

Adult attachment and health-related quality of life after acquired brain injury

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Abstract

The current research explores how adult attachment patterns present after an acquired brain injury (ABI) and possible associations with psychological distress, social isolation and health-related quality of life (HRQOL). It was hypothesised that attachment anxiety and attachment avoidance would explain additional variance in HRQOL and that this possible association would be mediated through psychological distress and social isolation. For this quantitative research a non-experimental, cross-sectional cohort design was implemented. Forty individuals with ABI completed the Experiences in Close Relationships—Relationship Structures questionnaire, the Quality of Life in Brain Injury questionnaire, the EuroQol-5 Dimension Scale, the Hospital Depression and Anxiety Scale and the Friendship Scale. The results suggest that levels of attachment anxiety and attachment avoidance after an ABI are similar to those reported in healthy samples. Moreover, higher rates of attachment anxiety and attachment avoidance were associated with lower HRQOL, as well as increased levels of anxiety and social isolation. No association was found with depression. However, depression was shown to be the largest significant predictor of HRQOL after ABI ($\beta = -.41, p < .005$). Social isolation was also shown to predict HRQOL after ABI ($\beta = .32, p < .05$). Mediation analysis suggests that both attachment anxiety and attachment avoidance have an indirect relationship with HRQOL through social isolation, or through social isolation and psychological distress. It is concluded that adult attachment is an important theory to consider after ABI, due to its possible indirect relationship with HRQOL. These findings suggest that professionals should consider individuals' attachment patterns for treatment purposes and try to foster secure attachment patterns during rehabilitation.

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Introduction

Epidemiology of Acquired Brain Injury

Acquired brain injury (ABI) is an inclusive category that embraces acute brain injury of any cause, including trauma, vascular accident, cerebral anoxia, toxic or metabolic insult and infection or other inflammation (Turner-Strokes, 2003). ABI is considered among the leading causes of death and disability across the world (Corrigan, Selassie, & Orman, 2010; Strong, Mathers, & Bonita, 2007). Traumatic brain injury (TBI) and stroke are the most common forms of ABI, with TBI alone predicted to become the third largest cause of death and disability worldwide by 2020 (World Health Organization, WHO, 2002). Consequently, TBI and stroke will be the main focus for this current literature review and research.

The global incidence rate of TBI is estimated at 235 per 100,000 people per year (Corrigan et al., 2010) and 160 to 350 per 100,000 people per year for strokes (Zhang, Chapman, Plested, Jackson, & Purroy, 2012). Currently, an estimated 900,000 people in the UK live with the long-term consequences of a stroke (National Institute for Health and Care Excellence, NICE, 2008a), with treatment accounting for approximately 5% of the total NHS budget (Saka, McGuire, & Wolfe, 2009). Although similar UK estimated figures for TBI are not available, it is estimated that 1.1% of the US population (3.2 million) are living with the long-term consequences of TBI (Zaloshnja, Miller, Langlois, & Selassie, 2008). The subsequent lifetime cost of TBI (medical costs and loss of productivity) in the US is estimated at \$60 billion per year (Finkelstein, Corso, & Miller, 2006).

ABI is therefore a major global health and socioeconomic problem (Maas, Stochetti, & Bullock, 2008), which places a significant burden on health care

providers. This burden is magnified because many individuals with ABI require specialised neurological rehabilitation (McMillan & Oddy, 2001). On an interpersonal level, ABI can have a devastating impact on survivors and their families. It is therefore essential that professionals establish a comprehensive understanding of the common outcomes after ABI, whilst expanding the knowledge and insights into successful rehabilitation for ABI survivors and their families.

Common Consequences of ABI

An ABI such as TBI or stroke can result in complex and comorbid lifelong difficulties in physical, emotional, social and cognitive functioning (Hoofien, Gilboa, Vaki, & Donovick, 2001). Physical health problems after ABI include fatigue (Cooper, Reynolds, & Bateman, 2009), limitations in motor functioning (Marshall et al., 2007), and chronic complications involving all body systems (Good, Bettermann, & Reichwein, 2011; Murphy & Carmine, 2012). Stroke and TBI are also associated with communication difficulties, including aphasia, dysarthria, and social communication difficulties (Good et al., 2011; Safaz, Alaca, Yasar, Tok, & Yilmaz, 2008).

One of the most prominent determinants of long-term difficulties and functional changes associated with TBI or stroke is cognitive impairment (Arciniegas, Held, & Wagner, 2002; Giaquinto et al., 1999). Common cognitive impairments after TBI or stroke can include reduced processing speed and difficulties with attention, memory and executive functioning (Dikmen et al., 2009; Schaapsmeeders et al., 2013). It has been suggested that cognitive difficulties after TBI or stroke can be lifelong, and are present many years post-injury (Hoofien et al., 2001; Patel, Coshall, Rudd, & Wolfe, 2003).

These common difficulties after a stroke or TBI can result in a decrease in leisure activities and independence (McKevitt et al., 2011; Ponsford et al., 2013), as well as changes in employment status (Hofgren, Esbjörnsson, & Sunnerhagen, 2010). However, these common consequences of an ABI are often shown to be highly associated with and dependent upon psychosocial factors, including social isolation and psychological distress. These difficulties affect not only the individual but also members of the survivor's social support system (Gan, Campbell, Gemeinhardt, & Mcfadden, 2006).

Psychological distress. TBI and stroke are strongly associated with a range of mental health problems. In particular, psychological distress and affective disorders, such as depression and anxiety, are consistently reported in the literature. Estimates of depression after TBI range from 14% to 77% (Whelan-Goodinson, Ponsford, & Schönberger, 2008) and are commonly cited at 33% after stroke (Hackett, Yapa, Parag, & Anderson, 2005). Furthermore, suicide rates increase after TBI and double after stroke (Teasdale & Engberg, 2001a, b).

It has been estimated that 38% of TBI survivors will experience an anxiety disorder (Whelan-Goodinson et al., 2008), with anxiety-specific estimates ranging from 3–28% for generalised anxiety disorder, 4–17% for panic disorder, 1-10% for specific phobia, 2-15% for OCD and 3–27% for post-traumatic stress disorder (Koponen et al., 2002; Whelan-Goodinson et al., 2008). Estimates of the prevalence of anxiety disorders after stroke range from 6-13% for generalised anxiety disorder (Whyte & Mulsant, 2002), 2% for panic disorder, 2-9% for agoraphobia and 5-30% for post-traumatic stress disorder (Lincoln, Kneebone, Macniven, & Morris, 2011). Although no gender differences have been found in the rate of post-injury depression

(Seel et al., 2003), it is suggested that females are more likely to report an anxiety disorder and males are more likely to report substance abuse after TBI (Ashman et al., 2004).

Depression and anxiety often co-occur after injury. It is suggested that 70% of individuals suffering with depression will also experience an anxiety disorder after TBI (Whelan-Goodinson et al., 2008). Psychological distress is also associated with a magnitude of other negative outcomes after stroke and TBI, including reduced self-esteem (Howes, Edwards, & Benton, 2005a, b), higher rates of suicide attempts (Silver, Kramer, Greenwald, & Weissman, 2001), and cognitive difficulties (Chamelian & Feinstein, 2006; Kauhanen et al., 1999).

Psychological distress after TBI is also positively associated with avoidant coping, worry, wishful thinking and self-blame, and negatively associated with productive coping and using enjoyable activities to manage stress (Anson & Ponsford, 2006; Gregório, Gould, Spitz, van Heugten, & Ponsford, 2013). Psychological distress is also strongly associated with social functioning and social isolation after TBI (Douglas & Spellacy, 2000; Stålnacke, 2007) and stroke (Hinojosa, Haun, Hinojosa, & Rittman, 2011; Lewin, Jöbges, & Werheid, 2013). This is consistent with data collected from non-clinical samples, with social isolation proposed as a risk factor for depressive cognition, cognitive decline, poorer executive functioning, and heightened sensitivity to social threats (Cacioppo & Hawkey, 2009).

Social isolation. Social isolation can be defined as “living without companionship, having low levels of social contact, little social support, feeling separated from others, being an outsider, isolated and suffering loneliness” (Hawthorne, 2006, p. 526). Evidence from the literature suggests that ABI survivors

often report experiencing elements of this multidimensional construct. For example, stroke and TBI are associated with loneliness (Hoofien et al., 2001; Salter, Hellings, Foley, & Teasell, 2008), a lack of purposeful social activity (Bulinsk, 2010; Hinojosa et al., 2013) and social disconnection (Levack, Kayes, & Fadyl, 2010).

ABI is also associated with reduced social support and limited support networks (Hoofien et al., 2001; Izaute et al., 2008; Temkin, Corrigan, Dikmen, & Machamer, 2009). For example, individuals with TBI report fewer contacts of social support and lower levels of satisfaction with social support when compared to a non-TBI control group (Tomberg, Toomela, Ennok, & Tikk, 2007; Tomberg, Toomela, Pulver & Tikk, 2005). Individuals with TBI also report a decrease in the number of friends who provide social support (Hoofien et al., 2001; Seibert et al., 2002) and limited opportunities for social networking, which is one of the most important areas of community participation that is negatively impacted after TBI (Morton & Wehman, 1995; Temkin et al., 2009). Likewise, it is suggested that following a stroke, individuals may experience a decline in available social relationships (Salter, Foley, & Teasell, 2010) and more dissatisfaction with their support (Clarke, Marshall, Black, & Colantonio, 2002).

Social isolation and social participation are crucial to consider after ABI, as group membership and social connectedness are deemed important for individuals' conceptualisation of the self, which may be susceptible to change after ABI (Gracey et al., 2008; Nochi, 2000). Such ideas lay at the heart of the social identity theory (Tajfel & Turner, 1986). The theory further suggests that identification with a social group provides an essential source of pride and self-esteem and produces sense of belonging to the social world. Furthermore, it has been proposed that social connectedness can provide meaning to difficulties experienced and provide both physical and emotional

support during developmental transitions, illness, and injury (Cohen, 2004). After stroke and TBI it has been suggested that social support contributes to positive adjustment and problem-solving, provides a buffer against the effects of stress and contributes to better outcomes (Cobb, 1976; Tomberg et al., 2005; Tsouna-Hadjis, Vemmos, Zakopoulos, & Stamatelopoulos, 2000). In addition, Haslam et al. (2008) find that multiple and maintained group memberships play a significant role in predicting well-being after stroke. This research supports the notion that psychological distress and social isolation are likely to be associated after ABI.

It is therefore crucial to consider individual differences that impact upon individuals' actual and perceived levels of social isolation, and how this social isolation may be appraised and experienced. Developing a greater understanding of individual differences in social isolation may help professionals predict who will experience a sense of social disconnection and who will be negatively impacted by such difficulties after ABI. Although gender has been suggested as one factor that affects the experience of social isolation after ABI, with women indicating more feelings of rejection and lack of support, and men more frequently emphasising feelings of alienation and need for isolation (Bulinski, 2010), further models and considerations need to be explored.

The impact on the family. The limited opportunity to integrate into the community after ABI often results in a greater reliance on family members (who are often primary caregivers) for social support (Morton & Wehman, 1995; Verhaeghe, Defloor, & Grypdonck, 2005). However, changes that occur within the individual with ABI can be extremely difficult for close relatives to cope with (Coco, Tossavainen, Jääskeläinen, & Turunen, 2011). Spouses and parents of individuals with TBI or stroke

often acquire new responsibilities and roles, whilst attempting to carry on their lives and adjust to the changes exhibited by their loved ones. Consequently, caregivers can experience increased levels of psychological distress, family burden and diminished social interactions, including loneliness and disconnection from peers (Engström & Söderberg, 2011; Ponsford & Schönberger, 2010; Visser-Meily, van Heugten, Post, Schepers, & Lindeman, 2005).

Family members' medical and psychiatric history, the level of disability of the ABI survivor and the severity of his/her behavioural and mood changes all predict poorer family functioning, caregiver distress and experience of burden (Davis et al., 2009; Palmer & Glass, 2003; Ponsford & Schönberger, 2010). Moreover, both patients' and family members' perceived social support have been shown to predict family outcomes after TBI (Coy et al., 2013; Hibbard et al., 2002). It is also essential to consider family members' adjustment to and appraisal of the situation and their coping strategies (Blais & Boisvert, 2005). Negative outcomes for family members after stroke or TBI are associated with avoidant coping, high threat appraisal, low self-esteem and demand for approval (Bakas & Burgener, 2002; Davis et al., 2011; Stebbins & Pakenham, 2001). Problem-solving and positive reappraisal of the situation are significantly related to better psychological adjustment (Coy et al., 2013; Harris, Godfrey, Partridge, & Knight, 2001).

Understanding relatives' psychological adjustment is important, as family support acts as one of the largest sources of positive support for survivors (Johnson et al., 2010) and disturbances in relationships can cause significant distress to both partners. However, rates of distress and burden in relatives and changes in family functioning vary across studies and families (Blais & Boisvert, 2005). It is therefore essential to understand and identify personal characteristics and mechanisms that

explain individual differences (for both the relative and patient) in the perception of changes in family functioning and levels of distress and burden after ABI. Although consideration of cognitive appraisal and coping styles are important, further broader psychological factors need to be considered.

Marital relationships. One specific source of family and social support that has received limited consideration in research is individuals' romantic/marital relationships after ABI. Maintaining a satisfying relationship whilst managing the associated difficulties and subsequent role changes after brain injury represents a significant challenge for couples (Blais & Boisvert, 2005; BurrIDGE, Williams, Yates, Harris, & Ward, 2007). It has been suggested that the experiences of spouses of individuals who have sustained a TBI are different to other family members, as they lose their major source of emotional support and take on roles more affiliated with parenting instead of an intimate relationship (Brooks, Campsie, Symington, Beattie, & McKinlay, 1986).

Research into the prevalence of relationship breakdown after ABI is inconclusive (Godwin, Kreutzer, Arango-Lasprilla, & Lehan, 2011; Kreutzer, Marwitz, Hsu, Williams, & Riddick, 2007). Some research reports marital stability after a TBI (Kreutzer et al., 2007; Ponsford et al., 2013; Wood & Rutterford, 2006), whilst other research suggests high rates of relationship dissolution (Hoofien et al., 2001; Thomsen, 1984). In a recent review of stroke patients, 9 out of 13 studies reported marital problems after stroke, including separation or divorce (Daniel, Wolfe, Busch, & McKevitt, 2009). Marital and romantic relationships are important to consider, as such relationships are suggested to provide psychological and physical health benefits (Feeney, 2008). Irrespective of the rate of marriage dissolution, it is widely accepted

that ABI can place a significant strain on marital relations (Daniel et al., 2009; Godwin et al., 2011; Ponsford et al., 2013) and results primarily show a decline in marital satisfaction after TBI (Burrige et al., 2007; Gosling & Oddy 1999; Ponsford, 2003). Marital satisfaction is suggested to be associated with better life satisfaction after TBI (Arango-Lasprilla et al., 2008; Corrigan, Bogner, Mysiw, Clinchot, & Fugate, 2001; Hicken, Putzke, Novack, Sherer, & Richards, 2002); however, more recently it has been suggested that marital status has very little predictive value in understanding life satisfaction after injury, whilst general family satisfaction does help to explain variance (Johnson et al., 2010).

