

Clinical Evaluations and Collaborative Design: Developing new technologies for mental healthcare interventions

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ABSTRACT

Ethical requirements, severe constraints on access to end users and the necessity of real-world clinical evaluations represent significant challenges to designers of new technologies in mental healthcare (MHC) settings. This paper describes the collaborative approaches, incorporating HCI methods with input for MHC professionals and MHC theory, which were applied in the development of Personal Investigator (PI), a 3D computer game developed to support adolescent mental health interventions. Different stages in the evaluation of PI are discussed and the lessons learned through a multi-site clinical evaluation are presented. This evaluation has provided strong initial evidence that games such as PI offer the potential to improve adolescent engagement in talk-based interventions. It has also provided an insight into factors which should be considered in future designs in the MHC domain, e.g. the need to incorporate high levels of adaptability in future systems. Based on the difficulties encountered and lessons learned critical aims for future research are outlined.

Author Keywords

Mental health, clinical evaluations, collaborative design, computer gaming.

ACM CLASSIFICATION KEYWORDS

H5.2. Information interfaces and presentation: User Interfaces - Evaluation/methodology.

INTRODUCTION

Mental health disorders are health conditions defined by the experiencing of severe and distressing psychological symptoms, characterised by alterations in thinking, mood or behaviour, to the extent that normal functioning is seriously impaired, and some form of help is usually needed for recovery. Although the past fifty years have witnessed major advances in the treatment of mental illnesses [1],

major challenges still remain. A recent large scale international study identified mental illnesses, including suicide, as the second leading cause of disability and premature mortality in developed countries. Large scale international studies also conclude that the majority of people suffering mental health disorders do not receive the required treatment [1, 2]. The primary causes of failure to receive treatment are lack of access to appropriate specialist services and the difficulties many people experience in engaging with traditional treatments, due largely to the social stigma associated with mental health difficulties. These factors are particularly severe amongst some of the most vulnerable social groups, including adolescents, young men and the socially disadvantaged [3].

To date the use of technology in talk-based interventions has been limited [4]. In the main technology has been used to replicate traditional therapeutic strategies e.g. electronic contact as a natural extension of face-to-face dialogue and the computerisation of self-help materials. While such approaches can assist in improving access, they have demonstrated only limited ability to improve engagement. Coyle et al describe the potential of technology to reshape therapeutic interactions, by becoming a third party in the therapeutic dialogue between a therapist and client and increasing the scope of the therapeutic interaction [4]. This new dynamic is predicted to prove particularly beneficial with adolescent clients experiencing difficulties with engagement.

Continued evolution of technology in this domain will benefit from the input of both HCI and MHC researchers [4]. Collaboration can help in maximising the effectiveness of new technologies, but is also necessary given the severe restrictions on access to end users typically faced by designer working in this domain. These constraints have many implications for the application of traditional design approaches. Furthermore, in order to provide objective evidence of the impact of new technologies on the outcomes of mental healthcare interventions, it is necessary to conduct clinical evaluations in real world settings. Such evaluations require extended durations and can only be conducted if new systems meet the ethical requirements of the domain. This paper describes the stepped design and evaluation approach applied in the development of the therapeutic 3D computer game Personal Investigator (PI),

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specifically designed to support adolescent interventions. To date PI has undergone several stages of evaluation, including an initial six month multi-site clinical evaluation in which it was used with 22 adolescents experiencing a broad variety of mental health difficulties. This evaluation has provided initial evidence that PI can help in improving adolescent engagement in talk-based interventions. It has also provided an insight into factors which should be considered in future designs. Based on the lessons learned in evaluating PI a set of requirements for future design approaches in the MHC domain are outlined.

CHALLENGES OF DESIGNING FOR THE MENTAL HEALTH CARE DOMAIN

Recent research has identified several significant challenges to effective design in the MHC domain [4, 5]. Of the issues identified, ethical requirements along with the sensitivity and stigma associated with mental illness pose particular difficulties. As well as meeting the ethical requirements of the HCI domain, research into the use of technology in MHC settings must adhere to the strict ethical requirements of the MHC domain. One significant implication of these ethical requirements is the severe limitations placed on access to MHC settings by non-MHC professionals. Very few HCI practitioners are likely to have the required qualifications or clinical experience which would allow them direct access to sensitive MHC settings or allow for regular direct contact with, or even limited second hand observation of, people suffering mental health disorders. Access constraints will vary depending on conditions including the target client group and the severity of the difficulties experienced. In some cases – e.g. with adult clients experiencing mild difficulties – limited contact may be possible. In more sensitive situations - e.g. in cases involving children and adolescents, or with clients experiencing more severe difficulties - restrictions on access become increasingly severe. In many cases access is not possible.

