Psychosocial Impact of Smart-technology Use in Acute Rehabilitation

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Declaration

I hereby certify that the material which I now submit for assessment on the programs of study leading to the award of Master of Science by Research Degree, is entirely my own work and has not been taken from the work of others, except to the extent that such work has been cited and acknowledged within the text of my own work. No portion of the work contained in this thesis has been submitted in support of an application for another degree or qualification to this or any other institution.

Kevin Cleary — 4/1/16

Signature of Candidate — Date

I hereby certify that all the unreferenced work described in this thesis and submitted for the award of Master of Science by Research Degree, is entirely the work of _____. No portion of the work contained in this thesis has been submitted in support of an application for another degree or qualification to this or any other institution.

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Abstract

Assistive Technology may play a critical role in the rehabilitation of persons with acquired spinal cord injury. Smart-technologies, i.e. Internet enabled mobile technologies, are contemporary forms of assistive technology, and are valued tools in clinical rehabilitation therapies and in the community. While the utilization of smart-technology can be advantageous to measures of occupational performance and functional independence, limited research exists examining the psychosocial impact of smart-technology use on subjective well-being and quality of life. Using a constructivist grounded theory approach, the present research employed an exploratory, mixed-methods, multiple case study design to examine the psychosocial impact of smart-technology use in acute rehabilitation. A sample of eight males with spinal cord injury, attending acute rehabilitation was recruited over a four month period. Analyses of the mixed-methods data yielded rich findings regarding the impacting role of smart-technologies for the men involved in this study. Access to social supports, entertainment media, and information searching were established as the most meaningful functions afforded by the technologies, and an overarching theme of 'self-driven rehabilitation' emerged as a key moderator of psychosocial impact. Implications for future research and practical applications of the findings are offered.

1. Introduction

As a result of developments in medical science and practice, the ultimate goal of rehabilitation for those with spinal cord injury (SCI) has shifted from extending life expectancy to enhancement of independence and quality of life (QOL) (Hicks et al., 2003; Hammell, 2007). Referral to clinical rehabilitation following traumatic injury can be a challenging time for individuals and their loved ones. In many cases, individuals who have experienced traumatic injuries are faced with newly acquired disablements which can present significant barriers in terms of learning to adapt to drastically new ways of living. Clinical therapy programs such as those implemented by psychologists, occupational therapists and physiotherapists, share similar goals in working with patients to increase participation in life and promote optimal achievement of daily activities.

Assistive technology (AT) plays a key role in the rehabilitation process, by enabling individuals with functional limitations to achieve important occupations that may otherwise be unsafe, difficult, or impossible to perform (Cowan & Turner-Smith, 1999). Central to many clinical rehabilitation programs is the client's acquisition of knowledge about appropriate ATs that can promote increased autonomy and empowerment in daily life (de Joode, van Boxtel, Verhey & van Heugten, 2012; Renwick, Brown & Nagler, 1996). The advent of Internet-enabled mobile technologies, referred to in this research as *smart-technologies*, have afforded numerous benefits for people with occupational needs (Verdonck, McCormack & Chard, 2011), enabling individuals with physical impairments to engage in activities that diminish the physical barriers often present in community settings (Amichai-Hamburger & Ben-Artzi, 2003; 2000).

Advances in the development and availability of inexpensive mobile applications, or

apps, has led to a surge in the growth of innovation in fields of telehealth/e-health (Doughty, 2007), telemedicine, smart-housing and home-automation (Doughty et al., 2007; Verdonck et al., 2011). Smart-housing systems, for example, are one of many such innovative technologies that enable the control of numerous household utilities including electric gates, doors, radios, televisions, blinds, curtains, heating systems and cooking appliances, via easy-to-use apps that function off most mainstream smart-technology devices. The utilization of such technologies can reduce, and in some cases eliminate/ dependence on human assistance/ aide, therefore promoting increased autonomy. While not all apps that operate on smart-technology devices require an Internet connection upon which to function, those that require connectivity with online networks can be of particular value to those with physical disabilities e.g. online shopping, social media and entertainment websites/ apps. As noted by Anderberg and Jönsson (2005) "Finding a platform where one is unhindered by an uncooperative body, where the body in general is less of an issue, can lead to an increased sense of independence for the individual" (p.721).

In addition to providing access to a plethora of meaningful occupations, the standardization of accessibility features present in mainstream smart-technologies today, qualifies them as electronic assistive technologies (EATs), a sub-category of AT (Folan, Barclay, Cooper & Robinson, 2014; Stern, Jeaco & Millar, 1999; Verdonck et al., 2007). Unsurprisingly, mainstream smart-technologies have established themselves as popular tools in clinical therapies in recent years (Stern, Jeaco & Millar, 1999; Verdonck & Ryan, 2008). While the occupational benefits of modern technologies for those in rehabilitation following traumatic injury may be clearly apparent, little is currently known about the impact of smart- technology use on psychological functioning.

A considerable body of literature has been published within the past decade in the

health and social sciences which documents both the positive and negative effects of Internet use on psychological wellness (Durkee et al., 2012; Huang, 2010; Kormas, Critselis, Janikian, Kafetzis & Tsitsikab, 2011; Kraut et al., 2002; Rosso, Taylor, Tabb, & Michael, 2013). Few studies however have conducted a broad examination of the *nature* of use of smart-technology devices in terms of the occupational affordances they impart to users in day-to-day life. Furthermore, no studies could be sourced that measured nature of use as a primary variable, in addition to obtaining a quantitative measure of impact of use on subjective well-being.

The present research aimed to address this deficit by employing a broader focus than most other research studies in this domain by examining psychosocial impact of device use in terms of both online and offline activities. In order to garner a holistic picture of psychological impact of device use, a mixed-methods approach was employed in the collection and analysis of data. An examination of the nature of preferred activities afforded by smart-devices was conducted in order to gain an insight into the occupational value of the devices for users in this study. Secondly, a quantitative measure of psychological impact was obtained using a validated measure of psychosocial impact of assistive devices. In addition, qualitative interviews were conducted to capture participants' perceptions of impact. The inclusion of both qualitative and quantitative research methods seemed logical given the current dearth of research in the area.

As ownership of Internet technologies continues to rise in Ireland, so too does the rate of Internet use (EHSS, April 2013; EHSS, March 2014). Smart-technology ownership in Ireland spans a diverse user populace, and user profiles are changing year on year (Eircom House Sentiment Survey, April 2013; March 2014). While rich data sets are available which highlight trends in smart-technology ownership and Internet usage across world nations,

empirical evidence pertaining to technology mediated behaviour and impact of such in vulnerable populations is sparse.

Members of spinal cord injured (SCI) populations are particularly vulnerable to negative psychological states and disorder compared to non-disabled populations (Bombardier, 2012; Craig, Tran & Middleton, 2009; Dijkers, 2005; Fabian, 1991; Kraft & Dorstyn, 2015; North, 1999; Roessler, 1990; Sartorius, 1992;Wyndaele & Wyndaele, 2006). In fact, it is estimated that approximately 40% of the SCI community are at risk of acquiring a depressive disorder during the first 6 to 8 months following injury whilst in the rehabilitative phase (Craig et al., 2009). Given that the overarching goal of rehabilitation is to promote optimum functioning and participation in life, consideration of the contribution of patient behaviours, including technology based behaviour, may provide valuable insights for clinicalpsychologists as to potential mediators of patient well-being and quality of life whilst in clinical settings. While the ubiquitous nature of smart-technologies in society today may afford users predominantly positive benefits it is important, nonetheless, that researchers examine 'both sides of the coin' in terms of the psychological impact of technology use in order to identify any associated risks, going forward.

The collective study of 'smart-technology use' and 'psychosocial well-being' is a vast and complex research terrain. The study of psychological well-being in itself can be a challenging endeavor (Dijkers, 2003; Duggan & Dijkers, 2001), thus the study of psychosocial impact of technology use is no easy feat. The primary intention of this research is to address the need for advanced research regarding the psychological impact of smart-technology use on well-being and quality of life. The choice to explore this phenomena with individuals with acquired SCI arose from (a) an acknowledgment of the psychological

vulnerability of individuals with SCI in acute rehabilitative phases (Bombardier, 2012; Craig et al., 2009; Kraft & Dorstyn, 2015) and (b) the uniqueness of the population in terms of their current context of use of technology in a clinical setting. In line with the upsurge in Internet use and smart-technology ownership in Ireland over the past five years (EHSS, March 2014), a considerable amount of research has been published, in the Occupational Therapy literature highlighting the assistive benefits of smart-technologies for people in clinical rehabilitation (Bowker & Tuffin, 2002). Conversely, a dearth of research also exists underlining the risks of Internet use to psychological well-being (Amichai-Hamburger & Barak, 2009; Barak & King, 2000; Becker, 2011; Campbell, 2005; Cho & Cheon 2005). In an age where technology is becoming more ubiquitous year on year (EHSS, March 2014), it is imperative that researchers prioritise the examination of psychological impact of mobile/smart-technology use, in a bid to inform both policy makers and laypeople alike of the risks and indeed affordances of technology use for both vulnerable and non-vulnerable groups in society today.

The thesis at hand employs the same definition of SCI as that of the World Health Organisation (WHO) and The International Society of Spinal Cord Injury (ISCOS) (Biering-Sørensen, Bickenbach, El Masry, Officer & Von Groote, 2011), which classifies SCI as injury, (traumatic or non-traumatic), to any lesions of the spinal cord. The participants in this study were recruited from the National Rehabilitation Hospital in Dublin, Ireland, based on the criterion that they had any form of SCI. Unfortunately, information regarding the extent/classification of each participants' injury was not recorded as a measurement variable because permission to access information contained in medical records was denied on ethical grounds.

In choosing an appropriate model of disability and SCI upon which to scaffold this research, particular attention was devoted to the employment of models that share similar (if not identical) perspectives as those that underpin the study's measures. As this research is concerned with the measurement of psychosocial impact of assistive devices it utilized a validated psychosocial measurement scale as its primary quantitative measure (Psychosocial Impact of Assistive Device Scale/ PIADS (Day & Jutai, 1996)). The PIADS was formulated based on the assumption that impact of device use stems from factors within the person and their environment (Day & Jutai, 1996). In this research, a biopsychosocial model was thus selected as a 'best fit' conceptual model as it acknowledges the role of biological processes as a basis for human function, and views psychosocial factors as fundamental mediators of subjective impact as a result. To insure construct validity, it was important that the conceptual models chosen aligned with the perspectives held by our instruments. The biopsychosocial approach to disability was thus chosen as our foundational approach and is the same approach employed by the International Journal of Psychology and the World Health Organization. Furthermore, the WHO's International Classification of Functioning, Disability and Health (ICF) is also based on the same holistic approach, and represents a hybrid of medical and social models of human functioning. The biopsychosocial model thus provides a rounded, inclusive approach to the study of psychological and social phenomena due to the conceptualization that mental process and behavior 'originate, develop and function due to close interaction of biological and psychological factors with social environments' with respect to necessary integration of other sciences (Da Silva & Solli, 2012).

In an effort to draw together each of the relevant, albeit distinct fields of knowledge pertaining to the phenomena under study, the remainder of this chapter is organised into a number of sub-sections. Given the applied nature of this research, a review of the extant

research derived from the Assistive Technology, Occupational Therapy, Quality of Life and Cyberpsychology literature is provided. Chapter 2 of the transcript presents a comprehensive description and justification of the research design, methodology and analysis techniques employed in the study. Chapter 3 outlines the results of research in text and table format. Chapter 4 then provides a narrative presentation and discussion of each of the eight case studies that comprised this multiple-case study, concluding with a cross-case analysis of the findings. In addition to the key finding, a number of theoretical and practical inferences are also drawn and directions for future research in the area are also provided.

1.1. Smart-technology as Assistive Technology

With usage and ownership of smart-technologies said to be at 98% among Irish households with children, and 76% in those with no children, Ireland's desire to be constantly connected is clearly apparent (EHSS, April 2013; EHSS, March 2014). Recent statistics published in March 2014 by Eircom's House Sentiment Survey report that 86% of adults living in Ireland own at least one smart-technology (defined in the report as 'a potential online device that can be used on the go); this figure represents an increase of 6% since February 2013. The report also states that any one person living in the average Irish home has access to 4 smart-technologies, with homes of 16 – 24 year olds said to possess an average of 6 devices. Smartphone ownership alone has risen from 53% in 2013 to 61% in 2014. A considerable increase in tablet ownership has also been observed; whereby 25% of adults were said to own a smartphone in 2013, this figure has increased to 40% in 2014.

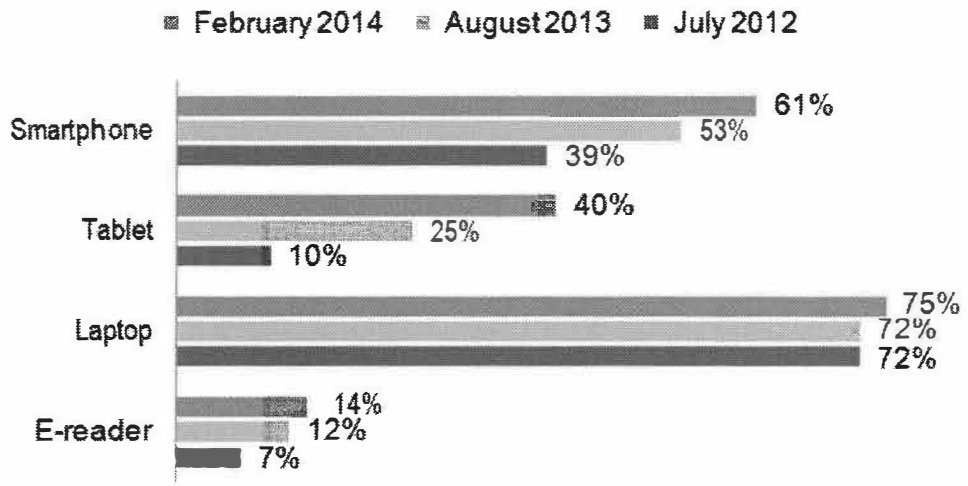

Figure 1: *Smart-technology Ownership in Irish Households* (EHSS, March 2015)

The upward trend in use and ownership of smart-technologies in Ireland has seen devices such as smartphones, tablet computers and games consoles take centerfield in contemporary occupational therapy programs (Verdonk & Ryan, 2008). Aside from promoting occupational engagement with activities of daily living (e.g. online shopping, online socialization and entertainment) (Verdonk et al., 2008), many smart-technologies in production today contain in-built assistive/ accessibility features, facilitating a broader population of users than ever before. Attractive aesthetic attributes of smart devices qualify them as inconspicuous, stigma free assistive technologies, which can in turn, reduce stigma-related anxiety in social environments (Lahm & Sizemore, 2002). While desktop computers and games consoles continue to hold their value and place in therapeutic programs, the recent peak in smart-technology ownership (EHSS, March 2014) has contributed greatly towards the prevalence of use of the devices in occupational therapy programs today.

1.2. Assistive Technology & Quality of Life

AT plays a critical role in the rehabilitation process and represents a key component of most rehabilitation programs (Bend, Van Der Pijl & De Witte, 2009). By definition, ATrefers to 'any item, piece of equipment or product system, whether acquired commercially off the shelf, modified or customised, that is used to increase or improve functional capabilities of individuals with disabilities' (Cook & Hussey, 1995, p.5). Alternatively, Cowan and Turner-Smith (1999) define AT as 'any device or system that allows an individual to perform a task they would otherwise be unable to do, or increase the ease and safety with which the task can be performed' (Cowan & Turner-Smith, 1999). ATs can vary widely in their sophistication; they can include low tech items such as slant boards and pencil grips, as well as high tech items such as voice recognition software and Electronic Aids for Daily Living (EADLs). Regardless of their intricacy, ATs can facilitate a plethora of functional benefits for those who use them. Mainstream smart-technologies, while they may not be purpose built as AT, can be classified as a subcategory of AT known as EAT (electronic assistive technology) (Verdonk et al., 2011).

While AT has existed since the beginning of recorded history – perhaps beginning with the discovery of the wheel (Renwick, Brown & Nagler, 1996), the computer revolution has contributed immeasurably to the field resulting in a rapid reform to which rehabilitation has yielded great benefits. Traditional models of rehabilitation characterised by the interfacing of professionals and clients leading to the complex evaluation and fabrication of an appropriate plan of action, held well into the late nineties (Renwick and Friefeld, 1996). Decisions regarding the suitability and purchasing of AT in recent times however, is often managed by the client themselves (Lahm & Sizemore, 2002).

A considerable portion of the AT literature focuses upon the highly complex and

Individualised process by which an individual can be matched with an assistive device (Scherer & Glueckauf, 2005). Findings from outcomes assessment research has confirmed that key to the optimal matching of person to technology is an early assessment of the consumer's needs for AT (Fuhrer, Jutai, Scherer & DeRuyter, 2003; Lenker & Paquet, 2004; Scherer, Coombs & Marbitz, 2004; Scherer, Sax, Vanbiervliet, Cushman & Scherer, 2005). In an article by Scherer and colleagues (2005) on the subject, the authors report that the increase in features and options of AT in recent times has led to their use being more widely considered as appropriate to accommodate for differences among users (Cook & Hussey, 2002). The authors stress however that 'the process of matching person and technology remains complex because people's expectations of and reactions to technology can be complex' (p.1321). People's reactions to AT can vary greatly depending on the ways in which a particular AT affects their physical and sensory capabilities (Scherer et al., 2005). In their review of the literature, Scherer and colleagues refer to a range of factors that are understood to impact one's reaction to AT e.g. personality and personal attitudes; background and experiences; lifestyle preferences; established interpersonal networks and communication needs; judgement and outlook regarding their perceived capabilities and functioning in a variety of situations; subjective quality of life/well-being; as well as patterns of adjustment that have been established to cope with loss and change. Another study by Lahm & Sizemore (2002) which focused its investigation on the process by which one chooses to utilise and purchase AT found that factors including familial expectations, financial constraints, equipment reliability and social image to be important mediators of AT selection and use. In addition, much research attention has been devoted to the investigation of factors that are thought to underlie AT use and abandonment, with many researchers attempting to uncover the dynamic processes by which individuals select, use and abandon

assistive devices. As a result, numerous assessment instruments have been developed as tools for correctly matching individuals to appropriate AT. Research has also found that the auspicious provision of AT, i.e. "the optimal timing of exposure to a device" (p.326) has been noted as a factor that is capable of enhancing the QOL of AT users and their carers (Cowan & Turner-Smith, 1999). Less attention, however, has been devoted to the examination of impact of AT use on measures of psychological functioning such as well-being and QOL.

The study and measurement of QOL as a research area has received considerable attention by researchers and healthcare practitioners across the health and social sciences over the past six decades and the concept continues to hold its place as a primary measure of well-being across many disciplines within the medical and social fields (Liddle & McKenna, 2000). Despite its prevalent utilization as an outcome measure of well-being in clinical care (Dijkers, 2005), fewer investigations have explored the psychological contribution of AT for those who use them in their everyday life. Research has confirmed that the use of smart-technologies as AT can be advantageous to measures of occupational performance and independence (Verdonk et al., 2008), yet, little is known about the psychological effects of smart-technology usage for those that use them for assistive purposes. Indeed, it is thought that measurement of psychosocial impact of an assistive technology can serve as a significant determinant of how users perceive the benefit of AT to their QOL (Jutai, Rigby, Ryan & Stickel, 2000).

Following a review of the literature surrounding QOL in spinal cord injured populations, concerning statistics pointed towards a strong need for further research into the impact of patient behaviours as a potential mediator of QOL. In a systematic review by Craig et al. (2009), it was reported that individuals with SCI are at a considerably higher risk of experiencing elevated levels of anxiety which often lead to anxiety disorders as well as

feelings of helplessness and poor QOL. In many cases individuals with SCI report significantly lower levels of well-being compared with non-disabled populations, scoring lower on physical, mental and social health as well as in other domains that are considered important to the quality of one's life (Dijkers, 2005).

Central to the rehabilitation of individuals attending acute rehabilitative care is an objective focus on enhancement of QOL (Fabian, 1991; Roessler, 1990; Sartorius, 1992). It is thus fundamental that QOL be treated as a principal component of research, theory and practice in rehabilitation (Renwick & Friefeld, 1996). Interestingly, despite the importance and value of QOL as a rich and indicative measure of well-being, in acute rehabilitation it is often not assessed directly (Renwick et al., 1996). This is due to the assumption that if elevations are observed in other key areas e.g. functional performance, strengths, limitations, independence or adjustment, QOL is likely to increase also (Renwick & Friefeld, 1996). When assessed clinically, or within the rehabilitation research, QOL was traditionally measured in terms of functional status or health status (Bergner, 1989). In their chapter, 'Quality of Life and Rehabilitation', in *Quality of Life in Health Promotion and Rehabilitation*, Renwick and Friefeld (1996) report on the longstanding debate surrounding the multiple QOL conceptualisations and measurement scales in the literature. In a more recent review, Dijkers (2005) in his paper 'QOL of Individuals with Spinal Cord Injury', writes on the same issue, and describes the tendency for researchers to use various definitions and measures of QOL interchangeably, adding more chaos to the 'psychometric tower of babel' (Mor & Guadagnoli,1988, p.1055). Although a number of attempts have been made to bring order to the area, no proposals have yet been accepted in the rehabilitation field (Dijkers, 2005; Lemieux, Goodwin, Bordeleau, Lauzier & Théberge, 2011; Haase & Braden, 2012; Birren, Lubben, Rowe & Deutchman, 2014). Not even a

basic classification of definitions has been agreed upon (Dijkers, 2005). Central to this issue is a tendency for QOL researchers to overlook the importance of clear explication of the operational definition of the QOL being employed in a study, contributing more ambiguity and confusion to an on-going problem.

In light of these issues, Dijkers (2005) emphasises the need for researchers to offer clarity and explicit justification for the use of measurement instruments, along with information about the theoretical framework on which the materials were developed. In the current research the Psychosocial Impact of Assistive Devices Scale, developed by Canadian clinical psychologists Jutai and Day (2002), was employed as the primary quantitative measure of impact of smart-technology usage on QOL. The scale was developed using stringent validation methods and has been validated for use with persons with SCI. It has been found to adequately reflect indices of quality of life and well-being in relation to AT use and was thus selected as the most appropriate instrument for the investigation (Day & Jutai, 1996).

1.3. Quality of Life and Spinal Cord Injury

Research findings surrounding psychological morbidity in SCI populations suggest that approximately 30% of individuals with SCI attending rehabilitation are at risk of acquiring a depressive disorder, with 27% at a risk of experiencing elevated depressive symptoms when living in community settings (Craig, et al., 2009). Morbidity rates are said to be abnormally higher in SCI populations (North, 1999), and suicide rates are reported to be five times higher in SCI populations than in the population at large (Dijkers, 2005). Given that between 223 to 755 persons per million are estimated to have SCI globally (Wyndaele et al., 2006), together with the risks and prevalence of negative psychological states associated with SCI, further investigation into the psycho-social impact of patient

behaviours such as the use of smart-technology, is merited. As Dijkers (2005) quite relevantly states, "As long as the QOL of individuals with SCI is on average below, or well below, that of their nondisabled peers, there is room for improvement through the development and use of improved technology, better rehabilitative methods, medical and psychological care, and other measures" (n.d). Extending this notion, Dijkers (2005) stresses that research aimed at evaluating technology, techniques and services would benefit from utilization of QOL measures in order to assess any changes that may result regarding the aspects of most concern to the individuals under study.

In accordance with fundamental ethical principals in psychology, disabled populations are considered to be psychologically 'at risk' or vulnerable in comparison to non-disabled populations. Although not an uncontentious assertion, in accordance with contemporary practice guidelines in the field of Psychology, the notion that all individuals with disabilities are more vulnerable or at risk than those without disabilities, is not unitary. This perspective may have been shaped by the definition of disability held by the WHO's (2012) medical model, which defines disability in a somewhat 'tragic' light (Swain & French, 2010), as "a problem of the person, directly caused by disease, trauma or other health condition, which requires medical care provided in the form of medical treatment by professionals" (p.20). This definition is perhaps reasonable due to the nature of medicine as a field that works in response to biological deficit, dysfunction or disorder. In psychology, those classified as having a disability are thus seen to more complex needs in terms of 'health' or 'wellness' compared to those without disabilities, and are perhaps seen as more vulnerable to risk in this regard. Recent research by Chadwick, Wesson and Fullwood (2013) supports the notion of inequality for people with disabilities by highlighting the social inequalities faced by people intellectual disabilities (IDs). In their systematic review of the literature pertaining to Internet

access by individuals with IDs, the authors discuss the societal inequalities faced by the population and highlight a number of barriers thought to mediate access and use of the Internet by the population. The authors categorize their findings using the following groupings; functional and economic barriers; societal attitudes and exclusion; policy and governmental support; support, education and training barriers; and individual impairment associated challenges. These findings further emphasize that individuals with disabilities, for better or worse, are faced with a different (and in some cases, more complex) challenges in life than those without disabilities.

