An investigation of the role of using IS/IT in the delivery of treatments for ADHD in university students


DOI: 10.4018/978-1-4666-9446-0.ch005

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Chapter 5
An Investigation of the Role of Using IS/IT in the Delivery of Treatments for ADHD in University Students

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ABSTRACT

Over the last decade, the popularity of incorporating advances in information systems and information technology (IS/IT) has been steadily growing. IS/IT can improve the delivery for better intervention and treatment with many different mental illnesses; however, there appears to be great potential for IS/IT in the context of young adults with mental disorders such as Attention Deficit Hyperactivity Disorder (ADHD). ADHD affects approximately 11% of the university population; negatively impacting students’ academic performance, study skills, and social life. The study design outlined in this paper suggests a possibility for the role of IS/IT in the delivery of treatments and management of ADHD in university students to be examined with the view to introduce IS/IT into the traditional treatment context. This research involves collecting data from psychologists in the form of semi-structured interviews and a grounded theory methodology using multiple cases is adopted.

INTRODUCTION

In recent years, Australia has become one of the leading countries in providing e-mental health services (Christensen & Petrie, 2013). Technology tools, such as the Internet and mobile devices, have the promise to improve mental health services especially by enabling early intervention and treatment for many people (Christensen, Griffiths, & Evans, 2002), especially young adults with mental disorders such as Attention Deficit Hyperactivity Disorder (ADHD).

DOI: 10.4018/978-1-4666-9446-0.ch005
Approximately 11% of students at university level have symptoms of ADHD (DiPietro, 2010). These symptoms negatively impact academic performance (Heiligenstein, Greta Guenther Msn, Levy, Savino, & Fulwiler, 1999) and usually affect such students in terms of keeping up with their academic load and various aspects of social life (Barkley1998; Quinn, 2001). Typically, individuals with ADHD are deficient in executive functions, such as Working Memory (WM) and planning (Barkley, 1997b) which is related to academic performance (Groppey & Tannock, 2009). ADHD often co-occurs with learning disabilities (LD) such as difficulty in organizing time, poor reading, writing or spelling skills, or completing tasks abilities (Mayes, Calhoun, & Crowell, 2000). Today, one of the most effective approaches to treat ADHD is the multimodal framework which includes: medication, education, therapy and coaching (Canadian Attention Deficit Hyperactivity Disorder Resource Alliance (CADDRA), 2011; Department of Human Services Victoria, n.d.).

The emphasis of this research design is on the non-pharmaceutical components of the multimodal framework: coaching, therapy and education. The role of IS/IT in each of these components is examined with the view to introduce IS/IT into the traditional treatment context. In addition, four cases are therefore chosen to represent the key treatment components; namely, case1:- coaching and Education (Swartz, Prevatt, & Proctor, 2005); case2:- Working Memory Training (WMT) therapy (Puffenberger, 2011); case3:- Cognitive Behavioural Therapy (CBT) (Ramsay, 2012); and case4:- Neurofeedback Therapy (De-identified patient data). Furthermore, the role of IS/IT in each of these cases will be examined. This research design does not involve gathering information from patients; it involves collecting data from psychologists in the form of semi-structured interviews and a grounded theory methodology using multiple cases is adopted. The main research question guiding this study is: How can an IT solution be designed to enable mental health providers to facilitate the delivery of treatments of ADHD?

RELATED LITERATURE

In this section, a brief background of the general use of IS/IT in healthcare is provided, followed by a definition of e-health and the general use of technology in mental health services and ADHD in particular. The last part of this section will point out the relevance of ADHD in university students and what current non-pharmaceutical treatments are used to treat and manage ADHD.

Background

The use of IS/IT in healthcare has the potential to assist developed and developing countries to solve many issues they are facing (Wickramasinghe, Geisler, & Schaffer, 2005), such as easy access to information and services, coping with changes in population health patterns and satisfaction and safety of stakeholders. Healthcare is becoming technology-driven (Mountzoglou, 2011) with the possibility of successful adoption of e-business in the form of e-health(Wickramasinghe, Geisler, et al., 2005). There is a wide range of e-health services (Eysenbach, 2001; Wickramasinghe, Fadlalla, Geisler, & Schaffer, 2005) and E-mental health is one such service.

Although the use of technologies in mental healthcare is relatively new, there are positive feelings in using technologies among different age groups for different mental illness preventions, treatments and management (Whittaker et al., 2012). Technology has the potential to improve efficiency, accessibility and the opportunities for early intervention and treatment of young adults (Anthony, Nagel, &
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Goss, 2010; Christensen et al., 2002); especially in treating young adults with ADHD (Beck, Hanson, Puffenberger, Benninger, & Benninger, 2010).