These constraints have many implications for the direct application of established HCI approaches such as user-centred and participatory design or ethnographic methods. For example, Gulliksen et al [6] identify 12 key principles for the development of user-centred systems. Whilst principles such as user focus, holistic design, ensuring a professional attitude, and developing a user-centred attitude - which support a general user-centred ethos - are applicable, other principles requiring regular access to end users or regular evaluations in context of use are less easy to apply directly. These constraints affect all stages in the systems development lifecycle and also the specific techniques which can be applied at each stage.

Clinical evaluations

In order to provide objective evidence of the impact of new technologies on the outcomes of mental healthcare interventions, it is necessary to conduct clinical evaluations in real world settings, with people experiencing the

difficulties targeted by the system. As well as the access constraint identified above, there are several other constraints on such evaluations worth noting. In MHC settings evaluation is typically a slow process, requiring time periods extending from several months to several years. Ethical consent is required for all proposed studies. Such consent is time consuming to organise and will only succeed if the safety of the proposed study has been thoroughly demonstrated, and an independent panel of MHC professionals is confident that the study is likely to have a positive impact. All studies are bound by guidelines such as those of the WMA Declaration of Helsinki which binds all researchers to the agreement that *“in medical research on human subjects, considerations to the well-being of the human subject should take precedence over the interests of science and society”* [7].

In relation to computer based interventions, if any substantial changes are made to a system, then the ethics review procedure must be performed again. One important implication of this constraint is that repeated evaluation is generally not possible. Furthermore, only completed systems can be submitted for evaluation. Intermediary or incomplete systems cannot be evaluated in clinical settings. Finally, design approaches must take consideration of the fact that clinical evaluations will be conducted by MHC professionals, rather than by HCI professionals.

COLLABORATIVE DESIGN

Researchers have begun to provide initial guidelines for the design of technology for talk-based MHC [4, 5]. One of the key factors stressed is the need for collaboration between HCI and MHC professionals. While access to people experiencing mental health difficulties may be limited, the same restraints do not apply to contact with MHC professionals. The benefit of involving domain experts and end users in the design process is well documented in HCI literature and has also been demonstrated in many related healthcare areas [8-11]. However previous research also stresses that effective collaboration cannot be taken for granted. In discussing the potential of multi-disciplinary teams Newell et al [10] suggest that they *“can be fraught with difficulties, as they [the team members] come from different backgrounds and have different jargon.”* While *“a fully co-operative team of clinicians and engineers is a world beating combination, it needs to be developed and fostered.”* It is suggested that to foster an effective team it is important that the nature of the design process be clearly stated. It is beneficial to have research oriented clinicians involved in the design team, as this helps to *“ensure that the ethos of the whole team is a research ethos, which is vital for long term research”*, and it is important to ensure *“that the clinicians are fully aware of the motivations and methodologies of the design process, which is very different from a normal clinical situation.”* Finally Newell et al note that while clinicians should be involved in the design process, they should not be allowed to take a dominant role. Whilst input from healthcare professionals is necessary it

must not come at the expense of input from HCI researchers. Whilst healthcare professionals have the necessary domain expertise, HCI researchers have the knowledge and experience of design methodologies and are also likely to have a broader knowledge of the potential uses of different technologies. Allowing for balanced input from each member of a design team is an essential element of a successful collaborative design process.

Decision Making Criteria

Fig.1 shows a broad outline of decision making criteria that can be applied in designing new technologies for the MHC domain. The aim of these criteria is to ensure that, when key decisions are made, there is an appropriate level of input from each member of the design team. The criteria do not rely on the point of view of any single discipline, rather they aim to allow for balanced input from both the HCI and MHC domains. Depending on the nature of the decision to be made (e.g. is it primarily a HCI or therapeutic decision), differing criteria can be called on and considered.

