Interactive digital narratives for mental resilience: Understanding the player experience of betwixt

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A B S T R A C T

Interactive storytelling has been successfully established in various artistic disciplines, and as the medium matures, we see a variety of forms and applications. Recently the form has been used for production of applications that offer the users various therapeutic elements. Our work exploring the usage and impact of such works presents a user experience (UX) study of a mobile application called Betwixt, designed to support mental resilience. Over a four-week period, recruited participants took part in usability tests and responded to surveys and interviews to answer questions on topics such as: navigation approach and difference in experience, motivation for using an application like Betwixt, and whether they were affected emotionally while using the application. We analysed our results through inductive coding and the retrieval of user analytics. Our key findings, presented in the form of observations, include: reasons why the application's narrative and interface affected the participants, how the interface can reflect negatively on an otherwise enjoyable narrative, how the interactive element of the application has been the main attraction for most participants no matter their background, and ways in which the application affected the participants emotionally via its conversational style and significant level of user agency in the narrative.

1. Introduction

In this article we present a User eXperience (UX) evaluation of the therapeutic Interactive Digital Narrative (IDN) Betwixt, a mobile storytelling experience designed to assist in improving mental resilience and enable self-reflection. Our work uses Betwixt as a case study in therapeutic IDN to explore user behaviours and attitudes that may be more widely applicable.

IDNs are products being researched by the IDN research community, who specialise in various forms of interactive storytelling and narrative technology, from hypertext fiction to story centric games. These forms contain interactive elements in the narrative, which a user can invoke and influence according to the scale of agency a creator has granted [1].

This research has been successfully embedded over the years in literature, games, cultural experiences, education, films, health sciences, and most recently in television [2–7]. With its ability to embed itself in multiple different disciplines, IDN offers exciting ways to go beyond entertainment and make serious applications, such as those related to health, more engaging [7–14]. While work is ongoing to explore the efficacies of these applications, it is also important to understand the overall experience of people when they are using them, by examining the user experience, the patterns of usage, and the design impact on experience.

The aim of our study was to explore the experience of people with an interactive storytelling application bearing therapeutic elements. Our motivation is not to understand the efficacy of the application from a therapeutic or health perspective, but to understand the UX of such applications and how players/users respond and behave within a therapeutic IDN, what motivates them to use one, how they experience it holistically and not just superficially by critiquing the interface, and the potential emotional impact an IDN application of this genre can have. Consequently, our approach is not one of health baselines and large-scale quantitative analysis, as might be expected in a trial exploring therapeutic efficacy, but a more qualitative approach that analyses and codifiers user behaviour and attitudes to better understand their experience.

We identified Betwixt to be a suitable application for our study, as it represents a fully developed example of the form we were seeking to explore. To achieve our aim, we set out to answer the following research questions:

1. How do users navigate the application and what are the key factors that render it positive, or negative for each person?
2. What drives people to use the application for the first time and what motivates them to use it again?
3. How has the experience affected the participants while playing and has it influenced them emotionally?

We identified initial usability issues and patterns of usage with a set of participants who tested the application and provided us with feedback. The data collected through surveys and interviews form our findings and contribute answers for our questions.

2. Background

Storytelling, in general, is recognised as a key mechanism for human knowledge sharing, societal organisation [15,16]. More recently, studies are progressing to examine the use of storytelling in cognitive behavioural science, to explore how narrative influences both individual and group behaviour [17]. The use of IDNs as specific methods of storytelling for health and therapeutic purposes is grounded in several fields of study for psychological intervention and for education: bibliotherapy, expressive writing, and serious games. Bibliotherapy is 'an emerging clinical technique that has been found useful for treating various clinical problems' [18]. Clinicians use directed reading, both in fiction and nonfiction, to aid and treat patients across all patient demographics with psychological issues, primarily related to mental illness and/or emotional problems [19]. Expressive writing is used for similar purposes in cognitive behavioural or analytic therapy [20], except rather than reading, the participants write in a form of 'written disclosure therapy' [21]. Both forms of therapy to date have primarily been used with print- and/or paper-based media, relying on prose narratives and their well-known conventions including characters, linear storylines, and limited reader agency in the progression of the work, though recent studies have begun to use IDNs in novel ways [7,21]. Likewise, IDNs and so-called 'serious games' have shown tremendous promise for educational and public communications purposes across an enormous range of subjects, purposes, and audiences [10,22–29].

The interactivity inherent in works designed to be experienced through digital devices offers both 'hyper' and 'deep' attention [30]: '[d]eep attention… is characterized by concentrating on a single object for long periods' (i.e., reading a novel), while '[h]yper attention is characterized by switching focus rapidly among different tasks, preferring multiple information streams, seeking a high level of stimulation, and having a low tolerance for boredom'. Playing games, surfing on the internet, watching TV while engaging in social media on second screens—these are activities typically associated with hyper attention. While hyper attention on its own is not an ideal state for learning [31,32], works that evoke both deep and hyper attention have the potential to engage learners on multiple cognitive levels, more thoroughly engaging them in the intervention. Thus, current studies [7,12,33–39], including the one presented here, aim to examine how interactive narratives can impact audiences in significant ways for education, communication, and mental health purposes.

3. The Betwixt application

Betwixt[1] is a 'Choose your own path' style IDN application available to download on the iOS platform that takes an interactive approach to promote self-discovery and mental wellness by providing a sense of agency to the users through a story. The application has been designed by a small team of software developers—an author, a cognitive psychotherapist, and a science writer—who have developed it with inspiration from the fields of study mentioned in the background section,

among others. The application aims to enable its users to build mental resilience through their own personal engagement with an interactive story. The story uses interactive tasks and a conversational storytelling approach to keep users on a personal journey of discovering their inner thoughts and perceptions of the real world.

The application's current iOS[2] version contains five story threads portrayed as 'dreams', each being made available in order and taking the user through a portion of the story (see Fig. 1 and Fig. 2). The narrative is guided by a narrator portrayed by an inner 'voice', and choices are offered randomly within the text as prompts to enable user engagement with the story in a conversational matter.

Once completed, each story thread (dream) comprises two additional forms of follow-up quests in the forms of: meditative sessions, where users are guided through an audio meditation (see Fig. 3), and information sessions (see Fig. 4) where users are given a chance to read about some of the psychological aspects of why the application was developed a certain way, and why their choices might have been informed one way or another.

