream manipulation skills and explore alternative ways of approaching their LD experiences. For instance, P1 reported that through the interview she gained insight into the possibilities of LD which she was curious to explore herself: "Knowing that I can refine my skills a bit more, like even jump in (actively engage with the dream) more often to test the limits of what I can augment." [P1]

4.1 DISCUSSION

This study used semi-structured interviews to explore the LD experiences of a sample of adolescents and perceived influence on their waking lives. The interviews revealed that participants used LD for diverse purposes, including rehearsing motor skills and supporting personal growth and mental well-being.

Motor Skill Familiarisation and Refinement

The degree of motivation for rehearsing motor skills varied between participants. Some practiced for enjoyment, others aimed for skill improvement. In general, purposely training skills positively influenced the efficacy of the practice, aligning with previous accounts from lucid dreamers (Schädlich & Erlacher, 2018b) and motor learning theories where motivation is perceived as a contributing factor to motor learning and performance (Wulf & Lewthwaite, 2016).

Task familiarity and complementing LD with physical practice also supported motor learning. That complementing LD with physical practice can enhance LD efficacy was suggested by two study participants and is in line with previous accounts (Schädlich & Erlacher, 2018b). LD can be considered a particular form of mental imagery practice. It has been demonstrated that mental practice combined with physical practice is more effective than either practice alone (Behrendt et al., 2021; Simonsmeier et al., 2021). Thus, it is plausible that combining LD with physical practice may also result in greater motor learning gains. The combined effect of LD with other practice types (e.g., mental, physical) is however yet to be tested experimentally. Physical practice is also likely to support task familiarisation which may consequently improve the simulation of the training environment during LD and potentially also reduce or help deal with dream problems.

Whether LD motor practice frequency influences subsequent motor performance is unclear. Experiments have demonstrated that motor learning can occur following a single LD motor practice (Erlacher & Schredl, 2010; Schädlich et al, 2017; Stumbrys et al., 2016). However, while some participants in this study reported improvements following a single LD motor practice, others did not. Factors like type of motor task, task familiarity, the extent of physical training, and encountering of dream problems may contribute to this variability. Further, although research reports no correlation between waking motor performance and the

number of practice trials during a single lucid dream (Schädlich et al, 2017; Stumbrys et al., 2016), whether this holds true across multiple nights of LD motor practice remains unexplored experimentally. One participant in this study suggested that a single LD motor practice may not be sufficient for pronounced motor learning gains. Multiple lucid dreams may also increase familiarity with the dream practice and allow dreamers to explore different practice conditions during LD, potentially reducing dream problems.

The effectiveness of LD may also be influenced by the nature of the task being practiced. It has been speculated that LD may be more effective for fine motor tasks or those involving higher cognitive functions (Bonamino et al., 2023). Implementing a structured practice for certain motor tasks may be challenging, particularly for activities relying on specific environmental conditions. For instance, while waking physical practice of activities like poi or balisong spinning can be completed in various environments (e.g., indoors, outdoors), other activities like surfing require specific conditions. Surfers may be spending a considerable amount of time waiting for suitable waves, and without the right conditions, practicing specific moves becomes difficult or inaccessible. Task nature may also affect how easily training equipment and environments can be accessed during LD. For balisong spinning, adjustments involve primarily device weight and length. Conversely, activities like rock-climbing feature more intricate details like hold position, rock inclination, shape, and texture. The inability to modify these types of physical attributes can impair dream practice, as illustrated by the example provided by P8.

According to the motor simulation theory mental imagery activates similar motor systems in the brain as physically executed movements (Jeannerod, 2001). Like mental imagery (Guillot & Collet, 2005a, Guillot & Collet, 2005b, Hardwick et al., 2018), temporal and functional equivalence (Dresler et al., 2011; Erlacher & Schredl, 2008; Erlacher et al., 2014) have been shown between LD and physically executed movements, suggesting that LD

can promote motor learning and subsequent improvements in waking performance. Findings from this study, add to previous qualitative and pre-post designs evidence that LD may support motor learning (Bonamino et al., 2023). For instance, motor performance improvements following LD motor practice have been observed for dart throwing (Schädlich et al., 2017), coin tossing (Erlacher & Schredl, 2010), and sequential finger-tapping (Stumbrys et al., 2016).

