

Computers in Talk-Based Mental Health Interventions

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Abstract

The cost to society of mental illness is substantial. A large scale international study has identified mental illnesses as the second leading cause of disability and premature mortality in the developed world (Murray & Lopez, 1996). Unfortunately, research also suggests that the majority of people suffering from treatable mental health disorders do not have access to the required treatment. Furthermore, even when treatment is accessible many sufferers are unable to successfully engage with professional services (Surgeon General, 1999; WHO World Mental Health Survey Consortium, 2004). Computer assisted mental health interventions have the potential to help in addressing this imbalance. However a review of literature shows that to date this potential has been largely unexplored. One of the primary reasons for this is that few researchers from a HCI or technical background have engaged in this area. The primary purpose of this paper is to provide a foundation and set an agenda for future research on the design of technology for talk-based mental health interventions. Theoretical approaches to the treatment of mental illness are reviewed, as is previous research on the use of technology in this area. Several significant factors effecting design and evaluation are identified and based on these factors a broad set of design guidelines are proposed to aid the development of new technologies. Of the issues identified, ethical requirements along with the sensitivity and stigma associated with mental illness pose particular challenges to HCI professionals. These factors place strict limitations on access to mental health care (MHC) settings by non-MHC professionals and create difficulties for the direct application of traditional HCI methods, such as participatory, user-centred and iterative design. To overcome these difficulties this paper proposes a model for collaborative design and evaluation, involving both HCI and MHC professionals. The development of adaptable technologies is an important element of the proposed approach. The final contribution of the paper is to suggest future research directions and identify ways in which HCI researchers can contribute to this work.

Keywords: Mental health, design methodology, collaborative design, ethical and access constraints, user engagement, adaptable systems.

1 Introduction

The primary aim of this paper is to provide a foundation and set an agenda for future research on the design of technology for talk-based mental health interventions (MHIs). Computer technologies offer the potential to fundamentally change the process of talk-based mental health care (MHC). Traditional interventions focus on face-to-face dialogues between therapists and their clients¹. Computers offer the potential to reshape this interaction, by becoming a third party in the therapeutic dialogue and increasing the scope of the therapeutic interaction, fig.1.

To date the use of technology in talk-based MHC has been limited. Many MHC researchers and practitioners are sceptical of the benefits of technology, citing fears such as damage to the client-therapist relationship, ethical and security issues and worries that the current skills of therapists may become obsolete. Others fear that technology in and of itself has a damaging impact on the mental health of society, identifying for example increased isolation due to excessive time spent online or the influence on young people of violent video games (Caspar, 2004; Gentile & Walsh, 2002). However given the serious global significance of mental health disorders, it is incumbent on MHC services to find new ways of addressing society's growing need for effective treatment. A review of initial research indicates that computer assisted interventions have significant potential to help in addressing this need. Even small changes could

¹ In MHC settings the word client, rather than patient, is generally used to describe a person suffering difficulties with mental illness.

significantly impact the general health of populations and greatly reduce the costs to society of mental illness.

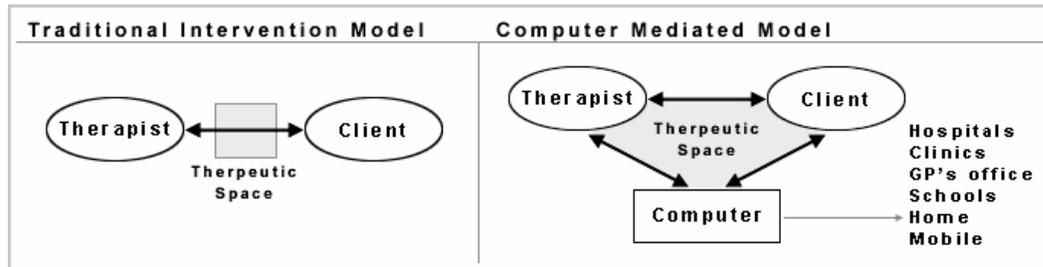


Figure 1: A Computer-Mediated Model of a Mental Health Intervention

This paper identifies two key aims for technologies designed for talk-based MHC: *access* and *engagement*, that is, how can technology increase access to MHC services and how can it then help clients to engage more successfully with treatment once they have access to it? To date the use of technology has generally been justified on the basis of increased access, rather than on increased engagement and actual improvements in the effectiveness of treatment (Caspar, 2004). It is possible to identify three stages in the introduction of technology in talk-based MHC:

Stage 1: designing systems that complement or copy existing non-computerised methods.

Stage 2: success in stage 1 can create a platform for the introduction of more complex, specialised systems, which offer MHC professionals the opportunity to fundamentally change the way they work.

Stage 3: more integrated use of technology may begin to have a feedback effect on theoretical models of MHC.

To date most research has focused on stage 1 of this process. 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. One of the primary reasons for this is that few researchers from a HCI background have engaged in this area. Moving research forward will require the close collaboration of HCI and MHC professionals. However to begin working in this area HCI researchers will require an awareness of the theoretical approaches to the treatment of mental illness. In this paper theoretical approaches are reviewed, as is previous research on the use of technology in this area.

Previous research, while limited, has provided initial indications of the potential of technology. The key challenge now facing HCI researchers is to develop approaches and provide guidelines which maximise this potential. This paper provides a foundation for this process. Significant factors in the design and evaluation of new technologies are identified and based on these factors a broad set of design guidelines are put forward. Of the issues identified, ethical requirements along with the sensitivity and stigma associated with mental illness pose particular challenges for design and evaluation. These factors place strict limitations on access to MHC settings by non-MHC professionals and create difficulties for the direct application of existing development methods, such as participatory, user-centred and iterative design. New methods are required which take account of the access constraints for HCI professionals working in this area. This paper proposes a two stage collaborative model for design and evaluation. Stage one focuses on the development of new technologies. The aim at stage one is to develop and evaluate systems to the point where they are shown to be usable by the target end users, are agreed to have clinical validity and are predicted to have therapeutic benefits. Stage two focuses on clinical evaluations. It is envisioned that stages one and two will overlap and complement one another, with stage one being lead by HCI researchers and stage two by MHC researchers. The development of adaptable technologies is an important element of the proposed approach. Adaptability is identified as a sustainable approach to the development of client-centred technologies. The final contribution of the paper is to suggest future research directions and identify ways in which HCI researchers can contribute to this work.

The remainder of this paper is divided into five sections. Section 2 discusses mental health and mental illness and identifies key challenges facing MHC services worldwide. Section 3 looks at significant factors which impact design in this area and proposes a model for collaboration between HCI and MHC

professionals. One of the key factors identified in Section 3 is the need for new technologies to build on the theoretical underpinnings and experience of the MHC domain. To this end Section 4 provides a review of theoretical approaches to talk-based MHC. Section 5 reviews the current state of the art in technology in talk-based interventions, looking at strengths and limitations and exploring how each area may be expanded. Finally Section 6 addresses the future of technology in talk-based MHC. It identifies new directions for research and discusses how HCI professionals are placed to take on this challenge.

2 Mental Health and Mental Illness

Mental Health and Mental Illness can be thought of as points on a continuum. The World Federation for Mental Health states: “*Mental health should not be seen as the absence of illness, but more to do with a form of subjective well being, when individuals feel that they are coping, fairly in control of their lives, able to face challenges, and take on responsibility. Mental health is a state of successful performance of mental function, resulting in productive activities, fulfilling relationships with other people, and the ability to adapt to change and to cope with adversity specific to the individual’s culture*”².

Mental Illness refers collectively to all diagnosable mental disorders. Mental disorders are health conditions defined by the experiencing of severe and distressing psychological symptoms, to the extent that normal functioning is seriously impaired, and some form of help is usually needed for recovery. Symptoms may include anxiety, depressed mood, elation, hallucinations, delusions, obsessional thinking or compulsions. Mental illness can affect an individual’s thought process, perception of reality, emotions and judgment and can result in low self-esteem, poor concentration, poor organisation skills and an inability to complete projects and make decisions. Individuals may also have difficulty in establishing support systems and sometimes display inappropriate behaviour. Common mental health disorders include: depression, anxiety and panic, bipolar disorder, behavioural disorders, obsessive-compulsive disorder, phobias, psychosomatic problems, schizophrenia and eating disorders.

