

# Using virtual environments for trigger identification in addiction treatment

L North<sup>1,2</sup>, C Robinson<sup>1</sup>, A Haffegge<sup>2</sup>, P M Sharkey<sup>2</sup>, F Hwang<sup>2</sup>

<sup>1</sup>Business Development Team, Swanswell,  
Suite 5, Hilton House, Corporation Street, Rugby, UK

<sup>2</sup>School of Systems Engineering, University of Reading,  
Whiteknights, Reading, UK

*liam.north@swanswell.org, chris.robinson@swanswell.org, a.haffegge@reading.ac.uk,  
p.m.sharkey@reading.ac.uk, f.hwang@reading.ac.uk*

*www.swanswell.org.uk, www.reading.ac.uk*

## ABSTRACT

This paper presents a novel application of virtual environments to assist in encouraging behaviour change in individuals who misuse drugs or alcohol. We discuss the background and development, through user-led design, of a series of scenes to engage users around the identification of triggers and encourage discussion about relevant coping skills. We then lay out the results of initial testing of this application that showed variation in responses but, on average, the system encouraged discussion around the topic and was linked to a mild improvement in the users' confidence in the subject matter of the session.

## 1. INTRODUCTION

Computers, games and other forms of interactive technology have the potential to offer new ways of reaching people who misuse drugs or alcohol. An estimated 306,150 people misuse heroin and crack cocaine in the UK (Hay et al, 2011) and an estimated 1.6 million people in England are alcohol-dependent (Department of Work and Pensions, 2010). Very few of those affected ever engage with the support they need with only 56.2% of drug users (Roxburgh, 2011) and 6% of alcohol-dependent individuals (Ward, 2010) accessing support. This leads to negative economic, social and health impacts. Even when people do engage in treatment services, there is a high rate of relapse. It is estimated that 40% to 60% of those completing treatment will relapse (NIDA, 2009). This has long-term cost implications with the cost of drug and alcohol misuse in the UK estimated to be between £20 billion and £55 billion (NICE, 2010) annually.

Triggers are the objects, people, and situations that lead to craving, and they play a big role in relapse and prevent people from reducing their use of substances. Triggers can include a wide range of things including triggers directly related to a substance (such as the substance itself or other related paraphernalia), stressful situations or interpersonal situations. Teaching people about these triggers and the ways they can deal with them can boost people's chances of recovery and avoiding relapse. This paper investigates a game-based system to support people in identifying their triggers as a part of developing coping skills.

## 2. RELATED WORK

The use of interactive technology in the treatment of addiction has been previously investigated in a range of contexts. Many of these are computerised versions of more traditional interventions such as brief interventions, where people are assessed and given initial information and encouraged to engage in a more in-depth manner, and Cognitive Behavioral Therapy (CBT) which uses a systematic, goal-orientated approach to treating problems.

Exposure therapy is another real world treatment that can be utilised by computer based therapies. It is a process in which the patient is exposed to situations to provoke a reaction relating to the disorder they are in treatment for. This enables the therapist to help the patient identify triggers for their behavior and develop coping skills. Studies (Martin, LaRowe and Malcolm, 2010) have found exposure therapy in the real world as effective as other addiction treatments but highlights issues around practicality and costs. Additional costs are

incurred by the need for exposure therapy to take place in multiple locations (Conklin and Tiffany 2002). Virtual Reality could allow this to be more practical and cost effective without exposing the service user to a potentially risky, uncontrolled environment.

Online brief interventions have been used to identify at risk individuals as effectively as trained staff, allowing more people to receive brief interventions with less staff time (the primary cost in delivering brief interventions) (Bewick et al, 2010). Similar CBT based systems have had similar results. One such study found the computerised system achieved similar results to existing face-to-face approaches using an eighth of the staff time (Marks et al, 2003). These show that desk top and browser based interventions can be effective, engaging and appropriate.