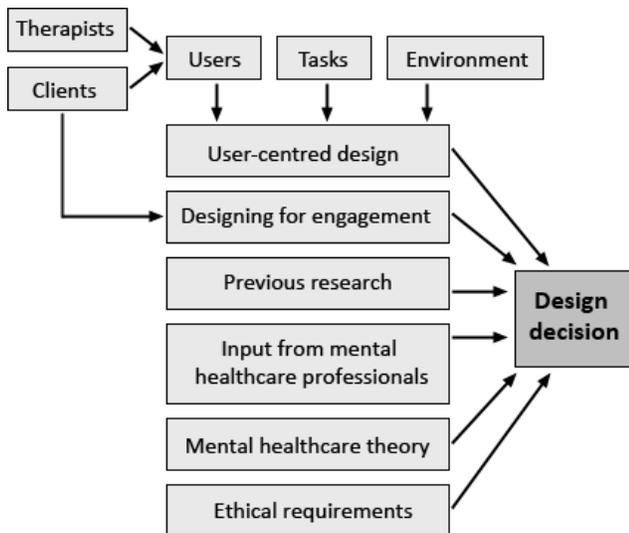


Figure 1. Using decision making criteria in designing for mental health interventions.

The decision making criterion incorporate important recommendations and guidelines suggested in [4, 5], and can be applied to decisions throughout the lifecycle of a system. They make specific reference to both therapists and clients, the two key user groups for systems used in interventions. Designing for engagement (Interactions 11(5), 2004) is also specifically referenced. Engagement is critical to building client-therapist relationships and improving client self-efficacy. It is however important to stress that designing for engagement in the MHC domain must place the emphasis on engagement with the treatment, rather than on engagement with the technology. There is little point in developing a system which, while deeply engaging for the user, does little to assist in achieving the overall therapeutic objectives. Successful technologies will achieve a balance, whereby an appropriate level of

engagement with the technology enhances engagement with the overall therapeutic process.

DESIGNING A 3D COMPUTER GAME

This section of the paper described how the strategies outlined above have been applied in the design and evaluation of a 3D computer game called Personal Investigator (PI). At the outset of the project which led to the development of PI, the aim was to develop an application which could support therapists working with adolescents in the Department of Child and Family Psychiatry of a large public hospital and its associated clinics. An iterative design process was applied in the development of PI, in which prototypes were developed and then reviewed/evaluated by the design team. The team consisted of both HCI and MHC professionals. The criteria outlined in Fig.1 were initially applied to broad high level decisions (e.g. what type of technology to use). As the design progressed, they were used as a basis for increasingly focused decisions (e.g. what type of game to build and how to integrate therapeutic content into a 3D game).

Defining the initial requirements

During the initial stages of the design process, informal interviews were conducted with approximately 20 therapists who work on a day-to-day basis with adolescent clients. The interviews identified that the majority of interventions involved individual work between therapists and adolescents, generally spread over several one hour sessions, which are typically one to two weeks apart. The therapists are required to work with a broad range of adolescents, experiencing a broad variety of disorders, of varying severity. The therapists interviewed, while comfortable using applications such as email and Microsoft Office, had limited or no experience of using computers in client contact situations. During interviews therapists confirmed the difficulties in engaging adolescents in direct face-to-face conversation. One therapist described how she would sometimes turn away and look casually out a window when talking to adolescents. Another described a time when going for walk with a client helped them to begin talking. He compared it to a situation in which fathers and their teenage sons, who sometimes find it difficult to communicate, may find it easier to talk when they are driving together in a car and are looking out at the road.

Based on the interviews conducted, and a consideration of guidelines outlined in [4, 5], the following initial requirements were identified for the application:

- It must work on computers generally available in public MHC services, and must not require additional expensive hardware or software not generally available.
- It must complement traditional intervention approaches and therapists must not require significant training before being able to use the application.
- It should use a technology which appeals to the interests of adolescents.

- It should be designed to support individual face-to-face work during clinical sessions.
- It should support a broad range of issues rather than targeting a specific disorder.
- It should support therapists in achieving broad therapeutic aims, including: achieving and maintaining client engagement, relationship building and engaging clients in constructive therapeutic conversations.