Self-efficacy and Motor Performance

The interviews revealed that practicing motor skills during LD enhanced waking self-efficacy. The increase in self-efficacy in participants' own motor abilities, also observed in previous accounts of lucid dreamers (Schädlich & Erlacher, 2018b), appears to develop from successfully executing the motor task during LD beforehand. This concept of 'I did once so I can do it again' relates well with Bandura's theory of self-efficacy (Bandura, 1997). The theory asserts that the primary source of self-efficacy is mastery experiences, namely that positive and negative past experiences impact the belief in one's ability to perform that task in the future. Thus, the experience of successfully executing a given task during LD, enhanced participants' self-efficacy to re-attempt that same task during wakefulness.

Other sources of self-efficacy proposed by Bandura (1997) are vicarious experiences (watching others perform the task), social persuasions (being encouraged by others), and physiological feedback (physiological responses relating to performing the task and resulting affective states). LD may also favour self-efficacy via these means. During LD, one can observe themselves or other characters perform a motor task (vicarious experiences). The use of a third-person perspective for motor learning purposes was described by one participant in this study (P1), and also observed in Schädlich and Erlacher (2018b). Schädlich and Erlacher (2018b) also reported of a dreamer who received a "pep talk" (p. 6) from a friend during LD, improving her confidence, suggesting that verbal persuasion from dream characters can occur during LD. Moreover, LD may provide an opportunity to explore physiological and affective

states related to the motor task in an environment dreamers perceive as safe and consequence-free. For instance, dreamers could use LD to train in various conditions (e.g., social pressure, competition, fear of failure) and learn to perform under the resulting affect states (physiological feedback).

Findings indicate that although one's belief in their motor abilities may be enhanced through LD, this may not necessarily translate to successful task execution or waking performance improvements. Four participants reported examples of increased self-efficacy, without corresponding motor performance improvements following LD. This aligns with a survey study where a larger proportion of adolescents reported enhanced self-efficacy than improved waking performance, after practicing sports skills during LD (Bonamino et al., 2024). Taken together, these findings suggest that following LD, one may feel confident in their ability to execute a particular motor task despite not necessarily attaining the desired performance outcomes. Future research should include a measure of self-efficacy alongside motor performance to further assess how these may be influenced by LD.

Feeling Safe and Consequence-free

Participants perceived LD as safe and consequence-free. This feature played a critical role in shaping their LD experiences, enabling them to comfortably step out of their comfort zones and engage in activities without the repercussion they would be confronting if awake. From a motor learning perspective, LD provided a unique opportunity for participants to push their boundaries and explore movements without fear of injury or physical strain. Unlike in wakefulness, during LD participants didn't need to warm up or worry about the impact of fatigue from previous training sessions. This aspect may make LD particularly suitable for high-level or elite athletes, who regularly undergo strenuous training sessions, potentially leading to injuries without adequate recovery (Windt & Gabbett, 2017), as well as other clinical and non-clinical populations who may benefit from LD when recovering from injuries, during

rehabilitation programs (e.g., recovery from a stroke), or when physical training is not accessible.

The sense of safety and having no consequences was also central to participants' experiences when LD was used for purposes other than motor practice. Through LD, participants gained increased self-confidence, self-efficacy, mental well-being, and personal growth. Addressing conflicts with peers and family, confessing feelings to loved ones, and freely expressing emotions during LD, prompted a sense of relief and enabled participants to more comfortably interact with these people when awake. Particiapants also used LD to prepare for waking-life events by exploring appropriate behaviours in an environment where they felt safe and comfortable. LD helped them deal with personal difficulties, such as gaining confidence in speaking to others, overcoming past traumatic experiences, and coping with loss. Bandura's (1997) theory of self-efficacy also applies here. Having experienced these situations in LD beforehand, enhanced participants' self-efficacy and reduced anxiety when facing similar challenges in wakefulness.

Consistent with current evidence, having fun was the most popular LD experience (Schädlich & Erlacher, 2012; Stumbrys & Erlacher, 2016). Participants engaged in various activities when having fun, including practising sports, flying, going on adventures, and passively watching the dream. Like having fun when awake (Oh & Pham, 2021), fun LD experiences promoted hedonic engagement and a sense of liberation, allowing participants to engage in activities they enjoyed and that may be too dangerous or not accessible in wakefulness. LD brought participants a sense of liberation, freedom, and empowerment, and encouraged contemplation and self-reflection. It offered them a safe space where they could relax, have new experiences, and momentarily escape the burdens and stresses of their waking lives. LD experiences translated to empowered waking mindsets, positive emotions, and increased motivation and self-confidence, promoting personal growth and mental well-being.