For the purposes of this study, the development team also made available an in-browser Web version of the application, accessed only

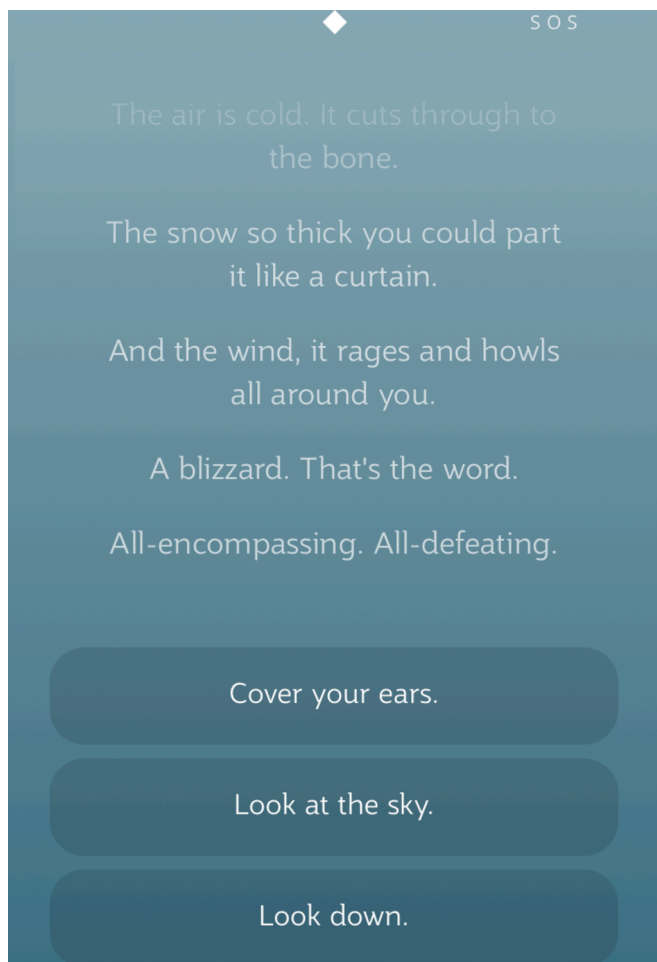
Fig. 1. Option for Dream 1.

Fig. 2. Dream 1 narrative.

via a link shared with the research team, which we could then use for those participants who were using a platform other than iOS. The link to the web version could be accessed through either a mobile or desktop device.

4. Methodology

We took a mixed methods approach to our study of Betwixt's user experience with a strong focus on analysing qualitative data but leaving room for quantitative data to further inform those qualitative findings. Our methods included a remote unmoderated usability test, pre- and post-usability surveys, and post-usability interviews with a limited subset of participants. The surveys enabled us to gather data on demographics, and personal reasons why participants were interested in taking part. The usability test enabled us to ensure participants had enough time to use the application at their own leisure and further gave us the opportunity to ask them questions after their experience using the application. Interviews looked deeper into the research questions by allowing some follow up questions based on participant feedback from the surveys. Overall, our approach to answering our research questions was to gather sufficient qualitative information about participants' experience of the application, their motivation for engagement, and whether the application bore any significant meaning or emotional implication for them. Cautious of the qualitative nature of the study and under guidance from Nielsen's [40,41] advice on usability testing, we purposefully targeted a small number of participants (10 < n < 30 where ideal n for first iteration is 15). The final number of participants we recruited (n = 26) is ultimately considered high but within the typical
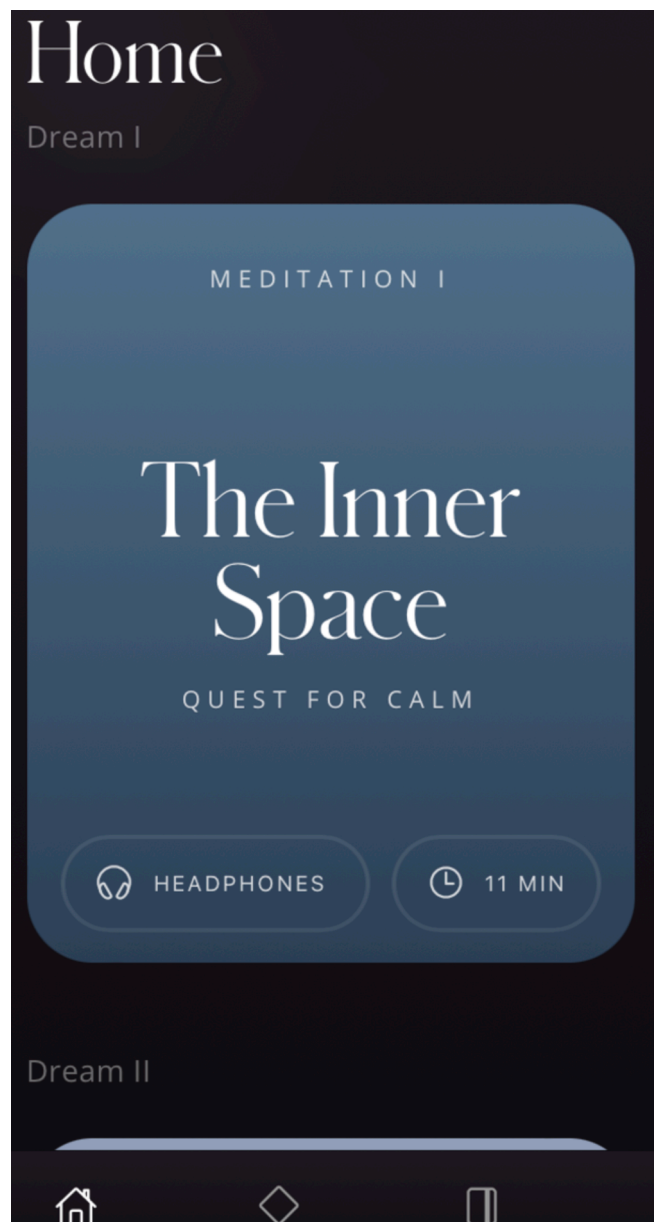

Fig. 3. Option for meditation session 1.