Examples of Important Design Decisions

The first critical decision facing the design team was what technology to use? Mobile technologies, multimedia storytelling and media rich websites were considered. Mobile technologies and media rich websites were not chosen as the decision had already been taken to develop an application for use in sessions, rather than between sessions. The final decision was to develop a computer game that adolescents and therapists could play together in sessions. While MHC professionals on the design team did express some initial concerns about the use of computer games, a consideration of the criteria outlined in Fig.1 ultimately lead to support for this decision. For example several studies have demonstrated the popularity of computer games with adolescents [12, 13]. There is also support within MHC theory for the use of therapeutic games [14] and, whilst previous research is limited, several studies have suggested potential benefits of therapeutic computer games [15]. Substantially more work has also been conducted on the use of computer games in educational and other health care areas. Suggested benefits include increased motivation, increased self-esteem, increased health care knowledge and self efficacy, improved problem solving and discussion skills and improved storytelling skills [16, 17].

Choosing a game type

Having chosen to develop a computer game, it became necessary to decide upon an appropriate game type. In discussions, MHC professionals expressed concerns that excessive gameplay would distract from the therapeutic process, and that adolescents would focus too strongly on achieving game goals and lose focus on the overall therapeutic goal. HCI researchers felt that challenging gameplay could assist in achieving the objective of engaging adolescents. Deciding on a style of game was an important step in addressing these concerns.

Many of the most popular commercial games focus on motor skill gameplay, which engages the player through fast paced action, requiring fast perceptual skills, rather than focusing on problem solving, character development and storytelling [18]. Role-playing games (RPG's) offer an alternative. Here the emphasis is on strategies, character interaction, relationships and emergent stories. It was decided that RPG's offer a good match between engaging gameplay and existing intervention methods. Based on input from MHC professionals, it was also decided that the amount of non-dialogue based gameplay would be limited

and that game interactions and tasks would focus on dialogues between the player and game characters. The ability to engage clients in therapeutic dialogue is a fundamental skill required of all MHC professionals. As the game was to be used in clinical sessions, it was envisaged that in-game dialogues could provide a context for more detailed conversations between the player/client and therapist. Game dialogues could also be used to organise and structure the delivery of therapeutic content.

Choosing an Intervention Model

The choice of an appropriate intervention model to implement was a critical decision in the development of PI. Previous research on computer aided intervention programs suggests that structured approaches such as Cognitive Behavioural Therapy (CBT) are more easily implemented than more freeform therapeutic approaches (e.g. psychoanalytical and humanistic). A MHC professional on the design team also highlighted the potential of Solution Focused Therapy (SFT). SFT is an established and effective strengths-based, goal-focused approach to counselling and psychotherapy. Like CBT, SFT is a highly structured therapy. SFT helps clients construct solutions rather than focus on problems, concentrating on the future and not on the past and focusing on recognising the client's own strengths, achievements and goals [19].

It was identified that the goal-oriented nature of SFT could complement the development of a therapeutic computer game, as both games and SFT actively use goals as a form of motivation. The first step in SFT is for the therapist and client to set an overall goal they want to achieve (e.g. overcome depression). This overall goal is achieved by completing smaller therapeutic tasks e.g. identifying personal resources. Computer games operate in a similar way. To achieve the major goals (e.g. finish the game), players must achieve minor goals (e.g. fight an enemy). In a therapeutic game the goals defined in the game are therapeutic goals, which will benefit the client in their day-to-day life.

How to integrate therapeutic content?

Having decided to develop a dialogue focused RPG style game the choice of an overall game metaphor (game world and game story) became an important design decision. In traditional Play Therapy [14], games provide a metaphorical structure and language to more easily talk about mental health problems. The overall game metaphor determines the language used while playing the game. MHC professionals highlighted a book called "Becoming a Solution Detective" in which a detective metaphor is used to teach the basic principles of SFT. The designers decided to adapt the metaphors used in this book to develop a detective game. It was at this stage that the name Personal Investigator (PI) emerged. In PI, instead of playing a *private investigator* hired to solve a case, the adolescent plays a *personal investigator* whose mission is to resolve a personal problem.

complete the tasks and answer the questions set by the characters they meet. Three of the in-game dialogues incorporate videos of adolescents describing how they overcame personal problems using strategies described in the game. Players are given a detective notebook, where they are asked to record all their thoughts and ideas. Upon completing the game, players receive a printout of their notebook.