Given the prevalence of smart-technology use in clinical practice and in community settings, it is important that researchers investigate the psychological impact of smart-devices and other ATs in an effort to inform users and professionals about their potential effects.

1.4. The Internet: a Double-Edged Sword

Recent statistics published by Internet World Stats (June, 2014), indicate that approximately 70.5% of the estimated 825 million people living in Europe currently use the Internet, with almost a third (approximately 251 million) of those said to be using the *Facebook* social networking website. In Ireland, an estimated 79% of the country's 4,832,765 residents are reported to be using the Internet, with over two fifths said to be using *Facebook*.

The recent increase in literary attention surrounding the examination of technology-based behaviours has seen a growing body of literature pertaining to the impact of Internet use on psychological health. While a considerable body of research exists pertaining to both the positive and negative effects of Internet use in non-disabled populations (Pujazon-Zazik & Park, 2010), few studies have focused their attention on the impact of Internet use within disabled populations (Cheatham, 2011). In a recent review of the experimental research

surrounding the effects of Internet use among adults with physical disabilities, Cheatham (2011) reports on the limited body of research in the area. A search of three well-established electronic databases was conducted (PubMed, PsycINFO, Web of Science), using basic search criteria, yielding only six studies for review. While three of the studies reviewed detected positive associations between Internet use and measures of well-being, three of the studies yielded no statistical significance. This same pattern has been reported in the literature concerning older adults' use of the Internet and well-being impact (White et al., 2002). The author emphasizes that conclusions regarding both significant and non-significant relationships within the studies reviewed are 'unfounded and premature' (p. 1) due to a lack of methodological rigor in each of studies evaluated. Cheatham also remarks on the current lack of evidence available upon which to evaluate the findings.

A study conducted by White and colleagues (2002) into the psychosocial impact of Internet training and Internet usage among older adults reported similar issues of non-significance which they attribute to a small sample size (N=38). Positive trends towards less loneliness, less depression, more positive attitudes towards computers and increased levels of confidence were observed in the intervention groups (N=19), suggesting positive psychosocial impact of Internet training and use; no statistically significant changes were observed from baseline scores in either control or intervention conditions however.

Conversely, a comparative study published in 2002 by Chen and Pearson examined age related impact of Internet use on the well-being in young and older adults by comparing group differences between older Internet users and non-users on psychological well-being and personal characteristics. In addition to differences observed between older and younger adults on measures of psychological well-being, the researchers reported that "older Internet

users were more positive than non-users concerning psychological well-being and personal characteristics" (p. 731). Findings regarding attitudinal differences across the age groups documented in this study may be attributed to age related cognitive or physiological differences, world views, and communication patterns across the life span. Further research is needed on this topic in order to draw strong conclusions.

Despite the current research deficit, the scientific study of Internet use and its relationship with psychological functioning is a growing research area, with certain topics taking precedence over others. The study of behavioural patterns in online environments, such as social networking websites is one such research area that has received significant attention by Cyberpsychology researchers in recent years. The trend in research pertaining to the use of social networking sites such as Facebook is logical given the number of people engaging with the website globally. In this regard, Facebook has served as an excellent environment in which to observe social behaviour in a virtual context. The tendency in psychological research to focus on human deficit has resulted in much of the Facebook research concentrating on adverse behaviours associated with its use, with perhaps less discussion of the positive opportunities afforded by such websites (Campbell, 2005; Lumber, 2012; Vandebosch, 2008; Pujazon-Zazik & Park, 2010).

The study of psychological impact of social networking websites is a growing research area within the computer-mediated behavioural fields. Issues raising most concern, which have also received significant attention in the media, relate to the effects of online socialization via Internet social applications e.g. instant messaging, social networking sites (SNS), status updating sites, chatrooms, blogging sites, online dating sites, and email (Pujazon-Zazik & Park, 2010). A recent investigation by Pujazon-Zazik & Park (2010) into

gender differences related to positive and negative health outcomes regarding adolescents' use of social applications, reported cyberbullying, (Campbell, 2005; Lumber, 2012; Vandebosch, 2008; Pujazon-Zazik & Park, 2010), online risk-taking behaviour, unwanted attention from sexual predators, and exposure to pornography to be major sources of potentially negative psychological impact among adolescents. Notably, these health outcomes are discussed in relation to adolescents' use of Internet based communication only, and exclude the measurement of *access* to the Internet and usage of different type of Internet devices. The findings reported here further illuminates the importance for researchers to examine smart-technology use in disabled populations; particularly given that adolescents and individuals with disabilities are both considered 'at risk populations'.

In addition to the adverse effects reported above, feelings of envy (Krasnova & Wenninger, Widjaja & Buxmann, 2013), depression (Moreno et al., 2011) and negative collective self-esteem (Barker, 2009) associated with use of social media engagement have also been reported in the literature as negative psychological impacts of Internet use. In addition to these findings, there is a tendency for women more so than men, to suffer from computer-related anxiety (Shottenbauer, Rodriguez, Glass & Arnkoff, 2004). These findings illustrate the extent to which engagement with online social environments can serve as threats to psychological health, and point towards the need for further research and intervention in the area.

Early research regarding Internet use and well-being by Kraut et al. (1998) regarded the Internet as a dubious environment that promoted depression, anxiety, loss of social involvement and lowered psychological well-being. A later study published in 2002 by Kraut and colleagues however, refuted these findings, declaring a lack of directional

causation as a central limitation to the research. Findings from a 3 year follow-up of the original sample revealed a dissipation of the previously reported negative effects (Kraut et al., 1998) suggesting that the negative effects reported may strongly related to the age of the sample, and the conditions of learning to use the Internet.

Research published around the same time by authors Amichai-Hamburger & Ben-Artzi, (2003; 2000) found a positive association between Internet use, loneliness and personality traits. The authors asserted that exposure to, and impact of, negative incidents online are dependent on the manner in which a website is used by both its users, and content designers; placing the onus of impact on both interacting parties. Arguably, there is a responsibility on website owners and administrators to conduct monitoring of the content that is posted and published on websites by users in order to control and minimise negative social behaviours on some level. Freedom of speech however is often used as a scapegoat to pacify whistle-blowers and victims of bullying in online environments (O'Connell, 2013).

Aside from the plethora of risks associated with Internet use in the media and academic literature, for persons with disabilities the Internet provides a level plane for users to manage disability disclosure, offering them the choice to disclose their identity in terms of impairment or not (Bowker & Tuffin, 2002). Indeed, Internet use can also promote increased levels of well-being in both men and women (White et al., 2002). For men, the Internet can enable them to express inhibited sides of their identity, and allow for the facilitation of therapies that encourage personal expression (Bochein, 2004). For women, engagement with the Internet can promote feelings of joy, equality and independence, due in large part to the egalitarian nature of females, and anonymous capabilities of online websites (Suler, 2004). In an early study by Hamburger and Ben-Artzi (2000), it was found that introverted and neurotic

women tended to engage more with social activities on the Internet than their extroverted counterparts.

McKenna, Green and Gleason (2002) suggest four key factors that distinguish Internet environments from face-to-face interactions, placing the Internet in its psychological context; (1) greater anonymity, (2) diminution of the importance of physical appearance, (3) greater control over the time, place and pace of interactions, and (4) the ease of finding similar others. These factors highlight the value of the online environments in providing an anonymous, controllable space where one has significant choice and control over the content they project to the others online. The Internet enables people to reveal selective aspects of their personality that some researchers term 'the true self'; a genuine side of one's personality that they find difficultly in expressing in non-cyber environments (Amichai-Hamburger & Bara, 2009). Furthermore, the Internet is often used by introverted and socially anxious individuals to authentically express themselves (Amichai-Hamburger & Barak, 2009). This function can be extended to children exploring their identities (Maczewski, 2002), disabled persons behaving more freely (Bowker & Tuffin, 2002), and those with sexual identities that differ from the mainstream (Ross, 2005).

While a number of investigations have noted that the positive (and perhaps understudied) possibilities afforded by the Internet may have identified some of the negative behaviours found online, it should well outnumber the oft reported negative impacts. The use of pseudonyms which facilitate anonymous commenting on some websites can in many ways promote lively discussion (O'Connell, 2013). On the other hand, they can attract 'trolls' i.e. online bullies to take advantage of the opportunity to hide behind avatars as they take verbal fire on other posters/ commenters (O'Connell, 2013). In her article 'Goodbye anonymity;

let's unmask the Internet' written for the Irish Times, O'Connell (2013) discusses the other side of anonymity. The author remarks that although some web-users take advantage of pseudonyms by behaving destructively, in some situations, she states, it is necessary for people to be discrete in their views so as to protect their identity for political or social reasons. This argument, along with many others, is a matter of importance in cases where people are falling victim to cyber-bullies with in-traceable identities or accountability for their actions. That said, the Internet is an excellent information resource for women and men, offering information on a variety of issues that can empower and educate people on a range of topics (Amichai-Hamburger & Barak, 2009).

1.5. Settling the Debate

Regardless of its predominant nature, the Internet should be recognised as a parallel environment that co-exists with the physical environment, drawing diverse populations of users with varying personalities and motives (Amichai-Hamburger & Barak, 2009). For better or worse, the global desire to be constantly connected is ever-present. In their book, *Internet and well-being*, Amichai-Hamburger and Barak (2009) propose an insightful perspective of the Internet, and offer clarity to the ongoing debate surrounding perceptions of the Internet as a dangerous entity. The authors affirm:

> "The Internet is actually a rich, complex environment. Within that environment, a possibly infinite variety of behaviours may be found. These include extremes of behaviour; for example, both acts of extreme aggression and extremely selfless, altruistic behaviours may typically be observed there; this reflects the well-known phenomenon of the two faces of the Internet (Barak & King, 2000, p. 94)"

Regardless of its dominant nature, the Internet should be viewed cautiously as a double-edged sword because, as evidenced previously in this chapter, it can pose potential threats to its users. An extensive body of research exists illuminating the at risk nature of SCI populations, which is evident in the prevalence of and risk of acquiring psychological disorder in the population (Bombardier, 2012; Craig, Tran & Middleton, 2009; Dijkers, 2005; Fabian, 1991; North, 1999; Kraft & Dorstyn, 2015; Roessler, 1990; Sartorius, 1992; Wyndaele & Wyndaele, 2006). Members of the SCI population are thus at a significant risk of experiencing negative psychological states both online and offline. In addition, the according the Code of Professional Ethics outlined by the Psychological Society of Ireland (2011), vulnerable groups such those with disabilities and those attending in-patient medical care are classified as *vulnerable* or *at risk.* A guidance document provided by the Irish Health Service Executive, Risk Management in Mental Health Services, also refers to those in receipt of mental health care as being vulnerable by nature. While the notion that individuals with a diagnosis of psychological disorder are more vulnerable than others may be somewhat contentious and assumptive, but such classifications serves as ethical safeguard to protect the well-being of those in question. It is thus argued that there is need to address the current research gap pertaining to the impact of smart-technology use in in-patient SCI populations.

1.6. Current Study

Rehabilitation is an ever-evolving field and as with any research field, it is subject to change in response to social change (Renwick & Freifeld, 1996). As with any empirical field of study, it must evolve in sync with advances in knowledge and social change. Over the past three decades, rehabilitation has undergone a number of shifts in focus. While traditional models of rehabilitation employed compensatory programs (Frey, 1984), more recent models

of rehabilitation have placed themes of adjustment and community integration at their core (Renwick et al., 1996). Since the early nineties, rehabilitation has placed subjective participation in community and health promotion high on its objective agenda. The fundamental aim of the current research is to contribute to the extant research concerning psychological well-being in spinal cord injured populations attending clinical rehabilitation.

Smart-technology ownership and use is on the rise in Ireland, spanning a wider demographic than ever before. Given the prevalence of smart-technologies use in therapy (Verdonck & Ryan, 2008; Verdonck, McCormack & Chard, 2011), and in everyday life Eircom, 2013; 2014) there is a need for research aimed at exploring the psychological effect of smart-technology use in vulnerable populations.

The three fundamental aims guiding this investigation were as follows. First, the study sought to conduct preliminary case study research into the nature and extent of smart-technology use, by a sample of individuals with SCI attending acute rehabilitation. Second, it sought to explore the subjective psychosocial impact of AT use within the sample, using qualitative interviews and quantitative questionnaires as primary and secondary data collection methods, respectively. Third, the study aimed to explore the mediating processes by which participants interact with their smart-device in their present lives, in hospital.

In contrast to a number of previous studies that focused their investigations exclusively on either positive or negative impacts of Internet use, the present research employed a non-directional, open-ended approach in its inquiry. The employment of a multiple case study design was selected in response to the complex nature of the phenomena under study and the questions being asked; a combination of descriptive and interpretive techniques was used in the analysis of the phenomenon. While the use of multiple cases can enhance the external validity and interpretability of the findings, the results outputted from

research may not be interpreted as generalizable to other populations. "By looking at a range of similar and contrasting cases, we can understand a single case finding, grounding it by specifying how and where, and if possible, why it carries on as it does; [In doing this] we can strengthen the precision, the validity, and the stability of the findings" (Miles & Hubberman, 1994, 29).

1.7. Research Questions

1. Does the use of smart-technology psychosocially impact the lives of patients with SCI attending acute rehabilitation?

2. What is the subjective psychosocial impact of using smart-technology for patients with SCI attending acute rehabilitant, if any?

2. Methodology

2.1. Research Design

The present research utilised an exploratory, fully mixed, concurrent, dominant status multiple case study design in its investigation. As the study was conducted in the contextual field, it is considered a naturalistic inquiry (Robson, 2002). As is the case with all scientific research, the goal of this study was to establish a thorough understanding of the phenomena under study (Cooper, Heron & Heward, 2014). Due to the current lack of extant knowledge in the area, an exploratory investigation was merited to obtain at least some level of 'description' of the phenomena in question. According to Cooper et al. (2014) description is the first of three levels of understanding required when studying any scientific phenomena. As stated by Baxter and Jack, the qualitative case study approach to research

> '[...] facilitates exploration of a phenomenon within its context using a variety of data sources. This ensures that the issue is not explored through one lens, but rather a variety of lenses which allows for multiple facets of the phenomenon to be revealed and understood." (Baxter & Jack, 2008, p. 544).

The qualitative element of this study was guided by the constructivist grounded theory methodology (Charmaz, 2006) throughout the data collection, analysis and evaluation phases of the research. Constructivist grounded theory holds immense value as a research methodology as it facilitates the rendering of trustworthy data that are grounded in the experiences of interviewees (Charmaz, 2006). This methodology was also selected as it emphasises the *constant comparison* method of interview transcripts whilst the researcher is still in the field. As the pioneer of constructivist grounded theory Kathy Charmaz asserts

that while many qualitative approaches to data collection involve the collection of vast quantities of data before beginning analyses, researchers employing the grounded theory methodology,

> "[...] use their emerging theoretical categories to shape the data collection while in the field as well as to structure the analytic processes of coding, memo-making, integrating and writing the developing theory. The 'groundedness' of this approach fundamentally results from the researchers' commitment to analyze what they actually observe in the field or in their data. If they find recurrent themes or issues in the data, then they need to follow up on them, which can, and often does, lead grounded theorists in unanticipated directions." (Charmaz, 1990, p.1171).

A mixed-methods approach was employed based on Greene et al.'s (1989) rationale of complementarity, which is discussed in the next section. Interviews were selected as the primary method of data collection, in combination with two self-report questionnaires, which served as secondary, supplementary methods of inquiry. One of the two questionnaires utilised was the Participant Profile Questionnaire which was created specifically for this study in order to measure behavioural variables related to the frequency, nature and duration of device use. The second questionnaire employed in the study was the Psychosocial Impact of Assistive Devices Scale (PIADS) (Jutai & Day, 2002). The PIADS was selected as an appropriate measurement instrument for use in this inquiry for a number of reasons, which are discussed later in this chapter.

2.1.1. Mixed-Method Designs

Prior to designing the present research, literature regarding the various typologies of mixed methods research (e.g. Leech & Onwuegbuzie, 2009; Creswell & Clark, 2007) was

sourced in an attempt to establish the most appropriate design on which to construct the investigation. Within the field of mixed methods research, a variety of research designs, terms and conceptualisations have been proposed by numerous authors in previous decades, which have contributed a great deal of confusion in the literature. Debate surrounding a widely accepted definition of mixed methods research, and framework of criteria on which to classify the concepts remains ongoing.

While some authors use the term 'mixed methods' to describe a set of techniques or methods by which to collect and analyse data (e.g. Creswell & Clark, 2006; Creswell, Clark, et al., 2003; Greene, Caraceli, & Graham, 1989; Onwuegbuzie & Teddlie, 2003), others view mixed methods as a complex methodology involving a combining of divergent methods (qualitative and quantitative) which each have conflicting theoretical, ontological and philosophical underpinnings. Generally speaking, mixed methods research involves a combination of qualitative and quantitative data collection methods; offering an alternative to traditional research designs which utilise either quantitative or qualitative methods exclusively within a single study (Leech et al., 2009).

Although the field of mixed methods has evolved considerably over the past number of decades it was considered in 2003 to be in its adolescence (Teddlie & Tashakkori, 2003). Since this time however, strides have been made within the field, with a number of key authors in the field having made various attempts to introduce some order to the paradigm by organising mixed methods designs into distinguishable groups (Leech et al., 2009). Choosing the correct type of mixed methods designs can be challenging for any researcher, particularly novice and doctoral researchers (Leech et al., 2009). One of the major issues in the field is the sheer number of mixed methods designs in existence. For example, in their book, leading authors and methodologists Teddlie and Tashakkori (2003) propose 35 variations, but

emphasise that an exhaustive typology upon which to organise mixed methods designs is impossible due to the widespread variations of mixed methods studies (Leech et al., 2009).

Nonetheless, a number of researchers have proposed numerous typologies by which to distinguish the various types (Greene et al., 1989; Patton, 1990; Morse, 1991, 2003; Creswell, 1994, 2002; Greene & Caracelli, 1997; Morgan 1998; Tashakkori & Teddlie 1998, 2003b; McMillan & Schumacher, 2001; Creswell et al., 2003; Maxwell & Loomis, 2003; Onwuegbuzie & Johnson. 2004; Johnson & Onwuegbuzie 2004). Leech and Onwuegbuzie (2009) however, criticise previous typologies for being overly complicated by including a myriad of designs, being overly simplified, lacking in critical criteria required by the research, and for not representing a consistent system. In response to these issues, the authors propose a three-dimensional typology of mixed methods research designs (e.g. Fig 1, p.269) which acknowledges the 'continuum' upon which research can fall, ranging from monomethod designs (where methods are not mixed), to partially-mixed designs, through to fully-mixed designs. The authors assert:

> "This class of mixed research involves using both qualitative and quantitative research within one or more of the following or across the following four components in a single research study: (a) the research objective (e.g. the researcher uses research objectives from both quantitative and qualitative research such as the objective of both exploration and predication); (b) type of data and operations; (c) type of analysis; (d) type of inference." (Leech et al, 2009, p. 267).

In line with Leech et al.'s (2009) typology of mixed methods research, *fully mixed* studies refer to those that mix methods within or across stages of a study, whereas with *partially mixed* studies, '... both the quantitative and qualitative elements are conducted concurrently or sequentially in their entirety before being mixed at the data interpretation [or

analysis] stage' (p. 267)(see Leech et al. (2009) for a review). In the present study, both of the questionnaires were administered and requested to be completed prior to commencement of the recorded interviews. The Participant Profile Questionnaire was then used within the interview that followed as a reference material to promote conversation regarding participants' smart-technology use. Thus, both qualitative and quantitative data-sets were gathered **concurrently** (i.e. within the same stage or phase, as opposed to sequentially (Leech et al., 2009)), and data were mixed within this phase.

Aside from the level of mixing methods, the *ordering* of methods also has implications for the type of research design employed. Depending on whether the qualitative and quantitative phases of the research have equal weighting (i.e. equal status) in answering the research questions, or whether one phase has priority over another (i.e. dominant status), the classification of research designs vary (Leech et al., 2009).

Therefore, the level of mixing data, in combination with the time at which data are collected, and the order and emphasis that is placed on each method has implications for the type of design chosen. This can be represented via a 2X2X2 matrix of mixed methods research designs proposed by Leech et al (2009). Accordingly, the current research employed a fully mixed concurrent dominant status multiple case study design in its investigation.

2.1.2. Philosophical Assumptions

Due to the concurrent collection, analysis and subsequent merging of the two types of data, issues regarding the philosophical assumptions of each type merited consideration. According to perspectives held by Creswell et al (2007) researchers are advised to avoid trying to mix data, and should instead attempt to merge findings in light of a paradigm from which they can work e.g. the pragmatic paradigm. Pragmatism is viewed by many as the

foundational philosophy upon which mixed methods research isconstructed (Tashakkori & Teddlie, 2003; Somekh & Lewin, 2005). This paradigm places the research problem at the core and does not stick exclusively to one philosophical framework. More contemporary paradigms however, differ in terms of their underlying framework and philosophic assumptions. The transformative paradigms for example, provide a framework that addresses the complexities of social research and advocates the mixing of methods at stage within the research. It recognises that realities are shaped by multiple elements (e.g. social, cultural, political, economic and ethnic/racial values. (Mertens, 2007). While traditional paradigms such as the former, contend that both qualitative and quantitative research methods have separate philosophical foundations which diverge in their assumptions and worldviews, "[...] transformative paradigms provide a mechanism for addressing the complexities of research in culturally complex settings that can provide a basis for social change {....} because research does not necessarily serve the needs of those who have traditionally been excluded from positions of power in the research world." (Mertens, 2007, p.7). Transformative paradigms recognize the merit of qualitative methods in capturing subjective perspectives, and maintain equal regard for the significance and objectivity of quantitative methods (Mertens, 2007). In her discussion of the topic, Mertens (2007) explains how a paradigm serves as a tool for researchers to determine their worldviews and related philosophical assumptions of their research and the implications of them for their research methodology.

2.1.3. The Mixed Methods Research Process

According to Collins, Onwuegbuzi and Sutton (2006), mixed methods research can be conceptually organised using 13 steps (see Onwuegbuzi et al. (2006) for a review). The third step in the model underlines 'determining the research/ mixing rationale', which precedes 'formulating the research objective', and 'determining the goal of the study'. In their review

of Alternative models for the use of multiple methods, Mark and Shortland (1987) suggest three defining purposes for multiple-method designs; (a) triangulation, in the pursuit of convergence of findings; (b) bracketing, which aims to obtain a range of estimates on a single correct answer; and (c) complementarity, whereby differing methods are used to study different phenomena (Greene et el., 1989).

The current study was guided the by the Complementarity principle, which Greene et al. (1989) claim enhances the interpretability of assessment of a single phenomenon 'via wider content coverage or alternate levels of analysis' (Greene et al., 1989, p. 257). The purpose of employing mixing methods in the present research was to provide a rigorous set of data upon which to conduct analysis of the complex phenomenon from multiple methodological standpoints. The purpose of Complementarity (Greene, 1987; Greene & McCintock, 1985; Rossman & Wilson, 1985; Mark & Shortland, 1987), involving the use of multiple methods in the assessment of the same phenomena, is in essence to "enhance the interpretability of assessment of a single phenomenon—for example, via broader content coverage or alternate levels of analysis." (Greene et al., 1989, p. 257) affording the researcher the potential to offset and counteract the biases of each method, in turn, strengthening the validity of the study's results (Greene et al., 1989).

In response to the limited number of exploratory studies examining psychosocial impact of smart-technology use in clinical settings, the present study addressed this gap by exploring the phenomena with a sample of 8 male individuals with spinal cord injury in an acute rehabilitation context.