Recent evidence supports the positive relationship between LD and subjective well-being (Wessling, 2023). The potential for LD to address trauma and support well-being can be explored in the context of its impact on emotional and psychological states (Bonamino et al., 2024). By realising one is experiencing a dream or by engaging with dream itself, individuals may gain insights and confront emotional challenges in a supportive and controlled environment, which may contribute to both processing and alleviating traumatic or challenging experiences. Sackwild and Stumbrys (2021) highlighted the empowering, self-exploration and freeing aspects of LD and its potentials for treatment of depression. Based on these findings and considering the critical processes of emotional regulation, self-evaluation, and identity development in adolescents (Branje, 2020; Crone & Fuligni, 2020; Silvers, 2022), LD could serve as a valuable emotion regulation and therapeutic tool in younger populations. However, it is also important to consider that LD, like other psychological processes, may also have negative effects. For some individuals, LD might exacerbate existing stress or trauma, particularly if the content of the dreams is distressing or if it leads to increased rumination (Bonamino et al., 2024). The complex interplay of dream content and individual psychological states suggests that LD's impact can vary significantly, making it essential to approach its therapeutic use with caution and individualized consideration.

Suitability of Lucid Dreaming Environments

In addition to providing a safe and consequence-free environment, LD offers several features that may make it particularly suitable for supporting motor learning, self-development, and well-being. One of these is the deliberate manipulation of the dream experience. When training motor skills, dreamers can recreate or manipulate habitual waking training conditions and practice skills in conditions that would be too dangerous or impossible during wakefulness. Like in Schädlich and Erlacher (2018b), some participants in this study were able to execute movements in slow motion and change perspectives, which they perceived as valuable for

motor learning and enhancing the understanding of the movement. Similarly, one could deliberately summon dream characters or specific settings to simulate waking life situations, express emotions, practice conversations, resolve conflicts, or engage in hedonic activities.

Consistent with previous accounts from lucid dreamers (Schädlich & Erlacher, 2018a; Schädlich & Erlacher, 2018b), the overall perception of LD was realistic and involved most or all senses. This realistic perception is likely to support LD's efficacy, as dreamers can better relate their LD experiences to their waking life. In line with other reports (Schädlich & Erlacher, 2018b), the perception of gravity and pain varied, and movements were perceived as smoother or realistic, and often involving a stronger kinaesthetic perception. For participants who rehearsed motor skills during LD, this kinaesthetic awareness provided a clear sense of how the movement should feel when executed correctly, which they would then aim to replicate when attempting that same movement when awake. Heightened proprioception and kinaesthesia awareness play an important role in motor learning. Through kinaesthetic feedback, individuals can fine-tune their movements and make corrections to refine their motor skills and improve performance (Toner & Moran, 2015).

Restricted Lucid Dreaming Experiences

In line with previous evidence (Schädlich & Erlacher, 2018a; Schädlich & Erlacher, 2018b; Schädlich et al., 2017), dreamers can encounter problems and disruptions during LD. However, these can be overcome or integrated into the dream practice. Despite being unable to correctly adjust the length and weight of the poi, P8 still managed to practice poi-spinning. When awake, he then found himself capable of adapting his movements to accommodate poi of different lengths and weights. This suggests that certain dream problems, although disruptive at first, may facilitate motor adaptation.

Participants generally exhibited a lack of dream manipulation skills. Although all could maintain agency and almost always influence their actions, only one participant could

comfortably manipulate the dream settings. Consequently, the activities participants could engage in during LD were often constrained by the settings the dream presented them with. Engaging in a desired dream experience was therefore not always accessible. The inability to influence the dream settings, common among lucid dreamers (Stumbrys & Erlacher, 2017), may explain, at least in part, why practical applications such as rehearsing skills and problem-solving are seldom adopted (Bonamino et al., 2024; Schädlich & Erlacher, 2012; Stumbrys & Erlacher, 2016). Some participants developed ways of dealing with their lack of dream manipulation. P9, unable to influence the dream environment, performed intention techniques before falling asleep to prompt desired dream settings. On some occasions, participants would deliberately avoid influencing the dream settings or dealing with dream problems, in fear it might lead to loss of lucidity, unexpected awaking, or further dream problems. Participants with poorer dream manipulation would often actively influence their lucid dreams only when needed (e.g., to avoid or escape nightmares and therefore to promote a more positive LD experience). Despite the lack of dream manipulation skills, all participants reported benefiting from LD, suggesting that LD may be a valuable and accessible tool also for novice lucid dreamers or those with limited dream manipulation abilities.