In addition there has been less study of the use of Virtual Reality Exposure Therapies however experiments have shown that craving can be triggered by virtual cues for smokers (Bordnick et al, 2004), alcohol users (Bordnick et al, 2008) and those who use cocaine (Saladin et al, 2006) indicating that the users respond to, and hence can be taught to identify, triggers in a virtual scene.

Exposure therapy is not the only potential avenue for exploiting VR technology in treatment, as one study into the therapeutic value of crushing virtual cigarettes shows (Girard et al, 2009). Participants were assigned to either a virtual environment where they found and crushed cigarettes, or to a neutral control environment. Those in the control group had a higher drop-out rate from the programme and less reduction in tobacco use. The authors suggest that this may show that the experimental group was more involved, had a higher level of motivation and reinforcement due to the crushing of cigarettes, which conditioned them to feel negatively about them, or had learnt to associate feelings of immediate success with the removal of cigarettes from their environment.

Video game technology (Gamberini et al 2009) was used to engage young people about drug-related issues. The game's narrative is user directed showing the consequences of their actions and presents relevant information. A survey of users found that the game was well received and was considered to be a reliable source of information; however there were issues around the lack of customisation available. No information was recorded on the user's craving or willingness to take drugs which leaves questions over its suitability as a behaviour change intervention.

Approaches used in other areas of mental health are also of relevance. Coyle, Doherty and Sharry (2009) developed a game to teach adolescents Solution Focused Therapy (SFT) skills. The game is played by the patient whilst the therapist oversees their progress and engages them in conversation around subjects that are brought up. The paper shows promise for the system, with clinicians feeling it was helpful or very helpful in engaging participants around the topic of SFT in 86% of cases. This shows that games can facilitate positive outcomes in a traditional therapeutic setting.

Reach-out central (Burns et al, 2007) works within a similar area. The game aims to engage a hard to reach audience, teenagers, around mental health issues. In the online game users become involved in a series of storylines relating to common problems and issues facing teenagers. The game, backed by a media campaign, was successful in engaging and influencing users. User feedback (Shandley et al, 2010) highlighted the need to engage users through early goals and direction, the need to offer a level of personalisation, focus on the most relevant issues and the need for the problems facing the user to not have a clear "right" answer.

In "*The Warriors' Journey*" (Morie, Haynes and Chance, 2011) narrative therapy (the exploration of issues and events in one's life through story telling) is used to help returning soldiers deal with any anxieties or difficulties arising from their return to civilian life. A second life based system engages users through a narrative that establishes the recurring themes throughout different forms of military service, and the associated stresses. The user is then able to engage in building their own narrative to reflect their experiences. This is intended to encourage a sense of self esteem, a feeling of control and provide a gateway to restructuring their life narrative and the achievement of a more positive outlook on life.

Virtual Reality exposure therapy has been found to be as effective as a real world equivalent (Emmelkamp et al, 2002 and Difede et al, 2007) in areas such as phobias and Post Traumatic Stress Disorder. This shows that there is therapeutic potential for this sort of technology.

### 3. OBJECTIVES

We have developed a simulation based VR application that comprises an exercise to identify potential triggers for craving within a series of virtual scenes. The application is being tested in a group programme for

people recovering from drug or alcohol addiction misuse issues. This research will investigate the following questions:

- Can virtual scenes be used to help service users learn skills to identify the triggers for their cravings?
- How does the virtual version compare to the real-world version of the activity in terms of user engagement and reported learning?

We hope to also provide insight into the following secondary questions.

- Does this technology stimulate greater levels of discussion and group work within a structured day programme setting than the existing activity?
- Do users feel engaged and immersed with this sort of activity?
- How can service users be directly involved in the development of games to teach coping skills?

The novelty of this research arises from several areas. The use of technology as part of the treatment of addiction has not been widespread in any format so far, particularly in a group setting. This research will also examine the delivery of a format of intervention, teaching users about identifying triggers and their patterns of behaviour, that has not been the focus of previous research.