It is generally agreed that there are several principal contributory factors in the development of mental health disorders: genetic disposition, past life experiences (particularly early life), current life events, physical illness and socio-cultural and economic factors. The social norms of any society have a large influence on what it means to be mentally healthy. Some of the specific socio-cultural issues which affect MHC include: gender, age, social class, disability, race, culture and ethnicity, sexual orientation and religious or secular assumptions. The social norms of any society will also influence the approaches used in the treatment of mental health issues and also the language used to refer to issues in this domain.

2.1 Talk-Based Treatment

The past fifty years have witnessed major advances in the treatment of mental illnesses. In 1999 the US Surgeon General’s office published its first ever report on mental health. The report concluded that (1) the efficacy of mental health treatments is well documented and (2) a range of effective treatments exist for most mental disorders (Surgeon General, 1999). Treatment generally takes the form of talking, listening and learning, physical treatment (drugs, ECT, biomedical) and/or social interventions. This paper focuses on listening-and-talking based intervention methods. Many studies have concluded that talk-based methods are equally as effective as drug based interventions in the treatment for many disorders (Surgeon General, 1999). Studies show greater acceptance of talk-based methods amongst people suffering mental health disorders and suggest benefits of talk-based interventions which extend beyond the end of the treatment. The benefits of drug based treatments generally stop with the cessation of medication and although the risks of side effects have been reduced, concerns still remain. Talk-based methods include psychotherapy, clinical and counselling psychology, psychiatry, counselling, and mental health social work. Interventions generally aim to be both remedial and preventative. They aim to both reduce a client’s current symptoms and suffering and also improve the client’s ability to manage and overcome future difficulties. Specific theoretical approaches to achieving these aims are reviewed in section 4 of this paper.

The authors of this paper are primarily focused on the application of technology in public health care systems. Private therapy often involves psychodynamic approaches that encourage open ended exploration of clients’ lives with the aim of gaining ever deeper insight and understanding. Public systems are more

² www.wfmh.org

likely to adopt more structured, goal oriented approaches, placing greater emphasis on achieving specific targets and relieving specific problems faced by the client in the shorter term. Section 4 of this paper provides a more detailed discussion of different approaches to talk-based treatment.

2.2 The Challenge Facing Mental Health Care Services

In 1996 Harvard University in cooperation with the World Health Organisation and the World Bank published the results of a large international study entitled 'The Global Burden of Disease' (Murray et al., 1996). The study revealed that mental illnesses, including suicide, are the second leading cause of disability and premature mortality in developed countries. Cardiovascular conditions come first and all malignant diseases, including cancer, come third. Combined mental illnesses account for over 15% of the total burden of disease in established market economies, such as Europe and the US, and major depression is the single leading cause of disability worldwide among persons over the age of five.

Unfortunately several large scale international studies also conclude that the majority of people suffering mental health disorders do not receive the required treatment (Surgeon General, 1999; WHO World Mental Health Survey Consortium, 2004). The primary causes of failure to receive treatment are lack of access to appropriate specialist services and social stigmas associated with mental health disorders. Studies suggest that while people suffering from severe psychotic problems do receive the required treatments, others suffering from more common, yet still disabling, disorders such as depression and anxiety do not. Figures show that among Britons with depression only half receive any help at all, while only 8% have seen a psychiatrist and only 3% have seen a psychologist. A similar picture has emerged in many other developed countries (Layard, 2004). This lack of access to specialist treatment is at odds with clinical guidelines, which recommend that people suffering mental disorders have access to specialist services and the possibility to choose between biomedical and talk-based treatments (National Institute for Clinical Excellence, 2004 - 2005) A similar lack of access to specialist treatment for people suffering from debilitating physical illness is unlikely to be deemed acceptable.

Along with the issue of access outlined above, a second critical challenge facing MHC services is that of client engagement. The importance of client engagement spans all theoretical models of MHIs (Assay & Lambert, 1999). The level to which clients engage both with their therapist and their treatment, and draw on their own personal resources is a major factor in the success of interventions. Unfortunately research suggests that, due largely to the severe stigma often associated with mental illness, many clients find it difficult to successfully engage with treatment. This problem is particularly severe amongst some of the most vulnerable social groups, including adolescents, young men and the socially disadvantaged.

Ongoing research and a review of literature (section 5) suggests that computer technologies have the potential to improve both access to and engagement with MHC services. The challenge facing HCI researchers is to develop approaches and provide guidelines, which maximise the potential of technology to achieve these aims.

3 Designing for Talk-Based Mental Health Care

This section of the paper identifies several significant factors in the design of technologies for talk-based MHIs. Based on these factors a set of design guidelines are set out and a model for collaborative design and evaluation is proposed.

3.1 Success Factors in Mental Health Interventions

The past two decades have seen an increase in the number of studies which attempt to identify specific factors which influence the success or failure of MHIs. (Assay et al., 1999) concluded that, across all interventions models, four main factors are responsible for achieving positive change. They have also estimated the relative contribution of each factor:

- 40% Client Factors - Client and environment strengths and resources.
- 30% Quality of Therapeutic Alliance or Relationship.
- 15% Therapeutic Model and Technique.
- 15% Expectance, Hope and Placebo factors.

These results demonstrate the central importance of client factors to effective interventions and also the importance of building a strong therapeutic relationship between the therapist and client. Client factors are discussed further in section 3.2.1 below.

There is much literature on the means of developing a quality therapeutic relationship. A review of this literature is beyond the scope of this paper. However four core values have emerged as fundamental to establishing a beneficial working relationship: respect, empathy, genuineness and client empowerment (Egan, 2002, p46). There are two key stages in the client-therapist relationship, first establishing the relationship and then maintaining it. Technologies which help in either or both of these stages are likely to prove particularly beneficial.

3.2 End Users

Technology designed for MHC settings must consider two sets of end users: MHC professionals and the people suffering mental illnesses with whom they work. MHC takes place in many settings and in many forms. Individual therapy, focusing on face-to-face dialogue between a therapist and client, is by far the most common form of treatment. It offers clients optimal confidentiality, privacy, attention, intimacy, and safety. Group therapy is also common. It offers clients the opportunity to learn that others experience similar problems to themselves, to be accepted by a group, to give as well as receive help and insights and to learn to draw on others experiences and perceptions. Specialist forms of treatment have also evolved for the treatment of children and adolescents and for family groups.

3.2.1 Clients

As highlighted above client factors are of critical importance to the success of MHIs. An analysis of the needs of the target client group is an essential element of design. Below we identify some broad client factors.

Client Groups: In general therapists work with three broad client groups: children, adolescents and adults. Within these groups there are many sub-groupings. For example amongst the adult group, young males aged 18-25 have been identified as being particularly vulnerable (BMA, 2006). Adolescents have also been identified as particularly in need of attention. Difficulties of access and engagement, while important amongst all client groups, are particularly severe with adolescent populations.

Direct and Indirect Communication: Whereas many adults are comfortable with direct face-to-face dialogue, this is often not the case with children, adolescents or clients experiencing problems with engagement. Many children struggle to express themselves with words alone and much research has been conducted into ways of engaging children using indirect channels and play. Some examples of tools used are storybooks, construction materials, artwork, puppets and board games (Sharry 2004). These materials provide a means of engaging children in indirect communication. Adolescents can be resistant to these methods; they like to be treated as adults and will not engage if they perceive they are being treated as a child playing games. Equally, many teenagers are private and self-conscious and often react confrontationally or not at all to direct dialogue with a therapist. Given the general enthusiasm of many adolescents for modern technology, technology has particular potential to help in adolescent interventions, replacing storybooks, board games etc, acting as a third part in the therapeutic interaction and providing a channel for indirect communication.

Client-Centred Technologies: Therapeutic interventions are most likely to be successful if the therapist engages with the client in a client-centred way. A quality therapeutic process will actively engage the client's participation, by involving their interests, strengths and ideas. Similarly, technologies are most likely to prove effective if they are designed to be client-centred. On this basis, a key factor in this design process is choosing the appropriate technology to use with a given client group. For example initial indications suggest that the use of computer games in adolescent interventions can improve client engagement and help in building a quality client-therapist relationship (Coyle, Matthews, Sharry, Nisbet, & Doherty, 2005).