Technological tools and methods, such as Internet-based interventions and mobile-based applications or Short Message Services (SMS) therapy are used for the treatment of people with mental illness like depression and anxiety (Whittaker et al., 2012). They also can target young adults seeking mental health attention (Christensen et al., 2002). The use of these types of technologies allowed Australia to be advanced in e-mental health services (Christensen & Petrie, 2013).

Australian E-Mental Health Development

The Australian government is investing heavily in e-mental health services because technology can assist in overcoming issues that are preventing young people from seeking mental health services and providers which create barriers to treatment. Problems include: lack of access to mental health services due to location, time or perhaps financial matters (Booth et al., 2004); stigma incurred by seeing a therapist (Burns, Davenport, Durkin, Luscombe, & Hickie, 2010; Christensen & Hickie, 2010); and therapist time and efficacy (Jorm, Wright, & Morgan, 2007). Reynolds, Griffiths, and Christensen (2011) argue that there are two types of e-mental health programs in Australia:

1. Information, support and assessment web sites including: informative website, diagnostics tools and screening methods;
2. Symptom prevention and management programs which are designed to treat or manage specific mental illness such as depression and anxiety.

The Australian Government has invested $70.4 million to date into developing and funding e-mental health services and telephone crisis assistance; also, the Australian Government will invest a further $110.4 million in the next four years targeting young adults (Australian Government, 2012). In addition, an estimate conducted between 2012 - 2013 showed that 96.5% of 15- to 24-year olds use the Internet in Australia (Australian Bureau of Statistics, 2014). By reviewing the list of the online or telephone services that were provided in the E-Mental Health Strategy for Australia documents (Australian Government, 2012), the majority of e-mental health programs are targeting illnesses related to depression, anxiety and suicidal thoughts. Although approximately only one in ten young Australians suffer from ADHD (The Royal Australian College of Physicians, 2009), this commitment to the adoption of technology in Australia makes the country a potentially rich site in which to consider possibilities.

ADHD

ADHD is one of the most common childhood behavioral disorders and can continue through adolescence and adulthood (Fischer, Barkley, Edelbrock, & Smallish, 1990), with between 5% and 10% of the childhood population having ADHD (The Royal Australian College of Physicians, 2009). Barkley (1998) argues that the symptoms of children with ADHD are usually hyperactivity, inattentiveness, daydreaming, and impulsiveness. Some of these symptoms will vary from one child to another (Barkley 1998).

ADHD in young adults causes attention difficulties and emotional instability which affects their life outcomes and results in underachievement (Wallace, Winsler, & NeSmith, 1999). They are at greater risk of developing anxiety, depression (Heiligenstein & Keeling, 1995), learning disabilities (Wender,
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Wolf, & Wasserstein, 2001) and deficits in executive functions, such as WM and planning (Barkley, 1997a). ADHD is estimated to affect approximately 11% of university populations and the majority of these students will face academic difficulties and perhaps will not complete their degree (Dipoleo, 2010; Grenwald-Mayes, 2001). Gropper and Tannock (2009) argue that there is a relationship between WM and academic performance in university students with ADHD also.

Studies have indicated that there is a relationship between ADHD symptoms and university students’ academic underperformance (Heiligenstein et al., 1999). Fewer ADHD students complete their degree than non-ADHD students (Barkley, 2006; Barkley, Murphy, & Fischer, 2008). There are issues that university students with ADHD face during their studies (Quinn et al., 2003) such as finding university academic style and social life overwhelming and hard to adjust to which may result in dropping out (Barkley 1998).

Often university students with ADHD are lower in function on a number of academic variables compared to their peers (Heiligenstein et al., 1999). These include: study skills, note taking, summarizing, and organizing (Mannuzza, Klein, Bessler, Malloy, & Lapadula, 1998). These academic variables craft common academic behavioural aspects; namely, higher rates of subject failure (Grenwald-Mayes, 2001), Lower Grade Point Averages (Murphy, Barkley, & Bush, 2002), and/or low class attendance (Wolf, 2001). Furthermore, anxiety, depression and low motivation are commonly found in university students with ADHD (Meaux, Green, & Broussard, 2009).

