

by David Haniff



Technology & Intrusive Thoughts

(a Work in Progress)

This article looks at the nature of bad thoughts that are not wanted, a mental health problem affecting **5% of the population** (Baer, 2002).

Intrusive thoughts are 'unwanted thoughts'. For example, people with Post-Traumatic Stress Disorder (PTSD) can experience flashbacks where they recall their experiences (Crosby, 2008). Here I explore how technology can be used to help treat intrusive thoughts. One method that has been used is to challenge the thoughts. Another method is 'en vivo' or exposure therapy - exposing people in a safe environment to an extent that it no longer becomes a problem. This has been used to treat problems acquired during wars, post-natal depression and grieving. It also looks at the biology of intrusive thoughts as well as further work.

There is a link between the

physiology of the brain and the psychology - as the phrase goes 'get the head right and the rest follows'. Work on PTSD highlights the use of the 'amygdala' which resides in the centre middle of the brain. The amygdala is used in fight or flight responses (Morey et al., 2012). Intrusive thoughts are associated with anger and are activated by the fight response. The amygdala releases a stress hormone which in turn can lead to long-term memory damage and poor decision making if you have sustained anger or anxiety. The fight or flight response is necessary as it is crucial to survival and without it the human race would not have survived, as you have to sometimes flee and sometimes you have to stand up and fight. However,

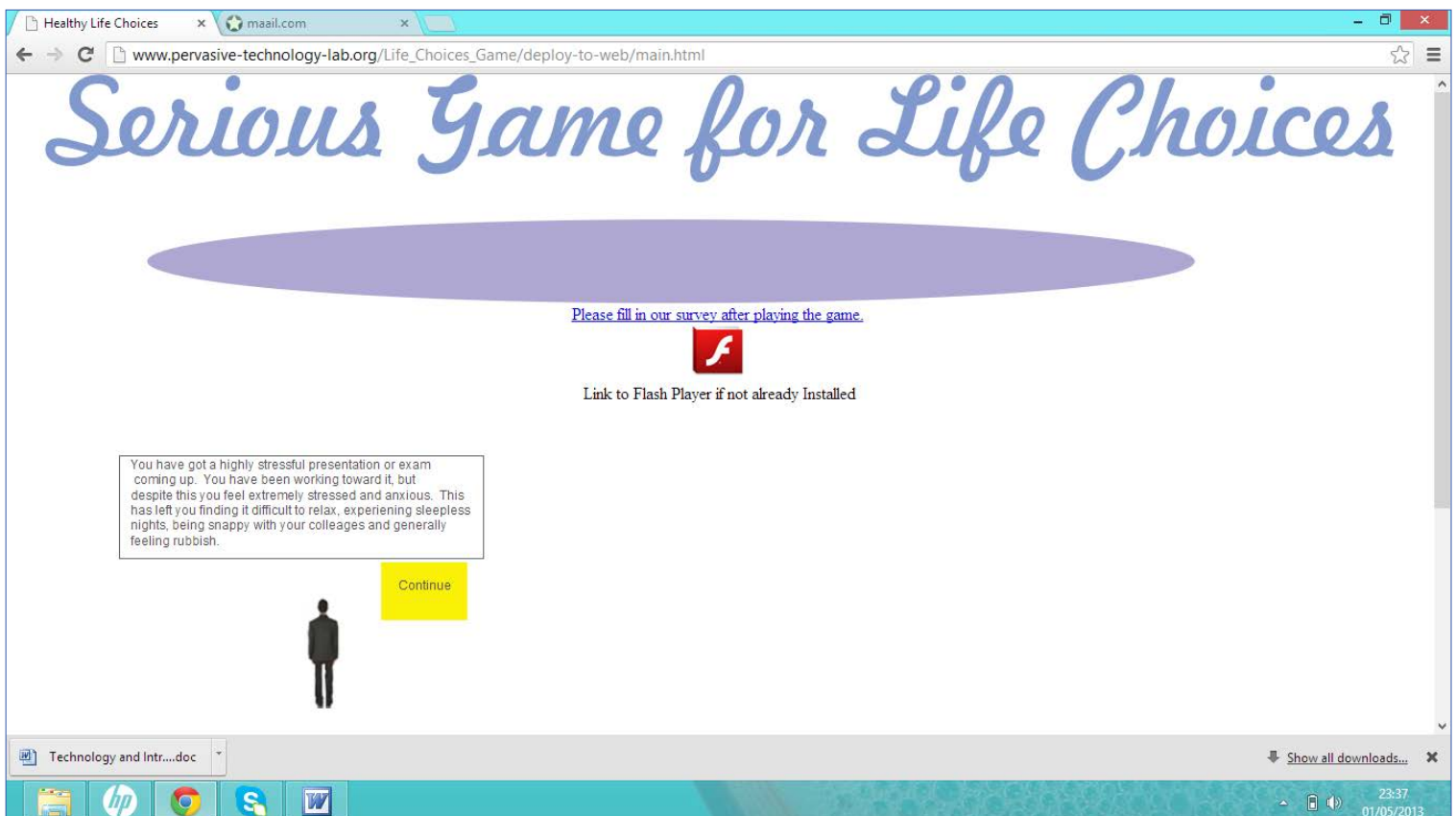
it being used in unnecessary situations such as with PTSD is not good for the brain, physically and mentally.