Regardless, a greater understanding of why certain marriages and long-term romantic relationships are successful, and why certain people remain satisfied after ABI, is needed. A consideration of broader psychosocial models of individual differences in relationship behaviour may inform understanding (Blais & Boisvert, 2005). Such consideration may also help to further understand and develop family interventions and treatments. Although evidence for the use of family intervention or involving a family member in treatment is strong when considering families coping with long-term chronic diseases (Martire, Lugstig, Schulz, Miller, & Helgeson, 2004; Shields, Finley, Chawla, & Meadors, 2012), at present there is limited evidence supporting specific family intervention after ABI (Kreutzer et al., 2009). However, an abundance of anecdotal, descriptive and quasi-experimental support is present in the literature (Boschen, Gargaro, Gan, Gerber, & Brandys, 2007). An increased understanding of broader psychosocial factors and patterns of interpersonal behaviours/relationships that may manifest after an ABI (especially within the family context) could help inform and develop the literature around family therapy after brain injury.

To summarise, there is a need to develop a better understanding of individual differences among common outcomes after ABI, particularly psychological distress and social isolation. With regard to social isolation, further information is needed to explain individual differences in the perception and impact of social support, but also differences in family functioning, marital success and satisfaction, and negative outcomes that are experienced by caregivers. Through this knowledge effective treatment can be developed for both the individual and family members after ABI. An understanding of broader psychosocial models will support professionals with such questions and may also develop the understanding of crucial outcome variables of quality of life (QoL), which is predicted by psychological distress and social isolation (Jaracz & Kozubski, 2008). This is essential, as arguably the ultimate goal for any health care professional working with ABI is to support individuals and relatives to develop and maintain a positive level of QoL (von Steinbüchel et al., 2010b).

Quality of Life

QoL is a difficult concept to measure, with other similar constructs such as life satisfaction and well-being causing “conceptual confusion” (Bowling, 2001, p. 1). However, it is generally accepted that QoL reflects the degree to which an individual’s needs are met and satisfied. This understanding of QoL is captured in the World Health Organization Quality of Life (WHOQOL) Group’s definition, which considers QoL as “an individual’s perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns” (WHOQOL, 1993, p. 153).

Three common conceptualisations and measurements of QoL appear within the literature. They include conceptualising QoL solely as a utility score (which can

inform economic decisions), as subjective well-being (e.g. life satisfaction or happiness) and as *statuses of achievements* across a variety of preselected dimensions (Dijkers, 2004). Empirical evidence proposes health as an essential dimension of QoL, with individuals consistently placing *health* among the most important areas of life (Farquhar, 1996). This has led to the development of a range of health-related quality of life (HRQOL) measures, which consider QoL as an individual's self-perceived multidimensional health status along various dimensions, including physical status, symptom status, functional status, health perceptions, and general and mental well-being (Wilson & Cleary, 1995).

There are a variety of HRQOL measures available, which correspond to the UK Department of Health's (DoH, 2008) encouragement of patient-reported outcomes (PROMs) to measure the performance of health care. In essence, HRQOL measures provide a patient-led baseline against which the effects of the intervention can be evaluated. Moreover, HRQOL may also inform economic evaluations of services. Summary index scores can be used to generate a subsequent score known as Quality of Life in adjusted years. This, in turn, can be used in cost–utility analysis (Revicki et al., 2009).

There are two forms of HRQOL measures: generic and disease Specific HRQOL measures. Generic measures are widely used, and are useful for the comparison of treatment results and level of HRQOL across various samples (Räsänen et al., 2006). The two most frequently used generic measures of HRQOL are the Medical Outcomes Study 36-item Short Form (SF-36; Ware, Snow, & Kosinski, 1993) and the EuroQol-5 Dimension scale (EQ-5D-3L; EuroQol, 1990). The EQ-5D-3L is currently recommended by the NICE guidelines as the HRQOL measure of choice (NICE, 2008b).

The EQ-5D-3L has been shown to be a valid and reliable measure in a variety of populations, including stroke samples (Hunger, Sabariego, Stollenwerk, Cieza, & Leidl, 2012), with limited research suggesting that the measure is responsive and able to discriminate between severity groups when used with TBI (Bell et al., 2005). In addition, the EQ-5D-3L has been shown to correlate with the Glasgow Outcome Scale–Extended (Jennett, Snoek, Bond, & Brooks, 1981), suggesting promising construct validity with TBI (Wilson, Pettigrew, & Teasdale, 2000). However, disease-specific information is often neglected in generic HRQOL measures (Bowling, 2001). This has been suggested to be true for generic measures in ABI, as measures do not capture the full complexity of HRQOL in brain injury (Carlozzi, Tulskey, & Kisala, 2011). Omissions include changes in cognitive functioning and self-concept (von Steinbüchel et al., 2010a). Furthermore, it has been argued that generic HRQOL measures cannot assess HRQOL without some potential biases among people with disabilities (Andresen & Meyers, 2000). Disease-specific measures are recommended when studying the most important effects of a given disease or condition, and when there is a need for strong sensitivity to the condition (Bowling, 2001).

The Quality of Life After Brain Injury questionnaire (QOLIBRI: von Steinbüchel et al., 2010a, b) was developed to address the omissions of generic HRQOL measures when working with people with brain injury. Originally developed for and validated with individuals with TBI, the QOLIBRI measures HRQOL across six dimensions (“cognition”, “self”, “autonomy”, “social relations”, “emotions” and “physical problems”). Thus, the measure encompasses the full range of difficulties associated with TBI. However, the measure is suggested to be appropriate to use with ABI samples (Truelle et al., 2010; L. Wilson, personal communication, September 30, 2013) due to the common themes across ABI that the measure taps into. However, no

research has explored this possibility to date. The development of a validated disease-specific HRQOL measure in TBI now allows researchers to use both a generic measure and disease-specific measures as recommended (Terreehorst et al., 2004). This allows for data to be compared across conditions, whilst being sensitive to condition-specific difficulties.

ABI and HRQOL

Research has consistently reported that individuals' HRQOL is negatively impacted after a stroke or TBI (Andelic et al., 2009; Jakola et al., 2007; Kiely, Brasel, Weidner, Guse, & Weigelt, 2006; Lopez-Bastida et al., 2012; Naess, Waje-Andreassen, Thomassen, Nyland, & Myhr, 2006). As with other difficulties associated with stroke or TBI, lower levels of HRQOL are believed to be relatively stable and lifelong (Forslund, Roe, Sigurdardottir, & Andelic, 2013; Godwin, Ostwald, Cron, & Wasserman, 2013). Alongside this, a lower level of HRQOL has also been demonstrated in the relatives of TBI and stroke survivors (Mar et al., 2011; Schlote, Richter, Frank, & Wallesch, 2006).

Several factors have been strongly associated with HRQOL after ABI when using a selection of generic measures. HRQOL after TBI and stroke is inversely related to psychological distress (Kiely et al., 2006; Steadman-Pare, Colantonio, Ratcliff, Chase, & Vernich, 2001; Sturm et al., 2004), social isolation (Carod-Artal & Egido, 2009; Steadman-Pare et al., 2001; Tomberg et al., 2007), cognitive impairment (Haacke et al., 2006; Kozlowski, Pollez, Thevenon, Dhellemmes, & Rousseaux, 2002), functional disability (Williams & Willmott, 2012), physical impairment (Sturm et al., 2004) and fatigue (Cantor et al., 2008; Naess et al., 2006). HRQOL after TBI and stroke is positively related to levels of participation in and satisfaction with leisure and

work activities (Andelic et al., 2009; Naess et al., 2006; Steadman-Pare et al., 2001), family satisfaction (Williamson et al., 2013), positive appraisal of the impact of injury (Jacobsson, Westerberg, & Lexell, 2010) and task-oriented and optimistic life coping (Tomberg et al., 2007). Research specifically using the QOLIBRI in TBI samples has suggested similar patterns of associations. Psychological distresses, social isolation lower functional status, employment status, and comorbid health outcomes have all been negatively associated with the QOLIBRI (Hawthorne, Kay, Gruen, Houseman, & Bauer, 2011; Siponkoski, Wilson, von Steinbüchel, Sarajuuri, & Koskinen, 2013; Soberg et al., 2013; von Steinbüchel et al., 2010b).

The association between injury severity and HRQOL is less clear. Some research has demonstrated a positive relationship between injury severity and HRQOL in stroke and TBI (Gosman-Hedstrom, Claesson, & Blomstrand, 2008; Hu, Feng, Fan, Xiong, & Huang, 2012). However, other research exploring TBI and stroke has suggested no relationship (Soberg et al., 2013; von Steinbüchel et al., 2010b) or a paradoxical relationship between injury severity and QoL measures (Brown & Vandergoot, 1998; Findler, Cantor, Haddad, Gordon, & Ashman, 2001; Forslund et al., 2013; Jones et al., 2011; Siponkoski et al., 2013).

It is essential to have a firm understanding of the concept of HRQOL and its main predictors. Such knowledge can help professionals to develop treatments that better support individuals and their families. Therefore, a greater understanding of psychosocial factors such as social isolation and psychological distress that help to predict QoL after ABI is important. One such model that may be useful to explore is the adult attachment theory. This broad, overarching theory may not only explain additional variance in HRQOL but also support professionals to develop a better understanding of the current established predictors (e.g. psychological distress and

social support). Furthermore, utilising adult attachment theory provides a unique perspective, as attachment constructs are theoretically and empirically distinct from other constructs, such as personality traits, distress and support seeking (Mikulincer & Shaver, 2007).

Adult Attachment

John Bowlby (1969, 1973, 1979, 1980) integrated concepts from ethology, cybernetics, developmental psychology and psychoanalysis to propose four interrelating systems that regulate human relational behaviour. These systems were attachment, caregiving, exploration and sex. The attachment system has since been recognised as being of significant importance and has developed into a leading theoretical framework for studying emotion regulation and interpersonal relationships (Cassidy & Shaver, 2008).

Attachment theory offers a biopsychosocial, lifespan account of how close relationships are formed, maintained and dissolved (Bowlby, 1979). It proposes that human infants have evolved a predisposition to seek safety and security from primary caregivers during times of threat. In comparison to other close relationships, these attachment figures are used as a secure base from which to explore the world (Bowlby, 1969). However, not all attachment bonds are the same. During infancy, individuals develop internal working models based on the sensitivity and responsiveness of the primary caregiver. This internal *lens* through which people see their relationships organises individuals' memories, behaviours and affect during social interactions (Mikulincer & Shaver, 2007). Although this working model is of particular interest during times of experienced threat, it also more generally provides individuals with a blueprint on how to behave and what should be expected during all social interactions

(Rholes & Simpson, 2004).

Based on findings from the Strange Situation Test (Ainsworth, Blehar, Waters, & Wall, 1978), which explores attachment patterns between primary caregivers and infants, it is proposed that there are three main attachment types during infancy. Responsive and sensitive caregiving that provides a secure base for restoring emotional balance during times of distress results in a *secure attachment*. Such infants are comfortable with interpersonal closeness and are willing to trust and depend on others. Attachment figures that are repeatedly experienced as inconsistent or unresponsive leave infants vulnerable to developing an insecure attachment. An infant who perceives close proximity to attachment figures as dangerous due to insensitive and unresponsive caregiving may develop an *avoidant* attachment. Such infants develop a dismissive approach to social interactions. They view others as unsafe and untrustworthy and thus avoid affective closeness and seek independence in goal achievement. Infants who perceive their attachment figures as inconsistent in their support and proximity develop a belief that they themselves are unable independently to handle experienced threats. This encourages the infant to intensify their support-seeking behaviour in an attempt to gain contact with attachment figures. This type of attachment is called *anxious-ambivalent* attachment. Although the attachment figure is still viewed positively, the inconsistent experience of rejection leads to an increased sense of helplessness and fear of abandonment. A fourth attachment orientation was later suggested, known as *disorganised* attachment (Main, Kaplan, & Cassidy, 1985). This form of attachment is characterised by both avoidant and anxious-ambivalent attachment, with such infants failing to develop a coherent attachment strategy. It is believed that this is the result of frightened or frightening behaviour exhibited by the attachment figure.

Disorganised attachment is suggested to lie at the heart of many emotional disturbances in later life, including borderline personality disorder (Fonagy & Luten, 2009) and major depression (Berry, Barrowclough, & Wearden, 2007). Furthermore, secure attachment during infancy is believed to instil a positive self-view as someone who is competent and lovable in later life (Vrtička & Vuilleumier, 2012). These associations with later outcomes capture Bowlby's (1969) hypothesis that attachment patterns are stable and trait-like in fashion. This prototype perspective holds that working models develop in infancy and continue into adulthood, impacting on later relationships and social interactions (Collins & Feeney, 2004). Although support is strong for this hypothesis (Grossmann, Grossmann, & Waters, 2005; Simpson, Collins, Tran, & Haydon, 2007), it does not deny the possibility of attachment change. The prototype perspective instead proposes that there is a stable factor underlying any variance in attachment patterns and recognises that attachment patterns can be modified and changed after disconfirming life events (Bowlby, 1988). A trauma such as ABI may be seen to be one such altering event.

Several studies have supported Bowlby's proposal that attachment is stable from infancy into adulthood (Allen, McElhaney, Kuperminc, & Jodl, 2004; Weinfield, Sroufe, & Egeland, 2000). However, conclusions drawn from changes in adult attachment are less conclusive. Some research has suggested that people report lower levels of security after significant relationship break-ups and life transitions (Davila, Karney, & Bradbury, 1999; Simpson, Rholes, Campbell, & Wilson, 2003). Other research has proposed that there is no such association (Cozzarelli, Karafa, Collins, Tagler, 2003; Lopez, Mitchell, & Gormley, 2002). However, Cozzarelli et al. (2003) demonstrated that increased social support is associated with increased security and that other changes in attachment are associated with changes in overall mental health.

It is thus proposed that it is not the negative life event that constitutes changes in attachment, but how the life event affects the individual. Furthermore, it has been suggested that it is the magnitude and impact of the life event that is important, and that certain life events are more likely to change attachment patterns (Fraley, Vicary, Brumbaugh, & Roisman, 2011).