## 4. APPLICATION DEVELOPMENT

### 4.1 *The “Spot the Triggers Challenge”*

The initial stages of this project involved consultations with end-users to identify and develop potential means of embedding interactive technology into services. This started with focus groups to identify and assess concepts for activities and tools that could be provided. One of these was a simulation to aid users in identifying, understanding and coping with triggers and cravings. This paper focuses on how this idea was extended and developed from this initial concept into a functional prototype.

The project involves developing a game to encourage learning by allowing users to take part in a virtual reality based task about their triggers. Within the game users navigate around virtual scenes containing a variety of potential triggers and are tasked with identifying the triggers in the scenes that are relevant to them. These triggers are then stored and used as the basis for other tasks around the development of coping skills. Currently these other tasks are delivered by workers but in future versions more of these elements will be incorporated into the game. This game allows services to deliver interventions in a new way and allows services to reach those who can't or won't engage with traditional services.

The game is based on an existing activity within a structured day programme. A structured day programme aims to teach service users a series of skills for their recovery. This programme includes a variety of activities and sessions aiming to train users in a number of areas including motivation to overcome issues, coping skills and general life skills. It is highly structured with participants expected to attend for several hours daily. Each cohort of individuals on the course moves through the programme together. Half-way through the programme a session focuses on triggers and cravings and contains an activity about identification of potential triggers. This task involves the session facilitator setting up the room to contain multiple different triggers. The room is set up to contain an area that is set out like a domestic room with some drug cues (e.g. needles and foil) and a bar scene containing triggers related to the consumption of alcohol (e.g. pint glasses and beer cans). The facilitator gives each participant a set of colored stickers and sets them the task of exploring the “scenes” and tagging their triggers with the stickers. The group then gathers to discuss the session and talk about the triggers they have identified. This approach has several limitations:

- It requires equipment to be transferred to the service delivery location
- It requires time and space to set up
- It is limited in the type of triggers that can be displayed; the breadth of triggers is limited to simple physical objects and the task is unable to replicate interpersonal situations, outdoor scenes or other stimulus

The computerised approach to this content should offer the following advantages over the physical mock-up of the environment:

- a wider choice of the scenes that users can explore
- a higher number of triggers can be included
- the use of non-static triggers such as interpersonal situations

- easier monitoring and recording of users actions such as the triggers they tag and their movements
- less equipment required for the activity
- less preparation time needed to set up the activity
- potentially a more engaging experience for users
- more realism in the scenes presented

#### 4.2 Early User Consultations

The project engaged with service users early in the development of the concept of the “spot the triggers challenge” virtual environment. Participants were recruited via their substance misuse workers. Researchers communicated the needs of the project to these workers and asked them to identify any individuals they worked with who would be suitable for involvement in the development process. The selection criteria were broad to allow input from as wide a range of service users as possible. Our requirements were:

- A history of substance misuse
- Willingness to engage in discussion and give feedback
- Engaged with treatment services
- Not presenting an undue risk to themselves or others

Additionally researchers requested additional focus on those in hard to reach groups such as young or female participants who traditionally do not engage with services in large numbers (statistics reveal that the average service user is 34 years old and 73% are male (NTA, 2011)). The needs of the project were communicated to staff through internal communication and briefings. We provided fliers and information sheets to assist workers in sparking interest in the project.

Through this we recruited 31 service users who were interviewed in either small groups or one-to-one interviews. This group tended towards an older male demographic. Whilst this matches the profile of drug and alcohol service users it is less ideal for reflecting the make-up of the substance misusing population as a whole, particularly as we wanted to encourage those who traditionally do not engage. Participants included 22 alcohol service users and 9 drug service users who tended to be at later and relatively stable stages of their treatment journey. 48% came from the Birmingham or Sandwell area (an urban city environment), 23% came from Coventry (a smaller city) and the others came from various towns around Warwickshire and Leicester (more rural, less densely populated areas). Six one-to-one interviews took place and the other service users were engaged in group settings with groups of between 2 and 7 participants.