Often, participants' lucid dreams revolved "around being realistic" [P5]. Thus, unless they perceived something to be possible or had experienced it when awake, they were unable to have that experience during LD. This may help explain why not all lucid dreamers can accomplish the same tasks or influence their dreams to the same extent (Schredl et al., 2018; Stumbrys & Erlacher, 2017). Some participants reported overcoming these limitations by adapting their intended actions during LD to their need for realism.

Nightmares and Lucid Nightmares

Participants' lucid dreams were occasionally disrupted by nightmare-like features. This is excepted given the association between LD and nightmare frequency (Schredl & Erlacher,

2004). LD as a form of nightmare treatment is common in both young and adult populations (Bonamino et al., 2024; Schädlich & Erlacher, 2012; Stumbrys & Erlacher, 2016) and supported by preliminary research (Ouchene et al., 2023). Accordingly, participants in this study reported often successfully overcoming or avoiding nightmares by manipulating the dream events into more pleasant ones or deliberately waking themselves up.

On rare occasions, three participants reported experiencing frightening lucid dreams they struggled to overcome. Although infrequent, lucid nightmares and other dysphoric lucid dreams can occur and are characterised by a lack of dream manipulation or the inability to awaken despite efforts (Mallet et al., 2022). These experiences can be particularly frightening to the dreamer and have received little attention compared to positive lucid dreams. Dreamers with limited dream manipulation skills might find it challenging to sustain positive LD states or overcome nightmares, potentially making them more susceptible to dysphoric LD experiences. Strengthening dream manipulation skills could potentially help prevent and alleviate dysphoric LD experiences.

Raising Awareness and Benefiting from Lucid Dreaming

The interviews highlighted the importance of raising awareness about the opportunities within LD. Participants often reported not being aware that certain elements of their lucid dreams were possible to influence. The interviews prompted participants to reflect on their lucid dreams, often realising their ability to influence their dreams was greater than they initially thought and encouraging them to refine their skills and explore alternative LD experiences. From this perspective, it would have been interesting to conduct a 6 or 12-month follow-up interview to gain insight into the changes of participants' LD experiences following discussion of their lucid dreams in this study.

Limitations and Concluding Remarks

Several limitations regarding the present study should be acknowledged. Findings are based on retrospective accounts. There is a possibility that the effects reported by participants did not directly emerge from LD but were instead elicited from other waking or sleeping events. Nonetheless, our findings align with previous evidence, indicating that LD may promote motor learning (Bonamino et al., 2023), confidence and self-efficacy (Bonamino et al., 2023; Sackwild & Stumbrys, 2021, Schädlich & Erlacher, 2018b), mental well-being (Wessling, 2023), and personal growth (Konkoly & Burke, 2019). The sample studied is heterogeneous concerning participants' LD experience, motivations, and ability to recall and provide details of their lucid dreams. This may account for the variability in interview duration (range: 38.32 – 147.67 minutes) and in the reported LD experiences. It is also of note is that six participants regularly engaged in sports during wakefulness, five of which also practiced motor skills during LD. Considering that a substantial portion of the sample were inclined towards sports, it is plausible that they were more likely to use LD as a tool to for motor practice, whether for specifically for skill refinement or fun. Further, no empirical verification procedures were conducted. Thus, it was not possible to validate participants' lucid dreams meaning there remains a possibility that the reported experiences occurred in non-LD states, these being other dream or waking states. Lastly, as with any recollection of dream and waking experiences, there is a possibility that participants might have inadvertently incorporated inaccuracies or embellishments into their reports, especially for dreams or waking experiences that occurred a significant time ago. This potential for inaccurate recall and other challenges associated with retrospective memory, may have affected the accuracy of the reported experiences, even if these reports align with other episodic memories. For a review on the reliability and implications of dream recall and reporting, see Booth and Stojković (2015) and Nemeth (2023).