Above and beyond choosing client-centred technologies, it is essential that any system is designed to meet the needs of given clients. The importance of this issue and a means of achieving it are discussed in greater detail in section 3.5 below.

Psychoeducation: Psychoeducation is aimed at helping persons with a mental illness, to access the facts about their illnesses in a clear and concise manner. It is also a way of accessing and learning strategies to deal with mental illness and its effects. Psychoeducation is not a treatment. It is designed to be part of an overall treatment plan. It is an important element of improving client efficacy.

3.2.2 *Mental Health Care Professionals*

Below we identify some of the factors likely to impact therapists' use of new technologies.

Time Constraints: Therapists working in public health care settings generally face high time pressures. It is important that technologies do not add to this pressure by placing extra demands on therapists' already limited time.

Training: An informal survey by the authors of this paper revealed that while many therapists are familiar with Microsoft Office, email and Internet software, few are currently likely to have had specific training or experience in the use of technology in client contact situations. Further to this (Berger, 2004) reports that although computer based training has many documented benefits and has become increasingly popular in other health science and educational programs, it is still largely unused in MHC training. These factors have a knock on effect on the use of computers in clinical practice. (Caspar, 2004) notes that, when questioned about increased use of technology, many therapists express concerns over the need for additional training and fear that existing skills may become obsolete. At this early stage in the development of technology for MHIs it is desirable that systems should be designed to take advantage of the existing skills of therapists and integrate with current working methods. As the use of technology becomes more common place, the issues surrounding the training of therapists will become increasingly important.

Security: Many MHC practitioners cite fears over the security of sensitive information as one their primary reasons for scepticism of the benefits of technology (Caspar, 2004). While many methods have evolved for ensuring the actual security of electronic data, perhaps more significant in MHC settings is the perceived security of this information by both therapists and their clients. In peer support and collaborative group systems it is also essential that the accuracy of information and the integrity of individuals be maintained and represented. HCI researchers exploring aspects of trust in computer systems can contribute to maximising this sense of security and trust in technologies.

Responsibility: Another concern for therapists is the new level of responsibility placed upon them by systems enabling clients to continually record personal data between therapeutic sessions, e.g. mood or anxiety levels. Should therapists have access to this data and if they do what responsibility does this place on them to monitor the data and to act on changes in the client's condition? Added responsibility in this area could considerable increase a therapist's time demands. However access to data could prove crucial in some circumstances; e.g. when a client is exhibiting suicidal tendencies.

3.3 **Ethical Requirements**

As well as meeting the ethical requirements of the HCI domain, e.g. see (Friedman & Kahn, 2002; Molich, Laurel, Snyder, Quesenbery, & Wilson, 2001), research into the use of technology in MHC settings must adhere to the strict ethical requirements of the MHC domain. These ethical requirements have significant implications for the design and evaluation of technologies. All health care professionals, including MHC professionals, are required to obey the basic Hippocratic Oath, often stated as 'first do no harm', which means that above all else interventions must not have harmful effects on the client. The Declaration of Geneva of the World Medical Association (WMA) binds professionals with the words: "The health of my patient will be my first consideration" (World Medical Association, 1949-2006). The WMA Declaration of Helsinki provides ethical guidelines for researchers. It 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" (World Medical Association, 1964-2004).

(Roberts & Dyer, 2004) have produced a concise guide to MHC ethics and suggest solutions to specific ethical dilemmas. As cultural and societal differences have been shown to be one of the key factors in the treatment of mental health difficulties, researchers and practitioners also need to be familiar with the specific requirements of their own culture or country. The Declaration of Helsinki states that "research investigators should be aware of the ethical, legal and regulatory requirements for research on human subjects in their own countries as well as applicable international requirements". Mental health associations

worldwide have produced detailed ethical guidelines for both research and practice. Some of the commonly espoused general principles include: welfare and nonmaleficence, confidentiality, respect for client's rights and dignity, integrity and competence.

To help in meeting the ethical requirements of the MHC domain we suggest that technologies (1) be based on accepted theoretical models of MHC, (2) be designed in full collaboration with MHC professionals, (3) be designed to integrate with existing working methods and (4) be used by clients under the guidance of a professional therapist. Prior to being used in clinical settings it is essential that (1) the reliability and usability of any technology is thoroughly verified, (2) the therapeutic validity of technologies is evaluated by MHC professionals and (3) ethical clearance must be agreed for all proposed studies. In relation to ethical clearance, the Declaration of Helsinki states that proposed studies "should be submitted for consideration, comment, guidance, and where appropriate, approval to a specially appointed ethical review committee, which must be independent of the investigator, the sponsor or any other kind of undue influence". Ethical review committees are designed to insure that guidelines, such as those given by (Roberts et al., 2004), are respected and that the well-being of clients is protected. This process of validating systems and gaining ethical clearance is a time consuming process which must be completed prior to each stage of the clinical evaluation of a technology.

3.4 Access Constraints

The ethical requirements and stigma associated with mental illness place strict limitations on access to MHC settings for non-MHC professionals. Very few HCI practitioners are likely to have the required qualifications which would allow them direct access to sensitive MHC settings or allow for direct contact with people suffering mental health disorders. Approaches to the design and evaluation must take consideration of this access constraint.

For example, participatory design would require direct collaboration with both therapists and clients suffering mental illnesses. Similarly the use of ethnographic methods would ideally require a HCI professional to be present in the MHC setting with a therapist and their client. While such approaches might be possible with less sensitive MHC disorders with adult clients, it is unlikely to prove ethically acceptable for more sensitive situations or in situations involving children or adolescents. It may be argued that observation using video recordings or two way mirrors could be used as an alternative to direct contact. However, given the ethical constraints and privacy demanded of MHC settings, even limited second hand observations are likely to prove ethically sensitive, time consuming to organise and prohibitive to regular use. Even in the training of MHC professionals there is a reliance on role-play rather than direct contact. While video records of real sessions and occasionally two-way mirrors are used, this is controlled by strict ethical guidelines (e.g. it must be done with the full agreement of clients) and is only deemed acceptable given the need to train future MHC professionals.

This obstacle to regular direct contact or even second hand observation has implications for standard approaches to design and evaluation such as iterative design. To successfully develop technology for MHIs it is therefore necessary to develop models for design and evaluation that take consideration of the access constraints inherent to this domain. An important element of any such models will be the ability to maximise the amount of evaluation that can be conducted independent of clinical evaluations. It is also desirable to develop technologies, which when evaluated and proven to be beneficial, have a broad usefulness across a wide range of MHIs. Finally models must take consideration of the fact that clinical evaluations will be conducted by MHC professionals rather than by HCI professionals.

3.5 Adaptability

Socio-cultural issues are one of the major factors in the development of mental health disorders and are a key factor which must be considered in treatment. Some of the specific socio-cultural issues which affect mental health care include: gender, age, social class, sexual orientation, religious or secular assumptions and race, culture and ethnicity. Professionals working in public health care systems are faced with the need to work with a broad range of clients, from a broad range of socio-cultural backgrounds and experiencing a broad range of disorders. Working in such situations requires therapists to be able to adapt their approaches to suit the needs of a given client.

In evaluating the therapeutic computer game Personal Investigator (described in section 5.6), it was found that small details in the design of the game had significant implications for the usefulness of the game with

a broad range of adolescent clients. While the game proved successful when used with appropriate clients, MHC professionals identified the fact that small details, such as the appearance of characters and the accent and language used in the voiceovers for game characters, made the game unusable with many clients. For example the upper-class English accent and the use words such as ‘excellent’ and ‘splendid’ by one game character was identified as having the potential to alienate adolescents in a particular urban clinical setting.

Given the importance of engagement in MHIs, the impact of design factors which cause alienation for clients are 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. A better approach is to produce systems which can be adapted to suit the needs of various client groups.

Further forms of adaptation are also desirable. For example, teams of therapists working in public health care setting often have different theoretical backgrounds and many adopt a variety of eclectic approaches to working with clients. For technologies to be of practical use in a broad range of MHC interventions, they should ideally be adaptable to (1) a broad range of theoretical models, (2) a broad range of mental health disorders, (3) the differing needs of various demographic groups, and (4) the specific needs of individual clients.