Using Personal Investigator in Clinical Sessions

When PI is used in clinical sessions the therapist and adolescent sit together at a computer, but the adolescent has full control of the keyboard and mouse. They play at their own pace and choose their own path through the world. If the adolescent asks for help, the therapist can elaborate on the subjects brought up in the game or answer more specific questions from the adolescent in relation to their situation. Throughout the game the therapist is a partner in the exploration of the game world and is no longer an interlocutor. In a one-hour session the game will normally be used for thirty to forty minutes.

EVALUATING PERSONAL INVESTIGATOR

There have been two distinct stages in the evaluation of PI. First the game was reviewed by experienced, independent MHC professionals. Following this a multi-site clinical evaluation was conducted.

Expert review

Before PI was used with adolescents it was reviewed and approved for clinical use by several independent MHC professionals. As well providing ethical approval for the clinical use of PI, this process identified an important issue which has a broader relevance for design in this area. It focused on the suitability of PI for a broad range of both clients and therapists.

Suitability for a broad range of therapists

While PI implements SFT in an open manner not aimed at specific disorders, therapists suggested that the use of SFT could in and of itself be an issue for therapists not trained in this approach. SFT is a highly structured and goal orientated approach to treatment. Other therapeutic approaches (e.g. Narrative Therapy or Person Centred Therapy) are more freeform and do not focus on achieving specific goals. While not precluding the game from use, the choice of a specific therapeutic approach has the potential to limit the suitability of the game (or any other system) for a broad range of MHC professionals.

Small Issues Can Make Games Unusable

MHC professionals also identified limitations in the suitability of PI to a broad range of clients. In several cases these limitations referred to issues such as the appropriate age range for the game. However expert evaluation also revealed that small design features, which may seem insignificant, could actually limit the effectiveness or even

make PI unusable in many circumstances. Three examples identified by therapists are outlined below.

1. "It's set in a school" – Several therapists felt that setting the game in a school, the Detective Academy, would make the game unsuitable for many clients, as adolescents experiencing mental health difficulties often have difficulties with formal school systems.
2. "One of the characters is a policeman": - Many adolescents referred to MHC services will have had difficult experiences with legal systems (e.g. social services or the police). These are often the clients whom therapists find most difficult to engage. Having a policeman character was identified as a potential problem with such adolescents.
3. "Splendid" – The first character players meet speaks with a formal English accent and uses words such as 'splendid'. Therapists felt this communication style could alienate many adolescents from disadvantaged urban backgrounds.

The fact that these simple game design features, which though not fundamental to the working of PI, have the potential to make the game less effective or even unusable, has significant implications for design in this domain. Other issues which arose during later clinical evaluations (e.g. difficulties caused by the reliance on keyboard skills) can be addressed using standard approaches to usability improvement. This is not the case with the type of small design features identified above. The fact that the choice of a specific therapeutic approach can limit the suitability of the game to a broad range of therapists is also significant. These issues are discussed further below.

Initial Clinical Evaluations

Having received the necessary ethical clearance a small scale pilot evaluation of PI was conducted, in which 3 therapists used the game with 4 adolescents. The findings of this study are available in [15]. Having completed the pilot study a ground up reimplementation of PI was undertaken using a commercially available game engine. A multi-site clinical evaluation was then carried out in which 8 therapists used PI with a total of 22 adolescents, ranging in age from 10 to 16 and identified as experiencing a broad range of difficulties including depression, anger management difficulties, low self esteem, behavioural problems, bullying, sexual abuse, attention difficulties (including ADHD), and suicidal ideation.

The study was designed to provide initial evidence of the therapeutic potential of PI, with the aim of justifying the time, resources and expense required to run larger scale and more detailed clinical evaluations, e.g. randomised controlled trials. The focus was placed on exploring the effects of PI on broad therapeutic factors such as the client-therapist relationship and client engagement.

During the evaluation process HCI researchers were not permitted access to sensitive MHC settings, nor was it

possible to view recorded footage of such settings. Feedback in the form of questionnaires to adolescents was permitted, however when PI was used in clinical settings the majority of therapists choose not to administer this questionnaire. The feedback which was collected consists of questionnaires and post-trial interviews with therapists.