In conclusion, this study provided insight into the LD experiences in a sample of adolescents and the role these may play in their waking lives. LD provided participants with a safe and consequence-free space where they could take risks, step out of their comfort zones, and engage in activities without the consequences they would normally be confronting if awake. Findings indicate that LD may promote motor learning, self-efficacy, personal growth, and mental well-being. Training motor skills during LD may result in enhanced waking self-efficacy, which may not always translate to improved waking performance. Although likely to support LD efficacy, advanced dream manipulation may not be a prerequisite from benefiting from LD, suggesting that LD may be a valuable and accessible tool also for novice lucid dreamers or those with limited dream manipulation abilities. Findings also indicate that participants enhanced their LD experiences by finding ways to compensate for their lack of dream manipulation and to overcome problems encountered during LD. Additionally, hedonic engagement during LD, and LD in general, brought them a sense of liberation and freedom, and a temporary relief from the burdens of waking life. In this respect, having fun during LD may play an important role in supporting mental well-being. The study also highlights the importance of raising awareness about the opportunities within LD, as dreamers may be encouraged to explore alternative or new ways to approach their lucid dreams. Given that adolescence is marked by processes of self-discovery, self-evaluations, and identity development (Branje, 2020; Crone & Fuligni, 2020; Silvers, 2022), LD emerges as a promising tool to assist young people in overcoming fears, expressing emotions, acquiring new skills and experiences, and fostering personal growth and mental well-being. We encourage future research to further explore via more objective intervention methods, the role LD can play in promoting motor learning, personal growth, and mental well-being. For example, identifying the long-term stability of therapeutic effects and considering the integration of LD into existing

therapeutic frameworks may inform on alternative therapeutic approaches to support mental

well-being in both clinical and non-clinical settings.

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Table 1.

Participants' Characteristics

Code	Gender [m/f]	Age [years]	LDF [a]	Lucid dreaming applications or activities engaged in at least one lucid dream	Motor skills/sports practised in at least one lucid dream
**P1	f	19	5	Having fun, preparing for WL events, self-development, nightmare treatment, practicing motor skills	Olympic weightlifting
**P2	f	17	7	Having fun, expressing emotions, preparing for WL events, nightmare treatment, practicing motor skills	Swimming
*P3	m	21	4	Having fun, nightmare treatment, practicing motor skills	Skateboarding, surfing
P4	m	17	5	Having fun, expressing emotions, self-development, nightmare treatment, practicing motor skills	Guitar
P5[b]	m	18	7	Having fun, nightmare treatment	
*P6	m	18	5	Having fun, self-development, nightmare treatment	
**P7	f	18	5	Having fun, preparing for WL events, nightmare treatment, practicing motor skills	Beach volleyball
**P8	m	18	6	Having fun, expressing emotions, preparing for WL events, self-development, nightmare treatment, practicing motor skills	Boxing, poi-spinning, rock climbing, poi spinning, balisong knives, video game, Rubric's cube, plank, one-arm pull-ups, handstands, splits

Code	Gender [m/f]	Age [years]	LDF[a]	Lucid dreaming applications or activities engaged in at least one lucid dream	Motor skills/sports practised in at least one lucid dream
P9[b]	m	18	6	Having fun, expressing emotions, preparing for WL events, self-development, nightmare treatment	

Note. Blank spaces indicate when a parameter is not applicable for a participant (P5, P6 and P9 did not practice any motor skills in their lucid dreams). m = male; f = female; LDF = lucid dreaming frequency; WL = waking life

* Participants who regularly engaged in sports during wakefulness.

** Participants who regularly engaged in sports competitively during wakefulness.

[a] LDF scale from 0 to 7 (4 = about once a month; 5 = about two to three times a month; 6 = about once a week; 7 = several times a week)

[b] Participants experiencing a combination of spontaneous/naturally occurring and deliberate (induced via induction techniques) lucid dreams (the remaining participants only experienced spontaneous lucid dreams).

Table 2.