ADHD Treatment and Management

Department of Human Services Victoria (n.d.) and the Canadian Attention Deficit Hyperactivity Disorder Resource Alliance (CADDRA) (2011) state one of the most effective approaches to treat ADHD is the multimodal framework Figure 1. This framework contains multiple components that best work together to support each other. This includes: medication, education, therapy, and coaching. The Therapy methods include: CBT (Safren et al., 2005), Neurofeedback therapy (Lansbergen, van Dongen-Boomsma, Buitelaar, & Slaats-Willemse, 2011) and WMT (Westerberg et al., 2007). Coaching is effective for adults with ADHD (Tuckman, 2009).

Therapies that have been found useful for treating ADHD in adults include CBT (Ramsay, 2012), Neurofeedback Therapy (Gevensleben et al., 2009) and WMT (Klingberg et al., 2005).

- CBT “refers to the pragmatic combination of concepts and techniques from cognitive and behavioural therapies common in clinical practice.” (Kaltenhater et al., 2006, p. vii);
- Neurofeedback Therapy appears to be a promising alternative or additional treatment without reported adverse effects (Arns, Gunkelman, Breteler, & Sprook, 2008; Gevensleben et al., 2009). Neurofeedback training involves the self-regulation of ongoing neuronal oscillations which are recorded by Electroencephalography (EEG), in one or more frequency bands by visual or auditory feedback, aimed at normalizing and/or self-regulating brain activity (Lansbergen et al., 2011).
- WMT aims to improve an individual’s working memory. This includes algorithm, non-algorithm or both computerized programs that automatically adjust the training difficulties based on the individual’s answers (Klingberg et al., 2005).
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Figure 1. The Multimodal framework
(Canadian Attention Deficit Hyperactivity Disorder Resource Alliance (CADDRA), 2011; Department of Human Services Victoria, n.d.)

Education includes information on intervention related to educational accommodations, support, and school management (Wilens et al., 2008).

Coaching which includes improving time management, studies, and social skills at university (Swart et al., 2005).

Technology Tools in the Multimodal Framework

This research will look at each one of the treatment options: therapy, education, and coaching. The study is designed to explore and to investigate the use of technology in the delivery of the treatment of ADHD in university students. The Multimodal framework is adapted to see where IS/IT is used or where it can be introduced. In addition, some of the technology tools that have been found in the literature are: previous studies are listed in Table 1.

Table 1. Tools used in the multimodal framework

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Tool</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Therapy</td>
<td>Neurofeedback Therapy</td>
<td>(Arns, de Ridder, Strehl, Breteler, &amp; Coenen, 2009)</td>
</tr>
<tr>
<td></td>
<td>CBT</td>
<td>(Wilens et al., 1999)</td>
</tr>
<tr>
<td></td>
<td>WMT</td>
<td>(Klingberg et al., 2005)</td>
</tr>
<tr>
<td>Education</td>
<td>Informative Website and Social media</td>
<td>(Canadian Attention Deficit Hyperactivity Disorder Resource Alliance (CADDRA), 2011)</td>
</tr>
<tr>
<td>Coaching</td>
<td>Smartphone / SMS reminder</td>
<td>(Prevatt, Lampropoulos, Bowles, &amp; Garrett, 2011)</td>
</tr>
<tr>
<td></td>
<td>Alarm/computerized reminders</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Email coaching/Time management</td>
<td></td>
</tr>
</tbody>
</table>
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RESEARCH DESIGN FRAMEWORK

The research design framework (Figure 2) is to guide the investigation in using the technology in treating and managing ADHD symptoms, and investigating whether these technologies have a positive impact on the academic performance of university students with ADHD.

METHODOLOGY

Choosing the suitable research method can sometimes be a challenge for academic researchers (Yin, 2002). Because this area of study has not been explored previously and the research questions do not have defined characteristics, a qualitative research method is the most suitable method and case studies and grounded theory are used as the framework for data collection and analysis. Therefore, this research design will use multiple case studies and grounded theory methodologies.

Case Study

Case studies are a tool of investigation found in numerous fields, especially evaluation, in which the researcher develops an in-depth analysis of a case (Creswell, 2013). According to Stake (1995), there are three types of case study research: intrinsic, instrumental, and collective case studies. To gain more insight and knowledge into this research topic, collective case studies have been chosen.

They are also called multiple-case design (Yin, 2009). Collective studies study in depth more than one case in one overall research study and are usually designed for the purpose of comparison (Yin, 2009). Soy (1997) mentions that when multiple cases are adopted in the research; each case should be treated as a single case and then each case’s conclusions could be used as a data contribution to the whole study. Lapan, Quartaroli, and Riemer (2011) argue that all the case studies conducted in the research should share the common characteristics. Case studies typically combine data collection methods such as interviews and focus groups (Eisenhardt, 1989).