Feedback from therapists on the clinical impact of PI

Therapists were asked to rate the helpfulness of PI on a client by client basis, Table 1. Whilst 3 neutral rating were given, there were no cases in which PI was found to be unhelpful. Table 2 shows therapists' answers to a series of questions regarding the impact of PI specific issues. Table 3 summarises therapists' responses to 3 overall impression statements.

Was playing PI helpful for this client?				
Very Helpful	Helpful	Neutral	Unhelpful	Very Unhelpful
9	10	3	0	0

Table 1. Therapists' ratings of the helpfulness of playing PI for each of the 22 adolescent clients.

The therapists agreed that while PI is a useful icebreaker, it is also more than just an icebreaker. Each also agreed that playing PI can have a positive impact on the client-therapist relationship and can help in structuring sessions. Whilst no negative ratings were given, therapists expressed a greater degree of ambivalence about statements on engagement (statements 6-9) and ownership. Many agreed that PI can help with engagement, can help in maintaining the interest of the young person and can increase the amount of conversation between the therapist and young person. In several cases therapists explained their neutral responses by stating that they had insufficient experience of using PI to give more definitive opinions. For example:

“Haven't really managed to use PI enough to form a clear view on most of the above section I'm afraid.” (T1 – referring to statements 6-9)

The ability of the game to assist in building a client-therapist relationship and the three-way dynamic created between the therapist, client and computer received the most positive comments. Comment included:

“It helps to create a rapport and a three way dynamic. Therapist is not directly posing the questions. You sit alongside each other facing the problem. The computer screen becomes the third party in the room allowing sessions to be less directive and more relaxed, opening up the lines of communication.”

The use of video-based peer storytelling also proved effective and particularly popular with adolescents. The use of 3D was also identified as beneficial. Therapists felt it had an empowering effect, allowing the adolescent more control over the pacing and direction of the therapeutic process.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. PI is a useful icebreaker.				
T5 T8	T1 T2 T3 T4 T6 T7	-	-	-
2. PI is a useful icebreaker, but it is also more than that.				
T2 T5 T8	T1 T3 T4 T6 T7	-	-	-
3. Playing PI can have a positive impact on the client-therapist relationship.				
T5 T7	T1 T2 T3 T4 T6 T8	-	-	-
4. Playing PI can help in structuring sessions with young people.				
T2 T6	T1 T3 T4 T5 T7 T8	-	-	-
5. PI is a distraction from beneficial therapeutic processes.				
-	-	T4	T2 T3 T5 T6 T7	T1 T8
6. Playing PI can make it easier to engage constructively with adolescent clients.				
T5 T6 T8	T1 T3 T7	T2 T4	-	-
7. When PI was used clients were more enthusiastic about sessions than is usually the case.				
T6	T5 T3 T7 T8	T1 T2 T4	-	-
8. PI can help in maintaining the interest of young people during sessions.				
T6	T2 T3 T4 T5 T7 T8	T1	-	-
9. Playing PI helped to increase the amount of conversation between me and my clients.				
T5 T8	T3 T6 T7	T1 T2 T4	-	-
10. Young people playing PI experienced a greater sense of ownership of the therapeutic process than is usually the case.				
T5	T2 T6 T8	T1 T3 T4 T7	-	-

Table 2. Therapists' responses to statements on the impact of PI on specific therapeutic issues.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Overall PI had a positive impact in the majority of sessions in which it was used.				
T2, T5, T6, T7	T1, T3, T4, T8			
PI complemented my traditional ways of working with clients.				
T1, T2, T5, T6	T3, T4, T7	T8		
I would like to continue using PI with further clients.				
T1, T5, T6, T7	T2, T3, T4		T8	

Table 3. Therapists' overall impressions of PI.

Therapists concerns and interaction difficulties

Whilst therapists' opinions of PI were largely positive, several significant concerns were raised:

Over-reliance on keyboard and literacy skills: The design of PI did not take account of the learning and literacy difficulties experienced by many adolescents attending MHC services. Several adolescents playing PI experienced difficulties due to the games over reliance on keyboard and literacy skills.

Fine control of playback is required: Each of the therapists who used PI felt there was a need for greater control over playing, pausing, rewinding, forwarding and replaying parts of the game – e.g. they felt it should be possible to pause and rewind dialogues with game characters and replay finished dialogues. Events in the game often triggered in-depth conversations between therapists and adolescents and it is important that future games can be easily paused or rewound at any point to facilitate these conversations.