A form of adaptation being investigated by the authors is one by which MHC professionals are able to adapt the therapeutic content delivered by systems. While HCI researchers focus on the design and development of frameworks for delivering therapeutic content, MHC researchers can adapt these systems for use in various interventions and evaluate their therapeutic benefits. Whilst it is desirable that a large number of therapists are comfortable using any system, it is not necessary that all therapists be able to make large scale modifications in the use of the system. A possible model of use for such a system is:

- Small groups of expert MHC researchers and practitioners develop and adapt content for use within their own areas of expertise e.g. targeting specific disorders and implementing specific intervention models.
- Larger groups of practitioners use these implementations with clients and have the option of making small scale adaptations to suit the needs of specific demographic groups or clients.

By enabling therapists to play an active role in building and tailoring the content delivered by computerised systems, adaptable technologies provide a sustainable approach to the development of client and therapist centred technologies for MHIs.

3.6 Collaborative Design and Evaluation

Research into the design of technology for talk-based MHIs requires the collaboration of HCI and MHC professionals. While collaborative design, involving domain experts, is desirable in most design spaces it has a particular significance in the MHC domain. As outlined above, the ethical constraints and stigma associated with MHIs mean that it is generally not possible for HCI researchers or practitioners to have direct contact with people undergoing clinical treatment. Even limited second hand observation of clinical interactions is likely to prove ethically difficult. Difficulties caused by lack of access are further exacerbated by the fact that few MHC professionals currently have the experience required to design or develop new technologies or to rigorously evaluate them to the standards required for successful introduction to clinical settings. Overcoming these difficulties requires the collaboration of HCI and MHC professionals. Fig.2 outlines a two stage approach for this collaborative process.

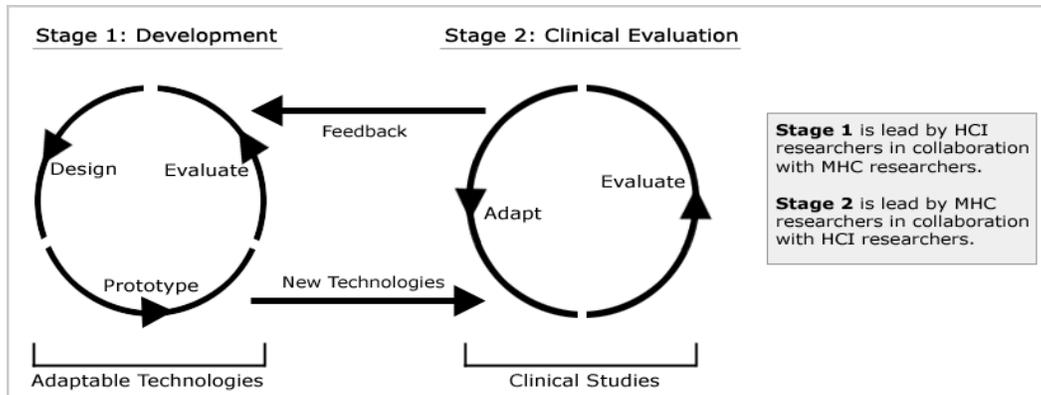


Figure 2: Collaborative cycles for the design and evaluation of technology for MHIs.

The overall aim of this two stage development cycle is threefold. Firstly, to develop a collaborative approach to the design and evaluation of new technologies for MHIs. Secondly, to increase the amount of evaluation that is conducted independent of clinical trials, which are time consuming to organise and inaccessible to HCI practitioners. Thirdly, to develop a sustainable approach to the development of technologies that takes advantage of the expertise of MHC professionals and takes account of the importance of adaptability in MHC settings.

Stage one of this process focuses on the design and development of technologies. The aim at stage one is to develop and evaluate systems to the point where they are shown to be usable by the target end users, are agreed to have clinical validity and are predicted to have therapeutic benefits. Stage two focuses on clinical evaluations. As well as evaluating specific therapeutic benefits, this stage should aim to develop protocols and guidelines for the clinical use of technologies, e.g. when and with which clients is it appropriate to use a given technology? It is envisioned that stages one and two will overlap and complement one another, with stage one being lead by HCI researchers and stage two by MHC researchers. As systems are developed at stage one they can be taken to stage two for clinical evaluation. The results of this evaluation will feed back into further design and development at stage one, which in turn provides further possibilities for clinical evaluation at stage two. In this way a parallel process for collaborative design and evaluation can evolve. As can be seen in fig.2 it is proposed that during the development stage adaptable technologies are developed.

The development of more detailed models for collaboration between HCI and MHC professionals will be an important aspect of future work in this area. Work is required to evaluate which user-centred methods, involving MHC professionals, are most effective at the different stages of an overall iterative development process e.g. understanding contexts of use, requirements analysis, design, development, evaluation and deployment. In related area such as Assistive Technology and Inclusive Design, researchers have developed adapted models for user-centred design. For example (Newell & Gregor, 2000) have developed an approach entitled User Sensitive Inclusive Design. (Poulson & Richardson, 1998) have developed the USERFit methodology for user-centred design of assistive technology. Similarly detailed models are required for the development of technology in talk-based MHC.

3.7 Design Guidelines

Based on the issues discussed above, and the challenges identified in section 2.2, table 1 sets out a list of guidelines for the design of technologies for MHIs. Several potential outcomes which may be targeted are also identified.

4 Approaches to Talk-Based Mental Health Care

The design guidelines set out above state that to ensure clinical validity it is important that technologies are designed based on accepted theoretical approaches to MHC. To begin working in this area it is therefore important that HCI researchers and practitioners have a grounding in major theoretical approaches. (Karasu, 1986) estimated that there are between 250 and 400 different approaches to talk-based MHIs. However there are only a handful of ‘major schools’ and in practice most professionals often borrow and

mix methods and techniques from various approaches. What follows are brief descriptions of the most prominent ‘schools’ of treatment – Psychodynamic, Humanist-Existential, Cognitive-Behavioural, and Eclectic-Integrative. Within each school particularly influential approaches are highlighted. It should be noted that there is no universally agreed way of classifying approaches to talk-based mental health care and approaches differ from culture to culture and country to country. The classification presented in this paper is adopted from (Feltham & Horton, 2000). The approaches outlined below have their theoretical origins in the US and Europe and reflect the most prominent approaches used by public health care services in these countries. For further details see (Capuzzi & Gross, 2003; Feltham et al., 2000; Payne, 1997).

4.1 Psychodynamic Approaches

Psychodynamic approaches include Psychoanalytic Therapy (Freudian), Adlerian Therapy, Analytical Psychology (Jungian) and Psychodynamic Therapy (Kleinian). Psychodynamic theories assume that behaviour comes from movements and interactions in peoples minds. They emphasise how the mind stimulates behaviour and also how a person’s social environment both influences and is influenced by the mind and behaviour. Great emphasis is placed on early life experiences and parental and sibling relationships. This approach developed from the early discoveries and theories of Freud, who found that by helping patients recall and talk about painful childhood experiences, he could relieve them of debilitating hysterical symptoms.

Psychoanalytic theory proposes that beneficial change can occur by increasing an individual’s self-knowledge and bringing the unconscious into consciousness. In this way past trauma may be re-experienced in the present, revealing hidden feelings and liberating creative potential for new resolutions and the prospect of taking greater responsibility for actions. Free association is one of the primary strategies. The client is encouraged to say whatever comes to mind and dreams may be explored. The therapist maintains a state of reverie, making links between associations and waiting for signs of repression, shown through hesitations or resistance to ideas, or slips of the tongue. Psychodynamic interventions are often very time intensive, sometimes based on years of work. While this approach remains popular in private practice, it is usually impractical for publicly funded or emergency interventions. However the influence of psychodynamic theories on subsequent theories is significant. Broad psychodynamic strategies have received little specific attention by researchers investigating computer assisted interventions.