There are advantages to using collective case studies as comparative type of studies can be conducted in which a number of cases are compared for similarities and differences. However, the depth of the analysis will have to be sacrificed due to the breadth of analysis (Johnson & Christensen, 2008).

This research design uses the 8 steps recommended by Eisenhardt (1989) as follows:

- Getting Started
- Selecting Cases
- Crafting Instruments and Protocols
- Entering the Field
- Analyzing Data
- Shaping Hypotheses
- Enfolding Literature
- Reaching Closure/recommendations.
Grounded Theory Methodology

Grounded theory has been used in health informatics since its inception, and grounded theory has been found effective in pointing out and describing the impact of Health information systems and their associated devices where an area has not been studied or is not easily described by quantitative approaches (Cummings & Borycki, 2011). In addition, Cummings and Borycki (2011) cite that grounded theorist has been viewed as a powerful tool when it comes to a development of health informatics' framework and/or applications.

Grounded theory, like other forms of qualitative research methods, has key concepts which differentiate this methodology from others.
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The research will follow the systematic design in grounded theory focusing on the use of the data analysis steps of open, axial and selective coding,

- **Open Coding**: Also known as initial coding, is the first step of data analysis which is identifying important words or groups of words in the data collected and then labelling them accordingly. Open coding is a process of reducing the data to a small set of themes that appear to describe the phenomenon under investigation (Glaser & Strauss, 1967);
- **Axial Coding**: This process facilitates building connections within categories;
- **Selective Coding**: The process of selecting and identifying the core category and systematically relating it to other categories.
- **Memos**

**RESEARCH DESIGN**

There are steps and processes that have been developed using a combination of those two methodologies to illustrate the research design (Figure 3). In this research design, two case study steps such as getting started and selecting case studies will be combined into one process. The research question is created to guide this paper, and avoid any unwanted data. Based on the research question, priori constructs were explored to assist in further measurement.

Four case studies will be selected with each representing an element of the multimodal frame or more. Case studies will be reviewed and notes and comments will be stored in the memos process.

Four case studies are chosen to represent key components of the multimodal framework. These case studies are shown in Table 2.

**Writing Memos**

Memos are written records of thoughts and ideas during the process of undertaking the grounded theory studies; they differ in intensity, coherence, subject, theoretical content and usefulness to the finished product. It is highly recommended that the memo be kept until the end of the research and never thrown away. In this research, writing a memo is an important process that overlaps and affects every single step and element of this research. It will start from developing the research questions to enclosing the literature review.

**Data Collection**

Both case studies and grounded theory share the same concept of data collection and analysis overlap and research can go back and forth until the main theory emerges.

**Crafting Instruments and Protocols**

For this research, between 8 and 12 registered psychologists will be recruited to participate. The targeted participants will be divided in four groups equally. Each group will be allocated to a case study. The
Figure 3. Process of Building the Research

Table 2. 4 Selected case studies

<table>
<thead>
<tr>
<th>Case Study</th>
<th>Treatment</th>
<th>Tool</th>
<th>Brief</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coaching</td>
<td>Coaching Education</td>
<td>Swartz et al. (2005) applied face-to-face coaching and education techniques to manage a university student’s ADHD symptoms in the UK.</td>
</tr>
<tr>
<td>2</td>
<td>Therapy</td>
<td>WMT</td>
<td>Puffenberger (2011) explored WMT training in individuals with Attention-Deficit/Hyperactivity Disorder to how effective this treatment is.</td>
</tr>
<tr>
<td>3</td>
<td>Therapy</td>
<td>CBT</td>
<td>Ramsay (2012) used traditional CBT on one of the his patients to help him reduce his ADHD symptoms.</td>
</tr>
<tr>
<td>4</td>
<td>Therapy</td>
<td>Neurofeedback Therapy</td>
<td>Neurofeedback Therapy is a recognized tool to treat ADHD (Wang &amp; Hsieh, 2013). This case study will be based on an unpublished case from a clinic in Melbourne, Australia, where Neurofeedback therapy was used in the treatment of ADHD in a university student.</td>
</tr>
</tbody>
</table>
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participants, registered psychologists, will be selected based on four dimensions: educational level, years of experience, specialization in ADHD and offering Internet technology as a treatment tool.