Attachment is a controversial and difficult concept to measure. In the field of adult attachment, it is recommended that self-reported measures be used when current relationships are the focus of the research (Ravitz, Maunder, Hunter, Sthankiya, & Lancee, 2010). Hazan and Shaver (1987) were the first to construct a self-reported measure (Adult Attachment Styles questionnaire) of adult attachment in the context of romantic relationships. They identified three types of adult romantic attachment congruent with the classifications for infants described by Ainsworth (1978). This was later expanded to four categories of adult attachment, developed by Bartholomew and Horowitz (1991), which are more commonly accepted (Ravitz et al., 2010). These categories are secure, anxious-preoccupied, dismissive-avoidant and fearful-avoidant.

However, original categorical measures that assign individuals to one type of attachment style have been heavily criticised, as they neglect differences amongst people within categories (Mikulincer & Shaver, 2007) and have limited statistical power when compared with dimensional measures (Fraley & Shaver, 2000). Consequently, an alternative perspective was developed that conceptualizes individual differences in attachment as variations along continuous dimensions (Brennan, Clark, & Shaver, 1998). Feeney (2008) suggests two higher order dimensions: attachment anxiety and attachment avoidance. Attachment anxiety refers to the fear of being rejected or abandoned. People prone to attachment anxiety will engage in thoughts, feelings and actions that focus on their attachment figures and whether this person is

available and responsive. Attachment avoidance refers to discomfort with intimacy and interdependence. Such people will experience pessimistic beliefs about others and avoid closeness to others whilst asserting their independence and self-reliance (Locke, 2008).

As working models underpinning attachment are traditionally conceptualised as trait-like, self-reported questionnaires often explore experiences in close relationships in general terms, rather than focusing on specific relationships. However, this has been criticised, as people have shown within-person variation of attachment patterns regarding different attachment figures (Brumbaugh & Fraley, 2007; Klohnen, Weller, Lou, & Choe, 2005). Recently, the Experiences in Close Relationships-Relationship Structures questionnaire (ECR-RS; Fraley, Heffernan, Vicary, & Brumbaugh, 2011) has been advocated as a useful attachment measure because it addresses the potential variability in the homogeneity of people's working models. The measure therefore explores attachment across different relationships. It also addresses other common methodological issues affecting other adult attachment measures including referential ambiguity, length and lack of breadth (Fraley, Heffernan, et al., 2011).

Why is Adult Attachment Useful to Consider in Regard to HRQOL and ABI?

As the adult attachment system is proposed to function as an internal resource (helping to regulate interactions, perceptions and emotions towards self and others) particularly during times of threat, the theory may help further to explain patterns in outcomes after ABI, which is likely to be perceived by the individual as an extremely threatening and unsafe time. Adult attachment will be demonstrated to be an important variable to consider after ABI, such as stroke or TBI. First, it will be considered for the association with key outcome variables commonly experienced after

injury, including psychological distress and social isolation. Second, it will be shown that adult attachment has been identified as an important predictor of HRQOL in other samples. It will thus be proposed that adult attachment may help further to explain additional variance in HRQOL after ABI. This research will consequently explore whether this proposed relationship is mediated through psychological distress and social isolation or whether it is directly related (see Figure 1). Finally, adult attachment theory will be shown to be an important consideration after ABI due to the theory's potential to develop professionals' understanding of patterns in therapeutic working alliances, which are important to foster in the pursuit of improving individuals' HRQOL after ABI.

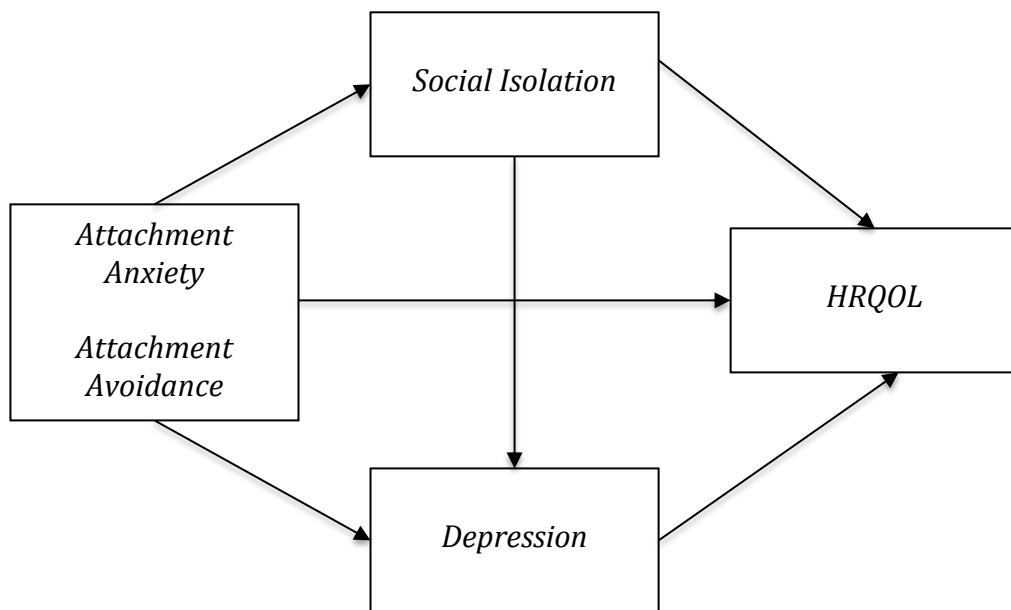


Figure 1. Theoretical model depicting potential direct and indirect relationships between adult attachment, social isolation, depression and HRQOL relationships.

Adult Attachment and Psychological Distress

Attachment theory has been considered essential for understanding the aetiology and maintenance of psychological distress (Shorey & Snyder, 2006). Meta-analysis has found more than a hundred studies indicating a negative association between secure attachment and psychological distress, most commonly conceptualised as depression (Mikulincer & Shaver, 2007). Securely attached individuals are also significantly less angry and have less interpersonal distress than those who exhibit high levels of anxious and/or avoidant attachment (Lopez & Brennan, 2000).

Research suggests that attachment anxiety has the strongest positive association with psychological distress (Shaver & Mikulincer, 2007; Wei, Heppner, & Mallinckrodt, 2003; Wei, Russell, & Zakalik, 2005), with other research suggesting that attachment avoidance fails to significantly predict psychological distress after attachment anxiety is controlled for (Lopez, Mauricio, Gormley, Simko, & Berger, 2001; Lopez, et al., 2002). This is consistent with the proposal that individuals high in attachment avoidance tend not to acknowledge their distress (Bowlby, 1988; Collins, 1996). However, in general it is commonly found that both attachment anxiety and attachment avoidance are positively related to depression and anxiety (Bosmans, Braet, & Van Vlierberghe, 2010; Catanzaro & Wei, 2010; Raque-Bogdan, 2011). Yet the processes through which the two attachment dimensions relate to psychological distress are proposed to be very different (Mikulincer, Shaver, & Pereg, 2003).

One useful model that highlights these differences is Shaver and Mikulincer's (2002) integrative model of the activation and dynamics of the adult attachment system (Figure 2). The model proposes that individuals' attachment systems are activated after experiencing a perceived threat. If this threat is followed by the unavailability of the attachment figure, individuals will experience distress. To compensate for this distress,

individuals will engage in one of two affect regulation strategies. These are known as hyperactivating or deactivating strategies and are believed to underlie individual differences in attachment anxiety and avoidance (Shaver & Mikulincer, 2004).

Individuals with high attachment anxiety utilise emotional hyperactivating strategies, which include heightened displays of distress, extreme efforts to maintain physical and psychological proximity to the attachment figure, heightened vigilance toward threats and intense monitoring of the availability of the attachment figure. The primary goal is to increase and maintain closeness to attachment figures, who are perceived as insufficiently concerned and available (Shaver & Mikulincer, 2004; Wei et al., 2005). Individuals who score highly on attachment avoidance are suggested to engage in emotional deactivating strategies. As proximity-seeking to the attachment figure is perceived as unfeasible and interpersonal relationships are perceived as unsafe, the individual engages in defensive independence and self-reliance, denial of attachment needs and suppression of attachment strivings (Mikulincer et al., 2003). This also includes a downplaying of the actual threats and a refusal to monitor the availability of attachment figures; as such behaviour may reactivate the system (Shaver & Mikulincer, 2004; Wei et al., 2005).

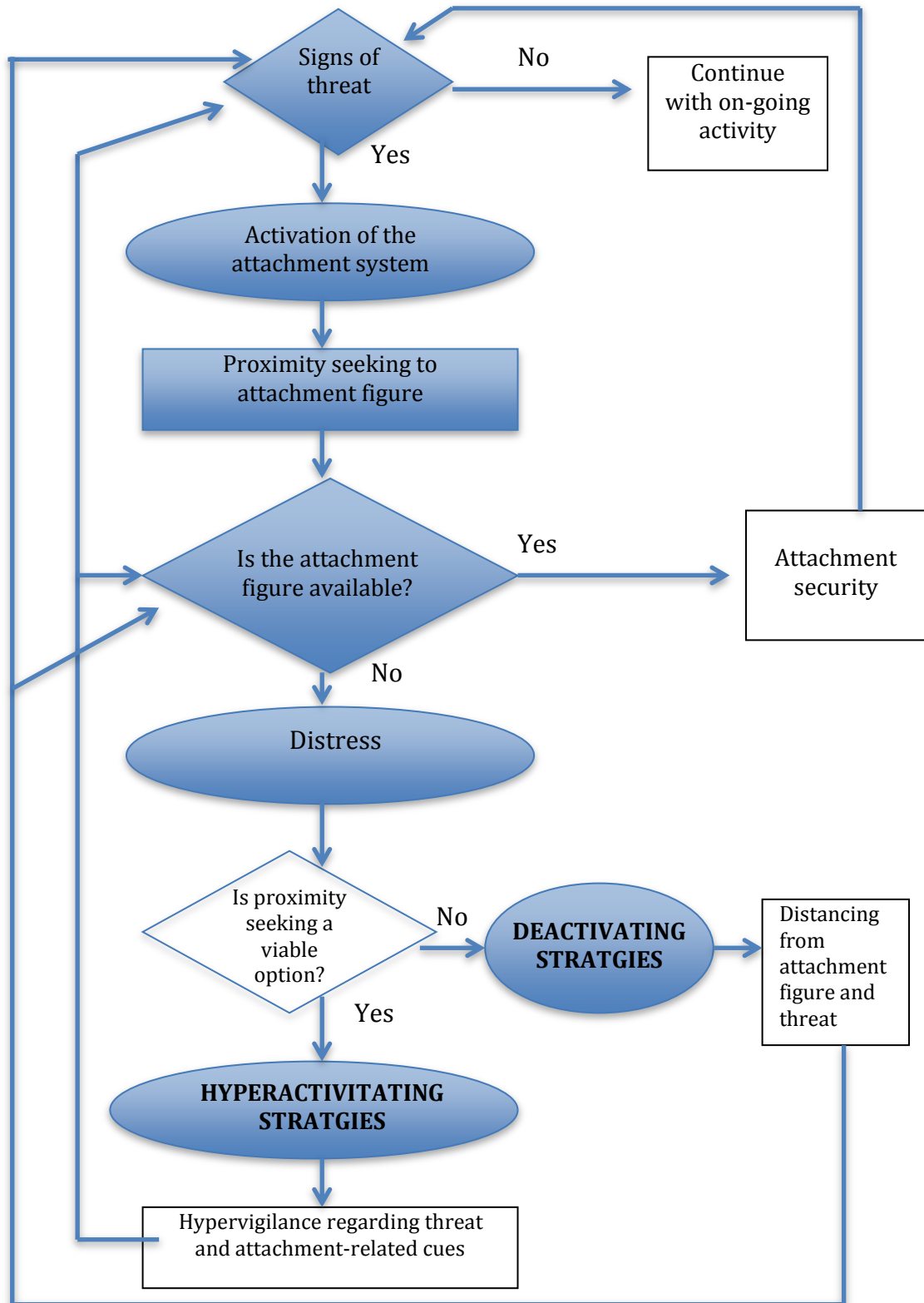


Figure 2. Shaver and Mikulincer's (2002) integrative model of the activation and dynamics of the adult attachment system.

Although both strategies temporarily reduce uncomfortable feelings created by interpersonal relationships during times of distress (Cassidy & Kobak, 1988; Wei et al., 2005), it is proposed that both contribute to psychological distress and interpersonal problems (social isolation and loneliness) in adulthood (Lopez et al., 2001; Wei et al., 2003; Wei et al., 2005). Hyperactivating strategies may at first lead to the desired increase of support, but rigid use of the strategy may leave attachment figures feeling overwhelmed and unable to provide the support requested. The attachment figures may subsequently reject the individual, causing further distress. Deactivating strategies may initially protect an individual from the unavailability or unresponsiveness of the attachment figure, but uncompromising use of this strategy may result in the individual feeling isolated (Wei et al., 2005).

Individuals who score highly on attachment avoidance and/or attachment anxiety rate their coping styles as less effective than do securely attaching individuals (Wei et al., 2003). This is supported by findings demonstrating that hyperactivating strategies are related to negative emotion-focused coping, escape/avoidance coping and mental rumination, whilst deactivating strategies are related to distancing/diverting strategies, high levels of emotional control, and limited use of social support and problem-focused coping (Berry & Kingswell, 2012; Holmberg, Lomore, Takacs, & Price, 2011; Lopez et al., 2001; Mikulincer, 2007; Ognibene & Collins, 1998; Wei et al., 2003). Self-criticism is also associated with high scores for attachment anxiety and avoidance (Zuroff & Fitzpatrick, 1994) and is suggested to fully mediate the relationships between attachment anxiety and psychological distress (Catanzaro & Wei, 2010). The relationship between attachment anxiety and psychological distress is also fully mediated by individuals' perceived ability to problem solve (Wei et al., 2003). Attachment avoidance is only partially mediated by both variables.

Based on Lazarus' (1993) coping model, it has been suggested that a secure attachment, which is associated with active coping, positive reframing, improved outcomes and post-traumatic growth (Bellizzi et al., 2009), can act as a protective factor for positive personal and environmental coping resources, such as self-esteem and social support (Mikulincer & Florian, 1998). It is proposed that such positive coping resources precede and influence the cognitive appraisal of whether an individual judges an event as irrelevant and benign or threatening and stressful, and the implementation of constructive coping strategies. That is, individuals' adaptive coping may be explained by their tendency to see stress as manageable and their own resources as adequate, which is likely to be influenced by individuals' attachment (Alexander, Feeney, Hohaus, & Noller, 2001).