Design Guidelines and Targeted Outcomes
<p>Clinical Validity</p> <ul style="list-style-type: none"> • Design systems based on accepted theoretical models. • Design systems in collaboration with MHC professionals. • Target important aspects of therapeutic interventions e.g. personal stories, psychoeducation, client engagement, problem solving and communication skills.
<p>Therapist Considerations:</p> <ul style="list-style-type: none"> • Design systems which take advantage of the existing skills and experience of therapists. • Design systems which integrate with therapists current working methods. • Do not place extra time pressure on already busy therapists.
<p>Access and Engagement:</p> <ul style="list-style-type: none"> • Choose technologies appropriate to a given client group. • Design for client engagement and reduced stigma. • Systems which help to establish, maintain or enhance client-therapist relationships are highly beneficial. • Design systems which encourage client self efficacy. • Offer clients flexibility in the delivery of therapeutic services e.g. online systems which allow services to be delivered in the client’s home. • Provide support to clients outside of the therapeutic session.
<p>Adaptability and Sustainability:</p> <ul style="list-style-type: none"> • Design systems which can be adapted for use across a broad range theoretical approaches

<p>and disorders and with various demographic groups and individual clients.</p> <ul style="list-style-type: none"> • Design for sustainability by placing the ability to make adaptations in the hands of MHC professionals.
<p>Practical Considerations:</p> <ul style="list-style-type: none"> • Ensure the usability of systems by the target user groups. • Ensure the security and perceived security of systems.
<p>Designing for Outcomes:</p> <ul style="list-style-type: none"> • Cost savings. • Time savings. • Increased access. • Increased flexibility in service delivery. • Improved outcomes. • Improved consistency. • Increased client engagement. • Improved client-therapist relationships. • Increased dialogue between therapists and clients. • Increased client self efficacy. • Support outside of clinical sessions.

Table 1: Design guidelines for technology in talk-based mental health interventions.

4.2 Cognitive and Behavioural Approaches

Behavioural therapy developed from early work in learning theory. Whereas psychodynamic theory states that behaviour comes from processes in the mind, learning theory argues that we cannot know what is happening in someone else's mind. We can only study and influence the behaviour which emerges. Aside from inborn reflexes, all behaviours are learnt through contact with the world (conditioning). It is therefore possible to learn new behaviours to replace those which cause problems (counter-conditioning). Treatments focus on doing things which lead to consistent changes in behaviour.

Cognitive therapies developed in part from behaviour theory and also incorporate lessons from social learning theory. Beck's Cognitive Therapy is the most evidence-based, influential and widely used cognitive approach (Feltham et al., 2000). Beck hypothesised that mental health disorders such as depression were 'thinking disorders'. His cognitive model relates thoughts to emotion and behaviour and proposes that it is not just people's situations and experiences which make them depressed or anxious, but rather their own internal schemata and how they process experience. A schema is a hypothetical cognitive structure which acts as a filter on incoming information. People can have adaptive and healthy schemata or maladaptive and unhealthy schemata, which tend to be negative, rigid and inflexible. Long lasting change comes from modifying a person's dysfunctional schemata and beliefs (cognitive restructuring). Some of the specific strategies used to bring about cognitive restructuring include Socratic questioning, considering alternative perspectives, completing automatic thought forms, reality testing and cognitive rehearsal.

Today few therapists use exclusively behavioural or cognitive approaches. Cognitive-Behavioural Therapy (CBT) has developed to include successful aspects of both approaches, with therapists focusing on changing thoughts and feelings alongside behaviours. CBT is more highly structured than many other therapeutic methods. Interventions generally follow a specific formulation of assessment, goal setting, attempting specific strategies and then measuring success based on valid and reliable clinical measures (e.g. the Beck Depression Inventory). Some of the most commonly used treatments include: exposure therapy, systematic desensitisation, relaxation training, response prevention, coping tactics, cognitive restructuring, self-monitoring and self regulation, covert sensitisation, psychoeducation, role rehearsal and social skills training. Client self-efficacy is one of the most important aims of treatments. Self help exercises and therapeutic homework are commonly given and there is an emphasis on psycho-education.

CBT is one of the best researched treatments. Empirical validation is emphasised. A number of studies have shown that CBT methods are superior to drug based interventions and other therapies for a wide range of problems, including anxiety disorders, mild to moderate depression, phobias (including social phobia), post-traumatic stress disorders, obsessive-compulsive disorders, chronic fatigue syndrome and psychosis (Feltham et al., 2000) pp320.

CBT is widely used in public health services. Some of the key reasons for this are that it is widely applicable, highly structured, goal-oriented, problem solving, easily learned and less time intensive than

more free form methods. For these reasons, CBT has received more attention in terms of computerisation than other approaches reviewed in this paper. The results of this research are reviewed in section 5.3.

4.3 Humanistic-existential approaches

Humanist and Existential approaches to psychotherapy emphasise the ability of human beings to reason, make choices and act freely. They focus on the capacity of the people to gain the personal power to control their lives and change ideas governing how they live. Personal empowerment is one of the primary aims. Psychodynamic and cognitive behavioural theory emphasise how the past has an important influence on the present. Humanist and Existential approaches emphasise how it is our interpretation of the past which is important. Consequently, through their personal freedom, people are able to create or define themselves and reinterpret their past in an empowering manner, which frees them to act towards a more fulfilling future.

Person-centred or Rogerian therapy, first developed by Carl Rogers in the 1940s, is one of the most influential humanistic approaches. Rogers identified an empowering client-therapist relationship as the essence of a therapeutic process and proposed that a quality therapeutic relationship could, in and of itself, provide the '*necessary and sufficient conditions for therapeutic personality change*' (Payne, 1997). The healing effects of treatment are predicted to occur through the client experiencing an emphatic, non-judgemental, positive and accepting relationship that frees them to achieve greater self acceptance. Although modern research suggests that an empowering relationship is not in and of itself sufficient, the importance of a client-therapist relationship is the most influential contribution of person-centred therapy to modern mental health interventions. As highlighted in the design guidelines set out above, improving to the client therapist relationship should be a key objective of new technologies for MHIs.

Narrative Psychotherapy is a more recently developed humanistic approach. The core text in its development is 'Narrative Means to Therapeutic Ends' (White & Epston, 1990). It developed out of movements in psychology by theorists such as Bruner who argued that storytelling represents a fundamental human means of communication and personal understanding. Personal narratives are central to a person's sense of self; through narrative thinking a person forms a sense of self, a sense of the world around them and of their place in that world (Bruner, 1986). Mental health problems can arise when a person tells overly negative stories or becomes blocked from telling their story, for many reasons including social isolation, overly critical environments, purposeful oppression (as in the case of physical or emotional abuse or ethical or political repression) or because a person feels their story does not fit with accepted or perceived social norms. Narrative psychotherapy can be seen as the process of inviting clients to tell and re-tell their life story from a variety of perspectives with the aim of generating alternative stories and reaching a coherent and meaningful narrative at the end. Many narrative interventions will seek to create a record of the client's story. This record can act as a tool for reflection. Traditionally this record is usually written, however multimedia systems now offer greater scope for media rich records and also greater possibilities for sharing and co-constructing therapeutic stories. Aside from specifically narrative approaches the importance of personal stories is pervasive in MHIs.

4.4 Eclectic-integrative approaches

Recent trends suggest that eclectic approaches to client treatment work best. Effective eclecticism however requires some integrating framework to give coherence to the entire process. Examples of eclectic and integrative approaches include: Cognitive Analytic Therapy, Multimodal Therapy, The Skilled Helper Model and the Trans-theoretical Approach. In this paper we highlight the Skilled Helper Model (Egan, 2002).

The Skilled Helper Model is a high level overview of the structure of a helping intervention. (Orlinsky & Howard, 1987) say that it is a generic model of helping and (Egan, 2002) states that it is the most widely used structural overview of counselling and psychotherapy in the world. Although the main thrust of the model is cognitive-behavioural it also incorporates client-centred and humanistic theories.

The model, fig.3, is separated into three stages plus an overall actions line. Each stage centres on a series of tasks that help clients move forward in managing problems and developing opportunities. The theme of stage one is problem/opportunity clarification and ownership. Stage two is about goal setting and commitment to goals. The therapist helps the client to envisage possibilities for a better future and then they work together to choose realistic and challenging goals for achieving solutions to key problems and

the proliferation of websites providing psycho-educational information, although the standard varies widely. See (Heinlen, Welfel, Richmond, & O'Donnell, 2003) for a review. Online discussion groups, forums, e-health groups and mailing lists have also been used to facilitate online group therapies and provide peer support and psycho-educational information (Houston, Cooper, & Ford, 2002; Page, Delmonico, Walsh, L'Amoreaux, Nanninhirsh, Thompson et al., 2000). Collectively these forms of online communication have become known as Internet Therapy. The Islands System project is currently attempting to combine various forms of Internet Therapy to provide MHC services to isolated European island communities (Angelos, Lentziou, Bekiaris, Fernanda, & Bullinger, 2005). To date the most common form of Internet therapy has been email (Rochlen et al., 2004). See (Goss & Anthony, 2003) for further details of each form of Internet therapy.