Results from Reflexive Thematic Analysis

Higher-order themes	Lower-order themes	Sub-themes	Codes
Learning and growth through LD	Skill familiarisation and refinement	Structured practice	Familiarity with the skill
			Number of dream practices
			Complementing PP
			Motivation and drive
		Self-efficacy vs performance	Change in self-efficacy
			Change in performance or skill refinement
			I did it once so I can do it again
		Ideal LD conditions	Successful skill execution in LD
			Understanding of the movement
			Opportunities and features of LD
			Right movement feeling
			Safe, injury and consequence-free environment
		Adaptability	Opportunities and features of LD
			Distractions as a learning opportunity
	Psychological uses and gains	Expressing emotions	Confessing feelings
			Releasing emotions
		Preparing for waking life events	Sport-related events
			Exploring other's reactions
			Having difficult conversations
			Improved confidence and self-efficacy
		Self-development	Self-reflection

Higher-order themes	Lower-order themes	Sub-themes	Codes
			New experiences and emotions
			Supporting social life
			Overcoming trauma and difficulties
		Having fun	Primary interest
			Different ways of having fun
			Pursuing personal interests
Optimizing LD experiences	Problems and how to deal with them	General problems	Waking up/loss of lucidity
			Recognising patterns
			Risks of dealing with problems
			Thinking = happening
		Movements and intended actions	I can't fly I can't run
			It takes a lot of effort
			Obstacles and shifts in the environment
		Equipment, environment, and dream characters	Unrealistic gravity
			Difficulties with equipment
			Problems as an opportunity
			Distracted by dream characters
		Nightmares and disturbing dreams	Dealing with nightmares
			Lucid nightmares
			Growth through negative experiences
		Dream manipulation skills	General lack of dream manipulation
			Dream problems because of dream manipulation
			Need for the opportunity to be there
			Ways around lack of dream manipulation skills

Higher-order themes	Lower-order themes	Sub-themes	Codes
			Experiences restricted by logic and realism
	Raising awareness	Pre-lucidity advice	Mindfulness and focus
			Pre-planning of lucid dreams
		Motor learning	Skill familiarity
			Being aware of discrepancies
			Complementing with LD with PP
		Improving overall experience	Avoiding negative thoughts
			Keep trying
			It's all about believing
		New ways of approaching LD	Haven't tried / haven't thought of
			Self-reflection through discussing own LD experiences

Note. RTA = reflexive thematic analysis; LD = lucid dreaming; PP = physical practice.

Table 3

Dream problems

Dream problem category	Dream problem type	Example quote
General	Unexpected awakening due to heightened or unexpected emotions, frustration, or self-induced pressure. (6)	"I just keep trying that action over and over again it just stresses (me) out … a lot of the time I end up erm just waking up." [P2]
		"I'm like 'Don't wake up don't wake up don't wake up'. Like 'Keep dreaming keep dreaming this is fun' … and then I end up waking up most of the time anyways." [4]
	Unexpected awakening or loss of dream lucidity during attempts at dream manipulation. (2)	"If you try and shift too many things you wake up, or you'd be losing lucidity." [P1]
	Awakening due to hazy vision (1)	"[Sometimes] after I gain lucidity almost like everything kinda goes hazy and I can't no longer see things … it's almost like something doesn't want me to be lucid. So kinda pulls me back and wakes me up." [P6]
	Doubt and loss of focus causing issues with dream manipulation or nightmares to develop (4)	"Sometimes the dreams don't work as you want, and er if you get nervous in your dream then that thing will er never really work." [P9]
		"My mind would just randomly think of something that I don't want and … it instantly just switches from … a happy lucid dream into a nightmare." [P5]
Movements and intended actions	Difficulties during task execution (3) or inability to fly (3)	"Say out of ten tasks I wanna do, probably only one or two [I manage to do.]" [P2]
		"You have those like dreams where like suddenly you won't be able to run as fast or like [you'd be] running slower and things like that." [P5]
Environment, equipment, and dream characters	Changes in the environment (2)	"There was a snowstorm or something as we were climbing up the mountain and something happened. I think it was too foggy or something that we couldn't go any further. So I just jumped off the cliff and just