Thus, psychologists will be chosen who are:

- Specialized in treating/preventing adults with ADHD;
- Have a minimum of 10 years of experience;
- Offer at least one of Internet technologies to deliver his/her services. i.e. Skype, Email, SMS;
- Have used at least one of the following tools which will identify which case they will fall into:
  - Coaching/Education;
  - WMT;
  - CBT (CBT);
  - Neurofeedback Therapy.

The participants will be reached via email or mail requesting participation in the research. In addition, a brief introduction of the purpose of the research as well as its scope and objectives will be enclosed. With regard to Individual Semi-structured interviews, the participants will be requested to take part in the study only after they provide their consent. This can be delivered to the researcher in two ways: e-mailing back a signed form or replying via e-mail to an invitation to participate by stating in the message that “The consent form was read and agreed to” (Meho, 2006).

The participants will be interviewed individually on a face to face basis as a primary tool of data collection; the secondary tool will be using an online video conference; Skype, for example, if the location of the participant is outside Melbourne. Other data collection option tools will be considered such as e-mail or phone interviews or a video conference (Skype).

The individual semi-structured interview’s protocol will be developed, which will mainly be focused on their perspective of the non-medication therapy that was introduced in the case studies and IS/IT involvement in the Multimodal Figure 2. The interview will also include the participants’ professions, years of experiences, number of patients with ADHD, and educational level.

Coding and Analysis of Data

Coding is the process of naming or labeling data, categories, and properties (Cummings & Boryckii, 2011). In coding analysis, the researcher moves back and forth from data collection and coding and analysis; this process will continue until a main theory starts to take shape. The data is analysed by within-case analysis and later cross-case analysis.

- **Open Coding**: The data collected will be divided into segments and then examined for common aspects that reflect categories or themes. After categorizing the data, extra examination of properties that will develop subcategories and based on common character has to be conducted.

For instance, the important words or group of words data collected will be divided into categories; later, with more depth analysis, these will create sub categories accordingly. From these categories and their subs, the Axial coding will be initiated.
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- **Axial Coding**: Identifying and improving relationships between the open coding’s categories and sub-categories. A core category will start to develop or take shape.

- **Selective Coding**: Selecting and identifying the core category and systematically relating it to other categories will occur in this level. The relationship will be validated and the categories will be refined. Most likely all the findings which will help in shaping the theory will occur in this stage.

**Shaping Hypotheses**

In this level the hypotheses will be compared to the four cases, which will improve the quality of the outcomes of this research.

**Enfolding Literature**

In this level, the findings will be compared with similar and conflicting literatures.

**Recommendation**

Based on the outcomes of the data analysis and findings and the literature, a recommendation will be created.

**LIMITATIONS AND RISKS**

This research will be limited to Australia and the participants will be asked only about the use of technology in treating ADHD in university students.

Participants’ location will be considered as risks which might affect the data collection if the participant lives or works outside Melbourne and is not able to use video conference tools.

**Discussion**

This research aims to explore how psychologists think of the use of technology in the delivery of treatment and management of ADHD in university students. It will discover how these professionals use such IS/IT in their routine treatment or management. The outcomes will contribute to Australia’s e-mental health strategy and programs.

On a micro level, this research will be seen in three different areas. These include: human resource mental healthcare cost for the Australian economy, general mental health and wellbeing for university students with ADHD, and Australia’s e-mental health program.

As mentioned earlier, university students are unlikely to complete their degree compared to their peers dropping out or failing to complete a university degree is a waste of resources. “In this respect, a key area of economic and social policy should be to ensure all young people have the capacity to contribute to the economy in the future.” (Lahey, 2003, p. 4). There are a number of challenges Australia is goi
to face in the next ten years. Firstly, to support the strong and growing economy is to have an adequate number of human resources to participate in the workforce (Lahey, 2003). These individuals have to be skilled and have the capability to be efficient and effective to their society. By increasing the access to and improving the delivery of mental health services that will assist university students with ADHD, e-mental health services will reduce the risk of these economic challenges that Australia might face.

Much of Australian universities’ direct revenue comes from international students. These students comprise approximately 24% of the total university student population (Khawaja & Dempsey, 2008) and they generated revenue of $3.892 billion in 2011 as reported by 37 Australian Universities (O’Brien, 2011). Therefore, international students with ADHD who will drop out or fail to complete their degree, will be considered an instant loss of revenue.