These patterns of self-appraisals and coping among insecure attachments are associated with higher levels of psychological distress when compared with coping strategies implemented by securely attached individuals, including those characterised as active, interpersonal, and problem-focused (Dimiceli, Steinhardt, & Smith, 2010; Folkman, 1997; Whatley, Foreman, & Richards, 1998). Similar findings of the impact of such coping styles have been replicated in ABI samples. High prevalence of maladaptive coping strategies is strongly associated with negative outcomes after ABI (Anson & Ponsford, 2006; Darlington et al., 2007; Tomberg et al., 2007).

Adult Attachment and Social Isolation

Adult attachment theory is also helpful to consider in regard to social interactions during times of distress (such as recovery from ABI), as individuals' internal working model provides a lens through which people evaluate and appraise social interactions (Collins & Feeney, 2004). It is demonstrated that individuals who

exhibit secure attachment and individuals who score highly on attachment anxiety seek the greatest amount of support, whilst attachment avoidance is associated with a reduced tendency to seek social support during times of distress (Collins & Feeney, 2000; Mikulincer, Orbach, & Iavnieli, 1998; Ognibene & Collins, 1998; Turan, Osar, Turan, Jilkova, & Damci, 2003; Vogel & Wei, 2005;). Secure individuals seek social support, as attachment figures are perceived as safe and able to provide a secure base to manage and cope with the perceived threat. Conversely, individuals high in attachment anxiety seek social support due to the belief that they are inadequately equipped to manage difficulties alone (Shaver & Mikulincer, 2002). High attachment avoidance results in individuals perceiving social support as threatening and leads individuals to rely on themselves to manage their distress during times of perceived threat (Vogel & Wei, 2005).

This suggests that attachment avoidance is likely to be associated with the greatest amount of social isolation during times of distress such as coping with ABI. However, social isolation may also be experienced positively and help to reduce anxiety, as social support is considered threatening. Research actually suggests that individuals with high attachment anxiety and/or avoidance perceive the least amount of social support and appraise supportive/helpful behaviour as less supportive when compared with securely attached individuals (Collins & Feeney, 2004; Ognibene & Collins, 1998; Vogel & Wei, 2005). This is especially true when messages from attachment figures are ambiguous. This occurs if attachment figures lack the appropriate skills, resources and motivation to provide effective support (Feeney & Collins, 2003). Such ambiguous messages may be experienced after an ABI as attachment figures lack adequate knowledge about ABI and may be coping with their own life changes. Furthermore, attachment anxiety and avoidance are both positively

associated with loneliness, although attachment anxiety exhibits a stronger relationship (Kafetsios & Sideridid, 2006; Wei et al., 2005). This is likely to be due to the discrepancy between desire for social support and the actual support received. It is proposed that individuals with a secure attachment have the greatest confidence in the responsiveness of partners, greater satisfaction with the support they receive, and more positive expectations about others' supportiveness (Mikulincer & Shaver, 2007). Consequently, it is suggested that secure individuals remain unperturbed during times of distress and experience longer periods of positive emotions, which contribute to mental health and social adjustment (Mikulincer & Shaver, 2009).

In addition, it is suggested that the association between attachment avoidance, attachment anxiety and psychological distress is mediated by perceived social support (Chi Kuan Mak, Bond, Simpson, & Rholes, 2010; Larose & Berniers, 2001; Moreira et al., 2003), although attachment anxiety appears to have a direct and crucial effect on psychological distress (Vogel & Wei, 2005). Similar mediating results have been found in stroke survivors (Li, Li, & Dai, 2008). This suggests that individuals with high attachment anxiety and/or avoidance may experience psychological distress after a stroke if they perceive a lack of social support. This may in turn be exacerbated by ambiguous messages from attachment figures due to that individual's lack of knowledge of neurological conditions. It has also been suggested that perceived social support mediates the relationship between attachment security and lower psychological distress in cancer outpatients (Rodin et al., 2007). This suggests that securely attached individuals will perceive the most amount of social support. Due to secure individuals' internal working models this support will be experienced as safe and containing, whilst fostering positive self-perceptions. This is likely to protect against the development of psychological distress. It is therefore likely that individuals with a more secure

attachment pattern will have the greatest level of HRQOL after a significant life event (such as an ABI) due to these associations with psychological distress and social support.

Adult Attachment and Relationships

Adult attachment is also important to consider when exploring relationship statuses and satisfaction, which have previously been demonstrated to be negatively impacted after ABI, and serve as a possible predictor of individuals' HRQOL (Blais & Boisvert, 2005; Williamson et al., 2013). It has been suggested that a secure romantic relationship may dampen the impact of a stressful life event and thus reduce individuals' reactivity to perceived threat (Selcuk, Zayas, & Hazan, 2010). Furthermore, a significant negative association has been found between relationship quality/satisfaction and attachment avoidance/anxiety (Collins & Feeney, 2004; Crowley, 2013).

The impact of attachment patterns on relationship satisfaction may be embedded in differences in conflict- and intimacy-seeking behaviours (Pietromonaco, Barrett, & Powers, 2006). Both attachment anxiety and attachment avoidance lead to an increase in destructive and coercive conflict management strategies (Selcuk et al., 2010). Moreover, Campbell, Simpson, Boldry, and Kashy (2005) find that anxiously attached people place a considerable amount of importance on partners' supportive behaviour and perceive it to be less adequately available on a daily basis. Conversely, avoidant attached individuals use their spouses less for emotional regulation, and are less likely to be influenced by changes in their partner's positive affect cycles (Butner, Diamond, & Hicks, 2007).

This negative impact on relationship satisfaction may subsequently have an effect on relationship status and relationship dissolution. Indeed, attachment avoidance and attachment anxiety have been demonstrated to have a small effect on relationship dissolution (Le, Dove, Agnew, Korn, & Mutso, 2010). Moreover, attachment avoidance has been positively associated with divorce and multiple marriages (Ceglian & Gardner, 1999; Hill, Young, & Nord, 1994), whereas attachment anxiety is associated with staying in unhappy marriages (Cobb, Davila, & Bradbury, 2001). Secure attachment is associated with marriage stability (Mikulincer & Shaver, 2007) and marriage satisfaction for both partners, which can protect against marital dissolution (Hirschberger, Srivastava, Marsh, Cowan, & Cowan, 2009). Therefore, adult attachment theory may help to explain differences in conflict management and thus marriage satisfaction. Consequently, there may be a difference in levels of attachment in different relationship statuses after ABI.

Adult attachment and Physical Health

Adult attachment is also suggested to impact on individuals' physical health. It has been demonstrated that avoidant attachment ratings are associated with conditions defined primarily by pain and anxious attachment ratings are positively associated with a wider range of health conditions, including cardiovascular conditions (McWilliams & Bailey, 2010). Maunder and Hunter (2001) considered three mechanisms that could lead those with insecure attachments to have elevated rates of disease and poorer physical health. It was proposed that insecurely attached individuals have an increased susceptibility to stress, which has a negative impact on physical health. Moreover, insecure individuals have a greater tendency to use external methods to self-regulate affect, such as substance misuse, under or over-eating and engaging in risky sexual

activity, all of which have a negative impact on physical health. Finally, insecurely attached individuals use less effective help-seeking behaviours, such as inappropriate use of social support and difficulties using medical assistance. Adult attachment is also suggested to be associated with medication adherence, which is again likely to affect physical health (Ciechanowski, Katon, Russo, & Walker, 2001). These findings suggest that adult attachment may be particularly useful to consider after ABI, which is commonly associated with more negative physical health-related outcomes, which are in turn associated with reduced HRQOL (Steadman–Pare et al., 2001).

The Role of the Therapeutic Relationship in Services for People with ABI

Adult attachment has been suggested to play an important role in the development and maintenance of therapeutic relationships, and thus in the outcomes from psychological therapies (Mikulincer, Shaver, & Berant, 2013). Specifically, global attachment security has demonstrated a positive association with the strength of the therapeutic alliance developed between patients and therapists/care-teams (Diener & Monroe, 2011; Smith, Msetfi, & Golding, 2010), whilst global attachment avoidance has a small negative effect (Smith et al., 2010). Research exploring patients' attachment to their therapists suggests that individuals who rate themselves as securely attached experience a better alliance (Mikulincer et al., 2013; Smith et al., 2010), whereas attachment avoidance is associated with reduced satisfaction and quality of the working alliance (Marmarosh et al., 2009; Smith et al., 2010). This is important because a stronger working alliance is considered a good predictor of successful therapeutic outcomes (Horvath, Del Re, Flückiger, & Symonds, 2011).

Moreover, different attachment patterns have been associated with a range of within-treatment behaviours. High attachment avoidance is associated with less help-

seeking, reduced treatment/medication adherence and greater fear of shame and humiliation during treatment (Ciechanowski et al., 2004; Dozier, 1990; Marmarosh et al., 2009). Individuals high in attachment anxiety may engage emotionally but are less compliant than secure clients (Daniel, 2006). Individuals with a secure attachment are more able to manage self-exploration and engage in self-disclosure, and they are more committed to treatment (Korfmacher, Adam, Ogawa, & Egeland, 1997; Mikulincer & Nachshon, 1991). These differences may explain why secure attachment is most strongly associated with positive treatment outcomes (Byrd, Patterson, & Turchik, 2010; Levy, Ellison, Scott, & Bernecker, 2011). Consequently, understanding patients' attachment patterns will help clinicians better to understand treatment behaviours and may inform intervention choice and strategies (Daniel, 2006; Harris, 2004). Similarly, in neurological rehabilitation it has been suggested that attachment theory may help the therapist to develop a clearer understanding of a patient's autobiographical history and reoccurring coping behaviours. It is also suggested that such knowledge is fundamental in the building of strong working relationships with individuals with neurological conditions (Laaksonen & Ranta, 2013).

Adult Attachment and Significant Life Experience

A paucity of research has considered how adult attachment may impact the outcomes for people with neurological conditions. However, adult attachment has been explored in regard to psychological distress, social isolation and QoL among people who have experienced a range of traumatic or significant life experiences. These findings may inform how adult attachment could impact individuals recovering from ABI such as stroke or TBI.

Prevalence of insecure attachment. It is reported that after the development of a chronic illness/disability, individuals predominantly exhibit an insecure attachment. This includes individuals with cancer (Schmidt, Nachtigall, Wuethrich-Martone, & Strauss, 2002), Crohn's disease (Agostini et al., 2010), chronic pain (Pearce, Creed, & Cramond, 2001), diabetes (Ciechanowski et al., 2004), Hepatitis C (Sockalingam, Wnuk, Strimas, Hawa, & Okrainec, 2011), Human Immunodeficiency Virus (HIV; Ciesla, Roberts, & Hewitt, 2004) and lupus (Bennett, Fuertes, Keitel, & Phillips, 2011). This is noticeably different to data collected from non-clinical samples, which suggests that secure attachment is the most common attachment style (Bakermans-Kranenbur & van IJzendoorn, 2009). Although these results are unable to determine the cause and effect of this association, it is possible that the psychosocial challenges experienced after the development of a chronic condition changes individuals' patterns of adult attachment (Bowlby, 1988).

Psychological distress, social isolation and other psychosocial outcomes.

Insecure adult attachment has been associated with psychological distress among individuals with chronic conditions, including Hepatitis C (Sockalingam et al., 2011), infertility (Mikulincer, Horesh, Levy-Shiff, Manovich, & Shalev, 1998), chronic pain (Mikulincer & Florian, 1998), and posttraumatic stress disorder (PTSD; O'Connor & Elklit, 2008). Insecure attachment, especially attachment avoidance, has also been associated with increased symptoms among individuals with PTSD (Benoit, Bouthillier, Moss, Rousseau, & Brunet, 2009) and chronic pain (Meredith, Strong, & Feeney, 2007) and with physical symptoms among individuals receiving general mental health treatment (Ciechanowski, Walker, Katon, & Russo, 2002). Finally,

secure attachment may act as a protective factor against the development of psychological distress during divorce (Birnbaum, Orr, Mikulincer, & Florian, 1997).

Furthermore, secure adult attachment has been associated with positive adjustment after the development of a chronic condition, including PTSD (O'Connor & Elklit, 2008), chronic pain (Meredith, Onsworth, & Strong, 2008), lupus (Bennett et al., 2011), infertility (Mikulincer, Horesh et al., 1998) and diabetes (Bazzaziana & Besharat, 2010). Conversely, attachment anxiety has been associated with negative adjustment (including high levels of suffering, fear of disease, hypervigilance, catastrophising and distress) to chronic conditions and laboratory experiments exploring pain tolerance (Bazzaziana & Besharat, 2010; Meredith, Strong, & Feeney, 2006; Schmidt, Strauss, & Braehler, 2002). It has also been suggested that attachment avoidance may have a direct negative impact on adjustment to a chronic condition, whilst simultaneously exhibiting a positive association with illness perception and task-orientated coping (Bazzaziana & Besharat, 2010). It is suggested that these conflicting findings may be due to the lack of differentiation between dismissing and fearful attachment in the research (Bazzaziana & Besharat, 2010). In particular, dismissing attachment (high attachment avoidance) is associated with less self-disclosure and greater sense of disease control, whilst fearful attachment (high attachment avoidance and anxiety) is associated with fear of rejection and limited self-reliance (Bazzaziana & Besharat, 2010). It has also been proposed that secure attachment styles have a positive effect on illness perception, and that this positive perception, alongside the usage of more task-orientated coping, predicts better adjustment and HRQOL (Bazzaziana & Besharat, 2010; Dennison, Moss-Morris, & Chalder, 2009; Stafford, Berk, & Jackson, 2009). Securely attached individuals are also more likely directly to engage with their illness and seek social support (Schmidt,

Nachtigall, et al., 2002). This has a positive impact on adjustment and suggests that securely attached individuals perceive their situations as less threatening than do insecurely attached individuals (Bartley, Head, & Stansfield, 2007).

Hyperactivating and deactivating strategies may also be important to consider in the context of chronic conditions. It has been shown that anxiously attached patients with chronic conditions utilise more hyperactivating strategies in their coping behaviours, while those with avoidant attachment rely heavily on deactivating strategies (McWilliams & Asmundson, 2007; Schmidt, Nachtigall, et al., 2002). Subsequent research has suggested that secure attachment is significantly associated with active coping and positive reframing (Schmidt, Blank, Bellizzi, & Park, 2012) in cancer survivors.

Relationship difficulties. The impact of adult attachment styles on individuals' marital relationships and their ability to provide and receive caregiving support has also been explored during stressful life events. It is suggested that cancer patients who are securely attached are better able to seek support and that caregivers who are securely attached are better able to provide affective support. Furthermore, attachment avoidance and attachment anxiety are associated with lower marital satisfaction and less responsive caregiving, which in turn may lead to distress in both parties while managing the effects of cancer (Braun, Mikulincer, Rydall, Walsh, & Rodin, 2007; Hunter, Davis, & Tunstall, 2006; Kayser, 2005). Caregivers are more likely to have difficulties in providing sensitive and cooperative care to partners who are more anxiously or avoidantly attached (Mikulincer & Shaver, 2007). This is in turn associated with reduced functional well-being for the partner (Porter et al., 2012).