10–30 range for qualitative studies of this type and provided a greater range of experiences for analysis.

Following ethics approval from Bournemouth University's ethics board, participants were invited to participate through an advert for recruitment via email through academic institutions, a network of researchers in IDN scholarship, online forums of people who are actively engaged in interactive narratives, and social media accounts.

When asked to be involved in the study participants were provided with an Information Sheet that explained the details of the study, what it hoped to achieve, what data would be collected and how the data would be used. Participants were free to decide on their own whether they wanted to take part in the study after reviewing the participant information sheet and signing the necessary boxes to give us their consent.

With the receipt of consent each participant was sent a link to an entry survey clarifying whether they would be accessing the application through an iOS or web-based platform, and their background and motivations for participating. On confirmation of the platform, a link to the application was sent to the participants along with instructions on how to start using the application. For the participants who were given access

Fig. 4. Option for information session 1.

to the web-based version, they were prompted to preferably use a mobile device. In the instance that a mobile device was not feasible, participants were prompted to access the application through a desktop.

All participants were given a period of four weeks to use the application and complete the trial. After four weeks participants were sent a link to an exit survey to provide feedback and explore usage and motivation. Those who were testing the application via the iOS platform were further approached for arranging an exit interview which explored the user experience and emotional impact. It is to be noted that the Web version of Betwixt, while similar, lacked some elements of the iOS version in terms of follow-up activities, replacing the information session with journalistic exercises instead. While data on their motivation and attitude towards the application as a whole was still of value, they were excluded from the interview part of the study in order to ensure a consistent experience for the subjects, and consistent context for the data collected, at that stage. After gathering all the data those were analysed and codified to form our conclusions.

5. Results & analysis

Our main research questions were as follows:

How do users navigate the application and what are the key factors that render it positive or negative for each person?

What drives people to use the application for the first time and what motivates them to use it again?

How has the experience affected the participants while playing and has it influenced them emotionally?

Due to some practical aspects around the user interface design that seemed to have influenced the overall experience, a fourth question relating to the user experience surfaced during data collection:

How did the interface design aspect affect each user's experience?

We have documented these user experience phenomena as answers to this fourth question along with our main research questions.

We recruited 26 participants: 12 tested the application on a mobile web version (only available for the study's purposes), 2 on a desktop web version, and 12 on the iOS application who all completed the survey on usage and motivation. Out of the 12 iOS participants (who were testing the most updated version of the application) we asked to interview, 11 agreed to let us collect in-depth information on their user experience and emotional impact. Our sample was generic, and the interviews were designed to be semi-structured to allow room for sub queries on some open-ended questions. In our analysis participants are identified as P(number).

In questions where findings were quantitative or based on demographics, we summarised them with graphical representations and combined the findings according to the requirements of our research questions. Examples include questions where users were asked to tell us whether they had a positive experience with the application and how often they used it. In questions where findings were qualitative, we used inductive coding approaches to classify the findings according to the requirements of our research questions. Examples include questions where users were asked to tell us whether the user interface has affected their experience at all or whether there were aspects they liked or disliked about the application.

Below we present a detailed analysis for each of our research questions (including our approach to each question), findings, and discussion.

5.1. RQ1 how do users navigate the application and what are the key factors that render it positive or negative for each person?

To answer this question on the navigation of the application we considered a combination of sub-questions appropriate to provide us with a more complete picture of people's individual experiences. We asked participants questions such as whether their experience with the storytelling aspect and the user interface was positive, how often they used the application, and what parts of the application they completed.

Fig. 5 shows a distribution of how often people have engaged with the application on a weekly basis given the 4-week period they were given, combined with their attitude responses on whether they enjoyed the use of the application or not. The number on each bar represent how many participants used the application daily, more than once a week, weekly, and less than once a week. For each time interval, the number of participants is separated into those who reported a positive experience (green columns) with the application and those who had a negative experience (red columns).

Those who responded negatively about their experience were likely to use it less than once a week. On average those who were positive towards the experience were likely to engage with the application no less than once a week with a few exceptions. Several participants mentioned they needed breaks between navigating each dream (see comments below), suggesting an emotional influence of the application required some time or reflection between the navigation of the dreams.

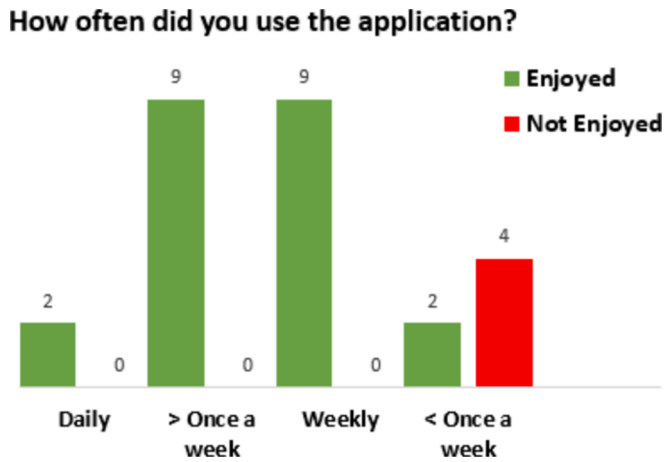This valuing of breaks and reflection follows what has been found in

How often did you use the application?

Fig. 5. Number of participants against the times they used the application and whether they enjoyed it or not.

similar work in game design [42,43] where breaks have been shown to benefit player engagement and understanding.

Evidence of this from participants is presented in the following statements:

"I went through more than one part in a sitting, so it gives you the option. If you feel stressed, you can just stop." – P22.

"I wouldn't have wanted to do each story straight after each… I needed that break between in the process." – P11.

"I definitely think it is a lot to take in if someone had done all dreams in one go. I wouldn't have been able to. It would probably be too much, so I quite enjoyed the weekly separation." – P3.

P22′s comment reflects the agency the user feels in engaging with the app, as they had the option to pause or stop if the narrative or exercises became emotionally overwhelming. P11 similarly emphasises agency in noting the option of a break as needed.