Engagement concerns: One therapist raised concerns that a particular adolescent did not engage sufficiently with the therapeutic issues raised in the game, stating that the *“client has a big interest in computer games + I found that he was playing the game to get the keys to move on rather than focusing on content or the development of his knowledge or skills. It was not used as a tool in this incidence but more as a ‘game’ i.e. not to be taken seriously.”* Another therapist identified a case in which the adolescent had used the game to avoid engaging with the therapist, stating the *“young person is very troubled and currently not engaging with workers. PI did help get her to focus on some issues and take time to do so, but she chose to try to exclude me, interacting only with the computer.”*

Addressing these engagement concerns will be a priority for future iterations of PI. One possibility suggested by therapists is that future games include questions which the therapist is required to answer, rather than all the questions being addressed towards the client. In this way the therapist could become more directly involved in the game and is offered the opportunity to make observations and even talk out loud about ideas before answering questions.

DISCUSSION & LESSONS LEARNED

The initial clinical evaluation of PI has provided evidence that computer games have the potential to assist therapists working with adolescent clients. In this case PI helped to create sufficient conditions from which effective therapeutic work could proceed. Collaborative design, involving multi-disciplinary teams including HCI and MHC professionals, offers the potential to move the use of technology in this domain to a level which could not be reached by either group working independently. However the process of creating and evaluating PI identified several

significant shortcomings, which highlight the need to improve design methods.

Improved non-clinical evaluation strategies

Given the risks, difficulties and durations typically involved in clinical studies, it is critical that future design approaches in this domain aim to maximise the use and effectiveness of non-clinical evaluations. Although a collaborative process was applied in the design of PI, and initial interviews were conducted with a broad variety of MHC professionals, the significance of several interaction issues (e.g. literacy issues) did not emerge until the finished game was used in clinical settings. It is important to ask why such issues were not identified earlier in the design process and to ensure that future design approaches are more successful. In the case of PI possible reasons for such difficulties include:

- While MHC professionals were aware of these issues, they did not feel it worth mentioning or significant. This difficulty has been documented by previous research in other healthcare domains. For example when developing a Desktop-PDA system for people with aphasia Boyd-Graber et al found that although clinicians *“had a wealth of information that was useful to our designs, much of it was tacit - that is, they did not think of it as being important or useful.”* [11]
- Boyd-Graber et al also suggest that inexperienced computer users often have difficulties envisioning the use of technologies which do not yet exist. Traditional mental health interventions focus on face-to-face dialogue, where literacy skills are not relevant. Prior to testing the completed game therapists may not have considered the implications of introducing a new form of interaction requiring literacy skills.

Future projects in the MHC domain may benefit from more rigorously applying traditional user-centred requirements gathering techniques. However the problem of access to clients by HCI researchers still remains. Techniques are required which help HCI researchers to gain access to the tacit knowledge of MHC professionals. One approach suggested in other healthcare domains is to engage clinicians in scenario based storytelling. More intensive use of this technique may prove useful in MHC settings, and is worthy of further investigation. The use of proxies for clients experiencing mental health disorders may also prove useful [11]. As part of their training MHC professionals are regularly required to engage in role-play scenarios based on proposed clinical situations. Asking therapists to role-play situations involving new technologies may prove to be an effective approach to requirements gathering, and may also prove effective in evaluating early design proposals and prototypes. Finally heuristic evaluations have been shown to be effective in other HCI domains. Is there an appropriate and effective heuristic checklist for technologies in the MHC domain?

It is important to briefly note that while more effective non-clinical evaluations methods can assist in improving the

quality of designs, clinical evaluation will remain the final arbiter of the clinical effectiveness and usability of any system. Clinical evaluations are necessary to assess the therapeutic impact of any system. Also in the case of PI several interaction issues (e.g. the importance of fine control over playback) emerged based on way in which the game was used in clinical settings.

Protocols for use and the importance of the therapist's role

A key factor to emerge from the evaluation of PI is the importance of the therapist's role in using the game effectively. This factor is highlighted in comments made by one therapist:

"I feel PI does not have a life of its own. It is part of a team working together: PI - the therapist - the young person. The pace was not dictated by PI but by the whole team. It was helpful that PI was there so that a decision could be made – do we continue the game or do we talk a bit more about this part etc. It is good then to have the game to go back to."