Those engaged in this stage of the process were consulted on several areas. They were presented with the initial demo version of the application, a small demonstration scene consisting of a street with some drug related cues (phone boxes, needles and foil) and a bar room with some simple furniture such as a bar and chairs and tables and glasses and bottles associated with alcohol. The interaction in the scene was limited to navigation around the scene and there were no interactive characters or events. The system was demonstrated to participants by the researcher, and participants were then given an opportunity to use the system themselves. They were asked about the following points:

- Would they be happy using a computerised system?
- Would they be happy to discuss their triggers and work with them in a virtual environment?
- What barriers do they anticipate to the use of the system?
- What scenes and triggers should be included?
- What sort of visual appearance should the system have?

Notes were taken during these sessions and were examined for key themes.

Their reaction to the demonstration was generally positive in regard to its potential to allow better preparation and practicing of coping skills, although there were some reservations including:

- Adaptability to meet individual user’s experiences with service users commenting that “different people have different experiences” and stating that that range of experience needs to be reflected in the end application but that too much content all at the same time could “overwhelm” the user
- The level of realism within the product was a contentious issue with some participants stating that they felt the application needed to be very realistic to engage users and others felt that it needed to be limited in its realism in order to reduce the risks associated with craving causing relapse

- The level of challenge in making the application widely available because of the need for equipment and staff involvement was also identified.

The most commonly identified areas for future developments were the addition of animated characters and greater levels of interactivity to encourage more immersion and engagement for the user.

The service users were also asked to think of triggers that should be included in the application. Their responses are summarised in table 1, with attention paid to the substance of choice of those informing us of the trigger.

**Table 1.** *Identified triggers.*

<b>Trigger</b>	<b>Those affected</b>
Drug paraphernalia (e.g. foil and syringes)	Drugs
Being in an area with available alcohol. Examples included bars and also places that were less easily avoided such as the local shop or supermarkets	Alcohol
Empty cans/bottles	Alcohol
Phone boxes (used for calling dealers; this tended to be more prevalent in urban areas and amongst older service users)	Drugs
Old friends (either those you used to use/drink with or those who don't know the issues you've had)	Both
Arguments with partners/families	Both
Bills (and associated stress)	Both
Money (both its availability and the stress arising from the lack of it)	Both
Beer gardens	Alcohol
Social occasions (particularly weddings and birthdays)	Alcohol
Other drinkers/drug users	Both
Off licenses/corner shops	Alcohol
Park areas (tended to be primarily associated with alcohol, particularly street drinking, but was also mentioned by drug users. Some local variation included canal areas being mentioned by service users in areas with large canal networks where the canal area frequently takes the place of parks as an outdoor venue for substance use)	Both

#### 4.3 Evaluation Prototype

On the basis of this input from the service user consultations, another version of the virtual “spot the triggers challenge” system was developed in Unity3D, a games development platform. The developed game allows participants to explore a variety of virtual scenes they might encounter in their daily lives that would bring them into contact with different triggers. It builds on ideas from the initial demonstration prototype and extends the range of virtual scenes that participants might encounter in their daily lives. Additionally interactions were added such as conversations with virtual characters. Each of these scenes contains various different triggers the user can interact with. The scenes represented in this version of the game were:

- a street scene (to represent triggers such as encountering old acquaintances, phone boxes, beer gardens and a local shop)
- a bar (that includes triggers related to alcohol and social situations), see Figure 1.
- a domestic scene (that represents the triggers related to financial stress, home environment and interpersonal arguments and stress), see Figure 2.