2.1.4. Inclusion Criteria

- Patients who were aged 18 years and older at the time of recruitment

- Patients who have been diagnosed with any form of injury to the spinal cord
- Patients who are currently residing as in-patients at the National Rehabilitation Hospital
- Patients who have an adequate understanding of, and ability to speak the English language
- Patients who own a smart-technology i.e. an Internet enabled mobile device

2.1.5. Exclusion Criteria

Patients who satisfied any of the exclusion criteria were ineligible for participation:

- Patients who are under the age of 18
- Patients with significant brain injury
- Patients who do not have an adequate understanding of, and ability to speak the English language
- Patients who do not own a smart-technology

2.2. Participants

2.2.1. Participant Characteristics

A heterogeneous sample of 8 males (M= 36 years, age range; 25-45 years) with SCI attending acute rehabilitation were recruited from the National Rehabilitation Hospital. No criteria were established regarding the recruitment of a male only sample; the fact that no female patients were recruited was natural occurrence. The number of months since incurring injury across the sample ranged from 4 to 24 months (M = 8.25 months).

Due to ethical factors pertaining to access to patients' medical files, it was not viable

to state the specific diagnosis of each participant. Questions related to marital status were also omitted following advice from the Institute Research Ethics Committee at Dun Laoghaire Institute of Art, Design and Technology.

2.2.2. Sampling Procedures

The sample was recruited via voluntary participation using a non-probability sampling method which was based on satisfaction of the inclusion criteria. No other mechanism of selection was employed.

2.2.3. Sample Size

The data analyzed in this study was derived from a sample of 8 males with spinal injury attending in-patient care at the National Rehabilitation in Dublin, Ireland. As is often the case with multiple case study designs, dominant weighting was given to the qualitative facet of the research.

Indeed, sampling is aimed toward theory construction, not population representation (Charmaz, 2006). The calculation of a predetermined sample size for the qualitative phase of the data collection is therefore neither applicable, nor possible in constructivist grounded theory designs, or indeed case study research designs. Pioneering grounded theorists, Glaser (1992; 1998; 2001) and Stern (2001) assert that criteria on which calculate a satisfactory sample size is not definitive; they prescribe researchers of the grounded theory method to continue sampling until all emergent categories or themes reach saturation – a point which cannot be predicted in advance of collecting data. As discussed by Yin (2009) in his book *Case Study Research; Design and Methods*, the adoption of sampling logic is not applicable in multiple-case study design. Instead, Yin suggests that the calculation of an appropriate number of cases to include in a given multiple-case study report is the choice of the researcher and comes down to the number of case replications needed to garner the desired

level of certainty on the topic. One of the benefits of employing a mixed methods research designs (as opposed to single method designs), is that they enable a broader coverage of more complex research questions, as is the case in this research (n.p.).

Two operational issues including (a) limited number of participants recruited for the study and (b) restricted time within which to recruit and collect participant data, impeded the potential for a large sample size.

2.3. Measures and covariates

As mentioned previously, a combination of qualitative interviews and quantitative questionnaires were used to obtain subjective measure of psychosocial impact of an assistive device (using the PIADS), and behavioural variables such as frequency, duration and nature of device use. A topic guide (appendix F) was used to guide the initial interviews. Based on emergent theoretical categories, the interview topics changed accordingly in order to explore certain themes. The first of the two questionnaires; the Participant Profile Questionnaire (appendix C) comprised of 10 question items and included a mixture of open-ended and closed questions. The second questionnaire; the Psychosocial Impact of Assistive Devices Scale (appendix D) is comprised of 26 Likert-scale items.

2.3.1. Participant Profile Questionnaire

A suitable instrument upon which to measure demographic characteristics of the sample in addition to measures of device use could not be sourced at the time of constructing this research. In response, a 10-item questionnaire was developed by the lead researcher which is aimed at capturing a subjective profile of smart-technology use that is suitable for use with persons with spinal injury attending acute rehabilitation (see Appendix C).

2.3.2. Psychosocial Impact of Assistive Devices Scale (PIADS)

The PIADS is a 26-item questionnaire designed to evaluate the psychological benefits

of assistive technologies. It is capable of measuring factors related to a person and their environment that affect the psychological adjustment of an individual (Day & Jutai, 1996, Jutai & Day, 2002). It is a quantitative standardized instrument used to measure the impact of an assistive device on functional independence, well-being and QOL recognizing that QOL is a highly complex concept (Day & Jutai, 1996).

The PIADS was designed on the assumption that an assistive device promotes good QOL in that the user feels (a) competent, (b) confident, and (c) inclined or motivated to exploit life's possibilities (Jutai, 1999). It has been validated as a measure to detect impact of any assistive device (Jutai, Day, Woolrich & Strong, 2002) and was designed for use with persons with disabilities to measure the psychosocial impact of assistive devices. The PIADS is a standardised and validated measure of QOL impact (Day & Jutai, 1996).

The three subscales comprising the PIADS are Competence, Adaptability and self- esteem. The Competence subscale is said to encompass concepts related to efficacy which Huber et al. (2008) note is sensitive to the perceived impact of a device on performance and productivity. The Adaptability subscale is sensitive to the enabling and liberating aspects of the device, while the self-esteem subscale is said to be an indicator of perceived emotional health and happiness that is sensitive to the perceived impact of a device on self-confidence and well-being (Huber et al., 2009). Results of a factor analysis found each of the subscales to retain good reliability and validity and to have excellent psychometric properties (Day & Jutai, 1996). A number of studies have demonstrated the PIADS to be a valid, reliable and responsive measurement instrument with good clinical utility that is sensitive to impact of a range of assistive devices, across a range of populations including those with spinal injuries (Day & Jutai, 1996). "With respect to internal consistency, Cronbach's a values were 0.95 for the PIADS total score and 0.92,

0.88, and0.87 for the Competence, Adaptability, and self- esteem subscales respectively" (Demers et al., 2002, p.585).

On administering the scale, respondents are requested to read the list of 26 words/ phrases related to how the assistive device in question might affect its user. All items are placed on a seven-point Likert scale ranging from -3 (reflecting maximum negative impact) to +3 (reflecting maximum positive impact), with a score of 0 indicating no impact or perceived change to the person's life as a result of using the device (Demers et al., 2002).

2.3.3. Topic guide

Each of the eight interviews were guided using a topic guide (appendix F) which served as prompt for the researcher while conducting the interviews. Items listed on the topic guide evolved with each subsequent interview in light of themes/ categories and content that the researcher felt was of relevance to the research. The topic guide used in the first interview was comprised of a list of broad topics that the researcher objected to explore; such items included (a) Types of smart-technologies used by the participant at present, (b) experiences using the/a particular device(s)' and 'nature and extent of use of the device(s)' and 'impact of use on achievement of daily activities'. As the data collection progressed, a more static set of questions emerged which were used in each subsequent interview.

2.3.4. Variables

Primary variables under investigation included (a) the type of smart-technology used most by individuals in their daily life, (b) the extent to which participants are able to use their device independently (ranging from 1 to 4), (c) the amount of time spent per day using the device, (d) the type (or category) of application participants engage with most on a typical day, and (e) the application or task they deem most useful or important to their achievement of important daily activities. Also of primary interest were scores on the Psychosocial Impact

of Assistive Devices Scale (Day & Jutia, 2002).

2.4. Procedure

Based on an assessment of patients medical records by Occupational Therapists, those who satisfied the inclusion criteria were deemed eligible to participate. Two Occupational therapists were involved in this screening and recruitment process. A list of patients deemed eligible to participate was then presented to each patient's respective Medical Consultant for informed approval. The approved patients were subsequently informed about the study in verbal and written format by Occupational Therapists, using the Information Letter (appendix A). The patients were assured that their participation in the research would not affect their care at the hospital in any way, and were encouraged to take some time to consider taking part in the research before contacting a member of the Occupational Therapy team with their decision.

In accordance with the Psychological Society of Ireland's (PSI) Guidelines for Best Practice for Psychologists, individuals were informed of their rights as a research participant at numerous intervals throughout the recruitment process. Patients who agreed to partake in the study were invited to meet with the lead researcher on a date and at a time that suited them, that did not coincide with any therapies or self-care programs. Meetings, which lasted approximate 1 hour, were arranged by an occupational therapist who wrote the meeting onto patients' official timetable for their convenience.

All meetings took place in a quiet, semi-communal area within the hospital (the Occupational Therapy Manager's office). Participants were once again reminded about the purpose of the study, the methods involved, and their rights as a research participant. On receipt of informed consent, patients were administered the Participant Profile Questionnaire

and the PIADS and were asked to complete each of them. They were also reminded that if they required any assistance with either of them, to simply ask the researcher.

A key consideration when designing this research concerned the order by which the interview and administration of the questionnaires would take. Following an evaluation of the strengths and limitation of each ordering, it was decided that administration of the quantitative questionnaires would precede the qualitative interview segment as they would provide a point of reference on which to advance the interview. This ordering also facilitated the opportunity to conduct member checking of the self-report data provided on the Participant Profile Questionnaire. According to Creswell and Clark (2007), this particular method of 'mixing the data' is known as 'connecting the data' (p. 7) and involves the building of one dataset upon another. Consideration of the participant functional level was also noted prior to the meeting. All participants were offered the opportunity to have the questionnaires filled out for them if they wished. On completion of the two questionnaires, the qualitative interviews commenced. The participant was reminded that the interviews would be recorded and were reminded of their rights once again.

Using a topic guide (see appendix F), the researcher began the interview by reviewing the Participant Profile Questionnaire. Questions were raised regarding the type of smart-technology the participant used most daily, the activities they perform using the device, as well as their experience when using different features of the device. Exploration of participants' perceptions of their smart-device as a positive or negative item, were explored also, in a natural, non-intrusive manner. Questions raised towards the middle of the interview were determined by extending exploration of emerging concepts that derived from responses to previous questions in the interview. Questions listed on the topic guide (appendix F)

which the researcher had predetermined as aspects that related to psychosocial impact were used to inform the interview. Given the nature of the Constructivist Grounded Theory method, a method of constant comparison of interview data and revision of interview questions in light of emergent themes and categories, was employed in preparation of each subsequent interview (Charmaz, 2006). This meant that the structure of each interview was informed by the analysis of previous interviewees' responses, in an effort to saturate each category of inquiry.

The primary aim of the interview was to capture participants' feelings around the processes by which their smart-technology impacts their life, in an effort to ground the action and processes elicited when using the device. Interviews were semi-structured and significant emphasis was placed on the utilization of open-ended questions in an effort to minimise response bias and demand characteristics.

Interviews lasted between 25 and 45 minutes. Following completion of the interview, participants were debriefed verbally and administered the Debrief Sheet (named the 'Letter of Thanks', see appendix E) which included a note of thanks for participation in the study and a reminder of the study's purpose. The form also included the contact details of all co-researchers, in the instance that participants had any further queries regarding the study. Also included on the Debrief Form, was information regarding support services available inside and outside of the hospital, including that of a senior clinical psychologist at the hospital.

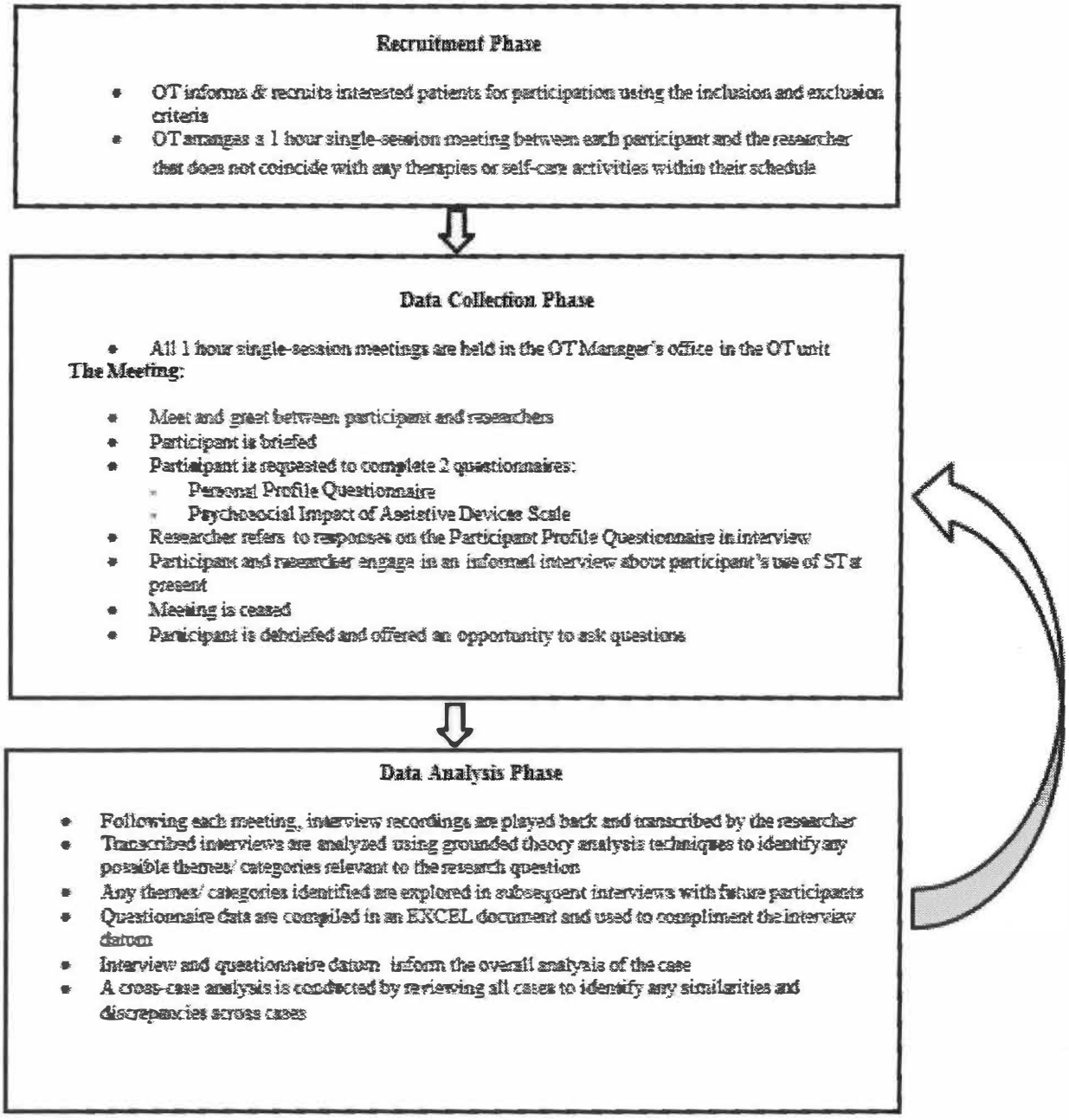

Figure 2. *Summary of Study Procedure*

2.5. Pilot Study

Prior to the recruitment of participants, a pilot study was conducted with four individuals (N=4), enrolled as third year Applied Psychology students attending the Dun Laoghaire Institute of Art, Design & Technology.

2.6. Ethical Considerations

The research at hand was reviewed and granted approval from various Ethical bodies within Dun Laoghaire Institute of Art, Design and Technology (IADT) and the National Rehabilitation Hospital (NRH) prior to its commencement. The project was designed and proposed in spring of 2012 and was submitted for review to the Institute Research Ethics Committee (IREC) at IADT in early autumn of 2012. It was subsequently granted approval in late autumn of the same year. The project was then submitted to the first of three boards of management at the NRH; the Medical Board. Approval was granted from the Medical Board at the NRH and the research was then presented to the hospital's Operational Management Committee. On obtaining approval from the Operational Management Committee, the research was submitted to a third and final Ethics board at the NRH; the NRH Ethics Committee. The data collection phase of the research did not commence until ethical approval was granted from each of the aforementioned bodies.

Due to the sensitive nature of the topics under study in this research, careful consideration of ethical standards was employed throughout each of the study phases. The research adhered strictly to the PSI's Guidelines for Best Practice for Psychologists as well as those outlined by the National Rehabilitation Hospital and Dun Laoghaire Institute of Art, Design and Technology throughout its design and conduct. Information regarding the nature and conditions of the research were provided in verbal and in written format to eligible participants prior to them being contacted about the research and consenting to participate.

All of the patients that were invited to take part in the study were advised to take some time to consider whether they would like to take part in the study before making a final decision. They were also informed of their rights to decline participation and withdraw from the study at any time in which case all respective data would be removed from the study and destroyed. Contact details of the lead researcher, Principal Investigator (a Medical Consultant at the hospital), were provided on both the Information Sheet (appendix A) and the Debrief Sheet/ Letter of Thanks (appendix E) in the case that participants may like to contact either persons for any reason.

Participants were informed of their choice to be contacted about the results of the research following its completion. Anonymity was also a key ethical consideration throughout the research process. Participants were informed at the beginning of the research about their rights around confidentiality and anonymity of data. Pseudonyms were used in place of participants' real names in order to ensure anonymity (Anderberg & Jönsson, 2005). They were informed that the presentation of data sets in the results would be depicted numerically. The measurement of QOL within clinical populations is a sensitive topic of investigation. It was important therefore to maintain a highly compassionate and discretionary approach when discussing any potentially emotive issues.

Each of the eight individual meetings took place in the OT Manager's office within the OT unit of the hospital, and took place between the hours of 9 to 5 to ensure that staffs were on hand to assist participants in any way, should they need it. A risk protocol was established prior to the data collection phase which outlined the line of operations to be followed in the instance that any issues arose in relation to participants' well-being during the meetings, or indeed following them. If the researcher observed any signs of distress or discomfort from a participant, the meeting would be ceased immediately. The researcher

would then remind the participant of their option to take a break and continue the meeting a later stage; to discontinue the meeting if they wish and/or withdraw from their participation. If a participant chose to discontinue and withdraw their participation, they would be administered the Debrief Sheet (i.e. the Letter of Thanks) and thanked for their participation.

The Debrief Form document contained the researchers' details and details of professionals at the hospitals whom they may want to talk to. Information about relevant Support Services was available inside and outside of the hospital to which they may also like to contact. A follow-up meeting with the participant would be organised in any case and the Manager of Occupational Therapy would be informed of the incident immediately.

3. Results

3.1. Quantitative Results

3.1.1. Analysis of Questionnaire Data

Scores obtained from PIADS were analyzed using the official PIADS Excel spreadsheet scoring system, which outputs scores across three subscales. The qualitative and quantitative data sets obtained from the Participant Profile Questionnaire and the PIADS were analyzed individually (case by case), and then comparatively, against the other cases in the study. Due to the exploratory nature of this research, no tentative hypotheses were tested. As this study employed a multiple case study approach in its design, no formal statistical tests were conducted. While various indicative behavioral characteristics were measured, any suggested relationships discussed are simply inferential and do not claim causality or statistical significance. As mentioned previously, the goal of case study research, and indeed exploratory research, is not to yield statistically rigorous findings that can be generalized to wider populations - nor is it the goal of such research to garner representative data. The objective in case study research in fact is to conduct analyses on cases in context within its conditions (Yin, 2009).

3.1.2. Descriptive Statistics

Table 1 illustrates the summary of demographic variables pertaining to each of the eight cases under study. A heterogeneous sample of eight males aged between 25 and 45 years (M = 36 years) comprised this multiple-case study.

Table 1:*Descriptive Statistics: Sample Demographic Variables*

Participant	Age	Time since injury	Smart-device used most daily
Conor	45	7 months	Tablet PC
Thomas	38	8 months	Tablet PC
John	41	4 months	Smartphone
Kevin	31	6 months	Smartphone
Chris	39	7 months	Smartphone
Richard	25	24 months	Smartphone
Joe	44	6 months	Smartphone
George	25	6 months	Smartphone

Table 2 presents key measurement variables pertaining to the subjective use of smart devises by each participant. Six participants reported a smartphone to be the smart-technology they used most daily, and two claimed to use a tablet PC. On typical weekday, participants reported to spending from 20 minutes to 4 hours using their smart-device, and from 20 minutes to 8 hours on weekends. Five participants reported engagement with communication based apps as the app the used most frequently, two participants claimed to use Internet browsing/ search engine apps mostly, and one participant claimed to use a gaming app most daily.

Table 2: *Descriptive Statistics: Key Measurement Variables*

Participant pseudonym	Smart-device used most	Ability to use device independently	Time per weekday spent using device	Time per weekend day spent using device	App used with most daily	App deemed most useful to achievement daily activities
Conor	Tablet PC	3	2 hour	2 hours	Games app	Games app
Thomas	Tablet PC	1	3 hours	8 hours	Google Search Engine (Google/ Internet browser app)	Email app
John	Smartphone	1	1 – 2 hours	1 - 5 hours	Search Engine (Google/ Internet	News website
Kevin	Smartphone	2	20 minutes	20 minutes	Text message app	Search Engine (Google/ Internet browser app)
Chris	Smartphone	1	3.5 hours	5 – 6 hours	Online Message app (Viber)	Online Message app (Viber)
Richard	Smartphone	1	1 hour	2 hours	Social Media app (Facebook)	Social Media app (Facebook)
Joe	Smartphone	2	3 – 4 hours	6 – 8 hours	Calls app	Online banking app
George	Smartphone	1	2 hours	4 – 5 hours	Calls app	Calls app

Table 3 presents a summary of mean overall PIADS scores and subscale scores across the sample. Scores on the PIADS can range from a minimum of -3 to a maximum of +3. Positive scores include any score above 0, which imply positive psychosocial impact of a device; scores that fall below 0 indicate negative psychosocial impact of device use. The scores displayed in table 3 (M=1.05, Median= 1.04), are presented in ranked order, from lowest impact scores to highest impact scores across the sample (N=8). Positive PIADS scores were yielded in seven out of eight cases.

Table 3: *Mean PIADS and Subscale Scores in ranked order, from least to highest psychosocial impact**

Participant Name	Device most used daily	PIADS Subscale 1 (Competence)	PIADS Subscale 2 (Adaptability)	PIADS Subscale 3 (Self-esteem)	Mean PIADS Score
Kevin	Smartphone	-1.42	-0.17	-0.25	-0.54
John	Smartphone	1.08	1.67	0.38	0.38
Richard	Smartphone	1.5	1	0.13	1.04
Thomas	Smartphone	0.58	0.33	0.13	1.08
Conor	Tablet PC	2.17	2.33	2.13	1.57
Chris	Smartphone	1.75	3	0.63	1.69
Joe	Smartphone	2.17	2.5	0.5	1.73
George	Smartphone	2.17	2.5	0.75	1.73

3.2. Qualitative Results

3.2.1. Analysis of Interview Data

The qualitative data derived from the 8 interviews were transcribed and analyzed using the 'constant comparison' method which is the fundamental technique of analysis in constructivist grounded theory methodology (Charmaz, 2006). Following each interview, the researcher transcribed the datum and began to apply codes and memos to any data that emerged as relevant to the psychological impact of device usage. Numerous coding techniques were used in this analysis phase including line by line, incident by incident, initial, and axial coding techniques (Charmaz, 2006). Codes were then grouped into themes/categories and subcategories. Following this stage of analysis, a cross-case analysis was conducted to establish any cross-over/commonality in emergent themes across the sample.

The most popular functions facilitated by the smart-devices were activities that enabled communication, socialization and access to social supports with others. Communication apps such as online and offline call and messaging apps, social media/networking apps and email apps were all noted as apps that participants used frequently. The second most popular category of tasks facilitated by the devices was information search apps. In many cases participants used such apps to search for information and products that enabled them to prepare for the future, adjust to a new way of life and progress in their rehabilitation. In addition the use of information searching apps facilitated learning, motivation and a feeling of self-esteem and autonomy as a result. Accessing various forms of entertainment was also a popular function of the devices which enabled enjoyment, satisfaction and escape from reality and connection with the outside world.

4. Discussion

This multiple case study represents the diverse experiences of eight men, aged 25 to 45, whom at the time of the study were attending acute rehabilitation having recently acquired a traumatic injury to their spinal cord injury. Each of the participants in this study hailed from various urban and rural locations around Ireland, and belong to diverse professional occupational fields. Seven of the men within the sample acquired their injuries within the previous four to seven months prior to participating in the study, while one participant was a returning patient to hospital, who acquired his injury two years ago. The findings presented here therefore, reflect the experiences of seven individuals whom, at the time of participation in this study, were undergoing an acute period of adjustment to a newly acquired disability, bringing with it significant challenges in learning to function in profoundly new ways. The findings derived from this research represent a unique and rare insight into the technology based behaviours and preferences of those involved and will hopefully inform current knowledge surrounding the psychological impact of Internet-enabled mobile technologies.