We also asked participants to tell us whether they accessed all the features offered by the app such as the dreams, information sessions, and meditation sessions; most participants said that they did. Participants favoured the dreams and information sessions over the meditation sessions, but the dreams were the main feature that all participants completed, apart from one participant who said they fell ill during the experiment and could not complete all the sessions:

"I did all of them. All the stories. I really liked them." – P10.

"I did yes. I really enjoyed it…. There were a few times where I wished I could have gone a little bit faster, but I think if I had done that, I might have kind of not stayed in the moment and might have just brushed over it. The pacing was good. I liked how there was a little bit of information on why those questions were asked and the information on the different types of drivers and things like that I thought that was fantastic. The meditations were good too, I loved the woman's voice. Very relaxing." – P24.

The meditations seemed to be the least favourite aspect of the application's approach, as quite a few participants said they either skipped them or did not complete them due to various personal reasons. These included lacking focus during meditations or having their own routine of regular meditation so no need for the app-driven session.

"I must say I didn't bother with the meditation. Meditation is something… it just doesn't work for me… it'll just be if I look at my watch 'Are we done yet?'" – P2.

"The meditations I did one which is a bit weird because I actually meditate a lot, like I meditate daily. But I've got my own routine, so I guess that's why." – P10.

In addition, we asked participants to tell us whether the application was in any way difficult to carry on with, at any stage during their reading, because of its therapeutic approach. Fig. 6 shows that 31 % of

Did you find the application difficult to keep up with and wanted to end parts or all of the experience before it was over?
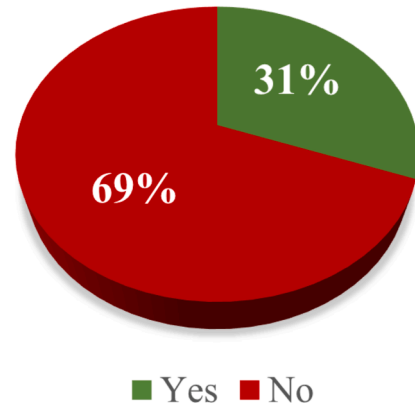

Fig. 6. Percentage of people who found the experience difficult or not.

the participants said they did. Where it was possible to follow up on these responses in interviews, none mentioned that something triggering or mentally overwhelming was the reason for not carrying on with the experience, or that they wanted to stop engaging with the application for any reason. Due to the limited sample size, the possibility remains that participants who felt the experience was difficult were simply not present in the sample of people we interviewed.

Table 1 was developed as part of an inductive coding process using common elements participants mentioned about their experience relevant to this research question. It is classified in three experiential themes that describe how the experience felt for participants on a practical level.

The themes Supportive, Informative and Personal Freedom and Control were identified.

Supportive describes the impact on participants who felt elements of their experience with the stories were emotionally supportive:

"Some of those reminiscing bits and thinking about the situation I thought that was quite scary but things like being scared is fine… I am enjoying a story I am enjoying the exploration I am not feeling in any way like this isn't in my control and the guide is there listening and is reassuring me that this is the procedure." – P25.

"I don't know it's almost like talking to a friend." – P12.

Informative describes the impact participants felt they gained through the information they were learning from the experience, and the supportive information sessions that offered a sense of understanding for why things in the story were done a certain way, or why some of their own thinking developed the way it did:

"I thought it was really insightful and it was I guess for me it was interesting that you have these thoughts and you never give much thought to them almost so it's like you don't really recognise some of the

Table 1
List of application influential elements with evidence quotes from participants.

Impact	No of mentions	No of participants
Supportive	4	2
Example quote: "It was helpful. It was supportive, kind of the scaffold I need for that time." – P12		
Informative	3	3
Example quote: "I really liked how you had the dream but then it had like the psychological breakdown of why you've been asked certain things. I found that really interesting." – P6		
Personal freedom and control	4	4
Example quote: "I am not dealing with a human aspect and the instruction of pleasing the person so it's just the focus is on the questions. It's on myself. At the same time, it comes in this interesting form, the medium is different." – P22		

things that you are struggling with or how you perceive yourself … that's why I really enjoyed the extra info bits because it kind of elucidated 'aw this is the psychology behind it'." − P3.

"I found that it was really nice to have the story and then the psychology behind the story and then the meditation and you've got that sort of… They are sort of linked but different. I sort of liked reading the rationalisation behind it and the reasons behind things in the sort of, in the knowledge part so I think that was quite nice." − P12.

Personal freedom and control describes the impact on participants who felt empowered through their personal involvement and control during the experience, enabling them to be open and honest with the application and what they felt because there was nobody judging their decisions or influencing them, such as a therapist:

"…it gave you just enough gentle pressure to kind of take a look at yourself without feeling really pressured by somebody being 'hmm tell me about this, tell me about that'. It felt very friendly and guiding without making you feel obligated to make an answer. It's nice because if it got to a point for somebody who was having a rough time and they were like this is too much, just turn it off." − P24.

5.2. RQ2 what drives people to use the application for the first time and what motivates them to use it again?

We asked participants through the surveys to tell us what motivated them to engage with the Betwixt experiment and whether they would be motivated to engage with a similar application again. Fig. 7 shows the motivations to engage with the application that participants reported and compares those with the professional background of each participant.

Most people who chose to engage with the study were primarily coming from an interactive storytelling background and their motivation was the interactive storytelling approach. While this may have limited our participant pool to those with a professional interest in the storytelling element, our findings regarding the application use and experiences remain. Also, we note that while most people may have had some affinity with interactive storytelling before engaging with the study, not everyone did. Some participants noted alternate reasons for engaging with the study, such as assisting in a research experiment. The majority of the latter were not affiliated with a storytelling or psychology background.

Particularly interesting was that many participants, including those that came from a psychology background, were motivated to take part in the study because of the interactive storytelling element rather than the mental or combined mental/storytelling approach. This means that the novelty of the storytelling approach could be a key factor to entice people from different backgrounds to try a similar experience. It also seems that the combined storytelling/mental resilience approach was more attractive to people of all backgrounds than the sole mental resilience approach. We can interpret this as a positive reflection on the use of IDN for broader purposes, such as education and mental health support. The entertainment and engagement of the interactivity and narrative acts, effectively, as an attractant or motivator. Participants who have tested applications designed for therapeutic effects similar to Betwixt's aims noted the novelty of interactive storytelling in Betwixt, and how its engaging approach to intervention is through interactive narrative is different from the other applications they tested. This suggests some novelty in the approach from Betwixt (or others with a similar IDN approach) will stand out even for regular intervention users. Essentially the interactive storytelling element attached to Betwixt is the key reason why people would pull to the surface this application, over other mental health applications:

"I have a lot of mental health apps incorporated into my daily routine but Betwixt is just totally different from anything else that I'd done before and the fact that it uses like a story, the narrative is like the carrier so it makes it very easy to be engaged and it's kind of exciting because you don't know what's going to happen next." − P2.