Furthermore, spousal attachment anxiety is associated with poorer marital satisfaction reported by the patient while managing the effects of cancer (Porter et al., 2012).

However, due to the dyadic nature of adult attachment, attachment patterns are also likely to impact on how an individual receives support during stressful life experiences. Individuals scoring higher on avoidant attachment scales are more likely to reject their partners' caregiving bids and frustrate their partners' efforts. Individuals scoring higher on attachment anxiety, who desperately desire love, are more likely to be overly dependent and demanding. As a result, they may burden their partner and create high levels of caregiving distress (Braun et al., 2007). Therefore, it seems logical that adult attachment may be important to consider in regard to marital relationships and caregiving patterns in couples managing and coping with ABI.

Quality of life. Given the association of adult attachment with psychological distress, coping strategies, social support, relationship satisfaction and physical health, it is an appropriate model to explore with regard to HRQOL after a stressful life event or development of a chronic condition (such as ABI).

It has been proposed that a lower level of attachment anxiety is significantly related to greater levels of HRQOL among Haitian immigrants (Belizaire & Fuertes, 2011) and individuals with HIV (Martin, Vosvick, & Riggs, 2012). Higher attachment anxiety has also been shown to be the main factor associated with lower physical HRQOL for gynaecological cancer survivors above other predictors including depression and anxiety. For all women in the study the main predictor for mental HRQOL was anxiety, although attachment anxiety was also shown to be a significant predictor (Hsieh, Chen, Hsiao, & Shun, 2013). This is further supported by research utilising categorical data on adult attachment, with fearful and preoccupied individuals

showing the lowest HRQOL (Bodner & Cohen-Fridel, 2010). Furthermore, anxious ambivalent attachment and depression have been shown to be substantial and independent predictors of HRQOL in depressed patients. Attachment avoidance has been shown not to be associated with the measure of HRQOL (Ponizovsky & Drannikov, 2013).

Other research exploring HRQOL among individuals with lupus and bariatric surgery candidates proposes that both attachment avoidance and attachment anxiety are significantly and negatively associated with a lower score on generic measures of HRQOL (Bennett et al., 2011; Sockalingam et al., 2011). Furthermore, both attachment avoidance and attachment anxiety were shown to predict HRQOL among breast cancer survivors, even when accounting for the variance explained by perceived social support. It was proposed that this demonstrates that attachment insecurity is a unique predictor of HRQOL over and above its relationship with social support (Fagundes, Jaremka, Malarkey, & Kiecolt-Glaser, 2014).

The literature often suggests that attachment avoidance is associated with lower levels of HRQOL because of individuals' limited use of social support (Sockalingam et al., 2011). Limited explanation has been provided for the association between attachment anxiety and low levels of HRQOL. The association may be the result of the individual's continuous demand for help and support, which, when rejected, confirms working models that they are unable to manage the situation. This, in turn, may result in increased psychological distress and limited responsibility for physical health care, which in turn impacts on HRQOL. Ponizovsky and Drannikov (2013) suggest that attachment anxiety is likely to be associated with HRQOL as attachment anxiety underlies the most dysfunctional and unstable interpersonal relationships, which will contribute to reductions in HRQOL. The authors also suggest that the reason

attachment anxiety is able to predict HRQOL to a greater extent than attachment avoidance is as a result of greater emotional distress among individuals with high attachment anxiety.

What is agreed in the research is that secure attachment is associated with better HRQOL (Bennett et al., 2011; Ponizovsky & Drannikov, 2013; Sockalingam et al., 2011). It has been suggested that for individuals with lupus, this association is due to individuals with secure attachment being more likely to experience positive adjustment, higher levels of rehabilitation success, better coping resources and better control of physical outcomes, which are all key components of HRQOL (Bennett et al., 2011).

Adult Attachment Neurological Conditions

A paucity of research has considered how adult attachment impacts the outcomes for people with neurological conditions. Several studies have considered adult attachment among individuals with dementia (Brown & Sholpsberg, 2006). Recently, Nelis, Clare and Whitaker (2012) have demonstrated that people with dementia present with predominantly insecure attachments, which is similar to findings considering other chronic conditions. However, although secure attachment was shown to be related to a more positive self-concept and fewer symptoms of anxiety, as would be expected, attachment was not shown to be associated with QoL (Nelis et al., 2012). This contrasts with previous research exploring HRQOL and adult attachment (Bennett et al., 2011).

To date, only two studies have explored adult attachment within samples of individuals with ABI. Dodd (2010, non-published thesis) explored adult attachment, depression, social support, and resilience among individuals with acquired disabilities.

Participants in this study included individuals with spinal cord injuries, amputees, and an unspecified number of TBI survivors. Li et al. (2008) investigated the relationship between adult attachment, social support and depression within a sample of 100 post-stroke patients. In this investigation, romantic adult attachment was explored using the Experiences of Close Relationships Inventory (Brennan et al., 1998), which utilises the dimensions of attachment anxiety and avoidance and the Relationship Questionnaire (Bartholomew & Horowitz, 1991), a categorical attachment questionnaire.

Comparing results to a college sample, Li et al. (2008) found that the average score for attachment avoidance and anxiety did not differ between the groups. However, similar to results from research on other chronic conditions, distribution of the RQ attachment types demonstrated a significant difference, with a much higher rate of dismissing individuals (high avoidance) in the stroke sample. Although unable to determine cause and effect for this relationship, the authors suggest that the traumatic experience of the stroke leaves survivors feeling isolated and disillusioned about relationships. This results in a more negative view of others (equivalent to high attachment avoidance) and an increased positive view of the self (equivalent to low attachment anxiety). This fits with Bowlby's (1988) understanding that adult attachment styles reflect a relatively stable relationship orientation, which can be modified after disconfirming life events.

Li et al. (2008) demonstrated a positive association between both attachment avoidance and attachment anxiety with depression, and a negative association with measures of social support. This supports the results linking insecure attachment, psychological distress and social support in other chronic conditions (Schmidt, Nachtigall, et al., 2002; Sockalingam et al., 2011). Li et al. (2008) found similar patterns when using attachment categories, as a significant difference was found

between the three insecure classifications of attachment in depression and social support when compared to secure attachment. Of the three insecure classifications, *fearful* and *preoccupied* patients (both with high levels of attachment anxiety) reported the highest levels of depression and the lowest levels of social support. Finally, it was shown that the relationship between attachment anxiety/avoidance and depression was mediated by social support, and that only a significant direct path was present for attachment anxiety, similar to other results (Vogel & Wei, 2005).

These findings suggest that after a stroke, securely attached individuals experience fewer interpersonal problems, such as reduced social support. Furthermore, both attachment avoidance and attachment anxiety are significantly associated with psychological distress, but as demonstrated in previous research, attachment anxiety has the stronger association. The authors suggest that there is a direct path for the impact of attachment anxiety on psychological distress, but the association of attachment avoidance and psychological distress is mediated through a lack of social support, which is similar to previous results (Vogel & Wei, 2005).

Summary and Proposed Research

ABI is associated with a range of lifelong negative outcomes, which can have a devastating impact on survivors and their surrounding families. These include psychological distress, social isolation, changes in important relationships and subsequently reduced levels of HRQOL. With the DoH's focus on PROMS, increased efforts have been made further to understand important predictor variables of HRQOL. Both psychological distress and reduced social support have been demonstrated as two important variables to consider. However, few overarching frameworks that may

further professionals understanding of these common negative outcomes after ABI including lower levels of HRQOL have been considered.

The biopsychosocial theory of adult attachment may be one such framework to consider, as it has been demonstrated that attachment anxiety and attachment avoidance are consistently associated with important predictors (e.g. psychological distress and social support) of HRQOL. However, at present, a very limited number of studies have explored adult attachment after the development of a neurological condition, and none at all have considered the dimensions of adult attachment and HRQOL in a broad inclusive sample of ABI survivors. Despite the lack of research exploring neurological conditions and adult attachment, research considering adult attachment, psychological distress, social isolation, HRQOL, relationship difficulties and satisfaction among other individuals experiencing different life-changing situations allows for some predictions to be made about the impact of adult attachment after ABI.

It is predicted that after ABI, both attachment anxiety and attachment avoidance will be associated with negative outcomes for both the patient and his/her close relatives. This may include increased psychological distress and social isolation as individuals rely on hyperactivating and deactivating strategies. It can also be predicted that after ABI, the dimensions of attachment anxiety and avoidance will be inversely associated with relationship satisfaction and positively associated with caregiver burden and relationship breakdown. Consequently, it would be logical to predict that both attachment anxiety and attachment avoidance would be inversely related to HRQOL, which has been demonstrated in a variety of different samples.

However, no research to date has explored adult attachment in a broad ABI sample, or considered how adult attachment may help to understand HRQOL after

experiencing a brain injury. The principle aim of this research is to develop a clearer understanding of the presentation of adult attachment after ABI and whether adult attachment may explain additional variance within HRQOL. The possible mediating effects of psychological distress and social isolation on the relationship between adult attachment and HRQOL will also be considered. Furthermore, previous research has also failed to consider adult attachment and individuals' relationship status after ABI, despite evidence indicating that this would be worthwhile (Hirschberger et al., 2009). Finally, as research utilising the ECR-RS (Fraley, Heffernan, et al., 2011) and QOLIBRI (von Steinbüchel et al., 2010a, b) is limited, due to the recent creation of both measures, this study will also further explore the psychometric properties of the measures in an inclusive ABI sample.

As a result of the present review, the following research questions were asked:

1. What is the prevalence of attachment anxiety and attachment avoidance amongst individuals who have sustained ABI? Are levels of attachment anxiety and attachment avoidance similar to norm data, or data reporting higher rates of insecure attachment for individuals experiencing significant life experiences?
2. Are there differences in reported attachment styles between groups of individuals with different relationship statuses after ABI?
3. Are attachment anxiety and attachment avoidance associated with psychological distress, social isolation and HRQOL after ABI?
4. Do attachment anxiety and attachment avoidance account for additional variance in HRQOL above that explained by psychological distress and social isolation?

5. Do social isolation and psychological distress mediate the possible association between adult attachment dimensions and HRQOL?

Based on the literature review, it was hypothesised:

1. High levels of attachment avoidance and attachment anxiety will be reported among individuals with ABI;
2. There will be a difference in level of attachment anxiety and attachment avoidance between difference categories of relationship statuses;
3. Both attachment anxiety and attachment avoidance will be positively associated with psychological distress and social isolation and demonstrate a negative association with self- reported HRQOL;
4. Both attachment anxiety and attachment avoidance will account for additional variance in HRQOL above that explained by psychological distress and social isolation;
5. A direct and indirect effect through social isolation and psychological distress between adult attachment dimensions and HRQOL will be suggested through mediation analysis.

Methods

Design

To explore quality of life and adult attachment after ABI, this quantitative research utilises a non-experimental, cross-sectional cohort design. This design has been used consistently to assess QoL after ABI (Andelic et al., 2009; von Steinbüchel et al., 2010a).

Participants

Services involved in the research. Participants were recruited from eight specialised neurorehabilitation services (according to the National Definition Set for rehabilitation services, British Society for Rehabilitation Medicine, 2008) across London and the South East of England. These eight services provide a range of neurorehabilitation programmes and support services for survivors of brain injury and their respective families. Broadly, the eight services involved in the current study share the primary goal of maximising the recovery and quality of life of both the individual with ABI and their family. Moreover, each of the services utilise a person-centred approach to care, conceptualising each patient as an individual with unique qualities, abilities and personal goals, instead of as a collection of behaviours and symptoms.

However, there are significant differences between the eight neurorehabilitation services used in the current study. These differences include the type of patients accepted for treatment in regards to injury severity, functional difficulties, and time since injury. Also, the services differ in the length and type of rehabilitation that is typically offered. Consequently, the structure of the support that is provided by each service varies considerably. A summary of each service and the

number of participants recruited from the service is provided below.

- 1) **Headway East London and Headway South East London.** This charity service provides community day centres for a variety of people who are living with the long-term consequences of ABI. The centres do not place a restriction on time since injury or level of disability. The service's primary focus is on providing a relaxed and supportive atmosphere for service users to socialise and engage in leisure activities. However, a selection of specialist services, such as occupational therapy, are also provided. A total of 13 participants were recruited from this service.
- 2) **The Oliver Zangwill Centre (Cambridgeshire).** This NHS service provides an 18-week neurorehabilitation day programme for adults of working age with ABI, most typically TBI. Accepted referrals are most commonly for individuals who are several years post injury and are struggling to cope and manage in their local community as a result of their injury. Patients require some level of independence, as they are expected to stay within the local area during the programme. Consequently patients are commonly considered to be relatively high functioning in regards to cognitive ability. A total of 10 participants were recruited from this service.
- 3) **Kerwin Court (Sussex) and Fen House (Surrey), part of the Brain Injury Rehabilitation Trust.** These charitable foundations provide specialist inpatient and residential neurobehavioural rehabilitation for individuals of working age with ABI. They usually admit patients

directly from the acute hospital setting once medically stable. A total of 7 participants were recruited from these charitable foundations.

- 4) **Queen Elizabeth Neuro Rehabilitation Service (Surrey).** This service provides a variety of both short- and long-term residential and non-residential specialist neurorehabilitation programmes for individuals after ABI. It typically admits patients directly from acute hospital settings, but it also takes patients from the community many months or years post injury. A total of 5 participants were recruited from this charitable foundation.
- 5) **Blackheath Brain Injury Rehabilitation Centre (South East London).** This service, which is funded by an independent care provider, consists of 2 inpatient units. One service specialises in neurorehabilitation for those who are exhibiting significant cognitive impairment and challenging behaviour as a result of an ABI. A further service supports individuals who have complex physical disabilities following an ABI. Both services admit patients directly from the acute hospital setting, as soon as they are medically stable. A total of 4 participants were recruited from this service.
- 6) **The Wolfson Neurorehabilitation Centre at St George's Hospital and Queen Mary's Hospital (South London).** This service provides a 12-week inpatient specialist neurological programme within a hospital setting for individuals who have recently sustained ABI resulting in physical and/or psychological disability. Referrals most commonly come direct from an acute setting and are predominantly for older adults. A total of 1 participant was recruited from this NHS service.