One way to address intrusive thoughts is to challenge them (Williams & Garland, 2002). A system being developed is the use of speech recognition to verbalise the thought and convey positive affirmations through text to speech. For example, if you have a thought about a friend or relative then text can counteract it and say something positive such as 'they are a good person who helped you through difficult times'. Challenging thoughts is a form of replacement and after some time would become intuitive. In other words, within time the challenges would become automatic.

Computer technology can be used to help people with mental health issues. Cognitive Behavioural Therapy (CBT) has already been used in Internet based applications such as 'Fear Fighter' and 'Beating the Blues'. The Internet has the advantage of being widely available, inexpensive and accessible at any time of day. Technologies such as

mobile phones are becoming pervasive. Devices such as Personal Digital Assistants (PDAs) have been used to present positive information for depression - for example, pictures, voices and videos of loved ones - the idea being to counteract the negative emotions and lift the mood of patients with good memories to help them get themselves out of depression. A Serious Game (game with a serious purpose) has been created to help treat depression, developed in Flash Catalyst and presenting advice for triggers

of depression. The idea behind a Serious Game is to teach a serious subject in a fun way. The use of Flash is to enable an Internet based game so it is easily accessible and reaches a large audience and is freely available [here](#). The game was developed using a 'Big Lottery Grant' within the United Kingdom, and in a survey created for the game using 'Survey Monkey', 30 people rated the concept of a game to help treat depression as over 70% as a good idea physically. The utility of a game for mental health therefore seems to be advantageous.



Virtual Reality (VR) has also been used to help treat PTSD and phobias such as arachnophobia, fear of flying and fear of storms. The idea behind using VR is that you can simulate the dangerous situation in a safe way through technology while also providing realism. In some studies the VR has given similar physiological and mental responses to the real event. A study at MIT (Massachusetts Institute of Technology) indicated that with shy males, the males responded physically in the same way with an Avatar as a real attractive woman (Pan

& Slater, 2007). In addition, physically there has been a marked improvement in the United States of America, for instance in sweating and eye pupil dilation as well as increased heart beat. VR has also been used to treat brain injuries, rehabilitating a person to an extent that they can function better in daily life. For instance, if a person has a tumor or an injury caused by combat then VR can be used to help physical motor response. Mental health problems can be tackled through technology in a new and innovative way.

The work in progress addresses the issue of challenging thoughts through speech recognition, which today is becoming more accurate and mobile. The work being conducted at the [Pervasive Technology Lab](http://PervasiveTechnologyLab.org) is developing a speech recogniser that examines what a person verbalises and challenges it. The organisation is a non-profit Community Interest Company (CIC) based in the United Kingdom looking into the use of new technology to help people with mental health problems. The system looks at keywords, for instance,



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'my MUM hates me' and then challenges it though a database and text-to-speech saying 'Your MUM loves you'. Mobile smart phones such as the iPhone have speech recognition capability that is accurate. The notion is that you replace negative thoughts with positive thoughts if these negative thoughts are irrational and unwanted. Technology such as Bluetooth headsets can make the recogniser unobtrusive. The prototype uses Dragon Dictate © which has a speech-to-text and text-to-script capability in addition to the use of VBScript for the software environment. Speech recognition has advanced remarkably over recent years and accuracy is good, and in addition the hardware for noise cancellation has improved to gain further accuracy.

The system produced will be tested using patients from a local mental health charity 'Milton Keynes Mind' based in the United Kingdom. The system will be assessed through interviews where an improvement would be monitored, using SurveyMonkey to collate the data. The

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initial specification used focus groups with counselling and a literature review to ascertain the needs of the patients. A technology review was also conducted to gain information about the kind of hardware that could be used and it was decided that the iPhone would have enough intelligence to handle the processing of data and applications. A technology review was also used for software to give an idea of the capabilities needed to meet the requirements of the applications.

Future work includes the use of a Global Positioning System (GPS) to locate people outdoors with dementia who might wander outside of the home. A GPS can give the longitude and latitude

of the individual and link it to a database of where the longitude and latitude are located within the country. There have been a number of cases where people with dementia have walked outside of the home, slept in the cold and died, so if you have their location then you know exactly where they are. In addition, the organisation is looking at the use of EEG (Electroencephalography - brain waves) to ascertain relation levels and provide feedback as to their level of relaxation. The VR system would use various scenarios to provide exposure therapy, for example, exposing the patient to a dirty house to help them get used to it. Another example of relaxation is the use of subliminal (below

earshot) relaxation music. The individual could put the music on an .mpg player and speakers and subliminally receive relaxation music that would affect their subconscious.

This article has described the use of new technology to help people with mental health problems such as PDAs, VR and Serious Games. It has also described the use of technology for unwanted thoughts that challenge the original notions, by changing negative thoughts and emotions to positive thoughts and emotions through

verbalisation of thoughts using a database linked to keywords that initiate negative to positive affirmations. ■

ABOUT THE AUTHOR

Dr David Haniff has a 1st Class Computer Science degree, MSc in Cognitive Science and Ph.D in Augmented Reality. He has worked as a researcher at the University of Birmingham, Open University and Loughborough University.

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