"If I was on the app store and I am just looking to do something about my resilience and there's a storytelling thing that would come really high up my list like evaluating the difference, especially like interactive storytelling not just here's some fairytales but actually a thing that responds to me." − P10.

Further evidence for interactive narrative as an attractant is supported in participant responses when asked what would motivate them to engage in a similar application again. Most participants, as Fig. 8 illustrates, said they were more likely to engage with an application that carried both the combination of mental health and storytelling rather than any one on their own. If, however it was a choice between the two, people would be attracted to the storytelling element; most of these responses came from participants with a psychology background. This suggests that a notable proportion of people may be motivated to use such an application not for therapeutic means, but for entertainment and that combined interactive storytelling and therapeutic intervention applications like Betwixt, may make for an interesting form of preventative treatment, as users can still be motivated to use the application for
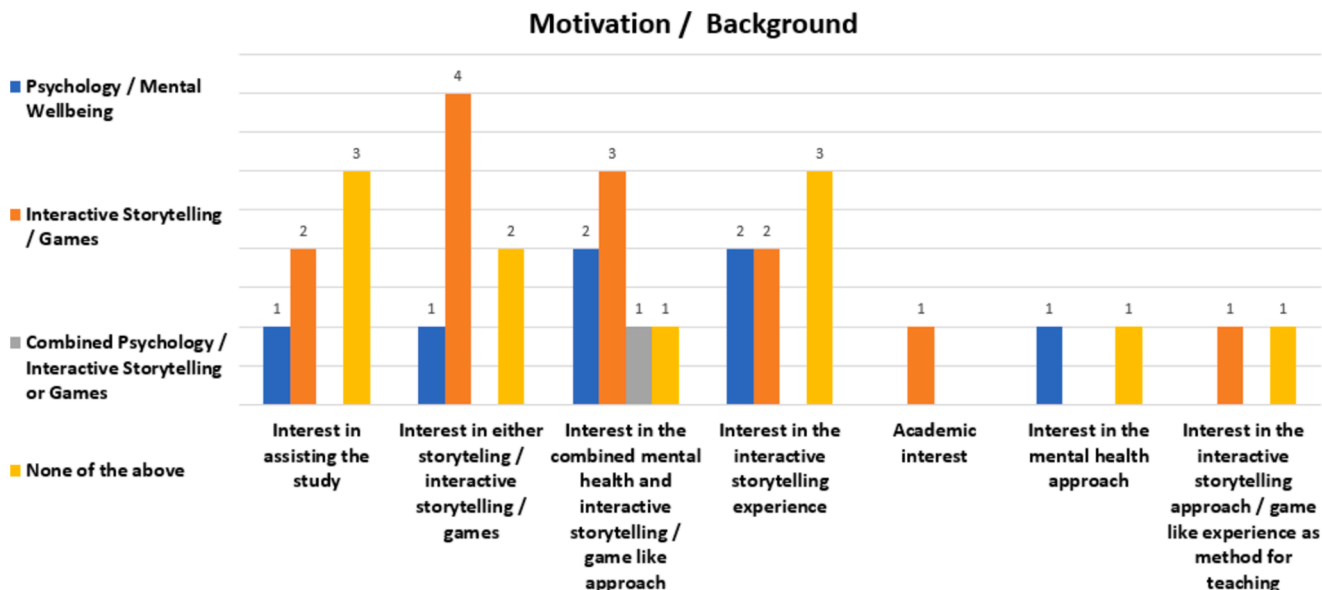

Fig. 7. List of reasons people were motivated to take part in the experiment based on their background.
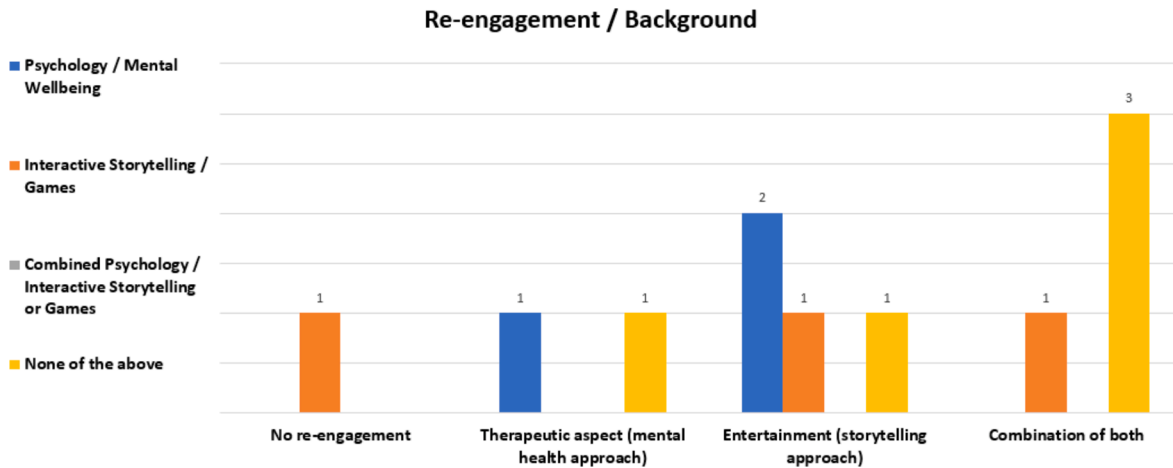
Re-engagement / Background

Fig. 8. List of reasons people would be motivated to take part in the experiment based on their background.

entertainment purposes even without an acute need for therapeutic aspects.