By improving the accessibility, it will reduce the demand on clinics by allowing individuals with mild to moderate mental health issues to seek assessment online. This will increase the opportunity and the availability of traditional face to face assessment for people who have complex mental health issues. Christensen et al. (2009) argued that e-mental health services will provide first contact with mental health providers without the need to contact the general practitioners (GP), or as they were called ‘gatekeeper’. In fact, it will reduce the overall cost and workload on clinics (Christensen & Hickie, 2010).

With all the benefits that e-mental health services provide, there is the possibility to improve the Medicare-related psychological services. In Australia, for any individual with assessed mental disorder to receive help under Medicare, she/he must be referred by a GP (Australian Psychological Society, nd). E-mental health service can improve the delivery of this process by providing online forms or email. It does not have to be to every single case but can be organized for people who are known to the GP or have a long history of mental disorder. This will also reduce the cost of visiting a GP.

IS/IT will not only allow the mental health services to be accessible for people in rural areas in Australia (Wickramasinghe & Misra, 2004), IS/IT will also minimize the financial barriers that prevent individuals accessing mental health services (Christensen & Hickie, 2010). To date, most of the E-mental health programs in Australia are provided free of charge to allow young adults to use most of the mental health services.

The outcome of this research will not only help such students to successfully complete their degree, but it will also assist them with their general happiness, mental health and wellbeing and sense of achievement. Students with ADHD might ultimately feel improved self-worth when they see technology helps them to improve their study skills and their ADHD symptoms. This research outcome will also provide solutions and recommendations to increase the delivery and improve accessibility of treatment and management for ADHD in university students.

This research will contribute to the development of an Australian e-mental health program, which will help to cover a broad area in mental health disorders and services and provide high quality outcomes that will assist both university students with ADHD and mental health providers.

CONCLUSION

This research in progress has served to investigate the possibilities for incorporating IS/IT into the treatment and management of ADHD in university students and assist such students in their studies. In particular, it suggests that such technology solutions can enable ADHD students to enjoy better outcomes at university and also better manage their ADHD.
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Given the increasing costs of healthcare and tertiary education, solutions that aim to support successful outcomes at universities as well as better healthcare outcomes are prudent and should be further investigated. Australia has become one of the leading countries in providing e-mental health services (Christensen & Petrie, 2013). This study serves to leverage this and specifically investigate the potential for e-mental health in the context of ADHD. Currently, the Australian government aims to develop a mature e-mental healthcare program by 2016; therefore, this research serves to significantly contribute to this development. Moreover, it provides high quality outcomes that will facilitate the use of IS/IT in the treatment of ADHD in university students and will assist these students to succeed in their studies. This research contributes to both practices; i.e., e-mental health practice in Australia as well as serving to extend theories regarding e-health and e-mental health.

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**KEY TERMS AND DEFINITIONS**

**Complementary and Alternative Medicine (CAM):** CAM refers to a broad set of healthcare practices that are not part of a country’s dominant healthcare system. They are used interchangeably with the main healthcare system medicine in some country. For example, acupuncture is used to help easing side effects of cancer treatment.

**Cupping:** Cupping therapy dates back to ancient Egyptian, Chinese, and Middle Eastern cultures. This treatment creates a local suction on the skin. Practitioners believe this mobilizes blood flow in order to promote healing. Suction is created using heat (fire) or mechanical devices (hand or electrical pumps).

**Electronic Medical Record (EMR):** An EMR is a digital version of a paper chart that contains all of a patient’s medical history from one practice. An EMR is mostly used by providers for diagnosis and treatment.

**Inquiring Systems:** Charles West Churchman defines inquiry as an activity that produces knowledge. He examines the epistemologies of five schools of philosophy from the perspective of general systems theory, asking the question as to whether each is suitable as the basis for the design of computer-based “inquiring systems.” He describes five inquiring systems which later helped form the basis for the design of knowledge management systems and Information System.

**Moxibustion:** A Chinese medicine therapy using moxa made from dried mugwort (Artemisia argyi - an herbaceous perennial plant with a creeping rhizome). Suppliers usually age the mugwort and grind it up to a fluff. Practitioners burn the fluff or process it further into a cigar-shaped stick. They can use it indirectly, with acupuncture needles, or burn it on the patient’s skin.

**Qigong:** An ancient Chinese health care system that integrates physical postures, breathing techniques and focused intention. Qigong practice typically involves moving meditation, coordinating slow flowing movement, deep rhythmic breathing, and calm meditative state of mind.

**Tuina (Chinese Remedial Massage):** Tui Na uses rhythmic compression along energy channels of the body, as well as a variety of techniques that manipulate and lubricate the joints. The practitioner may brush, knead, roll/press and rub the areas of the joints.