According to authors Onwuegbuzie and Teddie (2003), the analysis of qualitative and quantitative datasets within mixed methods frameworks are said to pass through at least some of seven stages of analysis. The present study, which was led by a flexible research design, satisfied entry into the final of Onwuegbuzie et al.'s seven stages of analysis, *data integration* (p. 492). *Data integration* is the 'stage whereby both quantitative and qualitative data are integrated into either a coherent whole or two separate steps (i.e., qualitative or quantitative) of a coherent wholes.' (p. 491). The following chapter presents an integration of the data corresponding to each of the eight individual cases that comprised

this multiple case study. Each of the cases presented follow the same presentation format; beginning with (a) a list of the prominent themes/ categories that emerged following thematic analysis of interview data, (b) a narrative presention of those themes in context to the individual and their device use, and (c) concludes with a brief examination of the individual's scores obtained on the PIADS.

Yin (2009) recommends that the discussion and presentation of findings in case study research is best conducted simultaneously so as to place findings in context; this structure Yin (2009) asserts, is useful in the presentation of multiple case studies, and is common in applied, exploratory studies such as this one. In order to avoid over-replication, this chapter begins with a narrative presentation of the findings related to each case, followed by a discussion of the cross-case findings in context to previous QOL in SCI research. The narrative presentation of cases uses a predominantly descriptive method in order to stick closely to the qualitative data as is the objective of constructivist grounded theory analysis (Charmaz, 2006). A discussion of the case findings is presented in the section that follows (the 'Cross-case Comparison: Key Findings from the Cases' section). The chapter concludes with evaluations, and implications for future research.

4.1. Case study 1 – Conor

Prominent Themes:

- Enjoyment and Satisfaction
- Frustration
- Motivation to learn

Narrative Description:

Conor is a 45 year old male who incurred injury to his spine as the result of an accident at home whereby he fell down his stairs. He was admitted to hospital seven months prior to being interviewed for this research. He appears to be in a relaxed, up-beat mood the day of the interview and has a warm, friendly manner. Conor is the recent owner of an Apple iPad tablet computer, which he has owned for 2 weeks. On a scale of 1 to 4 (whereby 1 indicates that he can use his tablet totally independently, without the help of another person, and 4 indicates that he cannot use his device without the help of another person), Conor classifies himself as a category 2; while he can perform some activities on his iPad independently, sometimes he requires the help of another person to operate his smart-device. His knowledge about how to operate activities other than the 'games' application on his iPad is limited at present. He states "[...] I just play games on it... That's basically all I do." As mentioned previously, results from Ripat's (2006) study into the psychosocial impact of assistive devices of new and experienced users found no difference between the groups, suggesting that that ability to use a device is not positively related to higher levels of psychosocial impact. In this regard, while Conor has only one main use for his device, the impact of engagement with such may still render high impact scores. As discussed further on, Conor yielded moderately high impact scores across each of the PIADS subscales scores

despite using his device for mainly one purpose; to play games. This finding echoes that of Ripat's (2006) study in that Conor's ability to use little more than one activity on his device was powerful enough to render a high psychosocial impact score, implying that his ability to use his device did not relate to or result in him yielding a lower impact score.

Enjoyment and Satisfaction

On a typical weekday, Conor might spend 2 to 3 hours playing games on his iPad. On a weekend day, Conor says he might spend up to 4 and 5 hours playing games on his device. He enjoys playing games such as *Candy Crush* and *Crosswords*. Despite his limited ability to operate other applications on his iPad, analysis of his interview and questionnaire data revealed that Conor experiences feelings of enjoyment and satisfaction when he plays and completes games on his smart-device. When asked by the researcher "Would you say you experience any positive feelings when you're engaging with your game?" Conor replied by saying,

> *"Oh yea, I get a great sense of satisfaction when I can work away on a game, like even a crossword. Like finishing a crossword – that's great satisfaction."*

His feelings of satisfaction, he says, arise when he is engaged in a game and when he completes a game. Conor thus experiences some level of positive emotion when engaging with the games app on his device. In addition to his positive experiences, he notes that sometimes he experiences feelings of frustration when he forgets how to do something on his device that he has been taught to him previously. He says:

> *"I feel happy if I can get to where I want to get without having to remember it. See I can't store an awful lot in my head at a time. I'm a very slow learner, always was. Never liked schools. But em, I find it too very frustrating when I'm I get taught something. And you could explain it to me and I would be*

able to remember until I go back up to the ward, what you said to me, and then it's just gone, it just leaves me."

Frustration

Conor's reports of frustration around using his tablet seemed to relate to his ability to retain previously taught information about how to operate his device in his short-term memory. The category 'frustration', presented itself at various points within the interview. Conor referenced how he also feels frustrated if 'something goes wrong' while he is trying to operate the iPad. Conor explain how his physical impairments related to his ability to use his arm, can sometime present challenges for him when he is using a stylus to navigate his iPad:

"[...] there's times that I get very frustrated doing it. When if something goes wrong. See my right arm's very sore, and I can only lift up a certain height. See if I have me stylus in between me fingers and I'm trying to type out things. And I have the shakes so it doesn't know how to do it. [....] To steady myself up. But em, I sometimes get very frustrated, especially when I'm playing the, eh, the word game on it. I have the word ready now so all I have to do is mark it. See sometimes with the shakes I'd go on and keep marking it as far as I could and then next thing wouldn't the blinking thing go off on me and I'd have to do it all again. And that's' what kills me. You know, having to do something a second time. Ah but sure it doesn't' make any difference, I'll get there sometimes. Then there's the days or eves that I could go for about 4 or 5 hours."

A key concept identified across 4 papers in Hammell's (2007) meta-synthesis was that of *good days and bad days*. The author emphasizes that although this concept may not be viewed as a QOL determinant, the recurrence of the theme across various studies and accounts was notable as it related to perceptions of life after SCI as being normal, or similar to what life was like before SCI. For example, Hammell cites a number of similar quotes that arose across different studies such as: 'There is always the good and the bad', 'I had good and bad days when I was walking and I have good and bad days now', 'It's a mixture of

good days and some bad days', 'Like anybody else, I guess, you have good days and bad days'. Perceptions of normal life as composing of a myriad of good and bad days has also been noted in research by Boswell, Dawson and Heininger (1998) which looked at 'Quality of life as defined by adults with spinal cord injury'. The concept of good and bad days being indirectly linked to perception of QOL in the present research may reflect the same findings noted in the work of Hammell (2007) and Boswell et al. (1998), but could also relate to the extent of Conor's physical functioning on a day-to-day basis – which in turn affects his ability to interact with his assistive device.

Conor made numerous references throughout his interview, to the optimal style in which he learns, and provided examples of learning aids that have helped him to operate devices in the past. He expresses a desire to be able 'go in and search' for things on his iPad, but feels that he needs someone to assist and teach him how to do so, perhaps providing a visual prompt in the form of written instructions. For example, he explains,

> *"It's a pity I can't – well I suppose I could be able to, go in and search all these things. If I could get somebody to just write down the basics of getting into it it'd be great. All I gotta' do then is have a look at that, when or if I get stuck, so I would.*
>
> *[Researcher: Yes, so like a guide?]*
>
> *Yea, that's it! That's, would you believe, that's the way I used to have to do it when I had an aul video cassette player. And the program on it was written down, but I couldn't understand it. So what I did was is I asked, the one who done it for me was my uncle. And I asked him would he mind writin' down so I that I could understand how to switch it on and go through all the easy parts so if it does go off on me again, I can just go back to the start of that and read it and put them all back in again."*

The impact of past experiences at school seemed to shape Conor's perception of himself as a 'slow' learner. He makes reference to his time at primary school and expresses

an apparent wish that he should have spent a few years trying to adopt a more focused approach. He continued by saying that he 'never liked primary school' and that he felt that he was 'wastin' the teachers time' which, he explains was probably wrong, but that that is how he felt at the time. There is strong evidence in Conor's interview that his current ability to learn and grasp new ideas has been shaped by his experiences at school. This category presented itself at numerous points throughout the interview transcript and may be of relevance to those working in rehabilitation, occupational therapy and with assistive technology. An assessment (subjective or objective) of a patient's learning style or learning preferences may be a worth of note prior to the prescription, administration or purchasing of certain assistive technologies. This finding may also be applicable to those working in the human computer interaction/cognitive ergonomic fields also as it highlights the role of learning and self- efficacy in the learning process.

In the below quotation, Conor speaks about how good he felt when his brother showed him how to watch a film on the Netflix app on his iPad. Once again, his potential to feel positive emotion seems to be clouded by feelings of frustration related to his negative self-perception and resulting from his schooling.

> *"[Researcher: And how did you feel when your brother showed you that? (Laurel and Hardy', film on Netflix, film app.)]*
>
> *It felt great after it. I felt great so like I can do something now. See the part of my problems too was when I couldn't learn. That was frustration it itself.. If I could have learned in school.. I shouldn't have put my head down and just go for it. The best I could. And if it wasn't – I should have spent actually, I should have spent a year trying to do that, and at the end of the year, if it wasn't for me then it wasn't for me, you know. But sure I sorta knew well before that.. Coz I never, even, eh, primary school. I never liked that either. I felt like I was wastin' the teacher's time, you know. Which was probably wrong, but I felt in me own self that I was wastin' her time."*

Motivation to Learn

Conor expressed a clear motivation to learn how to use more applications, such as the Google search app, the YouTube video hosting app and the RTE television player app, as evidenced in the excerpt below:

> *"[...] I'm trying to get into all the information like, to get into the google and all that and the RTE into them – they're pretty handy alright. But it's trying to get into other things that's a problem. Trying to get into the YouTube and that – it's very hard for me to get into it so it is but eventually I'll get it sometime, with a bit of somebody teach me and my own determination in getting it. Getting em, me trying to learn before somebody teaches me. Mmm. Well that's me going anyway. If it happens, it happens. Ah please God it will."*

This theme appears to tie into Hammell's (2007) key concept, *the importance of occupation; the need to explore new opportunities, to envision future engaged in meaningful activities*. Conor is clearly looking optimistically to the future which is evident in his motivation to learn how to use his device to do more. Despite Conor's desire to do more on his iPad, he seems to experience a lack of confidence in using the tablet in addition to a belief that he requires the assistance of another person to direct his learning on how to use the device.

It is evident from the above report that Conor's knowledge about how to operate his iPad mediates the type of tasks he uses the device to perform. Indeed, Conor's smart-device is a source of positive emotion i.e. happiness and satisfaction, however, it can also induce feelings of frustration related to Conor's physical limitations (connected to his injury), and to his memory. Notably, he uses the iPad significantly more on the weekends comparted with the weekdays.

Conor's PIADS scores

Conor yielded a mean overall PIADS score of 1.57 out of maximum score of 3. He obtained a high PIADS score (all above 2.13) on each of the three subscales; Competence, Adaptability and self-esteem. A score of 2.33 was obtained on the Adaptability subscale, which includes question items such as ability to participate, willingness to take chances, eagerness to try new things and ability to take advantage of opportunities. Conor's high score on this subscale (2.33) was echoed in his statements about his desire to learn how to do more things on his iPad. A score of 2.17 out of a maximum of 3 was yielded on the Competence subscale which includes questions related to feelings of competence, productivity, usefulness, performance and independence related to device usage. This score was reflected in Conor's interview when he spoke about his feelings of satisfaction when he able to navigate his tablet computer and complete a task (a game) on the device, independently. Conor scored 2.13 on the self-esteem subscale. This subscale relates to feelings of happiness and emotional health. According to the scale's authors, Jutai and Day (2002), this subscale is sensitive to the perceived impact of an assistive device on areas such as self- esteem, security, sense of power, self-confidence and control. It is possible that Conor's PIADS scores illustrate the impact that he anticipates the iPad to have in the future - which is a common clinical use of the PIADS (Day & Jutai, 2002).

4.2. Case study 2 – Thomas

Prominent Themes:

- Enjoyment via access to entertainment
- Communication via Facebook and email
- Learning, adjustment, rehabilitation & recording important milestones
- Change in use since entering hospital
- Keeps him sane
- Being a father
- Sharing the benefits

Narrative Description:

Thomas is a 38 year old father of three children, under the age of 11. He works in an occupation that involves prominent use of computers and the Internet, thus, he is an experienced user of technology. Thomas entered hospital 8 months ago. His passions in life l with outdoors sport such running, cycling and swimming in the sea. Thomas is an active person; he and his wife have been on many camping holidays around the world with their children and he describes himself as a 'get up and get out' type of person.

Thomas was given an iPad from his colleagues at work as a gift. He has mixed feelings about the Internet and often affiliates reading or watching news related items with work. 'I've got a funny relationship with the Internet', he says.

> *"I'm a complete technophobe so it's funny that you - I'm doing the study cause' I don't normally use anything [like the iPad]".*

Thomas doesn't have Internet on his phone as he associates it with work. Home-life for Thomas usually means spending time with family and doing outdoor activities. He remarks;

"I'm much more an outside person and to be in the world rather than to be online. It's not something – I'd much prefer previously to have gone out for a run, cycle or swim, than ever to be on the Internet"

Enjoyment via Access to Entertainment

Thomas spends approximately 3 hours on a weekday day (in the evening) using his iPad, and "all day" using it when he is "bed bound" i.e. on bed-rest for medical reasons. He uses his smart- device mainly

"... to watch breaking bad, on Netflix, check Facebook, and use it for emails, and also to check out different things about wheelchairs online.. so that's my main way of, outside of my mobile phone, communicating with the outside world."

He uses his device to to watch series' on Netflix (a media viewing application providing TV shows, documentaries and films); browse Facebook (a social networking website) and search for information using the Google search app. Thomas thus uses his device for entertainment, socialization and information seeking. He spends most of his time on browsing on the Internet using the Google search app as a means to retrieving information. Thomas can use his device totally independently but requires assistance to "move it around". He uses a stand for the iPad which he says is useful for watching media on the iPad beside his bed. Thomas has full functionality in his arms but little no movement in his legs due to his spinal injury.

Thomas' use of the Internet is extremely purposive. While he likes to browse the Facebook website, he considers the act of aimless browsing of the Internet a waste of time. *Preciousness of Time*, in fact, was a category in the transcriptions pertaining to Thomas' interview and surfaced many times throughout the interview. He regards the potential for

getting distracted by, and wasting time on the Internet as a negative aspect, stating:

> *"[...] the only negatives are that you can end up wasting time, looking at absolute nonsense. And I always feel that that's ah, you won't get that time back. So it's not a major negative... but you can just sort of think you can be doing useful things.. So, yea your right, I tend to go in when I'm looking for something, check emails, check Facebook"*

> *"I'm conscious of spending too much time on the Internet... I always feel it's a complete waste of your time... it's not a good... unless I'm looking for something specific, there's a lot of absolute rubbish on the Internet, just nonsense. Em... I think you can get distracted"*

Change in Use since Entering the Hospital

Thomas' use of the Internet (which is entirely facilitated by the iPad) has changed dramatically since entering hospital.

> *"...I used to have to use it for work and I do anything there that I needed to do. But after that, nothing. I don't have it on my phone. I don't want it really around me, I don't need it, but because I'm stuck in bed, it has become an invaluable tool. But, ordinarily, life being, if life gets back to the way it was in some sort of shadow form of it, but eh.. I won't be... there's no way I'll use an iPad as much. [....] previously I wouldn't check Facebook for more than three weeks. Eh... coz I'm here [in hospital] I check it a lot more."*

Communication via Facebook and email

For Thomas, Facebook has facilitated a significant amount of communication with others since he has come into hospital. Thomas explains that while he has received numerous messages of support from others via Facebook, he has replied to few:

> "...as I've been stuck here I've been getting lots of emails through Facebook [....] I've then tentatively sent out about I think three messages which is a world record for me." He informs me, "I've had contact with people in Japan and Australia around... able to tell them about your accident, do you

know what I mean?"

A systematic review of the literature on social support and social skills in people with SCI (Muller, Peter, Cieza & Geyh, 2012) reports that social support is related to better physical (e.g. lower frequency of urinary tract infection or pressure ulcers) and mental health (e.g. lower symptoms of depression and anxiety), lower levels of pain, effective coping and greater adjustment of disability and higher life satisfaction and QOL. In their discussion, the authors reference behavioural psychologist, Lewinston's perspective that good social skills can result in social outcomes, and how people use these internal resources to seek social support (Libet & Lewinsohn, 1973). In this regard, the participants in this study are likely self-managing their needs for social support as a buffer against the adversities that they are currently facing (Muller et al., 2012). The following theme, keeps him sane, is also likely explained the findings referenced in Muller et al.'s review.

Keeps him Sane

"[Researcher: Is there anything else you'd like to add?[about the iPad in general]]

"Well it keeps me sane to a certain degree. It is a good outlet."

Being a Father

The excerpt below illustrates how Thomas was able to research and organize his child's swimming lessons using the iPad.

Recording of his rehabilitative journey

In addition, Thomas informs me that the iPad has enabled the recording of his rehabilitative journey since his accident, which he explains is positive aspect of the device.

This function is an example of an application that does not require access to the Internet, but that has a significant impact on the individual's psychology.

> *"Plus... the other thing I use it for... pictures... you know... I've taken photos along the way... right from the 'Mater [Mater Misericordiae University Hospital, Dublin] Then I was extremely sick... em, up to now. So it's good to have that... you can see where you've come from.. How far you 'vegone... so yea, nah, it's an invaluable tool really.*
>
> *[Researcher: Is that upsetting, or more of a positive thing – to see where you've comefrom?]*
>
> *Ah no, it's a positive thing... it's a positive thing.. You have to ehh... you - you deal with ehh... no, it's not upsetting at all. It's a good thing coz I am where I am now... which is a lot better than where I was, you know."*

Adjustment, rehabilitation and preparing for the future

A major recurring category in Thomas' interview was that of, *Preparing for the future*. Thomas' iPad plays a key role in helping Thomas to prepare for the future e.g. it has enabled him to research information on wheelchairs and adapted cars. This category seemed to mediate a variety of positive emotions, which are evident in the passage below. These positive emotions include feelings of happiness and satisfaction which result from Thomas being able to source information on the Internet. It is clear that the Internet has a direct impact on Thomas' rehabilitation:

> *"[....] it can give you things to work on, you know, we're looking to buy a new car, as I said earlier, so we're able to do all that from my iPad when my wife comes to see me. We're able to look at wheelchairs... you know, you're able to do a lot of stuff on it so you're able to feel like you're making progress towards where you want to go. So it does, it gives you that, that ability to start planning a future – whereas if you were lying there with no iPad and no Internet access, you're... I think things would be a lot tougher."*

Thomas' use of the iPad has also served as key tool in helping him to prepare to return to work:

> *"I'm also using the notes for it... em... I have a wireless keyboard for it and headphones for it – cause' on the notes app you can talk into it and it writes out what you've said – which could be good for me, for my work. So we're testing out all those sort of things."*

> *"Yea, when I find something I'm looking for. Like I found suits that would help me swim in the sea, and I found suits that would heat you, deep sea diver top that would keep you warm in cold water – that was fantastic – really cheered me up [smiles] And there's been a few things that we found but eh yea, it's great portal into the outside world when you're stuck in bed."*

The Internet as a gateway

Thomas' iPad has facilitated a variety of functions for him including accessing entertainment media, socialization, communication, information gathering in preparation for future life i.e. researching information about wheelchairs and adapted cars etc., organisation of kids activities, recording of important life events, and adjusting to his disability and preparing to return to work. The impact of these functions on Thomas' life are immeasurable.

Learning via Information gathering, adjustment and rehabilitation

The use of the Internet as information gathering tool appears to impact Thomas in a positive way by nurturing his adjustment and motivation to get back to normal life.

> *"the Internet is a great way of seeing what's out there and seeing how, if you have a disability like this and it's new to you, there's a whole lot of things you need to find out about how life is going to be when you leave the hospital, and the Internet is probably the best way doing that, outside of talking to doctors. So, it's been a great help to me."*

"At the moment, I'm just trying to concentrate on getting better, so eh the main focus of sort of what I'm looking at is things around wheelchairs and things that might help me when I leave hospital"

"Knowledge is power"

"...one of the things you have to do when you have an accident like this, is educate yourself around how you're going to live and how you're going to cope with the new ways of living, and the Internet is a great empowering tool to do that, coz you can check the things you want to look at. You don't have to wait and ask for someone, you don't have to look it up on a book, it's all right there. Coz if you've thought of it someone else has thought of it – that's the way I view the Internet."

Notably, this category (learning and adjustment) was uncovered in another interview. Thomas' motivation to learn new things may be indicative of concepts of adjustment and coping; important elements of the rehabilitation process.

"... like one of the things I'm determined to do is to try and set up an Apple account and download music - which I've never done before. That's on my list – my to do list – over the next few weeks."

Sharing the benefits

Towards the end of my interview with Thomas, he explained how he likes to lend the iPad out to other patients on his ward on weekends that he is able to go home. He expresses how it makes him feel 'nice' to be able to share the benefits of his tablet with others.

"Oh another thing I've been able to use it for is em... like, it there was a match on, I'd be able to give it one of the other guys who are like... far more paralysed... who can't move... be able to put it up.. Friends bought a stand so you can watch it beside the bed and bring it up to the other patients.. And I leave it when I go home at the weekends, I I've lent it to one of the girls in the other ward so she can watch movies – coz there's nothing to do here at the weekend."

Thomas' PIADS Scores

An overall PIADS score of 1.08 was yielded in Thomas' case. Thomas obtained a PIADS score of .58 on the Competence subscale, .33 on the Adaptability subscale, and .13 on the Self-esteem subscale. Each of these scores indicates a positive psychosocial impact of the device on Thomas' functional independence, well-being and quality of life. The highest psychosocial impact score was obtained on Competence subscale which relates to factors that assist productivity, usefulness, performance and independence. This finding is substantiated in Thomas' interview datum where he speaks about the numerous instances in which his iPad has assisted his organisation and productivity. Competence subscale which includes questions related to feelings of Competence, productivity, usefulness, performance and independence related to device usage.

A score of .33 was obtained on the Adaptability subscale, which relates to the level in which a device promotes participation, willingness to take chances, eagerness to try new things and ability to take advantage of opportunities. Thomas scored .13 on the Self-esteem subscale which relates to factors including feelings of happiness and emotional health that result from using a device. As mentioned previously Jutai and Day (2002) assert that this subscale is sensitive to the perceived impact of an assistive device on areas such as self-esteem, security, sense of power, self-confidence and control.

4.3. Case Study 3 – John

Prominent Themes:

- Communication
- Access to entertainment
- Information searching and Escapism via The Internet
- Change in Use Since Entering Hospital
- Indifferent Feelings about the Internet

Narrative Description:

John is a 41 year old male from the midlands of Ireland. He incurred injury to his spine 4 months ago whilst at work. He informed me of some of the tasks involved with this occupation e.g. loading and unloading the trucks and hooking up the trailers. Incidentally a large heavy bar used to secure the load fell on John while he was unloading a delivery at work. John has the use of all of his limbs but requires a walking frame to assist him to walk.

> *On asking John about what he does in his spare time, for enjoyment, he tells me,*
>
> *"Ah... "I read a lot and eh I'm fond of a pint – that's about the size of it [....] Eh... prefer a quiet pint."*

John uses two smart-technologies in his life: his smartphone and a laptop. He stated on the Participant Profile Questionnaire that he can use his smartphone totally independently. In the most part, John uses his phone to read the news and retrieve information from the Internet. He spends approximately 1 to 2 hours on his smartphone on a typical weekday, and 1 to 5 hours on a weekend day. On the weekends, he tends to use his laptop more than his smartphone.

Communication, access to entertainment and information searching for escape

John states on the Participant Profile Questionnaire that the activity he performs most using his smartphone is reading the newspaper. The second most frequent activity he performs on his phone is browsing the Internet, and going on YouTube. He looks up information on the Transport Industry and if he has a question about something, he finds it useful to use Google search engine to find out information. On asking him whether he has ever used the Internet to retrieve information related to his injury, he say no. John's preferred mode of communication with friends and family is via calls or text messages. He is not a member of Facebook.

On asking John about the nature of his use of the Internet, he explains how his motivations can change; he might start but searching for something specific, but he sometimes allows himself to browse items that "pop up", that interest him.

> *"[....] if I need to find out something we'll just google it."*
>
> *[Researcher [....] how about when you use the Internet; what type of things do you look at on the Internet?]*
>
> *Em'.... Anything from...music to, you know sure. You could be looking at something on YouTube, something specific and eh, sure something else might pop up and take your interest and sure you go off on a tangent and eh, you know, one thing leads to another and you [laughs] I could spend all day on it if I could!"*

It is clear that the Internet is gateways for John to access music and entertainment media, gather information and act a way to pass the time.

Change in Use since Entering Hospital

Interestingly, this category presented itself in the two previous interviews also. John

explains how since entering the hospital, his use of smartphone and his laptop, has changed. On weekends, he spends a considerable amount times on his smart-technologies.