**Figure 1.** *Identifying triggers in a virtual bar.*



**Figure 2.** *Identifying triggers in a virtual living room.*

## 5. EVALUATION

In order to assess the safety and effectiveness of the application, we are conducting an experiment in the secure and easily monitored environment of a structured group setting. This section describes the experimental design, and reports on one session with service users.

### 5.1 *Experimental Design*

Participants for this study were recruited from within an existing structured day programme. Each cohort typically has between 4 and 12 people and will be assigned to either a control group or an experimental group on an alternating basis. Participants in the structured day care programme have already undergone a risk assessment prior to joining the programme and as such should not have risks of harm to themselves or others and are able to give informed consent.

The session of interest within the structured day programme deals with support networks, triggers and craving and the coping skills that can be used to overcome these trigger situations and the craving they incite. The session first involves a discussion around the kinds of support (both formal and informal) that people can access and the participants create a map of their support network. The next section deals with identifying triggers and will follow the procedure laid out for the traditional real-world task (control group) or the virtual reality task (experimental group). After this the facilitator discusses types of coping strategy with the group and helps them create action plans that they can put into place for the trigger situations they have identified as most relevant to them.

The control group performs the existing real-world activity as described earlier in the paper. The experimental group uses the virtual version of the task. Within the virtual version of the activity, one participant takes control of navigation around the scene and the tagging of objects identified as triggers. The other participants are able to observe their progress via a projector and are encouraged to discuss the process,

debate the relevance of certain triggers and guide the actions of the participant using the system. Both groups will be assessed using the same outcome measures and user feedback questionnaires. The questionnaires will be completed by participants before and after the activity and will assess their levels of understanding and confidence in the activity's learning outcomes (their understanding of triggers and their ability to identify their personal trigger), their levels of engagement with the task and emotional responses to the task (e.g. any feelings of stress or craving they felt during the task). These questionnaires will be analysed to find the average feedback scores and the variability in response for both the virtual environment task and the traditional discussion based task. Any verbal feedback given is recorded for later analysis.

## 5.2 Initial Results

The first trial group was assigned to the experimental condition and attended by 6 service users who all took part in the session and completed feedback forms for the session. The participants were predominantly male (5 male, 1 female). All participants were actively engaged in the programme alongside regular one to one sessions with substance misuse workers.

The feedback from the group (both within the session and via feedback forms distributed at the end of the session) was mixed with one very vocally against the use of technology, feeling the delivery needed to be pacier and "realer" with a greater level of non-visual feedback such as sound and, ideally, additional mediums such as smell.

The results from the feedback forms indicated that most individuals understood and followed the activity. The majority also thought the activity generated discussion in the group with 4 out of 6 either agreeing or strongly agreeing with the statement "the activity stimulated discussion within the group". This is reflected in participation within the group which included all members discussing the issues.

Participants were asked to rate their level of understanding of triggers and their ability to identify triggers before and after the activity, on a scale of 'No confidence', 'some confidence', 'a lot of confidence' or 'complete confidence'. Before the activity, the service users tended to have a reasonable level of confidence in these areas, with 3 of the 6 participants reporting 'a lot of confidence' in their understanding of triggers and ability to identify their personal triggers. This is in line with comments from the group facilitator indicating they felt triggers should be covered earlier in the programme as they come up in other discussions with service users prior to the relatively late point in the programme in which they are formally covered. Comparing the users' ratings after the activity, three of the six service users did not report any improvements in either of the learning outcomes. Two participants indicated improvement in both outcomes (confidence increased by 2 points for both people, understanding increased by 1 point for one and 2 for the other). One service user reported a decrease of one point for both learning outcomes.

The reported immersion was low with only one participant not completely disagreeing with the statement "I felt like I was in a real place". This affected the craving felt by the group with half the group completely disagreeing with the statement "I felt craving whilst using the system", one individual saying they neither agreed or disagreed with the statement and the others stating a slight disagreement. This was reflected in comments recorded about the purely visual nature of the system and the need for higher levels of feedback to other senses such as sound and smell.