Much of the research in this area has focused on developing models of practice for therapists working online (Maheu, 2003; Suler, 1999). Other researchers have focused on identifying the similarities and differences between online and face-to-face contact and on the benefits and challenges posed to therapists operating purely online. For example (Rochlen et al., 2004) suggests the benefits include convenience and increased access, disinhibition and internalisation, increased time for reflection and the therapeutic benefits of writing emails. Possible challenges suggested including missing non-verbal cues, misreading, time delays, technical difficulties for clients, issues of crisis intervention and issues of mistaken identity and security. This area has developed to the stage where ethical guidelines for the practicing of online counselling have been published by organisations including the American Counseling Association, the British Association of Counselling and Psychotherapy, and the International Society for Mental Health Online (<http://www.ismho.org>).

5.2 Computerised Questionnaires for Assessment, Diagnosis and Outcome Monitoring

Computerised versions of standard psychological questionnaires, for assessment, diagnosis and rating procedures, have been validated against therapist administered paper versions for conditions including phobias, depression and anxiety, obsessive compulsive disorder and alcohol and substance abuse problems (Butcher, 2004; Marks, 1999; Parkin, 2000). A meta-analysis study revealed that for statistically based assessments, computerised tests offer a 10% accuracy advantage over clinician administered paper tests (Butcher, 2004). Studies show that clients often find it easier to disclose sensitive information to a computer. Clients report feeling less embarrassed and more in control with a computer than with a clinician, but evidence suggests they can describe their feelings better to a human. Computers also offer advantages in terms of time savings, repeatability and eliminating many of the interpersonal variables of face-to-face written assessments, including variations in administration from clinician to clinician. Many computerised assessment procedures produce written reports, summarising the information entered by the client and making recommendations, which clinicians can use to help them make treatment decisions.

More limited recent research has focused on the benefits of more intensive and adaptive testing made possible by computers. Various adaptive versions of the time intensive Minnesota Multidimensional Personality Questionnaire have been validated against conventional versions in terms of scale validity and classification accuracy, but gave substantial item and time savings (Butcher, 2004; Butcher, Keller, & Bacon, 1985; Handel, Ben-Porath, & Watt, 1999). (Percevic, Lambert, & Kordy, 2004) describe the AKQUASI program, which uses regular computerised questionnaires to implement models for continuous monitoring and feedback. AKQUASI can be used from any Internet enabled device (PC's, laptops, PDA's, mobile phone) and allows clinicians to tailor questionnaires, schedule plans and scoring/evaluation algorithms, based on a palette of predefined functions, input elements and psychometric instruments. The program provides written and graphical feedback of scaled scores, evaluations of these scores and changes over time in relation to the concepts of 'clinically significant change' and expected treatment response. It also provides integrative evaluations of treatment status or progress and aggregation over patients. The system aims to enable adaptive allocation strategies, whereby clients who need additional treatment will get it and clients who are no longer suffering can terminate treatment or move to less intensive therapies. Limited trials have demonstrated several benefits including: a reduction in the duration of treatments, reduced failure rates for at risk patients, greater success rates of clinically significant improvement and reduced operating costs.

The success of computerised questionnaires shows that working with computers is acceptable to many clinicians and people suffering mental health disorders. The potential of computers to reduce client

discomfort with disclosing sensitive information is significant, as stigma has been identified as a key issue which must be overcome to improve MHC services. Systems such as AKQUASI can potentially improve the success rates and consistency of talk-based interventions, by providing more intensive feedback and assisting clinicians to monitor clinical outcomes and success factors. A particularly interesting aspect of the AKQUASI study was the facility offered to clinicians to choose and tailor psychometric instruments, schedule plans etc. In section 3.5 of this paper we discussed the benefits of adaptability by MHC professionals. Although in a limited way, AKQUASI is one of the first systems to offer such possibilities.

While initial benefits have been demonstrated, the MHC sector is lagging behind other health care sectors in taking advantage of medical informatics. (Percevic et al., 2004) identifies that methodological advances in psychometric assessment such as adaptive assessment and complex measures (e.g. response time, physiological measures, speech and video analysis), although used in related areas for many years, have not yet made a breakthrough into psychotherapeutic research and practice. The integration of case-based reasoning and data-mining into outcome monitoring have also not been explored. Further work is required on the presentation of feedback data, to evaluate what contributes to its effectiveness and what forms of feedback are appropriate and most valuable.

5.3 Computerised Treatment Programs for Cognitive and Behavioural Therapies

Recent attempts to design computerised treatment programs have, in the main, focused on cognitive and behavioural treatments. Earlier attempts to replicate psychodynamic and humanist approaches encountered difficulties; with natural language processing and the intangibilities of replicating a human relationship and client-therapist dialogue (Cavanagh, Zack, Shapiro, & Wright, 2003). As illustrated in section 4.2 cognitive and behavioural programs have the advantage of being more structured, systematic and goal based and of involving more psycho-educational elements and having measurable outcomes. This review highlights several recent, more widely tested implementations of cognitive behavioural strategies. For a review of older systems, see (Cavanagh et al., 2003; Marks, 1999; Newman, Erickson, Przeworski, & Dzus, 2003). Systems are divided into two categories: (1) treatments in which the computer is used as an adjunct to traditional face-to-face therapy, and (2) standalone systems in which the computer delivers almost the entire psychotherapeutic treatment.

5.3.1 Computer Supported Treatment

'Good Days Ahead: A Multimedia Program for Cognitive Therapy' is a DVD based learning program for the treatment of anxiety and depression, covering the core self help elements of CBT (Wright, Wright, Salmon, Beck, Kuyendall, Goldsmith et al., 2002). Psycho-educational material is complemented throughout by the use of videos, showing characters overcoming depression and anxiety using the methods of CBT. There are also graphics, multiple choice questions, checklists, mood ratings and interactive self help exercises and homework to encourage users to apply the lessons learned in real life situations. In a controlled study, clients experiencing major depression received nine 25 minute sessions with a therapist along with nine 25 minute sessions with the program. Results were compared with clients receiving nine full 50 minute sessions with a therapist. Response rates for computer assisted treatment were identical to standard therapy, but with considerable savings in direct face-to-face contact time (Wright et al., 2002).

Several recent studies have explored the potential of PDA's in computer assisted therapy. For example, (Przeworski & Newman, 2004) describe the use of PDAs in group treatment of social phobia. The program included a diary function for ongoing self monitoring of anxiety, as well as guidance on relaxation, cognitive restructuring, self-control desensitisation and homework exercises. Clients received 6 computer assisted sessions instead of a standard 14 sessions. The system demonstrated major savings versus standard treatment and proved equally effective. Clients expressed enthusiasm for using the PDA, found it very helpful and there was a high rate of compliance with homework exercises.

5.3.2 Standalone Treatment

There have been several studies on the use of standalone computerised treatment programs. These systems do not aim to fully remove the possibility of human intervention, rather they aim to minimise the required contact time in treatments and make it easier for treatments to be delivered in primary health care settings (e.g. GP's office), or in the clients own home.

Beating the Blues is a standalone PC based CBT program for anxiety and depression which has had extensive clinical trials (Proudfoot, Goldberg, Mann, Everitt, Marks, & Gray, 2003; Proudfoot, Swain,

Widmer, Watkins, Goldberg, Marks et al., 2003). Like Good Days Ahead, Beating the Blues is an interactive multimedia program, incorporating questionnaires and self rating scales, animations, voiceovers and video-based storytelling featuring people learning to overcome anxiety and depression. Results showed that standalone treatment with Beating the Blues is equally effective as standard therapy for treating anxiety and depression and achieves equal client completion rates. Clients reported significantly higher treatment satisfaction than for standard human treatment.