5.3. RQ3 how has the experience affected the participants while playing and has it influenced them emotionally?

We asked participants to tell us whether they felt their experience with Betwixt influenced their way of thinking and state of mind or had an emotional impact on them. No participants reported finding the application to be mentally overwhelming, and any reasons they felt the application was inconvenient had to do with user interface features rather than any emotionally triggering effects from the story. One participant told us that they purposefully accessed the application while going through a period of loss as they wanted to test whether it would trigger them emotionally in some way. They said:

"I wanted to try it when I was really stressed on the spot to see if it's gonna trigger me if it's gonna annoy me because I deal with different applications and I know where they just annoy someone…" – P22.

In terms of whether the story and overall structure of the application and the additional exercises (journal exercises & meditation for web users, info sessions & meditation for iOS users) have impacted the

Fig. 9. Stats of whether people were affected emotionally by the application or not.

participants' emotional state somehow, Fig. 9 illustrates that 73 % felt it did and 27 % felt it did not.

Other impacts on the participants were purely due to the design and structure of the interactive and engaging story. One participant (P2) felt that the story resembled a Cognitive Behavioural Script, and that the position required to inhabit a story space may not be possible for everyone. (We would note that P2 had a stronger opinion on mental health approaches as a person with a particular mental health condition attached to them.).

Feedback from other participants in the interviews was generally on the positive side, as they felt the application influenced them generally through the interface as well as the narrative and the interactive elements.

Particularly enlightening were the responses from several participants (P5, P22 and P24) who claimed that even if one goes into the application with some reservation, they gradually start to get more comfortable with it and they might feel confident to start adding their own text rather than just settle with the narrative choices.

In comparison to professional therapeutic treatment, the participants said that they did not feel the need to give a right answer to the person in front of them in order to potentially show some improvement in their treatment. They felt they could be more honest without disappointing someone because they were in a space they controlled, and nobody could "judge", such as the following response:

"I've had counselling before and I found that quite difficult in some ways because you are talking to a person and I am a little bit of a people pleaser so I kind of want to suddenly be okay because their work, their job is to make me feel okay. Whereas with this I didn't feel as bad about saying so or like reflecting that something was still negative, that I felt bad about something. Not necessarily saying that this hasn't worked but saying this is still a bad thing, something that is still difficult for me. I felt it doesn't matter if I don't respond to this. If a councillor asked me, I might feel obliged to talk in a certain way or to express certain things whereas with the application where you say it's only me and the computer, so I am not as bothered." – P5.

Table 2 was developed as part of our inductive coding process using common elements participants mentioned about their experience. It is classified into three experiential themes describing how the experience had an emotional impact on the participants based on feedback we gathered from the interviews. The themes Calming, Self-reflective, and Influential were recorded.

Calming describes the participant-reported impact reflecting some form of calming emotion, whether that was active or passive. Evidence of both seemed to be prevalent. One participant mentioned that the experience offered a sense of passive calming and suggested that this may be used to induce calming effects on, for example, students who

Table 2

List of application emotional impact elements with evidence quotes from participants.

Impact	No of mentions	No of participants
Calming	**3**	**3**
Example Quote: "I thought that colours and layout and everything was really quite beautiful. It was very feminine which I could have liked because a lot of the other times is very gender neutral and unisex but it was also very soothing it felt welcoming and calm." – P24		
Self-reflective	**4**	**4**
Example Quote: "I think there was a good element of critical reflection and the interactive elements where the voice asks you about things was a good way of actually incorporating you into the story…" – P6		
Influential	**5**	**5**
Example Quote: "I always find it hard to visualize the setting and stuff so having the sounds in the background and stuff was very nice and I liked the idea of this kind of on the scene voice, kind of as your friend/guide but asking you the tough questions that you are afraid to ask yourself. I kind of liked that." – P24		

need to be soothed or calmed down if they are overly active.

"I am a very sophisticated reader, and it came to me as calming and at the same time it was not boring it was not mundane it was really… I was really okay… you are dealing with a calming voice not somebody who triggers you, it's nice." – P22.

Another participant reported the overall interface felt like it was inducing a passive calmness to the experience, even if it was not the participant's primary purpose:

"The story was cool. I liked the background music thing I thought like that flowed in emotionally really well with how the story progressed." – P10.

On the other hand, some participants noted that the active engagement induced in the app directly contributed to their emotional responses:

"It quite appealed to me that it was an active involvement rather than passively listening to something or passively sitting there and being exposed to something." – P11.

This response suggests that Betwixt's interactive narrative employing active user agency offers a sense of calm to readers through story engagement and immersion in multimedia effects (such as music, colour, fonts, etc.).

Self-reflective describes the impact on participants who thought the app allowed them to self-reflect on some of their own actions and thoughts and remind themselves of things they knew were there but perhaps had forgotten about:

"I also liked the therapeutic bit even if you are not improving mental wellbeing at least there is this self-discovery element to it which was nice, cause I feel like sometimes knowing a little bit more about yourself and how things are is helpful in its own way." – P3.

Influential describes the impact on participants who felt that the application influenced or connected to them emotionally primarily through the interactive, personalised element of the story or other story features:

"I felt like I actually really enjoyed it once I got going and I liked the idea that it kind of tailored it towards me once it got going so once you start putting your name in and it starts calling you by your name and your previous responses are obviously considered in the later stages of the story so I really found that that was something that appealed to me because being involved in it, I think I learned a little bit better that way. I am more likely to change my behaviour and thought processes a little bit if I had a guided experience rather than just hearing what you should do." – P12.

5.4. RQ4: How did the interface design aspect affect each user's experience?

With this question our aim was to discover how the user interface influenced the participants' experience with the application, whether

positive or negative. We approached this question by asking participants to give us details on what aspects of the interface and overall application they liked, what they did not like, and what they would suggest for improvement. The participant responses to this question offer greater understanding of how the interface design might be affecting their experience.

Table 3 shows which features the participants said they valued, from both surveys and interview responses. Some participants mentioned a specific feature more than once.

Participant responses regarding the application's functionality and environment generally reported no significant issues that would impact their mood of the overall experience while navigating the application.

Table 4, on the other hand, shows the application elements participants mentioned negatively impacted their experience. Aside from technical issues, there were a couple of comments regarding the nature of the open-ended questions becoming less applicable following conversational segments where participants input custom responses.