Levels of engagement with the activity were varied. This was reflected both in the question responses relating to "feelings of engagement" with the section and through many participants' reluctance to take control of the game in the session (after the initial volunteers no one came forward to take control).

The session itself proceeded largely according to plan but was hindered by unexpected changes to the delivery space's layout resulting in the projection of images being more difficult and badly positioned limiting their effective use as a focus for the group. This detracted from the activity and user engagement in it.

Trials are currently ongoing and include plans for control groups which will enable us to compare the outcomes of the virtual and real world versions and assess the effectiveness of the computerised approach compared to the traditional version.

## 5.3 Deployment Considerations

The lessons learnt from this research so far about the practical delivery of this form of interactive tool include:

- *Be prepared to adapt to your delivery space:* Services are delivered in a variety of locations, normally decided not only on appropriateness but also on factors such as cost, location and availability. This

means that you need to be adaptable to different locations and ways of working and delivering. This is reflected in difficulties we had in delivering in the space provided in our initial trial

- *Not all demographics are comfortable with technology:* Services represent a broad range of demographics and as such will include people who are not very comfortable using technology. To facilitate this, the process should be as user friendly, error free and integrated into services as possible. This can be seen in the reliance of participants on facilitator guidance when using the application. Younger people tended to have a go and only ask questions when they had a problem with the interface whereas older individuals tended to need guidance on the basics of navigation through a 3D environment.
- *Different people respond to different things:* No learning style or approach applies to every individual; people tend to learn and engage in different ways and they also tend to be at different points of learning for specific subjects. This is reflected in our results that show some individuals responding to the activity and some not responding to it. This could indicate this form of activity would be better used in more selective cases, or through a process of self-selection.
- *There is a need for a wide range of triggers and situations:* The range of objects, situations and events that can act as triggers is large and can vary according to the age, background, and substance of choice and geographical location of an individual. This makes it challenging to create a programme that is universal whilst still having an individual impact. This is demonstrated by the large number of triggers identified in our consultations.
- *It can be difficult engaging end users to develop content and designs:* This problem is particularly acute in reference to hard to reach group as they tend to not be engaged with services and, by definition, those that are available for feedback are engaged and therefore presumably display some different characteristics from those who do not engage. This increases the risk in developing content and approaches as there is less certainty in the appropriateness of what you develop. This is demonstrated by the project's difficulty in finding a service user involvement group that represents a wide range of individuals

The initial results of our first trial group, whilst not universally positive, do offer a starting point for further development, giving us insight into needed improvements and shedding light on the potential best audiences for this technology. The literature indicates there is potential within both game based learning and the wider field of interactive technology to assist people in achieving behavior change especially in view of the unmet need in the provision of support.

Moving forward the project will require more extensive trials in both the current structured day settings and also wider ranges of settings and within hard to reach groups. Finally there also need to be assessment and implementation of the ways that this can be brought to a wider audience.

**Acknowledgements:** We thank all of those Swanswell staff and service users who have contributed to the design, development and testing of the application. We would also like to thank the Technology Strategy Boards Knowledge Transfer Programme for facilitating and funding this work.

## 6. REFERENCES

- B.M. Bewick, R. West, J. Gill, F. O'May, B. Mulhern, M. Barkham, and A.J. Hill (2010) Providing web-based feedback and social norms information to reduce student alcohol intake: a multisite investigation. *Journal Of Medical Internet Research* 12 (5) e59.
- P.S. Bordnick, K.M. Graap, H. Copp, J. Brooks, M. Ferrer, and B. Logue (2004) Utilizing virtual reality to standardize nicotine craving research: A pilot study. *Addictive Behaviours* 29 (9) 1889–1894.
- P.S. Bordnick, A. Traylor, H. Copp, K.M. Graap, B. Carter, M. Ferrer, and A.P. Walton (2008) Assessing reactivity to virtual reality alcohol based cues. *Addictive Behaviors* 33 (6) 743–7569
- J. Burns, C. Morey, A. Lagelée, A. Mackenzie, and J. Nicholas (2007) Reach out! Innovation in service delivery. *Medical Journal of Australia*, 187 (7) S31–S34.
- C.A. Conklin and S.T. Tiffany. (2002) Applying extinction research and theory to cue-exposure addiction treatments. *Addiction* 97 (2) 155–167.
- D. Coyle, G. Doherty, and J. Sharry. (2009) An evaluation of a solution focused computer game in adolescent interventions. *Clinical Child Psychology And Psychiatry* 14 (3) 345-360.
- Department of Work and Pensions (2010) State of the nation. London: HM Government