(Gega, Marks, & Mataix-Cols, 2004) reports on a trial at London clinic to test the integrated use of four previously validated standalone treatment programs. Fearfighter was used for the treatment of panic/phobias, Balance for generalised anxiety and mild depression, COPE for non-suicidal depression and BTSTEPS for obsessive compulsive disorder. Fearfighter and Balance are PC based applications that can be used either in a clinic or from home via the Internet. BTSTEPS and COPE use phone based Interactive Voice Response (IVR), where clients with a touch tone phone can access self help materials and guided self help exercises. The use of these systems by clients, complemented by brief contact with real therapists, enabled therapists to treat significantly more clients per hour than would have been otherwise possible, without appearing to sacrifice on the effectiveness of treatment. Because the systems were available from home many clients received treatment where it would not have normally been possible and patients had 24 hour access to help. The clinic gave a rough estimate of potential cost savings of between 15% and 41% per annum compared with a standard clinic.

The studies highlighted above demonstrate the potential of computerised cognitive behavioural programs to greatly reduce the costs of MHIs and greatly increase the number of patients a single therapist can treat. They can also increase access and make treatment more convenient for clients. Initial research has also demonstrated increased compliance with homework and self help tasks. This is significant, as such activities increase client self efficacy which significantly influences clinical outcomes. However the full scope of such systems has yet to be fully discovered. For example, in a physical health care context (Dishman, 2004) has envisaged a fully integrated system of '*wellness in place*', to enable many health care treatments and after care services to be delivered in the home by informal care givers e.g. family and friends. The potential of modern mobile phones has also not been explored. Mobile phones can offer many of the combined benefits of IRV and PDA based systems i.e. an existing, extensive and cost effective hardware platform, combined with mobile content delivery and support.

To date computer assisted cognitive behavioural programs, such as Good Days Ahead and Beating the Blues, are largely computerised multimedia versions of standard self-help and psychoeducation material. Within an educational context such systems would be classified as instructional approaches to learning. An alternative approach to learning with technology, likely to prove particularly beneficial in MHC settings, is the constructionist approach (Jonassen, 1998; Papert, 1980). (Jonassen, 1991) suggests that whereas the strength of instructional approaches lies in their ability to teach basic concepts and well structured knowledge, constructionist approaches can enhance engagement and are most appropriate for advanced knowledge acquisition and ill-structured knowledge domains. Constructionist approaches offer the learner/client the opportunity to experiment and construct new understanding by building personally meaningful artefacts, rather than simply by absorbing knowledge. They offer the potential to improve and personalise learning outcomes by increasing engagement, increasing collaborative learning, and increasing experimentation. The application of ideas from constructionist learning offers strong possibilities for future MHC exploration.

5.4 Virtual Reality Treatments

Exposure therapy and systematic desensitisation is one of the most commonly used counter-conditioning techniques in behavioural therapy. Clients are first taught relaxation techniques. They are then gradually exposed to an anxiety provoking stimulus and learn to use relaxation techniques to fight their anxiety. There is a large body of research into the use of virtual reality exposure treatments for many anxiety and panic disorders. Virtual environments allow clients with specific phobias to be placed in safe, yet realistic environments where they experience the various stimuli associated with their phobia. Virtual reality exposure is often used in combination with CBT training and physiological monitoring/feedback and has demonstrated improvements over traditional exposure methods. A detailed review of this work is beyond the scope of this report. For details see (Glanz, Rizzo, & Graap, 2003; Wiederhold & Wiederhold, 2004). Research is focused in several main areas:

- Efficacy studies of existing treatments.
- Extension of existing treatment methods to a greater range of disorders.
- Ongoing improvements to virtual reality hardware and software technologies. Of interest here is any research into visual or intelligence aspects of virtual environments (e.g. life like virtual character, intelligent characters, visual fidelity etc.).
- Issues related to presence in virtual environments.

A major disadvantage of virtual reality treatments is the need for expensive specialist equipment, which makes it prohibitive for widespread use in public health care systems. Research is ongoing into whether cheaper non-head mounted and desktop gaming technologies can deliver the same benefits.

5.5 Biofeedback

The use of biofeedback in MHC is based on evidence of the important relationship between cognition-behaviour-emotion and physiological change. Direct observation of physiological change can potentially enable self-awareness and psycho-physiological monitoring. The therapist and client can gain an insight into the clients' physical and emotional state and the client can learn techniques, such as relaxation exercises, for controlling their physiological state. To date biofeedback treatments have been used to treat disorders including anxiety disorders, ADHD and impulse control problems. Biofeedback treatments have proven particularly effective for engaging children and adolescents (Culbert, 1999). The core reference book for biofeedback practitioners is (Schwartz & Andrasik, 2003). Research on the use of biofeedback may be divided into three categories:

Biomedical engineering: ongoing research to develop the tools with which to measure and classify physiological signals. Work is currently ongoing on the issues involved in classifying specific emotions, however this work is still at an early stage (Picard & Klein, 2002).

Representation: once the relevant signals have been measured and classified, what are the most effective ways of representing these measurements? In the past measurements were generally displayed as graphical trends. More interactive forms of representation are currently being explored e.g. through music, animation and using computer games. For example (Pope & Paison, 2001) have developed methods for using off the shelf Nintendo and Playstation games in combination with electroencephalogram biofeedback, in relaxation exercises for children with attention deficit and hyperactivity disorders. Results concluded that the inclusion of games in normal biofeedback treatments increased the therapeutic effects. Both children and their parents rated as significantly higher their enjoyment of coming to video game based sessions. Children found the sessions more inherently motivating and remained more focused on therapeutic tasks.

Clinical verification: research to determine the actual effectiveness of biofeedback in the treatment of specific disorders, e.g. relaxation training for anxiety disorders.

5.6 Therapeutic Computer Games

Much literature in recent years has focused on the negative effects of computer games. Risks such as addiction and increased aggressiveness and violence have been suggested (Gentile, Lynch, Linder, & Walsh, 2004). There are however indications that suitably designed games can have positive impact in MHC settings (Coyle et al., 2005; Griffiths, 2004; Parkin, 2000). There was brief flurry of research in the 1980's and early 1990's. Increases in the costs, development time and technical expertise involved in developing modern games were key factors in the decline of this work. For details see (Coyle et al., 2005; Resnick & Sherer, 1994). As noted above (Pope et al., 2001) have provided a more recent demonstration of the potential of computer games incorporating biofeedback. Personal Investigator (PI) is a more recent non-biofeedback 3D computer game specifically designed to help adolescents with mental health problems (Coyle et al., 2005). The game incorporates a goal-oriented, strengths based model of psychotherapy called Solution Focused Therapy. A pilot clinical evaluation of PI was conducted, in which therapists used the game with five adolescents experiencing difficulties including anxiety and behaviour problems, attempted suicide, and social skills difficulties. In sessions the therapist and adolescent sat together at a computer, but the adolescent had full control of the game. Initial results indicated that playing PI in sessions was helpful in engaging adolescents. It can increase the amount of dialogue between therapists and adolescents, help in structuring sessions and help in setting therapeutic goals. The use of 3D had an empowering effect, allowing the adolescent more control over the pacing and direction of the therapeutic process. Both

therapists and adolescents found the game easy to use and therapists felt it integrated well with traditional approaches.

Computer gaming is a research area which has demonstrated a potential in helping to engage clients, but exploiting this potential further will require the close collaboration of HCI and MHC researchers. With this in mind development has begun, by the authors of this paper, on a system for adaptable games called PlayWrite. As well as allowing existing games to be modified, PlayWrite also provides an authoring tool which enables MHC professionals to create new content which can be used in existing game templates. These game templates are being developed by HCI researchers and implement a games approach similar to that used in PI. As in PI the main therapeutic content is carried in dialogues with game characters. The authoring tool expands traditional RPG style dialogues and allows MHC professionals to (1) implement informal conversations and question and answer sessions, (2) implement formal psychological questionnaires, (3) use video-based peer storytelling within computer games and (4) incorporate psycho-educational therapeutic information. In this way games become an engaging framework for the delivery of a variety of client-centred therapeutic content. Work is now ongoing to evaluate PlayWrite and develop a series of games, supporting a variety of theoretical models and targeting a range of disorders. As games are developed they will be evaluated for clinical validity and brought forward to clinical evaluation. This approach represents an initial implementation of the collaborative model for design and evaluation outlined in section 3.6 above.