Inclusion and exclusion criteria. To maximise the homogeneity of the participants for the current research, all participants were of working age (between 18 and 65) and described English as their main language. Individuals who had a known history of severe mental health problems (such as schizophrenia or other psychotic disorder) or who had a pre-existing learning disability were excluded from the study. Participants currently receiving acute rehabilitation or suffering from posttraumatic amnesia (PTA- the interval between injury and when the person regains continuous ongoing memory, McMillan, Jongen, & Greenwood, 1996) were also excluded. Furthermore, participants were required to have the capacity and cognitive ability fully to understand the research. Consequently, individuals who were too cognitively impaired to understand and complete the questionnaires and/or lacked the capacity to consent to the research were excluded. The clinical team within each service made this decision, as it was deemed they possessed the best clinical understanding of each potential participant.

Sample size. It was calculated that a total of 43 participants were required to complete the questionnaires to ensure adequate power for a large effect size. This was calculated using *g*power* 3.1.3 (Faul, Erdfelder, Lang, & Buchner, 2007) with a traditional p-value of .05 and power value of .80 (Cohen, 1988). An estimated effect size of .36 was first calculated through summing four relevant correlation coefficients from Li et al. (2008). Subsequently, due to the planned use of multiple regressions, a sample of Adjusted R²s from past research exploring QoL after acquired brain injury (all of which had included psychological distress) was considered. These samples ranged from .38 (King, 1996) to .58 (von Steinbüchel et al., 2010b). The smallest R² was converted into F² (effect size) via the equation $r^2/(1-r^2)$, which provided an effect

size of .61. However, as 0.61 is a very large effect size, the sample size was recalculated using the traditional large effect size (.35). Calculations indicated that a minimum sample of 43 was required when using a multiple regression with up to five variables.

Sample characteristics. The mean age of the sample was 43.54 years ($SD = 12.61$), with a range of 21 to 65. The ratio of males to females was 1.86:1, with a total of 26 men and 14 women tested. There was a high level of unemployment within the sample. Out of the total sample, 3 participants volunteered, 4 participants were retired, 10 were retired due to their injury, and a further 13 were unemployed. Only 10 participants were in current full-time or part-time employment. Moreover, 57.5% of the sample was married ($n = 16$) or in a long-term relationship ($n = 7$), the remaining 42.5% were single ($n = 12$) or separated ($n = 5$).

A total of 17 (42.5%) individuals had sustained a TBI, 13 (32.5%) a cerebral vascular accident including various strokes and subarachnoid haemorrhages, 5 (12.5%) an injury as a result of an infection (e.g. encephalitis), and 5 individuals (12.5%) were classified as ABI due to other causes, including hypoxic damage, injury caused by malnutrition and drug overdose. The average time since injury was 60.36 months ($SD = 75.68$), with a range of 3.38 to 279.23 months. All TBI participants had sustained a severe injury. The level of injury severity was based on length of PTA, or length of unconsciousness, both of which are commonly used estimates of injury severity after head injury (Green, Rohling, Lees-Haley, & Allen, 2001). This information was gathered from self-reported information or from the participants' team or family. Although it is difficult to determine duration of PTA accurately through self-reported methods, as it is both retrospective and subjective, it has been proposed as a reliable

estimation of injury severity after TBI (McMillan et al., 1996). An estimation of injury severity was not included for individuals with non-TBI injuries as there is a lack of an accepted and easy to administer measure found within the literature. However, individuals' attendance to the various neurorehabilitation services involved in the research is an indication that their injuries had a significant impact on individuals' functioning.

The consideration of individuals' self-awareness is recommended in ABI research (Sasse et al., 2012). However, it is not standard practice (Cooper-Evans, Alderman, Knight, & Oddy, 2008; von Steinbüchel et al., 2010a). No measure of self-awareness was included in the current study as common awareness measures utilise the discrepancy between reports from a significant other and the patient. Such measures were beyond the scope of the current study due to time constraints and the size of sample that was required for adequate power.

Measures

Hospital Anxiety and Depression Scale (HADS, Zigmond & Snaith, 1983).

The HADS (see Appendix A) provides a brief self-reported (fourteen-item) measure of psychological distress, which produces separate scores for both anxiety and depression. Each item consists of a statement about a symptom of anxiety (e.g. "I feel tense or wound up") or depression (e.g. "I feel cheerful") and asks respondents to indicate the degree to which they have experienced that symptom over the past week on a four-point anchored scale that differs between items. Scores are summed within anxiety (HADS-A, seven items) and depression (HADS-D, seven items) subscales, and range from 0 to 21. The norm score for HADS-D is 3.68, and it is 6.14 for HADS-A

(Crawford, Henry, Crombie, & Taylor, 2001). However, cut-off points are commonly set at 8 (mild), 11 (moderate) and 16 (severe) (Zigmond & Snaith, 1983).

The HADS has been used extensively with individuals with ABI (Draper & Ponsford, 2009; Hawthorne, Gruen, & Kaye, 2009; von Steinbüchel et al., 2010b) and is considered especially appropriate for people with ABI due to its focus on psychological symptoms of anxiety and depression, which avoids confounding physical symptoms of mood disorders with those of medical conditions (Cooper-Evans et al., 2008). Utilising the standard cut-off score (≥ 8), it has been demonstrated that for the diagnosis of a mood disorder the HADS-D has a sensitivity of 85% for TBI and 58% for stroke. The specificity for HADS-D is 80% for TBI and 94% for stroke. Moreover, for the diagnosis for an anxiety disorder the HADS-A has a sensitivity of 81% for TBI and 52% for stroke. The specificity for HADS-A is 79% for TBI and 90% for stroke (Dahm, Wong, & Ponsford, 2009; Sagen et al., 2009). It has consequently been suggested that for the diagnosis of depression and anxiety after stroke a lower cut-off point is used. However, to allow for comparisons to previous research and to reduce the chance of a false positive the cut-off of ≥ 8 was used in the current research.

Furthermore, the HADS has been shown to have strong psychometric properties when used with ABI samples (Sagen et al., 2009; Schönberger & Ponsford, 2010). For example, the internal consistency of the HADS-D is reported at .88 for TBI and .83 for stroke. The internal consistency for the HADS-A is reported at .92 for TBI and .89 for stroke (Sagen et al., 2009; Whelan-Goodinson et al., 2009). The factor structure of the HADS has been found to fit for an ABI sample (Dawkins, Cloherty, Gracey, & Evans, 2006). Furthermore, the HADS has shown good concurrent validity

with other measures of anxiety and depression in a range of samples (Bjelland, Dahl, Haug, & Neckelmann, 2002).

Quality of Life in Brain Injury (QOLIBRI, von Steinbüchel et al., 2010a, b). The QOLIBRI (see Appendix B) was developed to provide a brief self-reported and sensitive disease-specific measure of HRQOL for individuals after TBI. Through international validation studies with over 900 individuals with TBI, thirty-seven items were selected (von Steinbüchel et al., 2010a), which focus on TBI-related difficulties across six dimension of HRQOL. These domains are “cognition”, “self”, “autonomy”, “social relationships”, “emotions” and “physical problems”. Consequently, although the QOLIBRI was designed specifically for TBI, it appears to tap into common themes across ABI. It is thus suggested that the QOLIBRI is appropriate to use for ABI (Truelle et al., 2010; L. Wilson, personal communication, September 30, 2013).

The first four domains assess the individual’s *satisfaction* with different aspects of life since the brain injury and the final two domains assess how *bothered* individuals are with certain aspects of life since injury. All questions are based on a five-point Likert scale from *not at all* to *very*. The QOLIBRI was scored in accordance to von Steinbüchel et al.’s paper (2010b). Missing items on each subscale were imputed by the scale mean (if more than one-third of the responses were missing then the data set was not used for analysis). Individual subscale scores and the total score were then converted to a 0-100 score, by subtracting 1 from the mean and then multiplying by 25. Scores of 0 reflect the lowest possible quality of life, with higher scores demonstrating a better quality of life.

The QOLIBRI has been shown to have satisfactory psychometric properties (Hawthorne et al., 2011; von Steinbüchel et al., 2010a, b). Cronbach’s alpha for the

subscales ranged from .75 (physical problems) to .89 (cognition and self) and averaged .95 for the total score (von Steinbüchel et al., 2010a). Soberg et al. (2013) have recently shown similar results in regards to the measures' reliability. The total QOLIBRI score has also shown good test-retest reliability across two weeks (.91), as have all of the six subscales (.75- .89) (von Steinbüchel et al., 2010a). The QOLIBRI and the six subscales have also demonstrated strong construct and convergent validity, with systematic relationships observed with the GOSE, HADS, and SF-36, thus confirming expected patterns of correlations with other measures assessing emotion, disability and subjective HRQOL (von Steinbüchel et al., 2010a). Consequently, the QOLIBRI is recommended as the measure of choice for measuring QoL after brain injury (Hawthorne et al., 2011).

The Experiences in Close Relationships—Relationship Structures Questionnaire (ECR-RS, Fraley, Heffernan et al., 2011). The ECR-RS (see Appendix C) is a self-report measure of adult attachment derived from the Experiences in Close Relationships–Revised inventory (ECR-R; Fraley, Waller, & Brennan, 2000). This self-reported questionnaire uses nine items to measure attachment patterns through the dimensions of attachment avoidance and attachment anxiety. Six items relate to attachment avoidance (e.g. “I don't feel comfortable opening up to this person”) and three to attachment anxiety (e.g. “I'm afraid that this person may abandon me”). For each statement, respondents are asked to indicate the degree to which they agree or disagree based on a seven-point Likert scale ranging from *strongly disagree* to *strongly agree*. The same nine questions are repeated for four different relational domains (mother, father, romantic partner and best friend), thus making the ECR-RS a 36-item measure. The measure therefore not only provides a more generalisable global

score for an individual's level of attachment avoidance and anxiety compared to romantic attachment specific measures, but also an indication of individuals' attachment patterns in regard to specific relationships. The ECR-RS therefore addresses the lack of specificity in regard to relationships, which is considered a major limitation with other adult attachment measures (Fraley, Heffernan, et al., 2011).

Recently the two-factor model (attachment anxiety and attachment avoidance) has been confirmed for each relational domain using norm data from a sample of over 21,000 (Fraley, Heffernan, et al., 2011). Moreover, the composite scores for attachment anxiety and attachment avoidance in each relational domain (including global scores) have been shown to have high internal consistency (Cronbach's alpha > .85), and are therefore reported to be as reliable as those based on longer inventories (e.g., the ECR-R) (Fraley, Heffernan, et al., 2011). The test-retest reliability (over thirty days) for the individual relationship domains are also promising (.60-.80) (Fraley, Vicary, et al., 2011). The ECR-RS has promising convergent and construct validity. The ECR-RS correlates positively with the ECR-R, but importantly captures adult attachment in other domains instead of just romantic relationships. As expected, the strongest association demonstrated was between the partner domain and the ECR-R. Moreover, the attachment avoidance and attachment anxiety scales are meaningfully related to various relational outcomes (e.g., satisfaction, commitment and investment), personality traits and experiences of depression (Fraley, Heffernan, et al., 2011). Thus, it has been suggested that the ECR-RS has the ability to predict intra- and interpersonal outcomes better than broader attachment measures, and that it allows certain relationship outcomes to be better understood.

The Friendship Scale (FS, Hawthorne, 2006). The FS (see Appendix D) is a short six-item instrument for assessing social isolation. It covers both critical aspects of social isolation: perceived social support and perceived emotional loneliness. Originally designed to consider social isolation in older adults (Hawthorne, 2006), it has been considered appropriate to use with individuals with ABI due to its ease of administration and simplicity (Hawthorne et al., 2009).

Three items consist of a statement about symptoms of perceived social contact/support (e.g. “It has been easy to relate to others”) and the other three consist of symptoms of perceived social loneliness (e.g. “I felt isolated from other people”). The scale asks the respondents to indicate the degree to which they have experienced the said symptom over the past four weeks on a five-point Likert scale, ranging from *Almost always* to *Never*. Cut-off points are set at 0-11 (very socially isolated), 12-15 (isolated or with a low level of social support), 16-18 (some social isolation or some social support), 19-21 (socially connected) and 22-24 (very or highly socially connected).

The measure has demonstrated good psychometrics, including internal consistency (Cronbach’s alpha .83) and strong concurrent validity (Hawthorne, 2006). Results have also suggested that the measure is sensitive to known correlates of social isolation including measures of mental and physical health, indicating promising construct validity (Hawthorne, 2006).

The EQ-5D-3L (EQ-5D-3L, EuroQoL, 1990). The EQ-5D-3L (see Appendix E) is a short self-reported questionnaire developed to capture generic HRQOL. The measure asks individuals to rate their current health status across the five dimensions of “mobility”, “self-care”, “usual activities”, “pain/discomfort” and

“anxiety/depression”. There are three ordinal response levels available to the respondent for each health dimension. These describe *no problems*, *some problems* and *extreme problems* with the health dimension (Brooks, Rabin, & de Charro, 2003). This format provides a five-digit code specifying the results on each of the dimensions called the *EQ-5D-3L self-reported health state* (e.g. 11223 = no problems in mobility, no problems in self-care, moderate problems in usual activities, moderate problems in pain/discomfort, severe problems in anxiety/depression). Consequently, the EQ-5D-3L can define 243 (3^5) different health states. Two further states (unconsciousness and death) are also included.

This self-reported health state can subsequently be converted into a single *summary index score*. This is calculated based on data representing the general public’s perspective of each self-reported health state. These index scores range from .59 to 1.0, with greater scores indicating better overall health and a score of 1.0 representing full health. The index scores employed in this study are based on a British tariff developed by Dolan (1997). The mean index score for the general UK population is estimated at .86 (Kind, Hardman, & Macran, 1999). Summary index scores from the EQ-5D-3L can then be used to generate a subsequent score known as *quality of life in adjusted years*. This can be used in cost–utility analysis (Resnick et al., 2005). Respondents also rate their overall health on the day of completion on a hash-marked, vertical visual analogue scale (EQ-VAS). The EQ-VAS is a rating scale ranging from 0 (worst imaginable health state) to 100 (best imaginable health state) and represents the valuation of the health state from the patient’s point of view.