Dream problem category	Dream problem type	Example quote
		flew just down the mountain." [P6]
		"I'm playing in my street and suddenly … when I turn back my environment changes like this … I just turn sideways and I just come to my village place." [P9]
	Motor practice equipment (1)	"Everything just didn't feel right about it. Like I couldn't get the rock feeling how I wanted it to feel, I could not get the moves the right distance apart … I just could not get any of it to work right … Like until I woke up I was just tryina fix this one problem." [P8, when attempting to recreate a rock-climbing problem]
	Issues with gravity (4)	"If I do have a rock-climbing dream I would like usually be going to different planets. And so either the rock's really easy to climb or really hard. Cos like the gravity it's different." [P8]
		"Sometimes I can choose to like fly or run or something and then it kinda feels like an extra layer of gravity." [P2]
	Distractions by the environment or other dream characters (3)	"It's like my attention, my conscious attention within lucid dream is drawn towards something else … It's like I'm needed over there but like I'm still here what do I do. And that that actually does create like erm priority tension. Is like 'Wow, where do I go to. Do I go there do I go here. What do I want to do." [P4]
		"I'll be having a one-on-one with someone and like someone else would pop up and be like: 'All right, let's go somewhere else.' … Then I'll try and resist and go like 'No, I just wanna stick with this.' … I had to be *really* insistent to stay with the person I was already talking to … They stuck around for like a good half an hour of dream time and then they left.' [P1]

Dream problem category	Dream problem type	Example quote
Nightmares and disturbing dreams	Nightmares (9) and lucid nightmares (3)	"I had to choose whether I had to save mom's life or dad's life … I know that I'm in a dream, but I still have to make that decision and I can't influence [the dream]. … And I just remember waking up and I went 'oooof'... cos it was just terrible, tormenting." [P3]

Note. The number of participants experiencing the dream problem type is reported in brackets.

Appendix

Interview Guide

Table A1

Semi-structured interview guide

Section	Question
Demographics	How old are you and where are you from? What gender do you identify yourself as? Which sport do you compete in and at what level?
Lucid dreaming experience	What is your understanding of a lucid dream? Please give me an example of a lucid dream you had. How often do you lucid dream and when did you start lucid dreaming? Are your lucid dreams deliberate (planned) or spontaneous (random)? Do you use any techniques to induce them? If so, please describe what methods.
Specific applications	What do you usually do in your lucid dreams? Have you ever used a lucid dream… Please give me an example. …to learn a new movement/improve a specific movement? …to become more confident in performing a movement. …to practice any other motor or non-motor skills? …to improve tactics? …to complement physical practice? …when you were not able to practice physically or when you were injured? …to mentally prepare yourself (e.g., reduce anxiety and stress) for a competition or other? …to simulate a conversation with peers/family/others or a particular event? Do you use lucid dreaming for anything else? Please give me an example.
Effects on waking life	How do you feel when you practice a skill after rehearsing it in a lucid dream? Please describe what your waking performance/confidence feels like after rehearsing a skill in your lucid dream. In what other ways has your lucid dreaming practice affected your performance and confidence in wakefulness? Have you ever learned something completely new, had a new body sensation, or had an insight or idea that helped you during wakefulness? How did that lucid dreaming experience (e.g., simulating the conversion/event) make you feel/impacted you during wakefulness? In what other ways have your lucid dreaming experiences affected your waking life?
Dream manipulation	Please describe your level of dream manipulation in your lucid dreams. Please describe what you do when you become lucid in your dreams and how you prepare your practice (e.g., how you find the necessary equipment, dream characters, etc. in your dream) Have you ever… Please describe those experiences. …manipulated speed or time like moving in slow motion or speeding up? …changed perspective (e.g., seeing yourself from the outside, feeling yourself in someone else's body)? …constructed or changed your environment to support your practice/purpose? …summoned dream characters, partners, or coaches to ask for guidance or help you practice a skill/to support your purpose?
Problems and distractions	Please describe any problems you have encountered during your lucid dreams/anything that may have interrupted or made your practice difficult. How do you deal with them?
Characteristics of lucid dreaming environments	How do your movements feel in your lucid dreams compared to wakefulness? Please describe how you experience… in your lucid dreams. …gravity

Section	Question
	…pain
	…muscle power
	…exhaustion
	…balance
	…jumps and turns
	…surroundings
	…senses (sight, touch, sounds, smell, taste)
	…temperature
	How suitable do you think lucid dreaming environments are for practicing waking skills? Why is that?
Evaluation	Why do you lucid dream? What does it bring to you?
	What motivates you to lucid dream?
	Is lucid dreaming beneficial or harmful to you? Why is that?
	Do you think there any preconditions/preparations that one could undertake to benefit the most from lucid dreaming? What advice would you give someone to benefit the most from lucid dreaming?