> "[Researcher: And since you've come into hospital, have you been spending any more time on the technologies that you would at home?]
>
> Em'..... Yea, if I was staying over the weekend here at the hospital, yea, I would because tis eh, tis eh, a bit of a drag here on Saturday, you know. But eh, yea..."

Indifferent Feelings About the Internet

On asking John about how he feels about the Internet, he tells me, "...it's instant, you know! I just like to know what's going on, and that's about the size of it. I've never pondered whether it made me happy or sad. You know, it's just there, to pass the time." On responding to this question, I sensed some unease in John's voice and suspected that the discussion of 'feelings' may have caused him some discomfort. I decided not pursue the interview any further at this point as I felt it would have been unethical.

John's PIADS Scores

John obtained an overall PIADS score of .38, implying that his smartphone has a weak psychosocial impact on his QOL and well-being. This finding is not surprising as John does not use his phone a great deal, compared to the other cases described in this multipl case-study. A subscale score of 1.08 was yielded on the Competence subscale; a score of 1.67 was obtained on the Adaptability subscale, and .38 was observed in the Self-esteem subscale. A weak to moderate impact score was observed in the Adaptablity subscale which indicates the extent to which a device impacts one's productivity, usefulness, performance and independence. The scores indicated that John's smartphone holds the highest impact (1.67) in relation to ways his smartphone enables him to participate in life, take chances, try

new things and take advantage of opportunities. (Adaptability subscale). A weak score of .38 was yielded in the Self-esteem subscale which indicates that his phone has a little impact on his feelings of happiness and emotional health.

4.4. Case Study 4 – Kevin

Prominent Themes:

- Communication via Calls, Texts and Facebook
- Escapism and Relaxation via Entertainment on YouTube
- Change in Use Since Entering Hospital
- Mixed Feelings about Smartphone as a Help or Hindrance
- Negative Feelings on Facebook

Narrative Description:

Kevin is a 31 year old man from the south of Ireland. He has been in hospital for 6 months following his injury. Kevin has full use of his arms but requires the use the use wheelchair. Kevin uses three smart-technologies at present; his iPhone, a tablet computer and a laptop. He uses his iphone most, which he has owned for 3 years. In most cases he can use his phone independently but, as he states, If something was tricky..." he would require the help of another person to use certain aspect of it. On a average weekday and weekend day, Kevin spends 20 minutes using his iphone. He does not spend a great deal of time engaging with his phone, but he does find it useful. He explains; "I just use the phone for like every-day talking, texting, browsing, Youtube - all that kinda'' stuff like."

Communication via Calls, Texts and Facebook

Kevin states that he uses the text application mostly, followed by the YouTube application and the DoneDeal application (in that order). He feels that for him, the most useful applications on his smartphone are the Google search engine app, and email app.

finding out information and communication are thus important activities to Kevin at present. On asking Kevin what the best aspects were about his phone he said

> "I could live without the rest of the - Facebook like and YouTube and DoneDeal - but definitely [not] calls and texts."

Kevin used the term 'relief' when referring to the emotions he feels as result of being able to communicate with others outside of the hospital.

> *"[Researcher: What is your experience, or what type of emotions if any, do you feel being able to do that [call and text] on your phone?]*
>
> I suppose you feel kind of, I suppose relieved that you can make contact with people and stuff like that do you know like. If you weren't able to ring them, you'd feel lost like you know, kind of, I dunno really."

Escapism and Relaxation via Entertainment on YouTube

One the categories that surfaced in Kevin's interview that of escapism and relaxation. Kevin explained to me:

> "Like, when you're sitting down relaxed and looking up those things you feel like - you just feel relaxed like and there's no one around you and you're in your own kind or environment like do you know that kinda' way – sit back and chill out. [....] ... it helps you take your mind off things like, you can be a bit nosy do you know that kinda'' way."

A key use for Kevin, is his engagement with Youtube. On asking Kevin "what type of things do you watch on YouTube?" he replies by saying

> "Anything that's popular on the day, em'... Anything that's kinda' funny do you know that kinda''

way... Sports as well... Music... Machinery, am... different things like that do you know [....] check up movies, watch clips of movies and stuff like that..."

Kevin uses YouTube frequently and which seems to promote a state of relaxation and escapism for him. He touches on the importance and value of being able to switch off from what's going on around him. On asking him about his frequent use of YouTube, Kevin says:

"[....] relaxin' on it and watch whatever you want and block out everything that's goin" on a round you like when you get really into it like d'you know that kinda' way.

[....] Aw yea sure, like not everything that is going on around is to do with you. You need to be able to concentrate on one thing like, not several....."

Change in Use since Entering Hospital

As illustrated below, a change of use of the Internet was uncovered in this case, as well as all of the others. The use communication applications i.e. emails and calls has increased for Kevin since entering hospital.

"[Researcher]: [....] do you use email much?

Em'.. I didn't before but now kind of I do like do you know, 'cause a lot of people send emails so it's the quickest way to send information online."

Em'... yea definitely sure coz you're away from family and friends. It's the only way you can keep in contact really.

[....], I just found that's what I was doing like in the, in the, do you know like, to make contact with people, I dunno', it's hard to explain. But definitely, you'd be, you'd be lost without it now like d'you know,"

Negative Feelings on Facebook

As in the Case 2, (Thomas) discussed above, the use of Facebook as a means of communication was present in Kevin's life also. Kevin expressed some aggravation around those of his Facebook friends that publicize their negative feelings on it.

> *"[Researcher]: And do you use it [Facebook] much?*
>
> *[....] its rubbish now these days so I'm kinda'' thinking of getting rid of it. It's a bit extreme like, people putting on it 'I'm havin' a sad day' like, sure what am I supposed to do for ye, you know that kinda' way?*
>
> *[Researcher: Does that aggravate you?]*
>
> *It does, it does sure like yea. I'd say it aggravates a lot of people, do you know? No one wants to know your problems, especially on Facebook coz' everyone knows everything."*

Despite the negative emotion reported above, Kevin explains how Facebook is beneficial another ways:

> "Well.. in saying that, I have connected with a few friends that I've known before and that I lost touch with but like I still wouldn't, I still wouldn't be chasing after them if you know what I mean to be friends again like I'd just chat with them the odd time. But am you'd see people you would know and you wouldn't bother being friends with them coz they've really eh... they really don't' know you.
>
> Something like that you know."

Smart-technology as a part of you: Kevin made numerous references to his iPhone as an personal item that goes everywhere with you. He explains:

"It's an everyday thing like. Get up in the morning, the first thing you grab is the phone like.

[Researcher: Yea...]

Or put it in your pocket, and it's there all day, and for anyone wants you like d'you know, if it broke or you lost it or something like that, you'd miss it. There again you'd have no one annoying you as well so you say, like you'd be glad like."

Mixed Feelings about Smartphone as a Help or Hindrance

Interestingly, refers to his phone as being something he can neither live with or without. While this phrase is figurative and commonly used, Kevin explained that if he went without the phone for a week, he would probably cry. This behaviour appears to resemble a reliance on the device, on some level.

"You can't do without it

[....] No, if you went a week without the phone you'd probably cry like"

On numerous occasions throughout the interview, Kevin touches on the notion of being over-contactable, as a downside of having a phone: Notably, in almost every instance whereby Kevin expressed a positive comment about the beneficial aspects afforded by his smartphone, he noted a negative side to owning/using his smartphone also; this is evidenced in the below excerpt:

"[*Researcher: So the phone is a great tool to help to you get away from...]*

Yea yea, It can be yea, yea... Then again, it can be annoying as well cause# you'll have people ringing and texting all the time and you feel like hopping the phone off the ground.

[....]

[Researcher: 'Tell me a little bit more about that]

Sure like, if you're getting call after call like do you know know and you just want to have your dinner or your breakfast or just sit down and have a cup of tea or something , or talk to, maybe someone calls, or you know talk to herself like, and sometimes you just want to turn it off like. I haven't bounced it off the ground yet but I'd say someday I will. I'm due an upgrade anyway."

"If I lost it, it wouldn't bother me. Am... but then again like you'd feel like, you'd feel lost d'you know, you'd be wondering is there people trying to contact you."

It is possible that Kevin feels pressure to return all of the correspondences that people make to him and is frustrated at the burden that it causes him.

Kevin's PIADS Score

Kevin scored somewhat of a weak, positive overall PIADS a score of .07; which implies that his device had little overall psychosocial impact. He presented a score of -1.42 on the Competence subscale, -.17 on the Adaptability subscale and -.25 on the Self-esteem subscale. Kevin's scores on the PIADS were inconsistent with his interview datum and were therefore viewed as outlier data due to skewing effect that his scores would impose on the overall sample statistics. It is hypothesised that Kevin may have scored the PIADS incorrectly due to misunderstanding the format of the questionnaire. As the PIADS uses but negative and positive directionalised questions, it can be confusing for some users to understanding how exactly one must respond to different style questions.

On analyzing the PIADS scores pertaining to Kevin (whose PIADS scores indicated that his smartphone had a strong negative impact on his QOL), it was suspected the participant's understanding of how to complete the scale may have lacked clarity due to the inconsistent and contradictory data obtained in the participant's qualitative interview. The

data-set in question, which were strongly negative, naturally skewed the overall mean scores for the cohort and were thus omitted in the final stage of the analysis. Issues around the usability of the PIADS are offered in the next chapter. Mean overall PIADS scores calculated bar the outlier data resulted in a score of .16 (M = .16) and median score of .20.

4.5. Case Study 5 – Chris

Prominent Themes:

- Using a Smart-device as a rehabilitation tool
- Facebook for Socialization
- Change in Use Since Entering Hospital
- Internet as Entertainment
- Time elapsing
- Autonomy via Online Banking
- Communication and Staying in the Loop
- Functional Limitation as a Barrier of use
- Frustration via Facebook

Narrative Description:

Chris is 39 year old man from the South of Ireland. He acquired his injury seven months ago and has attended hospital since. Of all the smart-technologies that Chris has regular access to, he uses an Android smartphone most which he has owned for five months. He can use his smartphone totally independently and spends approximately 3.5 hour per weekday using his phone, and 5 to 6 hours on a typical weekend day. Of the many things Chris uses his phone for, he spends most of his time using an online messaging application (called Viber), followed by Facebook and YouTube. He uses the online messaging application to communicate with his friends, family and girlfriend.

Using a smart-device as a rehabilitation tool

Chris stated that the online messaging application on his phone is the most useful to him in his life at present. Aside from providing obvious communication functions, Chris sees writing messages as good exercise for his hands. He states; "It gets your hands goin' [...] it's good exercise". In this way, Chris uses his phone to promote movement in his hands; which he has only regained in the past two weeks. Prior to regaining his hand functioning. he was unable to move his hands. He tells me about how he used to use an app on his phone to operate the television and radio;

> *" [....] at the start I could use if for, I would use it for lowering up the telly', the television and the radio which is all one piece; there's an app on it that you, they've an app here in OT that you can, the Samsung phones have an app that you can program say to turn on the telly'."*

In this regard, Chris uses his phone as an assistive technology to operate elements in his environment. Furthermore, his smartphone is providing occupation, physical and indeed psychological benefits.

Facebook for Socialization

Chris uses Facebook to socialise with his friends. He explains how his friends often tag his name to videos so that he can watch then. As evidenced in the excerpt below, the use of Facebook as medium to socialise and share various forms of media is a powerful entity in terms of its potential impact on psychosocial well-being due the many psychological beneifits its can afford users. Chris explains;

> *"The lads would be tagging me on video's and stuff like that so, you go on and watch the video, and that leads into another, another, another, then you come back, go down the page again and get another*

so it's just something to be at'"

Frustration via Facebook

Chris expressed that he experiences feelings akin to aggravation at the behaviours of some the people that he is friends with on Facebook when he sees "people writing stupid stuff on Facebook". On asking him to elaborate about what he means, he says

"You see people at home or goin" to a hotel or stuff like that, they can't even go to the toilet some of them, and they're on the phones telling you what you want to do or what they're after doing, pure stupid like, nobody wants to know really. And like the more you see it, probably at the start you could have 20 or 30 people liking it, now people are just, they don't even bother liking it like, why, who the hell cares like?"

Chris also expressed aggravation when talking about other online behaviours that he observes on Facebook such as when people 'like' particular media that some people post on Facebook. He says;

"I don't like - you'd see some people there and they'd like everything they want to, to get their numbers up on their phone. You know the way you can like your friend or ask you friend to join. Like I've – whatever friends I have, I've friends that would be – they wouldn't be liking this and liking that every day you know, it's all stupid stuff. They're all genuine enough and like very few of them would be liking but I've one or two of them that starts like that, I just de-friend them straight away. Don't want to be lookin' at that sorta' stuff like, drive you insane."

"[Researcher re there any negative feelings that you feel in any way from using you phone, that you've experienced?]

No, just the Facebook where'd you'd be watching people that have nothing better to do and like just stupid stuff like 'oh we're goin" on holidays now, or goin" for diner now', letting the whole place

know like, who cares like?

[Researcher]: Yeah..

Pictures of your new-born children up on it like.
[Researcher]: Does that aggravate you?

Oh yeah like - I can't believe how stupid people are like, pure stupid."

It is apparent from the above excerpts that Chris sometimes experiences some negative emotions when he engages with Facebook. These emotions may or may not have an impact on Chris' psychosocial well-being however this is not something that could be easily manipulated and measured so it thus not predictive.

Change in Use since Entering Hospital

Chris explains how the Internet speed in the hospital was significantly faster than that his Internet speed at home and subsequent impact that it had on the way he uses his phone. Interestingly, 'Internet speed' did not arise as mediator for use in any of the other cases presented; this finding is however noteworthy.

"[Researcher] "Ok, and the most useful app on your phone for you is your Facebook?"

Yeah, I wouldn't be using that many other ones cause' like, you're in here all day, you know. Well I go home at the weekends but I don't use the - the Internet would be very poor at home, the 3G at home. The likes of here, loading videos and stuff like that are instant whereas at home you'd be waitin' for it so, you won't bother that way"

Internet as Entertainment

Chris tells me about how he uses the Internet as a means of entertainment, and thus enjoyment, in the evening. The use of smart-technology for entertainment purposes emerged

for most of the cases in this study and underlines the value of smart-technologies as entertainment tools in addition to their primary communicative function.

> *" [...] in the evenin' time I go back, get me dinner, and if there wasn't anything on I'd just go on phone, scroll through Facebook and watch videos and then you might just go onto another site watching videos."*

Time elapsing

Time elapsing was an emergent category in Chris' transcription. He explains how he can lose track of time when browsing the Internet. This may be beneficial to Chris in some was by functioning as a form of escapisms from his clinical surroundings. He says, 'Like you wouldn't feel an hour or two hours going by if you're looking at Facebook, just scrolling through videos and that"

Functional limitation as a barrier of use

Chris' functional status has changed over time which has affected his use of phone. He explains that while he used to require the use of earphones when speaking on his mobile phone, now he is able to hold the phone to his ear for short periods of time.

Autonomy via Online Banking

Chris uses an online banking application once every week or two to monitor his finances. As illustrated in the quote below, Chris' ability to conducting banking activities on his smartphone instils a certain amount of security, autonomy and control in Chris. On asking him if being able to bank online provides him a sense of control, he replies by saying,

> *"Security, oh yea, it does. It's great to be able to do that whereas before you'd have to go into the bank to check how much money have, or if you wanted to pass money, give money over to somebody or transfer visa card or stuff like that you can do it all now on the phone. Like the apps have go way*

quicker now as well and they're specifically for the phone say they're all smaller print app.

Communication, Staying in the Loop

Chris explains how he uses *Viber* – an Internet-based call and text application – to communicate with friends and family. He tells me how the app saves time and serves as forum for family and friends to communicate.

> *"[...] all the textin' is through Viber. You'd have - we'd have groups at home, brothers and sisters and family and girlfriend's be all... You'd have family group at home and you'd be chattin' through that or then you'd have the boys... bits and pieces like that so.. Oh it's great, it's great for... rather than having to ring five or six people, you can just put it in there and everybody sees it and that's it... everybody is notified of what you see and that's it – and then you get feedback whether they're happy or if they're not, or whatever the question is."*

Chris' PIADS Scores

Chris' PIADS scores were consistent with the information he disclosed in his interview. A mean overall PIADS score of 1.69 was yielded for overall impact. A score of 1.75 was obtained on the Competence subscale; a score of 3.00 on the Adaptability subscale; and a score of .63 on the self-esteem subscale. It is evident from Chris' subscale scores that his smartphone has a positive psychosocial impact on his independence, well- being and quality of life. He scored a maximum PIADS score of 3 on the Competence subscale which illustrates how Chris' smartphone enables productivity, usefulness, performance and independence as a result of using his phone which was evident in his interview transcript.

4.6. Case Study 6 – Richard

Prominent Themes:

- Communication via Facebook, Calls and Texts
- Learning
- Entertainment

Narrative Description:

Richard is a 25 year old student. He incurred his spinal injury over 2 years ago and is a returning patient to the hospital. Richard uses a smartphone most in his day to day life which he has owned for 2 years. He can use his smartphone independently. He spends approximately one hour per day using his phone on an average weekday and 2 hours per day on weekends. He states that he spends most of his time using the Facebook app, followed by the Google apps and the YouTube app. At a later stage in the interview however, he exclaims that he spend most of his time using the calls and text function on his phone. Richard feels that Facebook is the most useful app to him in his daily life.

Communication via Facebook, Calls and Texts

On speaking about his use of Facebook, Richard tells me that he uses the app it to keep in touch with friends and family abroad:

> *"...just to keep in touch with my friends and as well to keep in touch with friends abroad who might be moved away like, I find it very good for that. [....] Yea, coz myself I've two Aunties in America that keep in touch. [....] I find it relaxing sometimes just to go on Facebook to see what's, see the news or whatever, see - keep in touch with friends"*

On asking Richard whether he felt communication was important to him he replied by saying

> *"Yea, yea, I do yea – I think it's very important'. Richard reported spending 25 minutes per day using the text application on his phone to communicate; this equates to a third of his overall time spent using his phone."*

Learning

On asking Richard about the nature of his use of Google he explains that he, like many other participants, uses Google to access information related to his injury.

> *"[I use Google] to research things or to get information, stuff like that mostly yea [....] things about my injury and em' if I didn't understand something or something, I'd Google it and see what it says there. [.....] If maybe I got a letter and didn't understand some issue or part of it, I'd Google it and see what it says or what it meant and em - yea, or maybe I'd google something I looked up and didn't understand like, I find it useful for that alright. [....] it is a good feeling that you're able to use something to figure out like what you want mostly yea. I find it the easiest way to find out something like."*

Entertainment

Richard also uses his smartphone to access entertainment media using a television player app. He also explains how he enjoys browsing the YouTube app to watch videos also. He enjoys playing games also on his phone also.

Richard's PIADS Scores:

Richard's mean overall PIADS score (1.04) indicated a weak but positive psychosocial impact of his device on his functional independence, well-being and quality of life. Richard scored highest on the Competence subscale (1.50) which indicates that smartphone is most beneficial in terms productivity, usefulness, performance and

independence. This finding is reflected in Richard's interview also; his phone serves as useful tool that promotes independence and productive in that it enables his search for information, entertainment media aside from serving as communication device. These aspects are strongly reflected in Richard's interview data, evident in his use of his device to achieve a variety of social and independent activities. He yielded a score of 1.50 on the Competence sub-scale implying a moderate impact related to this domain; items related to feelings of Competence, productivity, usefulness, performance and independence related to device usage. He yielded a moderate score of 1.00. on the Adaptability subscale which indicates that his device positively enables his ability to participate, take chances, eagerness to try new things and ability to take advantage of opportunities Richard scored .13 on the Self-esteem subscale which implies a slight but positive impact of device use on indices of self-esteem including happiness and emotional health.

4.7. Case Study 7 – Joe

Prominent Themes:

- Entertainment
- Facebook & Staying in the Loop
- Preparing for the Future
- Communication with Family, Motivation from watching videos of Grandchildren

Narrative Description:

Joe is a 44 year old man who incurred injury to spine 6 months prior to his participation the study. The smart-technology Joe uses most daily is his smartphone which he has owned for 1 month. He can use his device independently. On an average weekday, Joe spends approximately 3 to 4 using his phone; on the weekends he spends from 6 to 8 hours engaging with his phone. In the Participant Profile Questionnaire, Joe reports that he uses the calls app on his device mostly. He feels the Internet banking app on his phone is the most useful app to him. He states in his interview however, that Daft.ie (a property website) is the most useful to him at present. In his interview he reports that he uses his phone m "mostly for texting, emailing, goin' onto Facebook, Donedeal, Youtube, and Daft.ie."

Entertainment

Although Joe states in the Participant Profile Questionnaires that he spend most of his phone-based activity using the calls app, he says in his interview that he spends most of his time watching videos of motorcars and motorbikes on Youtube. Youtube thus provides a mode of entertainment for Joe and is something that he enjoys doing and is likely to feel positive emotions in doing so. Joe makes reference to the positive emotional benefits that

Youtube provide for him.

> *"Yea you can get a great sense of humor off them, yea, and some of it can make you really, really laugh. And if you're feeling a little bit down and you go onto Youtube and you find something that's ah funny, it can pick you up a bit. [...] Yea, nothing as good as laughter to pick you up. To pick a bad day up, is a good sense of humor. A good sense of humour always makes you laugh – Laughter is the best medicine of all – I think anyway."*

Facebook & Staying in the Loop

Joe, like many of the other participants in this study, uses Facebook social networking site to stay in touch with social happens and view pictures of his family members. He remarks that he seldom uses Facebook to communicate but likes to browse the website for various news and media. Facebook is another enjoyable activity for Joe that is likely to impact him in a positive way.

> *"I use Facebook for, just catching up on some gossip [.....] It's also great to catch up on photographs that have been taken of my grandkids on Facebook."*

Preparing for the Future

Joe explains that he uses Donedeal website (a purchasing website) frequently as he is hoping to sell his current car, and purchase an adapted car in the near future. In this way, Joe's use of his phone is enabling him to prepare for the future and assisting his rehabilitation back to community life. In addition to buying and selling cars, Joe explains that he also actively seeking appropriate accommodation to rent when he leaves hospital. He says,

> *"...the most useful app is Daft.ie coz I'm trying to find rented accommodation that will suit my*

adapted needs. [....] ..it's a good feeling that you can look these houses up, that you don't have to be depending on someone else to notify you of what the house is like by trying to describe it ove the phone to you- what it's like – but the fact that you can use your own phone to look at this or these houses is a great, great help. At least then you have an idea before you even make a decisions on it – which one you would like to rent. You have an idea before you even make a decision, to see what it's really like in real life, so it's a huge bonus to be able to do that."

Communication with Family, Motivation from watching videos of Grandchildren

Joe spends a lot of his time engaging an online messaging app (called Viber) on his phone which he uses to communicate with his grown-up children, his grandchildren and his girlfriend. He describe the value of his smartphone as it enables him to watch videos of his grandchildren growing up which gives him a "great sense of motivation to keep going".

"Cause' it gives you the motivation then, you'd like to be able to use your arms, and your hands and your upper body again, so that you might be able to sit them up and sit them on your lap and play with them. It gives you great motivation to keep going and try and get your strength back in your arms and your fingers and your upper body, to be able to just do general things, even if you can't get up off the chair and walk and run with them and kick a football with them or bring them to a play-ground with them to push them on a swing and catch them at the bottom of the slide or things like that – it still means that you can go down and watch them doing it. You can video them on your phone where they're doing it, and you will always have that – if you're feeling a bit down, you go 'ah here', I'll have a look and see what the grandkids are doing today and you can go back in at it and have a look at your phone, and I'm sure that'd perk you up pretty quickly."

Joe's PIADS Scores:

Joe's mean overall PIADS score (1.73) indicated that his smartphone has strong positive psychosocial impact, particularly across the Competence and Adaptability subscales.

He obtained a score of 2.17 on the Competence subscale and an Adaptability subscale score 2.50; a lower score of .5 was obtained on the self-esteem subscale. These scores indicate a significant impact of use on Competence, productivity, Adaptability and performance, as well as a willingness to take chances. These findings are in line with the qualitative findings from Joe's interview. Joe's smartphone serves a variety of positive functions for Joe at present; aside from enabling promoting autonomy by enabling him to search for a new car and accommodation, his phone enables him to keep in touch with events in the outside world, as well as keeping him informed about import milestones in his family's lives, which motivates and uplifts Joe. Joe obtained a lower score of .5 on the self-esteem subscale indicating that his phone has a moderately positive impact on his self-esteem. Joe did not report any negative feelings associated with using any aspect of his smartphone.