A couple of participants gave us a few examples during the interview sessions. Participant (P2) mentioned a story question that asked, "What does this mean to you?"; the participant responded, "It means nothing to me." The application then responded, "Stories only have meaning when they are heard at the right time, maybe this is one to bury in your head for later." The participant felt like this response was prompting them to rethink their answer, go off, and return later with the right answer, as if the answer the participant had given was the wrong one. They acknowledge that this is one way to think about it, and that the notion might have been what was intended, but they mentioned it may come off negatively to someone.

Additionally, P24 mentioned a case in Dream 5 where in the context of the story they were asked if they could think of somebody who would deal with a certain situation. The participant responded, "I can't think of anyone," and the application responded, "OK well what would, 'I can't think of anyone', do in this moment." This gap in the programming, leading as it did to a glitch in the application's integration of an open-ended participant response, prompted a negative emotion for the participant (disappointment) in what had otherwise been a quite enjoyable and productive journey.

A number of participants also commented on the pace of the text's appearance in the application, which often frustrated their experience. If anything about the application affected participants negatively (in terms of UX), it was the inability to control the speed with which the text appeared. Below are two participant comments feeding back on this element:

"I don't think it's sort of something you want to go like in a game and say I want the speeder, but I did just notice my mind was wondering so I said, 'Aw for God's sake get on with it." – P2.

"I am an impatient fast-moving person and for me the text, very gently slowly came up and I know It was for setting the mood and all, but I was like I want to scroll through this." – P10.

As further reflection on their experiences with the application, we asked the participants to tell us if they felt there was something that could have improved their experience using Betwixt. Table 5 shows a list of those suggestions. Many of these suggestions reflect things

Table 3

List of features people particularly liked about the application.

Feature	No of mentions	No of participants
Design/ Environment/ Navigation	**13**	**10**
Sounds/ Background Music	**12**	**11**
App Missions/ Info/ Meditation	**11**	**10**
Story	**8**	**8**
Personalisation/ Participation / Continuity	**8**	**7**
SOS button	**1**	**1**
Thought provoking	**1**	**1**
Mental approach through storytelling	**1**	**1**

Table 4
List of features people disliked about the application.

Feature	No of mentions	No of participants
Technical / Interface issues	15	10
Slow text / pace	6	5
Authoritative, Disconnecting	4	4
Design / Navigation not clear	4	4
Story concepts and abstract setting	3	3
Duration of stories (long)	1	1
Untrustworthy medium	1	1
Everything	1	1
Free text entry	1	1
Conversation looked too much like text conversation	1	1

Table 5
List of features participants suggested needed to be improved in Betwixt.

Feature	No of mentions	No of Participants
Open ended questions to become redundant or reconsidered	4	3
Take away list or material available for download from each dream experience or practises explored in the story	4	3
Home screen to be clearer for navigation between different dreams	3	3
Setting to change speed and appearance of text	3	2
Desktop version to be made available	1	1
Design to be less plain	1	1
Progression maps to see the journey would be helpful	1	1
Additional stories with different genres weaving in mental health	1	1
Health warning before starting application for sensitive people	1	1
Progression to the story and more world travelling in the world rather than just talking to the voice to keep the imagination going	1	1
UI needs to be more intuitive i.e., symbols at the bottom not very clear	1	1
Save button should be included and be more identifiable for desktop version	1	1
Info about approach to exercises should be available in web version	1	1
Better sound and effects options	2	2
Journey to be more meditative than thinking	1	1

participants found they did not like about the application and offered improvements, but other things were general suggestions they wished the application offered in the first place. Examples of these were:

- Better navigational cues, as the current icons are not always clear. This confused many readers and thus disrupted their navigational experience.
- Settings to change the speed of text: some participants were frustrated by the forced slowness of the text.
- The information sessions to be made available on the web version of the application.
- Additional settings for other story settings, music, or text appearance so that if people wanted a different world or tune that they could relate to better, they could choose that. Additionally, to be able to change the way the text fades in and out of the screen.
- Progression maps to be available for showing the progress of a participant through the dreams/stories, and a takeaway list of main lessons learned after completing each dream.
- Reconfiguration of some open-ended questions to reduce dissonance produced if participants input unexpected responses.

6. Key findings

We presented in detail the analysis and main findings from our user-oriented study to assess the experience of users while using Betwixt, an interactive storytelling novel designed with the aim to improve mental resilience. We recruited 26 participants to the experience, surveyed them before and after their experience, and interviewed 11 of them for a deeper understanding of their experience and interaction with the application. We set out three research questions for our study, and through our findings included an additional fourth.

Our overall observations, labelled O(number), based on our findings and the subsequent results as presented in the analysis of each research question are summarised below.

O1 − Application experience.
O1.1 Story.

The application offered an engaging, immersive, and calming experience through the story, without triggering any significant mental health issues. This holds both for participants who enjoyed the experience, and for participants who did not.

O1.2 Interface.

The minimalistic interface was well received, with good colours and nice background music that offer a relaxing environment while traversing the story. Anything that took away from the experience of the application was related to malfunctioning UI features such as sound, login issues, slow text, meditation sessions not ending and, open-ended questions that failed to convey proper meaning.

O1.3 Exercises.

The information sessions (iOS) were a favourite among participants, as they enabled users to better understand their behaviour and choices in the application. The creative missions (Web) were also well received. The meditation sessions were received positively as well, with compliments on the narrator's voice, but some participants admitted not to have done them all because they either had their own routines or they preferred to quickly carry on with the stories.

O2 − Application Agency.
O2.1 Session control.

Controlling when to use the application (i.e., pause and resume the sessions anytime) offered participants a sense of confidence and authority. Participants favoured the option to take a break between stories rather than go through them in a continuous session.

O2.2 UI control.

Most participants expressed they wished they could control some aspects of the story flow, primarily the speed of text, as it seemed slow for most. Others mentioned the music or the story setting.

O2.3 Portability.

The application has portability which may be effective for people who need to access the app at any given time of day, although most participants were accessing the app either in the morning or before bed. One participant mentioned that they specifically went through the story while walking and it still held their focus and attention.

O3 − Application story approach.
O3.1 Interactive element.

Interactive storytelling elements positively motivate participants to use a mental health application. Many participants, regardless of background, were motivated to use the app because it involved the interactive storytelling element.