5.7 Collaborative Multimedia Storytelling

As highlighted in section 4, telling and reflecting on personal stories is a fundamental element of most, if not all, MHIs. While the computer game PI and computerised implementations of cognitive and behavioural therapies have shown benefits of incorporating video-based peer stories, other researchers have undertaken more intensive research on the uses of multimedia storytelling. (Sharry, Brosnan, Fitzpatrick, Forbes, Mills, & Collins, 2004) describe a more focused exploration of the potential of collaborative multimedia storytelling to engage clients (particularly children and adolescents) in narrative treatments. The Working Things Out (WTO) project, has developed an interactive DVD/CDROM containing the stories of eleven adolescents who have successfully overcome problems including depression, bullying, eating problems and self-harm. WTO distinguishes itself from previous resources in that the eleven adolescents undergoing treatment played an active part in the creation of the multimedia stories and this creation process facilitated an empowering therapeutic intervention. WTO is now being investigated as a therapeutic resource, individually or in small groups, with young people experiencing similar mental health problems. It is also being investigated as a preventative resource, for use in schools, by raising awareness of mental health issues. (Brosnan, Fitzpatrick, Sharry, & Boyle, 2006) describes ongoing work to develop a 12 week intervention program for adolescents incorporating use of WTO with a new multimedia storytelling toolkit which aims to streamline the animation process, making it accessible to a wider range of MHC professionals and their clients.

A far greater body of research has been conducted in educational settings on the potential of digital storytelling. There is much documented evidence of use of video-based, multimedia scenarios to engage adolescents in social learning. See (Goldsworthy, 2002) for further details. Lessons from constructionist educational research may also be adapted to enhance self expression and storytelling in therapeutic settings. For example Marina Umaschi Bers has coined the term *Identity Construction Environments* to describe the computer tools she has developed for exploring personal identity within community environments (Bers, 2001). Her work pays particular attention to the relationship between personal and moral values and personal identity. A substantial body of work has also investigated the use of peer storytelling and story listening systems e.g. see (Ryokai & Cassell, 1999; Ananny & Cassell 2001, Cassell 2002, Druin 1997). The possibilities of using the audio, photographic and video capabilities of mobile phones, to allow clients document, explore and reflect on their own life between therapeutic sessions has also not yet been explored. Nor has the potential of multimedia webblogging or ideas of '*citizen journalism*' (Ananny & Strohecker, 2002).

6 Discussion and Future Possibilities

Our review of literature has identified several areas in which initial benefits of technology in talk-based MHIs have been demonstrated. The introduction to this paper identified three stages in the development of

technology in mental health care settings. Research to date has largely corresponded to stage one of this process i.e. computerised approaches which copy traditional face-to-face methods. Future research will benefit substantially from the involvement of HCI researchers. This involvement will help to move research to a second stage, in which more specialist systems can offer therapists new possibilities for working with clients.

Access and engagement are two key factors which must be considered in designing technologies for MHIs i.e. how can systems increase access to MHC services and how can they then help clients to engage more easily with services once they have access to them? Electronic contact and computerised implementations of cognitive behavioural therapies have provided initial indications of the potential of technology to increase access. Such systems offer clients increased flexibility in the delivery of services and also can increase support outside of therapeutic sessions. They can also help to reduce the cost of treating individual clients and substantially increase the number of clients a single therapist can treat. However technologies for engagement have received less attention and our understanding of how to design such technologies is currently poor. Engagement is critical to building client-therapist relationships and improving client self-efficacy.

In recent years designing for engagement and "funology" have emerged as significant areas for HCI research. See for example (Interactions 11(5), 2004). Research in this area has significant potential to be applied in reducing stigma and helping clients to engage more easily in MHIs. Words such as fun, play, excitement, pride and engagement are used frequently in the literature. But the literature stresses that these features are designed to address utilitarian goals. (Monk, Hassenzahl, Blythe, & Reed, 2002) state: "*People are neither interested in a dull but useful tool, nor in a fancy but utterly useless toy. The challenge for HCI research is to systematically address hedonic (non-utilitarian) requirements and combine them with goal orientated requirements.*" Within a MHC context engaging technologies are a non-utilitarian means of achieving the utilitarian benefits (engagement, client self-efficacy) which increase the potential for positive therapeutic change. Research on computer games and multimedia storytelling in adolescent interventions has demonstrated potential. Further work is required to extend similar ideas for engagement to a broader range of systems. The application of ideas from research on constructionist approaches in educational technology is also likely to prove particularly beneficial in MHC settings.

(Picard et al., 2002) discusses early work on interactive computer systems which can begin to detect, label and react to the emotional and social needs of users. For example (Bickmore & Picard, 2004; Bickmore & Picard, 2005) has provided initial demonstrations of the benefits, in physical health care, of playful empathic conversation agents designed to create a perception of caring. Patients formed better relationships with empathic agents than with non-empathic agents and as a result were more likely to comply with a month long physical health care program. Further discussion on the role of empathy as a design factor can be found in (Hall, Paiva, & Aylett, 2004; Mattelmäki & Battarbee, 2002). It is an open question as to whether combining elements of fun with affective systems embodying fundamental therapeutic values (e.g. respect, empathy and genuineness) offers the potential to improve the effectiveness of computerised MHC delivery. For example, are the optimal computer therapeutic values the same as or different to optimal human therapeutic values? Is the absence of human values a forte of computerised systems, in that clients using such systems know they are dealing with a system, and don't feel judged or restricted in their presence? Section 5.2 highlighted studies which show that clients often find it easier to disclose sensitive information in computerised questionnaires. Clients reported feeling less embarrassed and more in control with a computer than with a clinician, but evidence also suggests they can describe their feelings better to a human. It may be that the adoption or non-adoption of human therapeutic values is appropriate to some situations and users, but not to others. The identification of optimal computer therapeutic values, and of their appropriateness to differing situations, would be a valuable contribution to future research in this area.

In section 3.6 we put forward a set of design guidelines and emphasised the need for collaborative design and evaluation of new technologies for MHIs. Further work is currently ongoing to develop this model and identify specific mechanisms for each stage of the process and provide feedback from clinical evaluations. The creation of adaptable technologies has been identified as an important element of this approach and the development of such systems will be an important aspect of future work in this area. While HCI researchers focus on the design and development of frameworks for stigma reducing, engaging and accessible technologies, MHC researchers can adapt the use of these systems to suit the needs of various interventions and client groups. Much of the previous work on technology in MHIs reviewed in this paper has been

strongly influenced by theoretical approaches to MHC favoured in Europe and the US. In the future there is the potential that a more diverse range of theoretical approaches can be applied to the development of new technologies. Given the significance of cultural issues in MHIs this will be an important aspect of future work.

As well as the areas discussed above there is significant potential for research in many other domains of HCI to be applied in MHIs. Section 3.6 of this paper noted the work by researchers such as (Newell et al., 2000) and (Poulson et al., 1998) to develop adapted approaches to user-centred design in the areas of inclusive design and assistive technology. There is also potential for ideas from computer supported co-operative work, computer mediated communication and trust in computer systems be applied in this area. HCI researchers in each of these domains are well placed to apply this knowledge in MHC settings. However applying this knowledge will require an awareness of the challenges posed by working in MHC settings, in particular those posed by access constraints, and will also require close collaboration with MHC professionals. In this paper we have provided an initial discussion of some of the factors affecting design for MHC settings and also proposed an approach for collaboration between HCI and MHC researchers. It is hoped this paper will act as a starting point for further discussion of such issues.

7 Conclusion

Mental illness has been identified as one of the key challenges facing society in the coming decades and health care services worldwide are faced with a pressing need to find new ways of providing accessible, engaging, cost effective services. There are strong initial indications that technology can play a significant part in helping to address this need. This paper has provided a review of theoretical approaches to talk-based MHC and previous research on the use of technology in this area. Future research will benefit significantly from the input of HCI researchers. Key issues for HCI research include the need to develop our understanding of the MHC domain and providing guidelines on how to design technologies which increase access, reduce stigma and increase engagement with MHC services. Research on achieving these aims must be conducted within the strict ethical requirements and access constraints inherent in this domain. These constraints necessitate the close collaboration of HCI and MHC professionals. This paper has put forward a set of design guidelines and outlined a broad model for collaboration between HCI and MHC professionals. The development of adaptable technologies is an important element of the proposed approach. Adaptability has been identified as a sustainable approach to the development of client-centred technologies. Finally, this paper has provided a foundation and set an agenda for future research on the design of technology for talk-based MHIs.

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