The measure is widely used, as it is simple to administer, score and interpret (Dyer, Goldsmith, Sharples, & Buxton, 2010). Moreover, the reliability and validity of the EQ-5D-3L has been demonstrated in various conditions and for the general

population (Petrou & Hockley, 2005; Schweikert et al., 2006). It is consequently recommended by the NICE guidelines as the measurement of choice for generic HRQOL (NICE, 2008) and shows adequate internal consistency for a range of chronic conditions (Pickard, Neary, & Cella, 2007). It has also been suggested that the EQ-5D-3L is suited to the assessment of HRQOL for general injury-related disability groups (Derrett, Black, & Herbison, 2009; Van Beeck et al., 2007), and it has been shown to have reasonable validity and reliability among stroke patients (Hunger et al., 2012). Less research has used patients with moderate to severe TBI, but the EQ-5D-3L has been shown to be responsive to treatment and able to discriminate between severity groups (Bell et al., 2005). In addition, the EQ-5D-3L has been shown to correlate with the GOSE in a group of patients with mild TBI, indicating strong construct validity (Wilson et al., 2000) The EQ-5D-3L is also suggested to have promising test-retest reliability with people with TBI (van Agt, Essink-Bot, Krabbe, & Bonsel, 1994).

Procedure

Potential participants were provided with an information sheet (see Appendix F) about the research at their neurorehabilitation service. Information was either presented at an appropriate service user meeting, or was provided directly to the individual after they were deemed appropriate for the research by their clinical team. Participants could also directly contact the research team by responding to posters that were placed within each service.

Once a participant had agreed to the research and been deemed suitable by their team, they were invited to attend a 45-80 minute supported meeting to complete the questionnaires. Due to common cognitive difficulties experienced after ABI,

participants were provided with the information sheet for a second time. Participants were supported in reaching an understanding of the information and time was allocated to answer any questions. Subsequently, informed written consent was gained from each participant (see Appendix G).

The participants were first asked to provide basic demographic information. This included their age, ethnic background, relationship status (never partnered, long-term/*de facto* relationship, married, separated or divorced, widowed - coding taken from Hawthorne et al., 2009), and employment status (full-time or part-time employment, full-time or part-time student, retired, retired due to disability, unemployed, volunteer/homemaker - coding taken from Brown et al., 2011). Participants were also asked to answer some injury-specific questions, including cause of injury, time since injury and estimated injury severity, where appropriate.

Participants were subsequently supported to complete the questionnaires, with as little help as possible. Although the aim was for all participants to complete the questionnaires unaided, participants could request to have the questions read aloud and rephrased if required. If the participant was still unable to comprehend the question after it was rephrased, they were directed to the next question.

After the questionnaires were completed, time was spent considering any distress that had been caused by the research. This was guided by a debriefing form (see Appendix C), which was given to all participants. When distress was raised, potential points of contact were explored with the participant. Any risk that was disclosed by the participant was fed back to their service. All participants who took part in the research were entered into a prize drawn for the opportunity to win one of five £10 gift vouchers. Ethical approval for the current research and stated procedure was gained from the Royal Holloway University of London's ethics committee (see

Appendix G) and from the NHS through Westminster's National Research Ethics Service (see Appendix I). Subsequent site-specific Research and Development approval was gained for each service involved in the research (see Appendix J).

Statistical Analysis

Assumption testing. All data were screened prior to analysis. Continuous variables were checked for any input errors and normality of distribution. This was achieved by visually examining graphic representation of the data for errors and outliers. Subsequently, statistics for skewness and kurtosis were calculated (Field, 2013) and results for the Shapiro-Wilko test, which is deemed the most powerful normality test, were considered (Razali & Wah, 2011).

Boxplots indicated several possible outliers (scores that were substantially larger than the upper quartile), especially for the attachment anxiety dimension across the various relational domains. However, only three scores had a converted z -score close to, or greater than ± 3.29 , indicating a significant outlier (Field, 2013). Due to the relatively small sample size and lack of reason to conclude that these cases were not derived from the target population, scores were not removed. However, to minimise the impact of these outliers, the winsorizing approach was utilised and outliers were replaced with the next highest score (Field, 2013). Data was balanced by using the same procedure at the other end of the distribution.

Age, total FS, HADS-D, HADS-A, total QOLIBRI and all the subscales of the QOLIBRI were normally distributed when utilising a ± 2.58 z -score cut-off (Ghasemi & Zahediasl, 2012). Parametric tests (Pearson's correlation and independent t-tests) were utilised to explore the hypothesised relationships between these variables.

Days since injury, partner avoidance and global, mother, father and friend anxiety were all positively skewed. Shapiro-Wilko scores suggested that only global avoidance was normally distributed. The ED-5D health index score was negatively skewed. Similar patterns of distribution were also present when exploring differences between those in a relationship and those single, and between males and females.

The utilisation of rank-based transformations for the management of non-parametric data has been recommended in a recent simulation study (Bishara & Hittner, 2013). However, it was recognised that the approach is less effective when testing differences between means. Although the majority of analysis in the current research was concerned with correlations, as some analysis explored the differences between means (e.g. those single and those in relationship) it was felt that such a technique was not appropriate. An alternative method for managing non-normally distributed data is to utilise non-parametric tests, which the literature often recommends (Field, 2013). However, Pearson's r and the independent t-test are also considered to be extremely robust tests, which are largely unaffected by the impact of non-parametric data (Edgell & Noon, 1984; Rasch & Guiard, 2004). Consequently, analysis was conducted with both parametric (Pearson's r and independent t-tests) and non-parametric (Spearman's r_s and Mann Whitney's U) tests. There was largely little difference between the outcome data, therefore parametric data was selected and reported to allow for consistency and standardised effect sizes to be reported (Nakagawa, 2004). However, deviation from non-parametric outcomes will be highlighted where appropriate.

Multiple comparisons were calculated between variables, which can increase the chance of making a Type I error (Field, 2013). To minimise Type I errors, two-tailed significance scores were calculated, regardless of whether there was a predicted

effect. However, a bonferoni test was not calculated, as recommended by Nakagawa (2004). It is argued that when research is novel and explorative, such corrections lead to a dangerous increase in Type II errors, which can in turn hinder the development of novel hypotheses. However, Nakagawa (2004) advocates for effect size to be routinely reported. Such an approach is commonly used in the mental health and neurological literature (Grant et al., 2013; Haley, Eagan, Gonzales, Biney, & Cooper, 2011). Cohen's *d* and Pearson's *r* were used to calculate the effect sizes. Scores of > 0.80 for Cohen's *d* and > .50 for Pearson's *r* are considered to demonstrate a large effect. Scores of > 0.50 for Cohen's *d* and > .30 for Pearson's *r* suggest a moderate effect. Scores of > 0.20 for Cohen's *d* and > .10 for Pearson's *r* suggest a small effect (Cohen, 1988).

Regression analysis. A hierarchical multiple regression was utilised to explore research question four, to see whether attachment dimension could explain additional variance in HRQOL. HRQOL was conceptualised as the outcome variable (*DV*), and depression, anxiety, social isolation, attachment avoidance and attachment anxiety as the predictor variables (*IVs*). Based on past research (Hawthorne et al., 2011) and correlation analysis from the present study the HADS-D was expected to have the most impact on HRQOL scores and was therefore entered first into the regression model. Anxiety and social isolation were subsequently entered. Attachment anxiety and attachment avoidance were entered into the second step of the regression model after the variance explained by depression anxiety and social isolation had been accounted for.

Cook's distance (< 1) indicated there were no significant outliers in the regression model (Cook & Weisberg, 1982). Diagnostic checks were also conducted

to ensure that multiple regression assumptions were met (Field, 2013). Residual histograms and scatterplots were examined to test assumptions of multivariate normality, linearity and homoscedasticity. These assumptions were all met. Furthermore, the Durbin-Watson test statistic was close to 2, suggesting the residuals were uncorrelated and thus confirmed the assumption of independent errors (Durbin & Watson, 1950). Multicollinearity was also considered. Although a condition index score of 19 indicated the possibility of multicollinearity, no substantial correlations ($r > .90$) between predictor variables were observed. Moreover, the average VIF was not significantly higher than one. There were also no shared loadings of variance (Field, 2013), and all tolerance scores were above .20 (Menard, 1995).

Mediation analysis. To consider Hypothesis 5, whether social isolation and psychological distress mediated the relationship between adult attachment and HRQOL, possible direct and indirect effects were explored. It was hypothesised that social isolation and psychological distress would mediate the relationship between adult attachment and HRQOL both directly and in-sequence. Specifically, it was hypothesised that attachment avoidance and attachment anxiety would predict social isolation and depression. These variables, in turn, would uniquely predict HRQOL and explain why those with high levels of attachment avoidance and attachment anxiety may experience lower HRQOL. In addition, sequential mediation was also expected, with adult attachment predicting social isolation, in turn predicting depression and therefore HRQOL (see Figure 1). It is proposed that such multiple mediation models are more “realistic” (Hayes, 2013, p. 88) than simple models that consider only one mediator.

An approach using multiple ordinary least squares (OLS) regressions with a bootstrapping procedure (10,000 samples as tested herein) was chosen to estimate direct and indirect effects (Hayes, 2013; Preacher & Hayes, 2004). This approach was selected over the more traditional causal steps approach (Baron & Kenny, 1986). The bootstrap analysis has grown in favour over recent years due to its sensitivity to detect true indirect effects (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002), its reduction in Type I and Type II errors (Hayes, 2009) and its appropriateness with small sample sets due to its non-judgment of sampling distribution (Preacher & Hayes, 2008). Furthermore, Preacher and Hayes' methods (2004) for assessing an indirect effect adopts the increasingly popular perspective that no initial association between the independent and outcome variable is required, as proposed by Baron and Kenny (1986).

Baron and Kenny (1986) also argue that mediation analysis is a causal model and thus if cause and effect cannot confidently be inferred, a mediation model should not be utilised. However, whilst agreeing that mediation analysis provides a causal explanation, Hayes (2013) proposes that mediation analysis can be explored even if causality cannot be established due to limitations in the research design. In these situations, Hayes argues that researchers must base the use of mediation analysis in a strong theoretical argument and acknowledge the difficulties of inferring causality. Indeed the majority of articles published in the *Journal of Counselling Psychology* using mediation techniques are non-experimental in design (Frazier, Barron, & Tix, 2004). Such precautions were taken in the present study. Although the term "effect" may be utilised, this is with the acknowledgment that analysis can only support the proposed model and that for a true "effect" to be determined it will be necessary to conduct experimental research. However, to add weight to the proposed model, an

alternative causal order of the variables was considered, as recommended (Hayes, 2013).

Mediation was analysed using the PROCESS macro for SPSS (Hayes, 2013). Model 6 was chosen, as it is a serial multiple mediation model. The significance of the indirect effects were based on the 95% confidence interval and deemed significant when the upper level confidence interval (ULCI) and lower level confidence interval (LLCI) values did not cross zero. In such cases, the indirect effect is subsequently significant at $p < .05$. Results will be discussed in unstandardized form, as recommended (Hayes, 2013; Warner, 2013).

Results

Descriptives

Descriptive data for the dependent variable – HRQOL as measured by the QOLIBRI – is presented in Table 1. It includes data for the total score and all six subscales. Descriptive data for each of the independent variables (HADS-D, HADS-A and FS) and the EQ-5D-3L summary index score is also included in the table. Due to the strong significant association between the EQ-5D-3L summary index score and the EQ-VAS ($r(38) = -.91, p < .001$), the index score alone was used for the rest of the analysis. Table 1 shows that there was a range of self-reported HRQOL after ABI. This includes those who reported very little dissatisfaction (98.65), through to those who reported very low total HRQOL (26.35). Scores on the QOLIBRI were similar to those previously reported (von Steinbüchel et al., 2010a), however, scores on the EQ-5D-3L were much lower compared to data collected from healthy samples (e.g. Kind et al., 1999). There was also a wide range for each of the independent variables. Some individuals reported very high rates of anxiety, depression and social isolation, while others reported experiencing no symptoms of psychological distress and feeling very socially connected.

The mean HADS-A and HADS-D scores were marginally below the cut-off for caseness (≥ 8), as recommended by Zigmond and Snaith (1983). This indicates that on average participants were not experiencing significant psychological distress. However, further exploration revealed that 32.5% of the sample exceeded the score for caseness for depression and 40% for anxiety. The data also suggests that many of the participants were experiencing social isolation, with the mean score for the FS being categorised as “some social isolation” when utilising the cut-offs recommended

by Hawthorne *et al.* (2006). A total of 55% of the sample experienced at least “some isolation”.

Table 1.

Descriptive Data for the Dependent and Independent Variables

Variable	<i>M</i>	<i>SD</i>	Range
QOLIBRI			
Cognition	49.73	26.17	7.14-100
Self	51.61	24.53	7.14-100
Autonomy	52.95	23.98	3.57-100
Social	59.57	21.98	12.50-100
Emotions	58.25	30.35	0-100
Physical	52.00	24.83	0-100
Total Score	58.21	16.85	26.35-98.65
EQ-5D-3L	.57	.31	-.18-1.00
Summary			
Index Score			
HADS-D	6.65	4.22	0-15
HADS-A	7.75	4.62	0-17
Friendship Scale	15.78	5.85	1-24

Table 2 shows the test statistics for the independent t-tests conducted to assess differences in HRQOL, depression, anxiety and social isolation between men ($n = 26$) and women ($n = 14$) and for individuals with TBI ($n = 17$) and non-TBI injuries ($n = 23$). No significant relationships were found, nor were any significant relationships found in regards to correlations between the participant's age or the time since injury, and HRQOL. The same pattern of results was found for the EQ-5D-3L. However, women ($M = 9.93$) reported significantly greater anxiety compared to men ($M = 6.58$) ($t(38) = -2.31, p = 0.027, d = 0.75$), as did individuals with non-TBI injury ($M = 9.13$) compared to those with a TBI injury ($M = 5.69$) ($t(38) = -2.32, p = 0.026, d = 0.75$). Cohen's d indicated that these findings had medium to large effect size. No significant correlations were found between participants' age, time since injury and psychological distress and social isolation. However, there was a moderate non-significant effect ($d = 0.58$) between the scores of men and women on the self subscale of the QOLIBRI, with men reporting high scores.

The means, standard deviations, skewness, and intercorrelations among the attachment avoidance and attachment anxiety scores across the domains are reported in Table 3. The data suggests that after an ABI the most common attachment pattern that is reported is low in attachment anxiety and attachment avoidance, indicating that secure attachments are often experienced after an ABI. This is demonstrated by the low means, standard deviations and positive skew for attachment anxiety and attachment avoidance for each of the relationship domains, including global scores. These scores are similar to the large normative data collected by Fraley, Heffernan, et al., (2011).

The correlations among the attachment dimensions across different relational domains are positive (except for father and partner attachment avoidance) but not

particularity strong, although, attachment avoidance to partners and friends is significant. This suggests that although there is a common theme in individuals' attachments, there is unique within-person variation.

Table 2.