4.8. Case Study 8 – George

Prominent Themes:

- Communication and Staying in the Loop
- Using Smart-technology as Rehabilitation Tool, Researching Stories of Hope and Motivation
- Preparing for the Future
- Independence and Increased Self-esteem
- Frustration related to Functional Loss

Narrative Description:

George is a 25 year old young man from Galway. He incurred his injury in Australia, where he has been living for the past couple of years. He has been in hospital for the past six months. The smart-technology George uses most in his life is an Apple iPhone smartphone, which he has owned for the past five or six years. He is able to use his phone totally independently. On an average weekday, he spends approximately 2 hours engaging with his smartphone, compared with approximately 4 to 5 hours on the weekends. He spends most of his time using the calls application on his phone, followed by the text message application, and the Facebook application.

Communication and Staying in the Loop

George describes his use of Facebook to me and tells me that he logs into Facebook in the morning and in the evening and uses it a means of communication with others.

> *"[I use it] in the evening time and morning for a bit, just browse through Facebook, write back to whoever wrote to me. Since my injury and since I came here, I've received a lot –I've been inundated*

with probably about 200 messages so I've just been writing back to them and keep in contact with people so, it's very important I think,"

On asking George whether friendship was important to him he replied:

"Ah it is yea, especially when you've an injury. You know who your close friends are, when they come and visit you, and do things that they wouldn't normally do. Before I couldn't do anything 12 weeks ago, scratch my head or anything, scratch me nose, they do it all for me, so you don't be long finding out who your friends are. The chips are down, most definitely. So, yea."

Using Smart-technology as Rehabilitation Tool & Researching Stories of Hope and Motivation

George explains that he uses the Google application on his device to search for information about his injury. He also uses his smartphone to research stories about others who have incurred similar injuries to him. It's possible that these stories provide George with hope, inspiration, motivation and comfort at present.

"At the weekends, I just do a lot of research on my injury, as I said just to see that there is hope somewhere. Other people have come over this, so we'll see we go but, yea, just looking at what they done. A lot of people have blogs that I do follow on a month to month basis, just write down what they've been doing that month. Yea, everyone has good days and bad days but it's part of life to be honest – just try and get on with it. Do what you can do every day. Hope for the best you know."

In addition to searching for information related to his illness, George explained how he uses his phone to try and promote movement in his fingers in a bid to increase his functional capabilities.

"...trying to get my fingers moving faster, just trying to play a few different games at the moment so I'll be able to try and learn. Some of the work, some of them don't but eh, anything I can do a bit quicker or anything, obviously It's going to improve my living you know, what I do in life and all that so,

makes me quicker, yea sure we give it a go and see what happens."

Preparing for the Future

George explains how he uses his smartphone in his quest to purchase a van for when he returns home. He explains to me that he is looking to buy a van so that he can travel around with his family as he likes.

"I just been looking to buy a cheap, 3 to 5 thousand van that I can have when my family and friends come up, we take off for a spin, get out and do something different for a couple of hours. And especially when I go home, I used to have a van at home in the house so – me and family, my uncle and my cousin – were all very close so just take off a couple of hours so I won't be stuck at home, all the time at home. But yea, I'm hoping to buy a van next week to be honest. Looking for one over in England."

Frustration related to Functional Loss

On asking George about whether using his smartphone ever caused him any negative feelings he explained that due to his injury, his physical ability to use his phone with his hands has declined significantly, which causes him feelings of frustration. He says,

"[...] only in the past 3 months, 12 weeks that I've been able to do this myself – before I'd have to get my mother or my cousin to send messages to people or to dial in the numbers to ring people. [....]
[Researcher] Yea. And how was that?
Ah it was alright but you couldn't have a proper conversation with someone, if there's someone else there. Ah it was ok, but now I'm able to use the phone, hold it myself, yea it's no problem."

Independence and Increased Self-esteem

Notably, George's functioning in his hand had improved in recent weeks and his

phone may, in some way, have promoted him to exercise his hands. Nonetheless, his phone has provided him with the ability to observe his progression in terms of his hand functioning, which in turn has made him feel "happy" which is evident in the below excerpt:

> *"[Researcher] Great, so over the past 12 weeks you've been able to use your phone on a pretty acceptable level?*
>
> *Yea, day to day basis yea, no problems whatsoever, so, very happy with that. "*

George explained how his injury caused him to experience hyper-sensitivity in his fingers causes him great discomfort when they touch off other surfaces. As evidenced in the quote below, George explains how the recent improvements in his fingers have increased his independence and self-esteem;

> *"[...] I have very sensitive fingers, [so] I didn't allow anyone to touch them or anything so – I wouldn't even hit the screen on the phone. With the stylus I can just type away and text away on the phone but like in the last couple of weeks my hand has improved and I can use my fingers a lot more now so I tend to use my fingers a lot more now so, I tend to use my fingers for my phone and with the iPad, I use the stylus. [....] it makes me feel good, you know, for weeks, months even, mother and cousin that was with me in hospital, they used to do all the texting and ringing for me. It's just when people are beside you, you can't have a proper chat to someone so, now that I'm able to do it on my own. Self-esteem, yea, makes me feel very very good."*

George's PIADS Scores:

George scored a mean overall PIADS score of 1.73, an Adaptability subscale score of 2.50, a Competence subscale score of 2.17, and a Self-esteem subscale score of 1.13. These scores indicate that George's smartphone has a strong psychosocial impact, particularly in terms of its impact on self-esteem, security, sense of power, self-confidence and control. This finding is perhaps unsurprising in light of the nature of his usage.

George's smartphone provides a variety of important functions in his life at present; aside from being a direct and accessible communication tool to connect with the outside world, his smartphone serves as a rehabilitation tool which strongly impacts his life on both a psychological level and a physical level. He yielded a high scored 1.92 on the Adaptability subscale which implies that George's phone is highly beneficial to him in terms of enabling him to participate in life, take chances, try new things and take advantage of opportunities. Georges' high score of 1.13 on the Self-esteem subscale indicates that his phone has a strong impact on his feelings of happiness and emotional health. There is strong evidence to support these findings in throughout George's interview transcript.

4.9.Cross-case Comparison: Key Findings from the Cases

Table 4 presents a summary of emergent themes derived from the qualitative analyses of each of the eight cases. Due to the descriptive nature of this research, inferences were not drawn from the cases unless salient evidence of concepts related was identified in data. Careful attention was devoted to the analyses of the findings using principles of constructivist grounded theory (Charmaz, 2006) in a bid to reflect themes that are truly grounded in the participants' data, as opposed to deducing the data to preconceived concepts.

Table 4: *Summary of themes across cases*

Case Study 1: Conor	**Case Study 2: Thomas**	**Case Study 3: John**	**Case Study 4: Kevin**
Enjoyment and satisfaction Frustration Motivation to learn	Enjoyment via access to entertainment Communication via Facebook & email Learning, adjustment, rehabilitation & recording important milestones Change in use since entering hospital	Communication Access to entertainment Information searching and escapism via the Internet Change in use since entering hospital Indifferent feelings about the Internet	Communication via calls, texts and Facebook Escapism and relaxation via entertainment on YouTube Change in use since entering hospital Mixed feelings about smartphone as a help or a hindrance Negative feelings on Facebook
Case Study 5: Chris	**Case Study 6: Richard**	**Case Study 7: Joe**	**Case Study 8: George**
Smart-device as a rehabilitation tool Facebook for socialization Change in use since entering hospital Internet as entertainment Time elapsing Autonomy via online banking Communication and staying in the loop Functional limitation as a barrier of use Frustration via Facebook	Communication via Facebook, calls and texts Learning Entertainment	Entertainment Facebook & staying in the Loop Preparing for the future Communication with family, motivation from watching videos of grandchildren	Communication and staying in the loop Using smart-technology as rehabilitation Tool researching Stories of hope and motivation Preparing for the future Independence and Increased self-esteem Frustration related to functional loss

Table 5: *Frequency of key themes across cases*

Theme	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8
Access to Social Supports		✓	✓	✓	✓	✓	✓	✓
(Communication/ socialization via call, messaging, email & social networking apps)								
Self-driven Rehabilitation	✓	✓	✓		✓	✓	✓	✓
(Preparing for the future via researching accomodation, vehicles, sports equipment; Researching medical information; Recording medical progress & missed family events)								
Pleasure Seeking		✓	✓	✓	✓	✓	✓	
(Enjoyment, satisfaction and escape via access to news & entertainment apps and websites; Autonomy via online								
Motivation	✓	✓	✓				✓	✓
(Motivation via videos of grandchildren; Learning via information searching apps; Inspiration & hope via injury related blogs; Motivation to learn to use more device functions)								
Change in Usage		✓	✓	✓	✓			
(Change in rate and usage of smart-device pre and post injury)								
Negative Affect	✓	✓		✓	✓			
(Aggravation from volume of communication from others; Frustration via device use due to physical functional loss/ impairment)								

Following analysis of the types of *apps* that participants claimed to (a) engage with most daily, and (b) find most useful to their achievement of daily activities (derived from the Participant Profile Questionnaire), communication based applications ranked most popular in both categories. Seven of the eight men reported using their device to communicate with others; five participants reported engagement with communication based apps as the ones they utilized *most* on a daily basis. Two of the five participants claimed to spend most of their time using messaging applications (one person used a standard offline text-message app, and another person used a web-based message app); another participant used a social media app as a communication platform; and the remaining two participants used standard

call apps. Although four participants listed a communication based apps as the app they used most frequently every day, six participants claimed to use communication apps such as text message, email, social media and call apps on a regular basis. This is an important finding as it represents a strong desire to communicate with others. Communication as theme/ category was not explored with Conor (case 1), as it did not emerge as a use or category at any point during his interview. Analysis of the interview data across the cases yielded equivalent findings. On analysing the frequency of key themes present across the sample however (Table 5), a number of other functions in addition to communication emerged as popular uses. In seven out of eight cases, participants used their smart-device to search for information which enabled learning, independence/ autonomy and motivation to move forward in their rehabilitation. In this way, the use of smart-technology facilitated a kind of 'self-driven' rehabilitation.

4.9.1. Access to Social Supports

Smart-technologies enabled the men in this study to communicate with others in a plethora of different ways, using various platforms e.g. online and offline call and messaging apps, email apps and social media websites. In this way, smart-technologies enabled fluid access to social supports. Access to social supports has been noted in the literature as key moderator of QOL in SCI populations (Hammell, 2004). The prevalent use of smart-technologies that enable communication with friends and family and participation in online social environments demonstrates the value of communication with others to the participants in this study. An extensive body of research exists that indicates that people with SCI are at an increased risk of experiencing psychological morbidity, lower quality of life and restricted participation in social life (Craig, et al., 2009j North, 1999 Dijkers, 2005; Wyndaele et al., 2006; Muller et al., 2012). Motivation to access social supports via communication apps was extremely apparent.

The role of social supports in the lives of people with SCI has been a prominent topic of research in the SCI literature for many decades (Muller, 2012). Engaging in social supports can be powerful in buffering against symptoms of stress and can enhance well-being and QOL (Schumaker & Brownel, 1984; Cohen & Wills, 1985; Muller et all, 2012). Evidence that participants used smart devices access social supports via communication with family, friends and social networks was evident in seven out of eight cases. In this regard, the notion that smart-technologies enables the individuals in this study to access social supports at a time when their risk of experiencing negative psychological states is increased (Craig, et al., 2009 North, 1999 Dijkers, 2005; Wyndaele et al., 2006; Muller et al., 2012), is positive.

Engagement in meaningful occupations/ activities was also reported by people with SCI in Hammell's (2007) review, in which she asserts occupation and ability to contribute as a key concept to OOL following SCI (Hammell, 2007). Occupation, which Hammell defined as anything that people did in their daily lives, was linked with any qualitative references that she felt related to the need to be busy, to explore new opportunities, to participate and be involved in meaningful roles, and to have something to wake up for (Hammell, 2007). Another study conducted by Hammell in 2004 yielded similar conclusions, presenting additional evidence supporting the relationship between perceived social support, social integration and higher levels of QOL in the SCI populations.

Research by Corbin and Strauss (1987) also highlights how engagement with supportive social networks can assist individuals with SCI to transform self-perceptions of disability into perceptions of capability, which the authors derived from findings related to the role of relationships with others in affirming one's self-worth (Hammell, 2007; Corbin & Strauss, 1987). The results yielded in this research appear to reaffirm the findings noted in previous research around social supports and OOL.

4.9.2. Self-driven Rehabilitation

In addition to enabling access to social supports and social environments, many of the participants reported using their devices to engage in occupations that enabled adjustment and progression in their rehabilitative journey; in this way, smart-technologies facilitated many of the men to rehabilitate in a manner that was self-driven/ self-oriented. Analyses of responses on the Participant Profile Questionnaire indicated that the second most popular type of app used by participants was an Internet browser/ information search app (namely, the Google search engine app). Two participants reported the use of the Google search app as the application they used most daily. A third participant listed the Google search app as the app they deemed most useful to them in their life at present.

Interestingly, the search for information using the Google search app was often motivated by a desire to prepare for the future and adjust and rehabilitate to normal life. On discussing the nature of each participant's use of the Google search app, it was revealed that Google was used by participants for the retrieval of information about wheelchairs, adapted cars and specialized sports equipment; all of which are related to the theme of adjustment and rehabilitation. The search for information related to one's injury and diagnosis was also a key use of the Google search application. One participant spoke about how he used Google to retrieve information from blogs, written by people with acquired spinal cord injury who have been through similar processes of rehabilitation. The participant explained that reading such accounts helped him to cope with his injury and motivated him to work hard in rehabilitation.

Another participant explained how he used the information search app to research information about his children's extra-curricular activities. In this way, access to the Internet enabled him to fulfil paternal duties, a regain control over his role as a father, despite him

being in hospital. Other rehabilitation related occupations afforded by the access to the Internet for participants included a searching property websites for suitable accommodation, searching automobile websites for a van to which he and his relatives can use to quickly get around, the search for specialized adapted cars for people with SCI and the search for specialized sports equipment.

The pursuit for information facilitated by the smart-technologies falls within Hammell's, (2007) category, *assuming responsibility and seizing control* a relationship that states seems to be present in the accounts of reports in her literature review (Hammell, 2007). In the present research, there appeared to be a relation between autonomy and productivity as most accounts involving 'control' (implicitly in number cases), seemed to go in hand with achieving to completing something that brought them closer to goal.

The Competence subscale on the PIADS is said to be sensitive to the perceived impact of a device on performance and productivity which are detectable across the 12 question items that comprise the subscale e.g. competence, productivity, usefulness, performance, and independence. It was thus expected that moderate to high scores would be yielded on the Competence subscale for those who identified as using their device for such purposes. Of the three individuals that listed an information search app as the app that they engage with most, or as the one they find most useful to their achievement of daily activities, low to moderate scores were yielded in two cases (Thomas, .58; John, 1.08) and one negative score was observed (Kevin, -1.42) on the Competence subscale. Following enquiry into for this explanation of this finding was not apparent but demonstrated the value of having a subjective measure of impact that could detect and illuminate such issues.

4.9.3. Pleasure Seeking

A third key theme that was derived from the analyses was that of pleasure seeking. Evidence of a variety of pleasure oriented activities is apparent across the entire sample, bar case study 8. While the act of pleasure seeking could have been inferred in case 8, it was not emergent in the interview data and was thus not identified as prominent theme. Themes such as enjoyment, satisfaction and escape were identified across cases 1 to 7 and were grouped under the theme of 'Pleasure seeking'.

The use of smart-technology to access entertainment media was a prominent theme that emerged across all participants in their interviews. Access to games, videos, entertainment media from T.V. players and entertainment apps, news, and media present on social networking sites were all referenced as sources of entertainment that were enjoyable to participants. A number of participants alluded to the fact that smart-technologies provided a form of relaxation, getaway and escape from reality. The ability to switch off, escape and relax by viewing entertainment media was thus a key use of smart-technologies for the men in this study. Attending hospital for extended periods of time, whereby privacy is automatically compromised when sharing a ward with other people, having the ability to engage in activities that promote positive emotions is beneficial for that reason. The Self-esteem PIADS subscale is comprised of 8 items that are said to detect the impact of a device on self-esteem, sense of security and sense of power and control, and self-confidence. A mean overall score of .55 was yielded for the sample on the Self-esteem subscale, which represent a low to moderate impact of device use on indices related to self-esteem.

pretense that positive experiences resulting from intentional activities have a powerful and, more importantly, a lasting effect on happiness levels which the authors assert

supersedes the impacts of life circumstances (Seldon et al., 2006). This model, which has become widely accepted and validated in the literature (Lyubomirsky & Lepper, 1999) is highly relevant to

the discussion of happiness levels in patients with SCI as it stresses the potential role of activities and behaviour as primary mediators of happiness. The findings presented in this study indicate that the men involved in this study spend on average 1.7 hours per week day (ranging from 20 minutes to 4 hours across the sample) to 3.8 hours on weekends (ranging from 20 minutes to 8 hours across the study cohort) engaging with smart-devices. In light of these data, the examination of psychological impact of technology-based behaviour on chronic levels of happiness is monumental and undoubtedly merits further attention by researchers, clinical psychologists and occupational therapists etc. Such analysis would provide valuable insights into the positive and indeed negative contributions of such behaviours on subjective measures of well-being and happiness with clinical populations.

4.9.4. Motivation

Another category identified as key theme was that of 'Motivation' which presented itself across five cases; case 1, 2, 3, 7 and 8. In case 1 (Conor), salient expression of Conor's motivation to learn more about how to use his smart-device was evident in his statement,

> "I'm trying to get into all the information like, to get into the google and all that and the RTE into them – they're pretty handy alright."

'Motivation to learn' was thus derived as a key theme for Conor. Conversely, in case 2, Thomas' interview data reflected a motivation to learn more about aspects pertaining to rehabilitation, which related to the theme 'Self-driven rehabilitation'. Intrinsic motivation to obtain advanced knowledge related to medical issues was evident in case 2 (Thomas) and case

3 (John) in statements such as Thomas'; "knowledge is power", and John's statement about how his smart-technology enables learning and information seeking; "[....] if I need to find out something we'll [I'll] just google it." Further evidence of motivation presented itself in the below excerpts which were derived from case 2 (Thomas), case 7 (Joe) and case 8 (George). :

"[....] one of the things you have to do when you have an accident like this, is educate yourself around how you're going to live and how you're going to cope with the new ways of living,"

(Case study 2: Thomas)

"[....] it gives you the motivation then, you'd like to be able to use your arms, and your hands and your upper body again, so that you might be able to sit them up and sit them on your lap and play with them. It gives you great motivation to keep going and try and get your strength back in your arms and your fingers and your upper body, to be able to just do general things"

(Case 7: Joe)

"At the weekends, I just do a lot of research on my injury, as I said just to see that there is hope somewhere. Other people have come over this, so we'll see we go but, yea, just looking at what they done. A lot of people have blogs that I do follow on a month to month basis, just write down what they've been doing that month. Yea, everyone has good days and bad days but it's part of life to be honest – just try and get on with it. Do what you can do every day. Hope for the best you know."

"[....] it gives you the motivation then, you'd like to be able to use your arms, and your hands and your upper body again, so that you might be able to sit them up and sit them on your lap and play with them. It gives you great motivation to keep going and try and get your strength back in your arms and your fingers and your upper body, to be able to just do general things, even if you can't get up off the chair and walk and run with them and kick a football with them or bring them to a play-ground with them to push them on a swing and catch them at the bottom of the slide or things like that – it still means that you can go have that – if you're feeling a bit down, you go 'ah here', I'll have a look and see what the grandkids are doing today and you can go back in at it and have a look at your phone, and I'm sure that'd perk you up pretty quickly"

(Case 8: George)

The finding that each participant's experience of motivation is reinforced and maintained by the use of smart-devices for occupational engagement (Verdonk et al., 2008) emphasizes their role as tools that enable and promote concepts of autonomy, efficiency, positive affect (happiness), empowerment, adjustment and coping. Each of the excerpts presented above reflect the experience of motivation in various forms that enable participation in family and social life and promote engagement with occupations of daily life. This finding mirrors the theme of assuming responsibility and seizing control in Hamell's (2007) meta-review, as well as the concepts that comprise the PIADS Adaptability subscale; ability to participate, willingness to take chances, eagerness to try new things and ability to take advantage of opportunities (Day & Jutai, 1996). In addition, this finding contributes to the research pertaining the role of modern technology as a means of occupational engagement for people with disabilities (Amichai-Hamburger & Ben-Artzi, 2003, 2000; Anderberg and Jönsson, 2005; Folan, Barclay, Cooper & Robinson; Stern, Jeaco & Millar, 1999; Verdonck et al., 2007; 2014; Verdonck, McCormack & Chard, 2011). Importantly, all of the themes identified in this study are mediated by smart-technology usage, suggesting that without such devices, related psychosocial well-being would not be present. As the findings suggest, psychosocial impact appears to be a highly subjective and individualized phenomenon that is rooted in one's desire to engage in occupations that are meaningful and worthwhile to them in their current daily life. As mentioned previously, the goal of rehabilitation for those with spinal cord injury (SCI) has shifted from extending life expectancy to enhancement of independence and QOL (Hicks et al., 2003; Hammell, 2007). Evidence from this research highlights the extent by which internet-enabled mobile technology contributes towards this goal, on both and micro and macro level.

4.9.5. Change in Usage

A change in the nature and extent of smart-technology usage since entering hospital was present in four of the eight cases. Participants reported changes in both rate (i.e. amount time spent per day) and nature of device use (i.e. types of activities performed) compared with usage prior to entering hospital. Kevin, for example explained that while he didn't use email to communicate with others prior to entering hospital, how he uses a lot to keep in contact with friends. He also remarked how his smart-phone is "the only way you can keep in contact really". Another participant (Chris) remarked how the Internet speed at the hospital was far faster than his Internet speed at home, which enables him to use the Internet a lot more than he is used to.

One participant, Thomas explained how the use of his tablet PC was highly uncharacteristic of his normal use of technology. He explained that although he works in an IT based occupation by day, he prefers to keep his use of technology and the Internet outside of work to a minimum – so much so, that referred to himself as a "technophobe'. As described previously, Thomas explained that the Internet is something which he associates almost exclusively with work and how he prefers to spend his time outdoors. However, since entering hospital, Thomas was gifted with a tablet from his work colleagues and now spends from 3 hours per day during the week, to 8 hours per day on weekends using his tablet. This finding highlights the potential influence of context/ environment on behavioural change (Cooper et al., 2014), and points towards the influence of context as a potential mediator or technology-based behaviour.

As illustrated in Table 3, an increase in use of smart-technologies at the weekends was observed in six cases. This finding, (in combination with the tendency for usage patterns to

change as a result of being in hospital) is a valuable indicator as to the prevalence of smart-technology use in the lives of the patients in this study. These findings have implications for a variety of professionals working within rehabilitation (e.g. clinical and behavioural psychologists) as they illustrate the subjective preferences and behaviours of the patients in this multiple case study.