Another therapist described rules which she feels have led to PI being used more effectively with clients:

"Prior to commencing the game we have a discussion about the game - and I gauge the interest level. I describe it as a thinking game. I talk about needing to take time to think before we write down our answers [in the game notebook]. So rule no 1 is the therapist or child reads out the question - and we have a talk about it before we write anything down. Once we have decided we type it, and only then press next. Rule 2 - if we are going too fast and not taking our time we may need to stop the game completely and work from a page instead. This is a good strategy for assisting with patience in the game."

Collating and sharing experiences such as this and developing and evaluating protocols for using a system should be a key aim of any clinical study. Therapists who use systems in clinical settings are well placed to play an active role in the development of such protocol.

Developing systems suitable to a broad range of clients and therapists

Evaluating new approaches in MHC settings is a very time consuming process. It is important that design approaches in the MHC domain take account of this issue. For example, it will be beneficial if clinical evaluations and the development of new technologies can proceed in parallel and complement one another. Also, given the time taken to conduct evaluations, it is important that systems should aim to be useful to a broad range of therapists, in a broad range of settings and with a broad range of clients. This however is not a trivial undertaking.

While PI proved successful when used with appropriate clients, MHC professionals suggested that small details in the design of PI have the potential to limit the effectiveness

or even make the game unusable with many clients. The significance of such issues was confirmed in the later larger scale evaluation. During a workshop two therapists discussed different reactions to the policeman character. One therapist felt that this was the character which appealed most to clients. In the second case the therapist said a client had visibly retreated from the game on meeting the policemen - the therapist mimed the client withdrawing from the computer. In this case the client was a young girl who had been referred to the mental health service as a result of a court order.

The fact that small design details, such as a policeman character or the language and accent of other characters, can impact the effectiveness of a game has significant implications for design in this domain. Given the importance of client engagement in MHIs, the impact of design factors which cause client alienation is likely to be severe. However a balance must be struck here. There is little point in producing bland systems, which while not likely to cause alienation, are equally unlikely to enhance engagement. It is also important to note that the issues identified in PI are not critical to overall operation of the game. Nor are they critical to the new form of interaction which the game enables between therapists and clients. The strength of PI lay not in its use of specific characters or conversations. It lay in the game's ability to create a context for more detailed therapeutic conversations between therapists and clients. For example the policeman character could be replaced by a footballer talking about the importance of back up from team mates. However this change could cause alienation for other clients, e.g. young girls or boys who don't like football. Rather than producing a fixed game, or indeed any other fixed system, a better approach would be to produce games or systems which can be adapted to suit the needs of various client groups. One preliminary study of an adaptable system in MHC settings is described in [22].

Alongside adaptation to suit the needs of clients, further forms of adaptation are also desirable. For example, expert reviews described in this paper suggested that the use of SFT in PI had the potential to make the game unsuitable for therapists not trained in this approach. Later evaluations again confirmed the significance of this issue. When asked to identify the greatest weakness of PI, one therapist, who had used the game with several clients, stated that its greatest weakness was the use of SFT, commenting: *"one of my biggest difficulties is that PI does not fit with my way of working"*. She did not feel that SFT is an inherently poor approach to treatment, rather that, given her training as a narrative therapist, the goal orientated nature of SFT - and thereby PI - was inappropriate to her normal ways of working with clients. When asked to give her opinion on the statement "playing PI can help in structuring sessions with young people", she chose 'agree', but added that structure is not necessarily a positive thing and that

“structure is not the way of working for narrative therapists”. Asked to comment further she added:

“What excites me is working this way rather than the PI game. PI gave it a kick start. I would love to have a repertoire of games. And PI is probably one of the ones I'd use least.”

ONGOING PRIORITIES

The design and evaluation of PI provided initial evidence of the benefits of collaborative design involving both HCI and MHC professionals. Based on the difficulties encountered and lessons learned in evaluating PI, critical aims for ongoing research include:

- The investigation of techniques which help HCI researchers to gain access to the tacit knowledge of MHC professionals.
- The investigation of techniques which increase the effectiveness of non-clinical evaluations.
- The investigation of techniques which support the development of systems which can be adapted to meet the needs of a broad variety of clients and MHC professionals.

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