O3.2 Participation

Participants felt involved and like they were heard because of the conversational style of the application and the continuation of their answers. They felt they could be open and honest with the app without fear of judgement.

O3.3 Personalisation

Participants liked that the application was personalised and responsive to their own choices or textual input.

O3.4 Exploration

Participants mentioned that they felt a sense of freedom because they

were allowed to navigate a choice-based narrative rather than be forced into a linear one.

O4 – *Application emotional approach*.

O4.1 Potential positive emotional influence.

Participants mentioned that the application has a potential to positively influence people with mild mental health concerns in an emotional and practical space.

O4.2 Potential to stimulate emotional resilience.

Participant evidence suggests the application stimulates the emotional resilience of people on a tolerable level and in such a way that encourages mindfulness and self-reflection on aspects they knew about themselves but never thought of or dealt with.

7. Conclusion

We conducted a user experience study to evaluate the an IDN application with therapeutic elements (Betwixt). Our motive was to explore the user experience not on the level of its efficacy as a health intervention, but on its experiential impact on behaviour, attitudes, and emotions given its interactive storytelling nature and the theme of the story. Our emphasis was very much on how participants felt before, during and after their experience as a user of the application. Our results gave us sufficient data to form answers to our research questions and were rich enough to allow us to introduce an additional research question.

Our research questions were:

How do users navigate the application and what are the key factors that render it positive or negative for each person?

Each participant went into the experience with different levels of mental resiliency in the given time. Some mentioned they wanted to simply try the application, some mentioned they were going through something emotionally turbulent, and some desired to improve their mental resilience. As such, we saw that each participant's initial level of mental resiliency was a key factor to their overall experience with the Betwixt application. In addition, the technical interface, environment, and frequency of play were factors to the difference in experience for each participant. Most participants navigated the application with breaks between each story thread and completed all available dreams in order. Some deviated from the optional mediation sessions, but particularly enjoyed the information sessions as an additional element to getting to know more about narrative structure, or the psychology behind their choices in the narrative.

What drives people to use the application for the first time and what motivates them to use it again?

While some participants were initially attracted to the app's therapeutic element, the interactive element seems to have been the drive for subsequent re-engagement with Betwixt. Participants conveyed that interactivity and control over the experience was an important aspect of their overall journey and that it played a major factor in why they would engage with a similar application again. Participants were encouraged to concentrate on the story because they were actively participating in its progression, and they were keen to carry on because they were curious to see the story to the end. This indicates that interactivity enhances concentration and story drives curiosity.

How has the experience affected the participants while playing and has it influenced them emotionally?

Overall, we found that control over when to read the story was beneficial and the ability to stop or resume anytime was desirable as for some participants pausing was essential. The element of control offered participants a boost in confidence and therefore productiveness in

interacting with the narrative. They felt comfortable in being open and honest whenever the application asked a potentially triggering question; without a real person confronting them, there was less pressure on them to give the application the 'right' answers. Rather, they were prompted to write down things as they felt them at the time. Additionally, they felt the setting of the narrative and the mystical 'voice' that responded based on participants' choices created a soothing emotional effect for participants. This led some participants to adopt lessons from the app into their everyday life, or to self-reflect on things they had neglected.

How did the interface design aspect affect each user's experience?

Our findings indicate that the application's interface, no matter the quality and impact of the narrative itself, negatively affected the user's experience, as did technical issues such as slow text speed and inadvertent screen locking during app use. On the other hand, the colour scheme, the background music, and the minimalistic interface graphics had a positive effect on the experience. The narrative itself, while warmly perceived, was not without caveats, when for example some of the responses offered nonsensical meaning to participant input. This then raises the question: would an application with a more responsive design and no technical flaws invoke different user reactions, and would a constant stream of sensible feedback evoke further emotional impact on the users?

To conclude our study addressing the attitudes towards the therapeutic elements of IDNs like Betwixt, we asked participants for their opinion on whether they felt an IDN-based approach like, but not limited to, Betwixt could potentially work effectively as a therapeutic application. Participants indicated they felt the application would work for some people with mild mental health concerns but may not be suitable for those with more severe cases requiring professional intervention. They told us that it would be suitable not only for people who need some concentration and mental resilience but also for creative people who need to engage with something to focus or children who need to be calmed down, especially children who are prone to gaming because it does a good job at keeping people focused on it, even when they are on the move. While proving these statements was outside of the scope of our project, we hope by sharing our findings and the feedback from users of IDN-based therapeutic applications like Betwixt, we can inform the development of more robust IDN interventions targeted for health interventions.

Our study at this stage indicates how therapeutic IDN such as Betwixt—a conversational interactive storytelling application, where users evoke a level of control and take responsibility for their own actions— elicit a range of motivations, behaviours, and attitudes from its user experience. However, it should be noted that this study has focussed on the user experience of the application, and while there is potential for therapeutic impact this would need to be evaluated separately. Our findings provide a basis for a greater understanding of this particular form of serious game in terms of a qualitative exploration of the experience in depth with a smaller number of participants beyond a brief quantitative assessment of the usability. This includes the role of breaks in such an experience (something that confirms findings from player experience research [43]), as well as the mixed attitudes towards extradiegetic activities such as meditation, but also the role of story and interactivity in user concentration and curiosity, and the value of keeping the user feeling in control. It is to be noted that a limitation of this study, and many studies like it, is that usability and UX impact upon each other (as seen in the technical issues noted in this article) – while it is impossible to decouple these aspects entirely in user research future work on therapeutic IDNs may seek to adopt multistage approaches that mitigate the impact of this. Our findings may serve as a basis for future best practice in these experiences with Betwixt serving as a case study in therapeutic IDNs from which we may better understand user behaviour and attitudes in this particular form. However, these findings also demand future investigation particularly as to the prevalence of these

issues and evidence to support our observations from a greater variety of applications. While such further work is beyond the scope of this study and these initial findings are of value as empirical evidence in their own right, it is important that indicative observations and data be validated with wider research that both considers other applications with a varied UX profile alongside larger scale quantitative evidence.

CRediT authorship contribution statement

Sofia Kitromili: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization. **Charlie Hargood:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization. **R. Lyle Skains:** Writing – original draft, Methodology.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability

The data that has been used is confidential.

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