Central to the study of psychological impact of technology use is an understanding of the consequence of use on positive affect, happiness measures, and well-being. Prominent positive psychology theorists Lyubomirsky, Sheldon and Schkade (2005) propose a conceptual model of happiness which posits that subjective happiness is determined by three core factors; a genetic set point (which the authors affirm accounts for 50% of one's happiness (Diener & Lucas, 1999) - and possibly up to 80% of happiness according to behaviour-genetic studies conducted by Lykken and Tellegen, (1996)); life circumstances are said to account for 10% of individual differences, and intentional activities and practices are thought to account for up to 40% of one's overall happiness. While the percentages proposed represent variable averages, the authors assert with absolute confidence that these three components comprise subjective happiness. It is thus posited that the impact of intentional activities hold significant dominance over the impact of life circumstances on chronic happiness levels (Sheldon & Lyubomirsky, 2006). The model, which has become highly established and popularised throughout the past decade, is constructed on the

4.9.6. Negative Affect

The theme 'Negative Affect' was identified as key theme that presented itself across four of the eight cases; case 1, 2, 4 and 5. Negative feelings experienced when engaging with

Facebook, a social networking app, were identified in cases case 4 (Kevin) and case 5 (Chris) which were represented by feelings of aggravation in response to the behaviours of other users posting certain material onto the app's 'new feed' forum. Kevin (case 4) expressed aggravation when speaking about users who post comments regarding their negative emotions, while Chris (case 5) expressed similar feelings when talking about users who post information about their life, like pictures of babies and statements regarding them going on holidays or having dinner:

> *[....] its [Facebook] rubbish now these days so I'm kinda'' thinking of getting rid of it. It's a bit extreme like, people putting on it 'I'm havin' a sad day' like, sure what am I supposed to do for ye, you know that kinda' way?*
>
> *[Researcher: Does that aggravate you?]*
>
> *It does, it does sure like yea. I'd say it aggravates a lot of people, do you know? No one wants to know your problems, especially on Facebook coz' everyone knows everything."*
>
> *(Case 4: Kevin)*

> *"[Researcher] Are there any negative feelings that you feel in any way from using you phone, that you've experienced?]*
>
> *No, just the Facebook where'd you'd be watching people that have nothing better to do and like just stupid stuff like 'oh we're goin" on holidays now, or goin" for diner now', letting the whole place know like, who cares like?*
> *[Researcher]: Yeah..*
>
> *Pictures of your new-born children up on it like.*
> *[Researcher]: Does that aggravate you?*
>
> *Oh yeah like - I can't believe how stupid people are like, pure stupid."*
>
> (Case 5: Chris)

While conclusions about the casual relationship between exposure to such content and feelings of aggravation are unclear and out of the scope of this research, it is possible that the concept of envy may play a role in these cases. The experience of envy whilst engaging with online social networking apps has been reported in previous research (Krasnova & Wenninger, Widjaja & Buxmann, 2013), as have other negative psychological states such as depression (Moreno et al., 2011) and negative collective self-esteem (Barker, 2009). In this research, access to medical files as a means of information was not possible however, data pertaining to the men's current psychological functioning would have been informative for the purposes of discussion of 'negative affect' as a key theme – particularly given it's prominence across half of the cases.

Aside from the use of social networking apps, negative affect was also identified in case 1 and 2 (Conor and Thomas) via different mediators. In Conor's case, he expressed feelings of frustration due to the effects of his hand functioning on his ability to use his device. As illustrated in the excerpt below, he explained how a shake in hand movements impedes his ability to use his device as fluently as he would prefer.

> *"[...] there's times that I get very frustrated doing it. When if something goes wrong. See my right arm's very sore, and I can only lift up a certain height. See if I have me stylus in between me fingers and I'm trying to type out things. And I have the shakes so it doesn't know how to do it. [....] To steady myself up. But em, I sometimes get very frustrated, especially when I'm playing the, eh, the word game on it. I have the word ready now so all I have to do is mark it. See sometimes with the shakes I'd go on and keep marking it as far as I could and then next thing wouldn't the blinking thing go off on me and I'd have to do it all again. And that's' what kills me. You know, having to do something a second time".*
>
> *(Case 1: Conor)*

Alternatively, in Thomas' case (case 2), his expression of negative affect was less prominent as a key theme but noteworthy nonetheless due to its relevance to the theme.

Thomas made reference to the potential for internet use to result in "wasting time", particularly if he is to get "distracted". Thomas' reference to time as an irreversible concept and his apparent mindful attitude about the risk of internet use in causing such, suggested that time was something of particular value to him:

> *"[...] the only negatives are that you can end up wasting time, looking at absolute nonsense. And I always feel that that's ah, you won't get that time back. So it's not a major negative... but you can just sort of think you can be doing useful things.. So, yea your right, I tend to go in when I'm looking for something, check emails, check Facebook"*
>
> *"I'm conscious of spending too much time on the Internet... I always feel it's a complete waste of your time... it's not a good... unless I'm looking for something specific, there's a lot of absolute rubbish on the Internet, just nonsense. Em... I think you can get distracted"*
>
> (Case 2: Thomas)

As discussed previously, members of SCI populations are particularly vulnerable to negative psychological states and disorders compared to non-disabled populations (Bombardier, 2012; Craig, Tran & Middleton, 2009; Dijkers, 2005; Fabian, 1991; North, 1999; Kraft & Dorstyn, 2015; Roessler, 1990; Sartorius, 1992; Wyndaele & Wyndaele, 2006). In order to better understand the mediators of negative affects experienced by users of internet-enabled technologies and design evidence based interventions to prevent and counteract such effects, research such as the present study are valuable in uncovering the mediators of negative experiences. While a plethora of evidence for the positive aspects of smart-technology use has been presented, the presence of negative experiences is noteworthy. While measurement of the extent of negative affect on psychosocial impact of device use was not yielded, the findings provide a sound foundation for future research in the area. Given that three out of four of the cases reported to be regular users of the Facebook social networking app, it is possible that the

negative affects identified may be associated with concepts of envy (Krasnova & Wenninger, Widjaja & Buxmann, 2013), depression (Moreno et al., 2011) and negative collective self-esteem (Barker, 2009) as reported in previous studies into the psychological risks associated with use of social media apps. Conclusive evidence of such way not yielded however.

4.9.7. Online Versus Offline Apps

Interestingly, half of the apps that participants reported to use most are Internet-based applications (Google search app, Viber online text and call app, and Facebook social media app) while half are not. Contrary to the cross-over of responses related to the app most used daily category, all of the participants differed in terms the application they deemed most useful to achievement of daily activities. Applications listed in response to this category included a games app, email app, news app, information searching app, on-line call and text message app, social networking app, online banking app and standard call app. These apps can be categorized under the following groups: communication (with one person noting an online calls and text message app, another person noting a standard call app, and another person noting an email app as the most useful app they use), followed by an entertainment apps category (with one person listing a news app, and another person listing a games app). Others reported an online banking app, Google's information searching app and the Facebook social media app as the applications they deem most important to their achievement of daily activities. In addition to the previous measurement variable, communication based apps were found to be the most popular category of applications in this measurement domain also.

Other variables measured in this research including participants' ability to use their device independently, number of smart-devices currently used in one's life, and demographic

variables such as age and occupation were useful for inferential analyses purposes and were beneficial in providing context within each of the cases. Although pattern matching (Yin, 2009) as an analysis strategy was beneficially applied to the data to identify patterns pertaining to smart-technology usage, it was illogical to apply this technique to all of the variables measured in this study.

Notably, all participants claimed to have access to at least two smart-technologies in their lives at present. This finding mirrors a recent report published by Eircom's House Sentiment Survey (2013) which stated that access to Internet technologies in Ireland is currently at an all-time high.

4.10. Strengths

The goal of this study was to address the current deficit in research related to the study of psychological impact of smart-technology use. The selection of a mixed-methods, multiple case study design was highly beneficial in providing answers to the research questions as it enabled a broad investigation of technology based behaviour and subjective perceptions of related psychological impact, through a qualitative and quantitate lens.

According to Cooper, Heron and Heward's (2014), three types of scientific investigations exist which each contribute a different level of knowledge and understanding of a concept; description, prediction and control. Description of a phenomenon, the authors assert, is necessary in the first instance whereby little is known about a particular concept or phenomenon (Cooper, Heron & Heward, 2014). The present study, therefore, represents a modest contribution to the literature in this regard, and contributes towards current knowledge pertaining to psychosocial impact of mobile technology use.

While the findings presented are preliminary and lack ecological validity making

them non-generalizable, they nonetheless provide rich insights into the use of mobile technology by individuals SCI. In addition, the employment of both objective and subjective research methods enhances transferability of the findings yielded which is also notable.

The adoption of constructivist grounded theory principles in this research contributed immensely to the trustworthiness validity of it the outputs. Considerable attention was devoted to the selection of a rigorous design and to the adherence of ontological principals and divergent philosophical views pertaining to the research methods employed. It should be noted that in classical grounded theory, a practice known as *theoretical sensitivity* is a prerequisite to the collection of any data. Theoretical sensitivity refers the researcher's prior knowledge of extant theory and literature surrounding the concept(s) or topic(s) under study. This feature, which is underlined by classical grounded theorists and pioneers of the methodology, Glaser and Strauss (1964), holds that researchers adopting the methodology should approach a research area with a tabula rasa, or blank slate i.e. they should hold virtually no preconceptions of the concepts under study. Conversely, Charmaz, founder of the Constructivist Grounded Theory methodology, advocates an alternative approach. She acknowledges the inevitable impact of the researcher as an active and influential co-constructor of knowledge in the interview process, and argues that the notion of the 'tabula rasa' state of knowledge is unrealistic. She asserts:

> "Rather than reflecting a *tabula rasa*, grounded theorists bring to their studies the general perspectives of their disciplines, their own philosophical, theoretical, substantive, and methodological proclivities, their particular research interests, and their biographies. They do not bring, however, a set of finely-honed preconceived concepts and categories to apply automatically. Should grounded theorists apply such concepts and categories-even their own previous ones-to new data, they must justify them. When using the grounded theory method, researchers actively form questions and seek data." (Charmaz, 1990, p.1170)

In agreement with Charmaz's (2006) perspective, the choice to employ a constructivist grounded theory approach was indicative of the exploration of subjective perceptions of impact in this applied research study. This approach allowed for a low level of sensitization to the literature which was imperative to the linear organization of this academic thesis throughout its lifespan.

Yin, (2013) in his writings on 'Criteria for judging the quality of research designs', suggests four 'logic tests' upon which any research can be evaluated; construct validity, internal validity, external validity, reliability. While Yin's internal validity criteria is not applicable in this instance due its concern with establishing causal relationships in positivist research, the term 'credibility' is often used as a corresponding term in the qualitative research. Credibility refers the accuracy by which a study tests or measures the concepts it sets out to measure; in other terms it relates to "How congruent [...] the findings [are] with reality" (Merriam, 1998).

Construct validity, which Yin (2009) refers to as 'identifying correct operational measures for the concept being studied' (n.p.) was accomplished to a high degree through the employment of the PIADS. The selection of a previously validated and standardized scale, which was originally designed for use with disabled populations, was fundamental to the quality of the study. The PIADS has also been found to be a highly reliable, valid, and standardized instrument that has been used with persons with spinal injuries in the past (Jutai & Day, 2002). The PIADS has been found to accurately and sensitively predict the impact of assistive device on 26 indices thought to be related to functional independence, well-being and QOL (Jutai & Day, 2002). As reported previously, numerous studies have found the PIADS to be a valid, reliable, and responsive measurement instrument with good clinical

utility that is sensitive to impact of a range of assistive devices across a range of populations including those with spinal injuries (Day & Jutai, 1996).

Using multiple sources of evidence in an effort to formulate a chain of evidence when conducting research is also important to attaining a high level of construct validity (Yin, 2009). It may be argued that the influence of interaction and interpretation by the interviewer when analyzing data are threats to validity and could thus be noted as a limitation of this and indeed all qualitative research. However, Yin (2009) suggests the ensuring of construct validity in case study research lies in the completion of two steps: 1) Defining the phenomena under study, and 2) identifying operational measures that match the concepts. The present research provided detailed definition and explication of the phenomena under study including information about its underlying assumptions, throughout the investigation. Secondly, in addition to employing a validated measure of psychosocial impact, the use of interviews and the Participant Profile Questionnaire enabled the yield of multiple sources of evidence which Greene's (1987) asserts, enables for complementarity of findings leading to an enhancement of construct validity.

External validity, which Yin 'defines as the domain to which a study's findings can be generalized' (n.p.) is a 'major barrier' in doing case study research. Notably however, the purpose of case study research is not to output statistical generalization (as with surveys) and analytic generalization (as in experiments) (Yin 2009). Yin suggests by applying replication logic in multiple case studies researchers can introduce a respectable element of external validity into multiple case studies. A replication method was employed throughout the data collection process in line with constructivist grounded theory principles.

Finally, the test of 'reliability' is based on the ability of other researchers to replicate

the methods of this study using the description the descriptions provided in the procedure section. Detailed description of the procedures conducted in this research is provided should a replication of the study at hand be conducted in the future. Importantly, the underlying aim of replication in case study research is not to yield findings or conclusions similar to other studies however (Yin 2009).

In his paper on the topic of credibility in qualitative research, Shenton (2004) suggests 13 provisions that can be made by the qualitative research to ensure credibility: a) adoption of well-established research methods, b) the development of an early familiarity with the culture of participants organizations, c) random sampling of individuals, d) triangulation/use of various methods, e) tactics to inform honesty in informants, f) iterative questioning, g) negative case analysis, h) frequent debriefing session, i) peer scrutiny of the research project, j) the researchers reflective commentary, k) background, qualifications and experience of the investigator, l) member checks, m) thick description of the phenomenon under scrutiny, n) examination of previous research findings. Each of these provisions were considered by researcher and significant weighting was placed on adherence to these elements in order to ensure the validity and quality of research design: (a) Sound justification for the choice of research methods employed has been provided throughout this thesis: (b) The researcher held extensive experience with both spinal injured populations, and with the hospital from which the sample were recruited prior to proposing of this research (none of the participants in the study however were not known to the researcher at the time of recruitment): (c) As discussed in chapter two, a purposive sample method was employed in this study. Random sampling, while desirable, was thus not practical in this instance: (d) Triangulation of methods was also employed which was beneficial to the examination of the concepts under study and validity of the findings; (e and f) despite some oversights, tactics to

inform honesty in informants were employed through the use of interview questioning whereby iterative reference to, and discussion of responses on the questionnaires within the interviews was conducted throughout each individual interview; (g) Negative case analysis involving the examination of deviant cases was performed where appropriate whereby cases that deviated from the majority were used to prompt questions to inform prospectus interviews leading to the refinement of the findings: (h) Debriefing was performed by the researcher at the end of the data collection sessions with each participant; (I and j) Peer scrutiny and reflective commentary by the researcher and her supervisors was performed at numerous stages of the research involving the critiquing of various elements of the research throughout; (k) In terms of the researcher's experience and qualifications, the researcher held an Honours Bachelor of Science degree in Applied Psychology, and conducted training in qualitative research methods in preparation of the research. Her experience with the hospital and population under study was also advantageous to her understanding of the clinical and organisational structure of the patients schedules which facilitated a smooth transition through the proposal stages of research; (l) Member checks were conducted with all participants bar the first participant, Conor - the decision to conduct member checking of responses on the Participant Profile Question was made after the first interview had been conducted; (m) The provision of in-depth descriptions of the concepts under study are provided throughout this research, however, due the current lack of theoretical concepts pertaining to psychological impact of smart-technology use, a description of concepts thought to be related in some way to the research were outlined; (n) As this study is an applied research study, theoretical sensitisation was necessary. A review of the literature related to well-being and QOL in persons with SCI and research surrounding the psychological impact of Internet use and assistive devices was conducted.

4.11. Limitations

The recruitment of a homogeneous sample of all male participants (while coincidental) may be criticized for its restriction of range because the findings presented reflect a male perspective only. The lack of female participants in this study thus limits the transferability of the findings but, nonetheless, provides a good rationale for future research in area. A parallel study into the psychosocial impact of smart-technology in a female SCI population in acute care would enhance the usability of this research by providing a more complete picture of the concepts, across both genders.

A purposive sampling method was employed to establish patient's eligibility for participation in the study; employment of a random sampling method therefore was not viable.

While in the majority of cases, analysis of the data-sets reflected consistent findings across measure, a number of discrepancies were observed in some instances whereby responses on the questionnaires were inconsistent with information disclosed by participants in their interview. During analyses, some inconsistencies were observed whereby reports of technology-based behaviour on the Participant Profile Questionnaire did not match accounts of technology-based behaviour in interview data. For example, discrepancies were noted in response to the question regarding the top five applications that the individual engages with most daily. Had individual accounts been member checked with participants after analyses of their data had been conducted, this could have been rectified. This issue was observed in only two cases. Retrospective/ recall bias regarding the discrepancy between what people think they do/ have done versus what they actually do/ did maybe responsible for this finding. Response bias may also have played a role. These issues are common threat to validity in the social research (Gomm, 2009). Potter &

Wetherell (1987) warn against primarily relying on the accuracy of people's accounts of past experiences and events due to the conservative and collective nature of memory (Gomm, 2009).

The employment of the PIADS scale, despite its valuable contribution, presented some noteworthy issues that may be deemed threats to the validity of findings. Firstly, an issue presented itself regarding to the usability of the PIADS scale as an appropriate measure for use with persons with lower levels of literacy.

As the PIADS utilizes a Likert-scale scoring system, completion of the PIADS requires a considerable level of literacy and intelligence on the respondent's part in order to understand the concepts presented within the scale. While a glossary of terms was provided to participant, it is assumptive to presume that such an aide is sufficient. Secondly, respondents must understand how to complete a Likert-scale questionnaire and how each concept is affected by the various numerical values in the system. Furthermore, three of the question items of the PIADS (item 5, confusion; item 10, frustration; and item 21, embarrassment) are 'negative' or 'reverse- scored' concepts whereby higher positive scores on these items imply a greater negative impact. A considerably degree of comprehension of these things is necessary to accurately complete the PIADS accurately.

The extent to which these issues may have impacted scores on the PIADS is thus unknown. In one case (Kevin's) it is suspected that the factors listed above may have resulted in one participant yielding a negative overall PIADS score. This conclusion is based on the fact that the participant's responses on the PIADS in comparison to those reported in his interview reflected divergent perceptions of device-impact. This conclusion is unclear however, due to his reference to feelings of frustration associated with his device.

Unfortunately, this incident was observed in the analysis phase of the research and the opportunity to member check his responses had passed. This instance may have had implications for the comparative analyses of the findings and will have undoubtedly impacted overall mean PIADS scores.

Evidence of the over-use of closed questions in the first two interviews presented itself in the transcription stage of the research. This issue was attributed in large part to the limited experience of the lead researcher in conducting qualitative interviews. The lead research is currently advancing her education as a behavioural psychologist which had implications for the qualitative analyses. Due to philosophical foundations of behaviourism with its roots in empiricism, the lead research was challenged when drawing inferences from the data. While analyses of the case study findings may be criticized for a lack of interpretation, her training in behaviourism interacted with her ability to infer without observable supporting evidence. This is noted as shortcoming of this research.

4.12. Recommendations for Future Research

Due to the recent increase in smart-technology use and ownership nationally (EHSS, April 2013; EHSS, March 2014), the importance of conducting research into the positive and negative impact of device use on psychological function in SCI populations is apparent. This study provides an informed starting point for advanced research into the relationship between psychological processing and mobile technology use. This descriptive study represents a valuable contribution to the applied research as it has gone some way to addressing the current deficit of research pertaining to the psychological effects of technology use.

While a broad exploration of smart-technology use and subjective psychosocial impact of such was achieved, an in-depth investigation of intrinsic motivations that underlie usage were not explored. This may serve as an interesting line of inquiry for future

researchers and justification for such is provided here. Consideration of the limitations of the PIADS scale in terms of usability and accessibility is also merited in order to avoid the shortcoming discussed. Researchers hoping to utilize the PIADS may benefit from constructing an adapted version of the scale by replacing some of the more complicated terms, with others; the use of everyday language that is appropriately matched to the literacy level to the population under study would likely serve the internal validity of a study. Member checking participants' responses would also enhance the integrity and trustworthiness of any future studies looking to advance on this research.

The research at hand may afford future researchers in this area, the basis to formulate a priori hypotheses upon which to conduct additional investigations of the concepts highlighted in this research. The findings presented above surrounding themes of autonomy, productivity and positive emotion could be explored with further in another qualitative piece with a population of people with acquired disability in order to illuminate the powerful role of the individual in their own rehabilitation.

While this study represents and largely inductive enquiry, future investigations may seek to employ a deductive methodology using a larger sample size, with a greater weighting on quantitative research methods and analysis techniques. As this research focused its enquiry with a homogenous sample, future research could aim to employ a mixed-gender sample in order to enhance the potential for generalization.

Future research study could seek to replicate the same research design employed in this study but explore the phenomena with other populations of individuals attending hospital in a pairwise manner which Onwuegbuzie & Leech (2005) refer to as pairwise sampling designs. As mentioned previously, the development of a parallel research study

with a female population would enhance the usability and transferability of the findings offered here. A similar study conducted with children attending rehabilitation would also serve as informative and useful for healthcare professionals and researchers. Such findings could be used to explore the use of everyday technologies as education and rehabilitation tools for children who are in both early and late stages of rehabilitation.

This study has demonstrated the prominent use of technology by the eight men studied and serves as foundational research for advanced research in the area. Given the temporal extent of usage and change in usage at weekends observed in this research, a relationship between increased usage and increased leisurely time is evident. The results of this study demonstrate this relationship and which may provide a basis for further enquiry on the topic.

The role of communication, social and connecting with the outside world was a prominent finding that future research may wish to capitalize upon. The apparent self-managing of participants to progress and prepare for the future represented some level of acceptance and adjustment to disability. These finds are relevant to clinical psychology and cyber-psychology as they indicate self-driven rehabilitation facilitated by technology. Given the amount of time the participants spend engaging with smart-technologies, perhaps this offers a new avenue for rehabilitation professionals to capitalize upon. The development of purpose built applications aimed at promoting social engagement with other individuals in various stages of SCI rehabilitation may be beneficial to SCI users. Apps also provide an innovative platform for the testing of technology based clinical interventions. Further research could also object to examine the user preferences of computer mediated communication versus face to face communication in a bid to capture communication

preferences in modern society.

4.13. Practical Applications of Results

The case findings presented here, provide a substantive insight into the role and impact of smart-technologies on QOL across the sample studied. This research thus highlights psychological contributions of smart-technologies in the lives of the men studied through engagement with occupations (activities) facilitated by the devices. As evidenced by the behavioural data yielded on the Participant Profile Questionnaire, the use of smart-technologies for communication and socialization was found to be the most popular function of the devices across the sample. This finding may be relevant to clinical psychologists and occupational therapist as it illustrates a desire for individuals to access social supports which can have numerous occupational and psychological benefits. Findings surrounding the nature and extent of use of smart devices may present opportunities for the delivery of innovative clinical interventions for those working in such fields.

The documentation of patient behaviours at times outside of clinical therapies and self-care may be of interest to clinical psychologists and consultants as this information may serve as useful information upon which to infer the impact of recreational activities on levels of well- being whilst in hospital.

The findings yielded here may have implications for the Human-Computer Interaction (HCI)/ Cognitive Ergonomics research due to the number of references made by participants, to negative feelings resulting from their physical and functional abilities. For example, Conor, in his interview, spoke about his experiences of frustration when using his iPad as a result of a shake he has in his hand. Professionals working in HCI may use this information to guide the construction of hardware and software devices designed specifically for those with cognitive and functional limitations. The results presented may also be relevant

to those working in Assistive Technology fields as they demonstrate the popularity of mainstream technology as AT. Smartphones, tablet PCs and laptops were of the most popular technologies within the sample with communication applications being the most popular apps. The search for information was also a key use for a number of the men which demonstrates an intrinsic motivation for the men to want to learn and adjust to their diagnoses. The data yielded in this study may contribute towards current knowledge about popular smart devices for those with SCI and may thus inform service delivery and recommendation for Assistive Technology.

4.14. Conclusion

The findings presented herein, illustrate the prominent role that smart-technologies can play for people with SCI attending acute rehabilitation. The use of smart-technologies by the sample provided numerous enabling benefits which appear to contribute to a self-motivated desire to engage in meaningful occupations, prepare for the future and adjust to the challenges facing them in terms of reintegration into society outside of hospital. The assistive benefits of smart-technologies for people with SCI were highlighted and findings regarding the extent of use of Internet-based apps by the sample, supports the notion of an 'always on', constantly connected society is upon us. The measures employed in this study enabled the garnering of detailed user profiles of technology-based patient behaviours that may serve as foundations for hypothesis testing in future research.

The findings provided here hold great potential for future researchers and policy makers to capitalize upon through the application of online clinical interventions such as SCI-based social networks for access to social supports, app based behavioural interventions for cognitive restricting of disability, and app based information resources that may serve to fast-track subjective adjustment and participation in life whilst in early and indeed late states

of rehabilitation. As the study represents a diverse set of cases within a common context, it illuminates perhaps the 'taken for granted' functions that Internet technologies can afford individuals in acute care that may be overlooked by some rehabilitation professionals.

The results of this research suggest that smart-technologies serve as excellent assistive technologies that hold great potential in terms of their psychosocial effects on functional independence, well-being and QOL.

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Appendices

Appendix A - Information Letter

Month, year

Subject: Invitation to consider participating in upcoming research study at the NRH

Dear_____,

You have been invited to take part in a research study that is being conducted here, at the National Rehabilitation Hospital (NRH). The study is entitled *Exploring the Psychosocial Impact of Smart-technology Use in Acute Rehabilitation* and is being conducted in collaboration with Dun Laoghaire Institute of Art, Design and Technology.