- J.A. Difede, L.S. Malta, S. Best, C. Henn-Haase, T. Metzler, R. Bryant, and C. Marmar (2007) A randomized controlled clinical treatment trial for World Trade Center attack-related PTSD in disaster workers. *The Journal Of Nervous And Mental Disease* 195 (10) 861-865.
- P.M.G. Emmelkamp, M. Krijn, A.M. Hulsbosch, S. De Vries, M.J. Schuemie, and C. Van der Mast (2002) Virtual reality treatment versus exposure in vivo: a comparative evaluation in acrophobia. *Behaviour Research and Therap*, 40 (5) 509–516.
- L. Gamberini, F. Marchetti, F. Martino, and A. Spagnolli (2009) Designing a serious game for young users: The case of happy farm. *Studies in Health Technology and Informatics* 144 77–81
- C.A. Girard, V. Turcotte, S. Bouchard, and B. Girard. (2009) Crushing virtual cigarettes reduces tobacco addiction and treatment discontinuation. *CyberPsychology & Behavior* 12 (5) 477–483.
- G. Hay, M. Gannon, J. Casey and T. Millar (2011) Estimates of the Prevalence of Opiate Use and/or Crack Cocaine Use, 2009/10: Sweep 6 report *London: National Treatment Agency*
- I.M. Marks, D. Mataix-Cols, M. Kenwright, R. Cameron, S. Hirsch, And L. Gega (2003) Pragmatic evaluation of computer-aided self-help for anxiety and depression. *The British Journal of Psychiatry* 183 (1) 57-65.
- T. Martin, S.D. LaRowe and R. Malcolm (2010) Progress in Cue Exposure Therapy for the Treatment of Addictive Disorders: A Review Update. *Open Addiction Journal* 3 92–101.
- J.F. Morie, E. Haynes And E. Chance (2011) Warriors’ journey: a path to healing through narrative exploration. *International Journal on Disability and Human Development* 10 (1) 17–23.
- National Institute of Clinical Excellence (NICE) (2010) Alcohol-use disorders: preventing harmful drinking. *London: National Health Service*
- National Institute on Drug Abuse (NIDA) (2009) Principles of drug addiction treatment *Washington: National Institute of Health*
- National Treatment Agency for substance misuse (NTA) (2011) Statistics from the drug treatment monitoring system, 1 April 2010 - 31 March 2011 *London: National Health Service*
- M. Roxburgh, M. Donmall, C. Wright and A. Jones (2011) Statistics from the National Drug Treatment Monitoring System (NDTMS) 1 April 2010 – 31 March 2011 *London: National Treatment Agency*
- M.E. Saladin, K.T. Brady, K. Graap, and B.O. Rothbaum, (2006) A preliminary report on the use of virtual reality technology to elicit craving and cue reactivity in cocaine dependent individuals. *Addictive Behaviors* 31 (10) 1881–1894
- K. Shandley, D. Austin, B. Klein and M. Kyrios (2010). An evaluation of reach out Central’: an online gaming program for supporting the mental health of young people. *Health Education Research* 25 (4) 563-574.
- M. Ward. (2010) Investing in alcohol treatment. *London: Alcohol Concern*.