Dr. Eimear Smith (Consultant in Rehabilitation Medicine) and I are joint Principal Investigators/ Supervisors to the study. Also on the research team is Lisa Held (Occupational Therapy Manager), Myriam Hamel (Occupational Therapist), Fiona Maye (Occupational Therapist), and Louise Cleary (Masters by Research student).

If, after reading this information, you have any questions, please do not hesitate to contact Louise Cleary (the study's Lead Investigator). Contact details belonging to all involved can be found at the bottom of this letter.

The aim of the study is to explore the different the types of smart-technologies (i.e. smartphones, laptops and tablet computers etc.) that are being used by patients with spinal cord injury, at the hospital. Please read the information below and take some time to consider whether you are interested in taking part. If you

would like to participate in the study, please contact either Myriam or Fiona, in the Occupational Therapy Unit.

Please remember that your choice to participate is entirely voluntary. You are not obliged to take part in the study if you do not wish, and your decision will not affect your schedule or care at the hospital in any way. Any information you provide for the study is anonymous and confidential. Any information presented in the results will be represented anonymously i.e. no personal details related to your identity will be displayed.

Your involvement in the study will require you meet with the Lead Researcher, Louise Cleary, for approximately 1 hour, at a time and date that suits your schedule (most likely on a Friday afternoon). At the meeting, you will be asked to complete/ answer aloud) two questionnaires relating to your use of smart-technology. You will then be invited to partake in a recorded discussion (also known as an interview) about what you use your smartphone laptop or tablet computer for on a an average day. The purpose of the interview is to gain a better understanding into how patients think and feel about using smart-technologies during their stay at the hospital.

The interview would be recorded so that the researcher can listen back to the conversation and reflect on it. Any information used in the results of the study will be presented anonymously; a personal identification number (PIN) will be used in place of your name throughout the study to protect your identity. Please read the information sheet below before considering your decision.

With thanks and kindest regards,

Dr. Jacinta McElligott *Dr. Eimear Smith*

RESEARCH STUDY INFORMATION SHEET

Study Title: Exploring the Psychosocial Impact of Smart-technology Use in Acute Rehabilitation

What is the Purpose of the Study?

In light of the recent growth in ownership of smart-technologies (i.e. ***Internet enabled mobile technologies*** such as smartphones, laptops, and tablet computers); more people are using these devices to engage in activities of daily life. Thanks to the Internet, smart-technologies allow us to work, shop, communicate, and access entertainment media at any time, and from nearly any location.

The goal of this study is to document which smart-technologies are among the most popular with patients at the NRH, and why. With your help, we hope to gain a deeper insight into the ways in which smart-technologies impact people with spinal cord injury. By gathering this information, we can improve our knowledge of the benefits and limitations of smart-technologies so that we can better understand the potential impact of these devices, and inform future patients about the value of smart-technologies for different lifestyles.

Your Invitation

You are invited to consider taking part in this research, which is entitled *Exploring the Psychosocial Impact of Smart-technology Use in Acute Rehabilitation*. The study is being led by Louise Cleary (a *Masters by Research Student at Dun Laoghaire Institute of Art, Design & Technology)* under the supervision of Dr. Jacinta McElligott, Dr. Eimear Smith, Lisa Held, and Myriam Hamel and Fiona Maye at the National Rehabilitation Hospital. The study is being conducted in collaboration with Dun Laoghaire Institute of Art, Design and Technology under the guidance of Dr. Andrew Errity, Dr. Marion Palmer and Ms. Cliona Flood, and is being conducted as part of a Masters by Research degree.

Before you decide whether or not you wish to take part, it is important that you understand why this research is being done and what it will involve. Please take time to read this information carefully and discuss it with friends and relatives if you wish.

Do I have to Take Part?

No. Your decision to participate is entirely voluntary. If you do decide to take part, you are free to withdraw from the study at any time, without question.

What Will I Be Asked To Do?

If you agree to participate, you will be one of approximately 40 patients taking part in the study. You will be asked to meet with the lead researcher (Louise Cleary) for a once-off meeting, at a date and time that suits your schedule, for approximately 1 hour. At the meeting, you will be asked to fill out/ answer aloud two questionnaires that relate to how you feel your smart-device impacts your daily life. You may also be invited to participate in a recorded discussion-style interview, where you would be asked to discuss your feelings about how smart-technologies affect you in your daily life.

What are the Benefits of Taking Part?

By taking part in this research, you will help to inform those who attend and work within rehabilitation, about the role of smart-technologies in contributing towards the quality of life of people with spinal cord injury. Your participation will help us to gain a better understanding of the types of technologies that are currently being used by patients in the NRH at present, so that we can inform future patients and staff at the hospital about the value and impact of smart-technologies for different lifestyles.

What are the Disadvantages of Taking Part?

There are no known risks associated with participation in this study. If any issues arise during the meeting e.g. if you find that you are experiencing any undesirable feelings such as upset, anxiety etc., the interview will be stopped immediately. You will then be asked if you would like to continue at a later stage, or withdraw your participation completely – in which case you do not have to give reason for your withdrawal from the project, and all data that you have provided will be destroyed if you wish.

How will Information about Me Be Used?

The data collected in this study will include questionnaire data and interview recordings. It will be analyzed and reported in written and statistical formats such as bar charts and graphs. All data will be anonymously presented so your data will not appear alongside your name. The results of the study may be published and used for future analyses.

Who will have Access to Information about Me?

All of the data collected will be kept in the strictest confidence and will be securely stored in the Lead Researcher's office in a locked filling-cabinet and in a password protected computer. None of the research data will be distributed to third parties but may be used for future studies. The data will be retained for 5 years after the study is completed so that it can be prepared for publication and/or conference presentation. It will be destroyed after this date.

Your participation in this research is **anonymous** i.e. your name will not be attached to any information you give. Instead, you will be given an ID number. You should keep a note of your ID number so that if at any stage you decide to withdraw from the study, the researcher can find your data and remove it from the study.

What will happen to the Results of the Study?

The results of this study will printed as part of a thesis document for the Masters by Research Degree at Dun Laoghaire Institute of Art, Design and Technology and will be submitted for publication in 2014. If you would like a copy of the published research, please notify Louise Cleary. The project will finish in April 2014 and a copy of the study will be available thereafter.

What if there is a Problem?

If you have any concerns regarding any aspect of this study, you may wish to speak to someone on the research team who will do their best to answer your questions. Contact details for all of those involved are provided below.

Thank You

Your participation in the project is highly valuable and will benefit both patients and staff at the hospital, as well as those studying in the area.

Reminder

If you are interested in participating, please contact either Myriam or Fiona in the Occupational Therapy Unit

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Appendix B – Consent Form

Consent Form

Project Title: Exploring the Psychosocial Impact of Smart-technology Use in Acute Rehabilitation

Please tick the boxes if you agree to the statement, and place an X in those that you do not agree to

- I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions
- I understand that my participation in the this study is voluntary and that I am free to withdraw at any time
- I agree to take part in the study
- I understand that the information I provide will be anonymised - so my name will not appear alongside any information that might be presented in the results of the study
- I agree to the interview being recorded

- I am happy for any information I disclose for the study to be used for future research projects
- I would like to be contacted with the results of the study
- I am happy for quotes of what I say to be used in the results of the study
- I would like to see any proposed quotes before making a decision

_____	_____	_____
Name of participant	Date	Signature

Appendix C – Participant Profile Questionnaire

Participant ID# _____

Participant Profile Questionnaire

Project Title: Exploring the Psychosocial Impact of Smart-technology Use in Acute Rehabilitation

Instructions

Please answer all the following questions by filling in the blanks and ticking the boxes where appropriate. Questions 1 to 5 are concerned with general details including your age, gender and background. Questions 6 to 11 relate to questions about your use of smart-technologies

Please specify the following:

1. Your age (in years): ____

2. Your gender: Male □ Female □

3. Your most recent occupation: _____

4. The time (in months) since your injury_____months.

5. The type of spinal injury you have: _____

The following questions relate to your ownership and use of smart-technologies

5. Please state all of the smart-technologies that you use in your life at present (these may include smart-technologies used in therapies at the hospital).

1. _____

2. _____

3. _____

4. _____

6. How long have you owned your most used smart-technology?

_____

7. Please tick the box that best describes you:

□ I can use my device without the help of another person

□ Sometimes I need the help of another person to use my smart-device

□ Almost all of the time, I need the help of another person to use my smart-device

□ I cannot use my smart-device without the help of another person

8. On an average weekday, how much time do you send using your most favoured smart-technology?

_____

9. On an average day of the weekend, how much time do you spend using your most favoured smart-technology? _____

10. Please indicate the **top 5 activities** you use your smart-technology for in a typical day.

1. _____

2. _____

3. _____

4. _____

5. _____

11.. Of the activities you use your smart-technology for, which activity would you say is the **most useful** to you in your life?

_____

Appendix D – Psychosocial Impact of Assistive Devices Scale

Psychosocial Impact of Assistive Devices Scale (PIADS) Today's Date: _____
month/day/year

Client Name: _____ ☐ male ☐ female
(last name, then first name)

Diagnosis: _____ Date of Birth: _____
month/day/year

The form is being filled out at (choose one) 1. ☐ home 2. ☐ a clinic 3. ☐ other (describe): _____
The form is being filled out by (choose one) 1. ☐ the client, without any help 2. ☐ the client, with help from the caregiver (e.g., client showed or told caregiver what answers to give) 3. ☐ the caregiver on behalf of the client, without any direction from the client 4. ☐ other (describe): _____

Each word or phrase below describes how using an assistive device may affect a user. Some might seem unusual but it is important that you answer every one of the 26 items. So, for each word or phrase, put an "X" in the appropriate box to show how you are affected by using the _____ (device name).

	Decreases	-3	-2	-1	0	1	2	3	Increases
1)	competence	☐	☐	☐	☐	☐	☐	☐	
2)	happiness	☐	☐	☐	☐	☐	☐	☐	
3)	independence	☐	☐	☐	☐	☐	☐	☐	
4)	adequacy	☐	☐	☐	☐	☐	☐	☐	
5)	confusion	☐	☐	☐	☐	☐	☐	☐	
6)	efficiency	☐	☐	☐	☐	☐	☐	☐	
7)	self-esteem	☐	☐	☐	☐	☐	☐	☐	
8)	productivity	☐	☐	☐	☐	☐	☐	☐	
9)	security	☐	☐	☐	☐	☐	☐	☐	
10)	frustration	☐	☐	☐	☐	☐	☐	☐	
11)	usefulness	☐	☐	☐	☐	☐	☐	☐	
12)	self-confidence	☐	☐	☐	☐	☐	☐	☐	
13)	expertise	☐	☐	☐	☐	☐	☐	☐	
14)	skillfulness	☐	☐	☐	☐	☐	☐	☐	
15)	well-being	☐	☐	☐	☐	☐	☐	☐	
16)	capability	☐	☐	☐	☐	☐	☐	☐	
17)	quality of life	☐	☐	☐	☐	☐	☐	☐	
18)	performance	☐	☐	☐	☐	☐	☐	☐	
19)	sense of power	☐	☐	☐	☐	☐	☐	☐	
20)	sense of control	☐	☐	☐	☐	☐	☐	☐	
21)	embarrassment	☐	☐	☐	☐	☐	☐	☐	
22)	willingness to take chances	☐	☐	☐	☐	☐	☐	☐	
23)	ability to participate	☐	☐	☐	☐	☐	☐	☐	
24)	eagerness to try new things	☐	☐	☐	☐	☐	☐	☐	
25)	ability to adapt to the activities of daily living	☐	☐	☐	☐	☐	☐	☐	
26)	ability to take advantage of opportunities	☐	☐	☐	☐	☐	☐	☐	

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Appendix E – Letter of Thanks

LETTER OF THANKS

To each and every participant,

We would like to extend our sincere gratitude for a taking part in this research project. We appreciate the time and effort you have offered to this research, and would like to remind you that the results of this research will be of great benefit to those attending and working in Rehabilitation Hospitals in the future. Thanks to your generous efforts, we will be able to gain a deeper understanding of how smart-technologies can benefit people with spinal cord injury in their daily lives.

Remember, if you would like to be contacted regarding the results of this study, or have any further questions, please contact the lead researcher (Louise Cleary) and she will be delighted to help you in any way. The results of the project will available in 2015.

For your information, a list of all the researchers involved in this project is provided below, along with a number of helpful organisations.

Your sincerely,

The Research Team

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Help Organisations

Spinal Injuries Ireland (SII)

SII provide support and services for people with SCI providing them with emotional and practical support if needed

T: 01-2355217 E: info@spinalinjuries.ie

Aware

Aware provide telephone based support services for people who living with depression, or are worried about a loved one who is experiencing depression.

T: 01-6617271 Helpline: 01-6766166 (open 10am to 10pm, 7 days a week) E: aware@iol.ie

Appendix F – Interview Topic Guide

Interview Topic Guide
Date: _____
Interview number: _____

Research Questions

1. Does the use of smart-technology devices psychosocially impact the lives of patients with spinal cord injuries attending acute rehabilitation?

2. What themes emerge regarding the nature of use, and value of smart-technology devices for patients with spinal cord injury attending acute rehabilitation?

***Definition of Smart*-technologies**

Refer to Internet-enabled mobile technologies

Topic Guide

1. **Ice-breakers**
   - ✓ Meet and greet participant
   - ✓ Talk about weather
   - ✓ Offer water before beginning
   - ✓ Verify participant's knowledge of the study aims
   - ✓ Brief participant on procedure
   - ✓ Any questions
2. **Device**
   - ✓ Type of ST used most
   - ✓ Other ST used
   - ✓ Ability to use ST independently
3. **Usage**
   - ✓ Time per day spent using device
   - ✓ Activities performed using device
   - ✓ Final
   - ✓ Is there anything else you'd like to add?
   - ✓ Do you have any questions?
   - ✓ Debrief

Appendix G – Sample Raw Data

Raw Data	Incident by incident codes	Researcher Memos
I watch breaking bad, on Netflix, check Facebook, and use it for emails, and also to check out different things about wheelchairs online.. so that's my main way of, outside of my mobile phone, communicating with the outside world. *[Researcher: Super! You mention that the most useful application [on the iPad] is the Internet [Google search app].]* Yea. *[Researcher: Yea, why is that?]* Coz' that's, in terms of if were looking right now to buy a new car, we use the Internet, we're looking to find our where there's different ehh wheelchair facilities – that's on the Internet – all of the information that we need at the moment, em'.. because life has changed so dramatically, a lot of it is on the Internet, so eh.. yea', it is by far the most useful tool on the iPad. Eh'.. and I use it most days. *[Researcher: And how do you feel when you use the ipad.. or when you use.. lets just talk about it in terms of the Internet. How do you feel when you're using the Internet?]* Well.. It's good. I would have normally only used the Internet at work, em, before my accident. So, in terms of how I feel using it now, I'm not sure how to answer that. I mean I'm happy.. What do you… [Researcher: Well.. do you experience any positive emotions particularly?] Yea, when I find something I'm looking for. Like I found suits that would help me swim in the sea, and I found suits that would heat you, deep sea diver top that would keep..	Uses of smart-device: He watches entertainment media on Netflix app, keeps up to date with social events on facebook, communicates via email, researches information about wheelchairs. Feels that using his ST and mobile phone is his primary means of communication with others outside of hospital. Agrees that Google search app is the most useful app on his IPad Uses Google search app to retrieve information about new cars, Informing himself and wife of accessible/ adapted cars Expresses dramatic changes in his life and how Internet helps him to adapt to those changes. Feels that the Internet provides him with 'a lot' regarding information. Strongly feels that the access to the Internet is the best function of his ST Uses the iPad most days Change in use of technology since entering the hospital. Normally associates the Internet with work but now it serves him greatly. Feels positive 'when I find something I'm looking for' Finding items that enable him to do the things he enjoys i.e. swimming	Possible themes: - Enjoyment via access to entertainment - Communication & keep in touch with work - Staying in the social loop - Using ST as a rehab tool to search for AT - ST as a gateway to outside world **'that's my main way of, outside of my mobile phone, communicating with the outside world.** Convergence of response on Participant Profile Questionnaire re app most used Uses - Internet app to research info about new adapted cars - Progress/.Rehabilitating/ Adapting to new life - Internet holds **'all of the information we need at the moment, em.. because life has changed so dramatically, a lot of it is on the Internet' 'it's by far the most useful tool on the ipad.'** Possible theme: Change in Use since entering hospital Change in associated use. Positive feelings/ emotions re retrieval of information e.g. purchasing a specialized wet suit - Progress/.Rehabilitating/ Adapting to new life

Appendix H – Case Studies

Case Study 1: Key Measurement Variables

Name	Conor
Gender	Male
Age	45
Time since injury	7 months
Occupation (most recent)	Construction Laborer
Smart-technology (most used daily)	Tablet
Ability to use device independently	2*
Other Smart-technologies used regularly	Desktop PC
Typical time per weekday spent using device	2 – 3 hours
Typical time per weekend day spent using device	4 - 5 hours
Device application/ feature most used/ engaged with	Games
Device application/ feature deemed most important to achievement of daily activities	Games
PIADS Mean score	.26
PIADS subscale score 1 (Competence)	2.17
PIADS subscale score 2 (Adaptability)	2.33
PIADS subscale score 3 (Self-esteem)	2.13

Note, *1 = The participant can use his/ her device independently; 2 = Sometimes the participant needs the help of another person to use their smart-device; 3 = Almost all of the time the participants requires the help of another person to use his/ her device; 4 = The participant cannot use the smart device without the help of another person

Case Study 2: Key Measurement Variables

Name	Thomas
Gender	Male
Age	38
Time since injury	8 months
Occupation (most recent)	News Editor
Smart-technology (most used daily)	Tablet
Ability to use device independently	1*
Other Smart-technologies used regularly	None
Typical time per weekday spent using device	3 hours
Typical time per weekend day spent using device	8+ hours ("All day when bed bound")
Device application/ feature most used/ engaged with	1st - Google 2nd – Email 3rd - Netflix
Device application/ feature deemed most important to achievement of daily activities	Google
PIADS Mean score	.04
PIADS subscale score 1 (Competence)	.58
PIADS subscale score 2 (Adaptability)	.33
PIADS subscale score 3 (Self-esteem)	.13

Note, *1 = The participant can use his/ her device independently; 2 = Sometimes the participant needs the help of another person to use their smart-device; 3 = Almost all of the time the participants requires the help of another person to use his/ her device; 4 = The participant cannot use the smart device without the help of another person.

Case Study 3: Key Measurement Variables

Name	John
Gender	Male
Age	41
Time since injury	4 months
Occupation (most recent)	Truck Driver
Smart-technology (most used daily)	Smartphone
Ability to use device independently	1*
Other Smart-technologies used regularly	Laptop
Typical time per weekday spent using device	1 – 2 hours
Typical time per weekend day spent using device	1 - 5 hours
Device application/ feature most used/ engaged with	1st – News online (Google) 2nd –News website (RTE) 3rd - YouTube
Device application/ feature deemed most important to achievement of daily activities	News
PIADS Mean score	.12
PIADS subscale score 1 (Competence)	1.08
PIADS subscale score 2 (Adaptability)	1.67
PIADS subscale score 3 (Self-esteem)	.38

Note, *1 = The participant can use his/ her device independently; 2 = Sometimes the participant needs the help of another person to use their smart-device; 3 = Almost all of the time the participants requires the help of another person to use his/ her device; 4 = The participant cannot use the smart device without the help of another person.

Case Study 4: Key Measurement Variables

Name	Kevin
Gender	Male
Age	31
Time since injury	6 months
Occupation (most recent)	Farm Labourer
Smart-technology (most used daily)	Smartphone (Iphone)
Ability to use device independently	2*
Other Smart-technologies used regularly	Tablet Laptop
Typical time per weekday spent using device	20 mins
Typical time per weekend day spent using device	20 mins
Device application/ feature most used/ engaged with	1st – Text Message App 2nd - YouTube 3rd - Donedeal
Device application/ feature deemed most important to achievement of daily activities	Google + Gmail (emails)
PIADS Mean score	-.07
PIADS subscale score 1 (Competence)	-1.42
PIADS subscale score 2 (Adaptability)	-.17
PIADS subscale score 3 (Self-esteem)	-.25

Note, *1 = The participant can use his/ her device independently; 2 = Sometimes the participant needs the help of another person to use their smart-device; 3 = Almost all of the time the participants requires the help of another person to use his/ her device; 4 = The participant cannot use the smart device without the help of another person.

Case Study 5: Key Measurement Variables

Name	Chris
Gender	Male
Age	39
Time since injury	7 months
Occupation (most recent)	Yard Foreman
Smart-technology (most used daily)	Smartphone (owned for 5 months)
Ability to use device independently	1
Other Smart-technologies used regularly	Desktop PC Table PC
Typical time per weekday spent using device	3.5 hours
Typical time per weekend day spent using device	5 – 6 hours
Device application/ feature most used/ engaged with	1st – Text Message App 2nd – Facebook 3rd - YouTube
Device application/ feature deemed most important to achievement of daily activities	Text Messaging
PIADS Mean score	.20
PIADS subscale score 1 (Competence)	1.75
PIADS subscale score 2 (Adaptability)	3.00
PIADS subscale score 3 (Self-esteem)	.63

Note, *1 = The participant can use his/ her device independently; 2 = Sometimes the participant needs the help of another person to use their smart-device; 3 = Almost all of the time the participants requires the help of another person to use his/ her device; 4 = The participant cannot use the smart device without the help of another person.

Case Study 6: Key Measurement Variables

Name	Richard
Gender	Male
Age	25
Time since injury	24 months
Occupation (most recent)	Student
Smart-technology (most used daily)	Smartphone (owned for 24 months)
Ability to use device independently	1
Other Smart-technologies used regularly	Laptop
Typical time per weekday spent using device	1 hour
Typical time per weekend day spent using device	2 hours
Device application/ feature most used/ engaged with	1st – Facebook 2nd – Google 3rd - YouTube
Device application/ feature deemed most important to achievement of daily activities	Facebook
PIADS Mean score	.10
PIADS subscale score 1 (Competence)	1.50
PIADS subscale score 2 (Adaptability)	1.00
PIADS subscale score 3 (Self-esteem)	.13

Note, *1 = The participant can use his/ her device independently; 2 = Sometimes the participant needs the help of another person to use their smart-device; 3 = Almost all of the time the participants requires the help of another person to use his/ her device; 4 = The participant cannot use the smart device without the help of another person.

Case Study 7: Key Measurement Variables

Name	Joe
Gender	Male
Age	44
Time since injury	6 months
Occupation (most recent)	Truck Driver
Smart-technology (most used daily)	Smartphone (owned for 5 months)
Ability to use device independently	*2
Other Smart-technologies used regularly	Smartphone
Typical time per weekday spent using device	20 mins
Typical time per weekend day spent using device	3 – 4 hours
Device application/ feature most used/ engaged with	1st – Calls App 2nd – Donedeal App 3rd - Daft.ie
Device application/ feature deemed most important to achievement of daily activities	Online Banking
PIADS Mean score	.20
PIADS subscale score 1 (Competence)	2.17
PIADS subscale score 2 (Adaptability)	2.5
PIADS subscale score 3 (Self-esteem)	.50

Note, *1 = The participant can use his/ her device independently; 2 = Sometimes the participant needs the help of another person to use their smart-device; 3 = Almost all of the time the participants requires the help of another person to use his/ her device; 4 = The participant cannot use the smart device without the help of another person.

Case Study 8: Key Measurement Variables

Name	George
Gender	Male
Age	25
Time since injury	5 - 6 years
Occupation (most recent)	Drainer
Smart-technology (most used daily)	Smartphone (owned for 5 months)
Ability to use device independently	*1
Other Smart-technologies used regularly	Tablet PC
Typical time per weekday spent using device	2
Typical time per weekend day spent using device	4 – 5 hours
Device application/ feature most used/ engaged with	1st – Text Message App 2nd – Calls 3rd - Facebook
Device application/ feature deemed most important to achievement of daily activities	Calls
PIADS Mean score	.20
PIADS subscale score 1 (Competence)	1.92
PIADS subscale score 2 (Adaptability)	2.17
PIADS subscale score 3 (Self-esteem)	1.13

Note, *1 = The participant can use his/ her device independently; 2 = Sometimes the participant needs the help of another person to use their smart-device; 3 = Almost all of the time the participants requires the help of another person to use his/ her device; 4 = The participant cannot use the smart device without the help of another person.