Summary of T-Tests Exploring Differences Between Gender and Injury Type, and Pearson's Correlations Considering Associations Between Age and Time Since Injury for the Dependent and Independent

Variable	Gender (<i>t</i>)	Injury Type (<i>t</i>)	Age (<i>r</i>)	Time since Injury (<i>r</i>)
QOLIBRI				
Cognition	0.45	0.10	-.07	-.20
Self	1.80	1.09	-.27	-.01
Autonomy	-0.86	0.57	-.29	-.05
Social	0.57	0.12	-.07	-.04
Emotions	0.49	0.41	.08	-.05
Physical	0.64	0.52	-.03	-.04
Total Score	0.69	0.54	-.16	-.19
EQ-5D-3L	-0.89	0.23	-.08	-.13
Summary				
Index Score				
HADS-D	-0.30	-0.91	.10	-.11
HADS-A	-2.31*	-2.32* [^]	.14	.07
Friendship Scale	1.01	0.75	-.10	-.11

* $p < .05$.

[^]Equal variances not assumed

Table 3.

Summary of Correlations, Means, Standard Deviations, and Skewness for Relationship Structures Anxiety and Avoidance Scores in Each Relational Domain

Variable	Avoidance				Anxiety				Global	
	Mother	Father	Partner	Friend	Mother	Father	Partner	Friend	Avoidance	Anxiety
Avoidance										
Mother	-									
Father	.26	-								
Partner	.10	-.20	-							
Friend	.23	.20	.34*	-						
Anxiety										
Mother	.62**	.26	-.10	-.18	-					
Father	.03	.60**	.10	.02	.24	-				

Partner	.33	.14	.54**	.19	.22	.05	-			
Friend	.28	.31	-.07	.26	.20	.24	.18	-		
Global Avoidance	.66**	.59**	.53**	.72**	.24	.29	.47**	.29	-	
Global Anxiety	.56**	.48**	.13	.07	.75**	.56**	.62**	.53**	.42**	-
<i>M</i>	3.10	3.22	2.49	3.23	1.84	1.67	2.13	1.79	3.01	1.86
<i>SD</i>	1.95	1.96	1.80	1.79	1.60	1.27	1.37	1.02	1.19	0.80
<i>Skewness</i>	0.89	0.57	1.42	0.42	2.25	2.37	1.02	1.74	0.52	1.37

Note- Association between Partner-Friend avoidance non-significant using r_s . Association between Friend-Mother avoidance, Father-Mother anxiety and Partner avoidance-Global anxiety all sig. using r_s

* $p < .05$; ** $p < .01$

Overall, people reported the greatest amount of similarity in the way they related to their friend and partner, and to their mother and father, and the least amount of similarity between their father and partner, and their mother and partner. Moreover, the correlation between attachment anxiety and attachment avoidance are relatively high in each relational domain. For example, people who tend to be more avoidant in their relationships with their partner, also report being more anxious about their partner's availability and responsiveness.

Table 4 shows the test statistics for a range of independent t-tests conducted to assess for possible differences in attachment patterns between men and women. No gender differences in attachment patterns were found, although there was a moderate non-significant effect ($d = 0.51$) between the scores of men and women on partner anxiety, with women reporting greater partner anxiety. There were also no differences in attachment patterns between those with a TBI and those with other ABI. Finally, there were no significant associations between attachment domains and age or time since injury.

Finally, Table 5 shows the mean and standard deviation for the HADS, FS, QOLIBRI and global attachment anxiety and attachment avoidance scores for those currently in a relationship and those not in a relationship. It shows that there is no significant difference between the two groups on any of the variables as has been hypothesised. However, there is a moderate non-significant effect ($d = 0.60$) between the scores of those in a relationship and those single on the emotions subscale of the QOLIBRI, with those not in a relationship reporting being more *bothered* by emotional difficulties since their injury.

Table 4.

Summary of T-Tests Exploring Differences Between Gender and Injury Type, and Pearson's Correlations Considering Association Between Age and Time Since Injury for the Different Attachment Dimension Across Different Relational Domains

ECR-RS	Gender (<i>t</i>)	Injury Type (<i>t</i>)	Age (<i>r</i>)	Time since Injury (<i>r</i>)
Mother Avoidance	-1.28	1.42	.20	.18
Mother Anxiety	-1.16	0.55	.14	.23
Father Avoidance	-1.40	-1.14	-.17	-.02
Father Anxiety	0.17	-0.95	-.33	-.05
Partner Avoidance	-0.62	-1.15	.18	.10
Partner Anxiety	-1.58	-0.59	.32	.16
Friend Avoidance	0.79	0.70	.04	.05
Friend Anxiety	0.97	-.044	-.05	.08
Global Avoidance	-1.08	-0.07	.03	.13
Global Anxiety	-0.93	-0.29	.09	.22

Note- No significant test statistics found.

Table 5.

Summary of T-Tests Exploring Differences Between Individuals Currently in a Romantic Relationship and Those not Classified as in a Romantic Relationship

Variable	<i>In a Relationship n = 23</i>		<i>Not in a relationship n = 17</i>		<i>t</i>	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
<i>HADS-A</i>	8.22	4.67	7.12	4.61	-0.74	0.24
<i>HADS-D</i>	7.04	4.14	6.12	4.4	-0.68	0.22
Friendship Scale	15.96	6.59	15.53	4.86	-0.23	0.07
QOLIBRI						
Cognition	47.83	24.63	52.31	28.68	0.53	0.17
Self	55.12	22.56	46.85	26.93	-1.10	0.36
Autonomy	56.06	23.60	48.74	24.55	-0.95	0.31
Social	63.41	24.58	54.38	17.22	-1.23	0.40
Emotions	66.09	24.49	47.65	34.83	-1.86	0.60
Physical	51.09	24.59	53.24	25.86	0.27	0.09
Total Score	60.90	15.76	54.57	18.05	-1.19	0.39
Global Av.	3.09	1.29	2.91	1.06	-0.46	0.12
Global Anx.	1.79	.79	1.96	.88	0.67	0.22

Note- No significant *t* statistics found.

Main Analysis

Bivariate correlations. Two-tailed bivariate correlations were calculated to evaluate the relationship between the independent variables and between the independent variables and the QOLIBRI (*DV*). For a complete description of the correlation coefficients see Table 6.

As expected, there was a significant positive correlation between the HADS-D and the HADS-A. There was also a significant negative correlation between both the HADS-D and HADS-A and the FS, indicating that social isolation and psychological distress were positively associated. The FS, HADS-D and the HADS-A were also all significantly associated to total scores of the QOLIBRI, with depression yielding the largest negative correlation. Depression was also significantly and negatively associated with all six subscales of the QOLIBRI and produced the largest correlation with the cognition, self, autonomy and physical problems subscales compared to the FS and HADS-A. The FS and HADS-A were also associated to all the subscales apart from autonomy. The Friendship Scale demonstrated the strongest association with the social relationships subscale, and HADS-A associated most strongly with the emotions subscale.

Global attachment avoidance also showed some significant negative associations with HRQOL. Higher attachment avoidance was associated with lower total scores on the QOLIBRI and lower scores on the cognitive and social relationships subscales. Global attachment avoidance also demonstrated a significant negative association with the FS and was positively associated with the HAD-A.

Table 6.

Pearson's Correlations Between Relationship Structures Anxiety and Avoidance, HRQOL, Psychological Distress and Social Isolation

Variable	HADS-A	HADS-D	Friendship Scale	Global Avoid	Global Anxiety	Cognitive Self	Auton- omy	Social Relationships	Emot- ions	Physical Problem	Total Score
HADS-A	-										
HADS-D	.60**	-									
Friendship Scale	-.61**	-.53**	-								
Global Avoidance	.33*	.29	-.61**	-							
Global Anxiety	.35*	.21	-.38*	.49**	-						

QOLIBRI

Cognition	-.47**	-.64**	.59**	-.41*	-.20	-						
Self	-.49**	-.67**	.45**	-.27	-.18	.66**	-					
Autonomy	-.26	-.63**	.25	-.15	-.01	.55**	.71**	-				
Social	-.47**	-.44**	.67**	-.44**	-.30	.49**	.47**	.38*	-			
Relation												
Emotions	-.54**	-.41**	.48**	-.21	-.51**	.33*	.45**	.31	.42**	-		
Physical	-.48**	-.64**	.47**	-.28	-.19	.51**	.53**	.43**	.37*	.42**	-	
Problems												
Total	-.57**	-.70**	.63**	-.38*	-.31*	.80**	.86**	.76**	.69**	.66**	.68**	-
Score												

Note- Association between Cognitive - Emotions non-significant using r_s . Association between Global avoidance-depression and global anxiety-social relations all *sig.* using r_s .

* $p < .05$; ** $p < .01$

Attachment anxiety was also associated with lower total scores on the QOLIBRI and the social relationships subscale. However, global attachment anxiety demonstrated its strongest negative association with the emotional subscale. It also showed a negative association with the Friendship Scale and HADS-A. Neither attachment avoidance nor attachment anxiety were associated with depression.

Exploring relationship specific attachment avoidance and attachment anxiety showed there were few associations with other variables for attachment dimensions with father, partner and friend (see Appendix K). This included a significant negative association between partner avoidance ($r(38) = -.57, p < .001$), friend avoidance ($r(38) = -.45, p = .004$), and partner anxiety ($r(38) = -.49, p = .002$) with the FS, suggesting that such attachments are positively associated with social isolation. However, there were several significant associations between attachment patterns to one's mother and HRQOL that were similar to patterns demonstrated with global attachment estimates (see Table 7). Higher attachment avoidance to mothers were associated with lower scores on the FS, QOLIBRI total and three subscales (cognitive, self, and social relationships). Attachment anxiety to mother was negatively associated with the social relations subscale.

Table 7.

Pearson's Correlations Between Mother Attachment Avoidance and Mother Attachment Anxiety, and HRQOL, Psychological Distress and Social Isolation

Variable	Mother Avoidance	Mother Anxiety	HADS-A	HADS-D	FS
Mother Avoidance	-	-	.22	.20	-.39*
Mother Anxiety	.62**	-	.21	.11	-.23
QOLIBRI					
Cognition	-.35*	-.19	-	-	-
Self	-.38*	-.20	-	-	-
Autonomy	-.20	-.06	-	-	-
Social	-.46**	-.36*	-	-	-
Emotions	-.30	-.38*	-	-	-
Physical	-.20	-.07	-	-	-
Total Score	-.43**	-.27	-	-	-

* $p < .05$, ** $p < .01$

Hierarchical Multiple Regression. A hierarchical multiple regression was carried out with HRQOL (QOLIBRI total score) as the dependent variable. Depression (HADS-D), anxiety (HADS-A), social isolation (FS) and global attachment avoidance and global attachment anxiety were used as the predictor variables. The purpose of the regression was to explore the combined predictive power of these independent variables and to determine the extent to which attachment avoidance and attachment anxiety accounted for the variance in HRQOL after the effects of previously identified predictors (depression, anxiety and social isolation) were accounted for. Table 8 presents the results of the hierarchical multiple regression analysis.

Depression, anxiety and social isolation explained a significant amount of variance in HRQOL ($F(3,36) = 16.71, p > 0.001; R^2 = .58, \text{adjusted } R^2 = .55$). In this model, HADS-D ($t(36) = -3.40, p = .002$) and social isolation as measured by the Friendship Scale ($t(36) = 2.28, p = .029$) made significant unique contributions to explaining the variance in HRQOL. Contrary to Hypothesis 4, the addition of the predictor variables attachment avoidance and attachment anxiety did not significantly increase the variance explained by model one ($F(5,34) = 9.71, p > 0.001; R^2 = .59, \text{adjusted } R^2 = .53$). Although attachment avoidance and attachment anxiety still contributed to a significant model, the additional predictors only contributed an additional 1% of variance, and substantially reduced the size of the F statistic as indicated by a non-significant F change score. Neither attachment avoidance nor attachment anxiety made significant unique contributions to the variance in HRQOL.

Table 8.

Hierarchical Multiple Regression Analyses Predicting HRQOL From Depression, Anxiety, and Social Isolation (Model 1) and from Attachment Anxiety and Attachment Avoidance (Model 2).

Variable	Unstandardised		β	t	Sig	R^2	F	Sig
	B	$SE B$						
Model 1						.58	16.71	< .001
HADS-D	-1.91	0.56	-.48	-3.42	.002			
HADS-A	-0.31	0.55	-.09	-0.57	.572			
FS	0.92	0.41	.32	2.28	.029			
Model 2						.59	9.71	< .001
HADS-D	-1.92	0.57	-.48	-3.37	.002			
HADS-A	-0.23	0.57	-.06	-0.40	.690			
FS	0.88	0.49	.31	1.79	.082			
Global AV.	0.10	2.16	.01	0.05	.963			
Global Anx.	-1.85	2.76	-.09	-0.67	.507			

Mediation analysis. To evaluate the direct and indirect effect of attachment dimensions on HRQOL through social isolation and depression, two serial multiple mediation models were estimated. The effects of the IV on the proposed Ms (paths a_1 and a_2), the effects of M_1 and M_2 on the DV partialling out the effect of IV and the other M variable (paths b_1 and b_2), the effect of M_1 on M_2 (path d_{21}) and the direct effect of IV on DV after controlling for M_1 and M_2 (path c') are presented in Figure 3 for attachment avoidance and Figure 4 for attachment anxiety. Although there were greater accounts of anxiety caseness than depression in the sample, the HADS-A was not included in the mediation analysis. This decision was made after the previous regression model indicated that anxiety was not a significant predictor variable of HRQOL. Moreover, it is reported that increasing the number of mediators that are highly correlated leads to greater sampling variance and reduces the power of the analysis (Hayes, 2013).

Attachment avoidance. Mediation analysis suggested that attachment avoidance did not exert a significant direct effect on HRQOL after partialling out social isolation and depression ($c' = -.44$, LLCI = -4.37, ULCI = 3.49). However, with the consideration of social isolation and depression the total effect of global attachment avoidance on HRQOL was significant (-5.51, LLCI = -9.71, ULCI = -1.10), as was the total indirect effect (-4.97, LLCI = -8.86, ULCI = -2.06). As predicted, a significant indirect effect of global attachment avoidance on HRQOL through social isolation was found ($a_1b_1 = -2.89$, LLCI = -5.87, ULCI = -0.24), which suggests that ABI survivors with increased attachment avoidance have lower HRQOL as a result of greater social isolation. There was no significant indirect effect of attachment avoidance on HRQOL through depression ($a_2b_2 = -.45$, LLCI = -1.80, ULCI = 3.39). However, further support for Hypothesis 5 was found as a significant indirect effect of global attachment avoidance on HRQOL through

social isolation and depression ($a_1b_1d_{21} = -2.52$, LLCI = -6.51, ULCI = -0.58) was shown. This suggests that people with increased attachment avoidance have lower HRQOL, as a result of greater social isolation, which is in turn, is associated with higher depression.

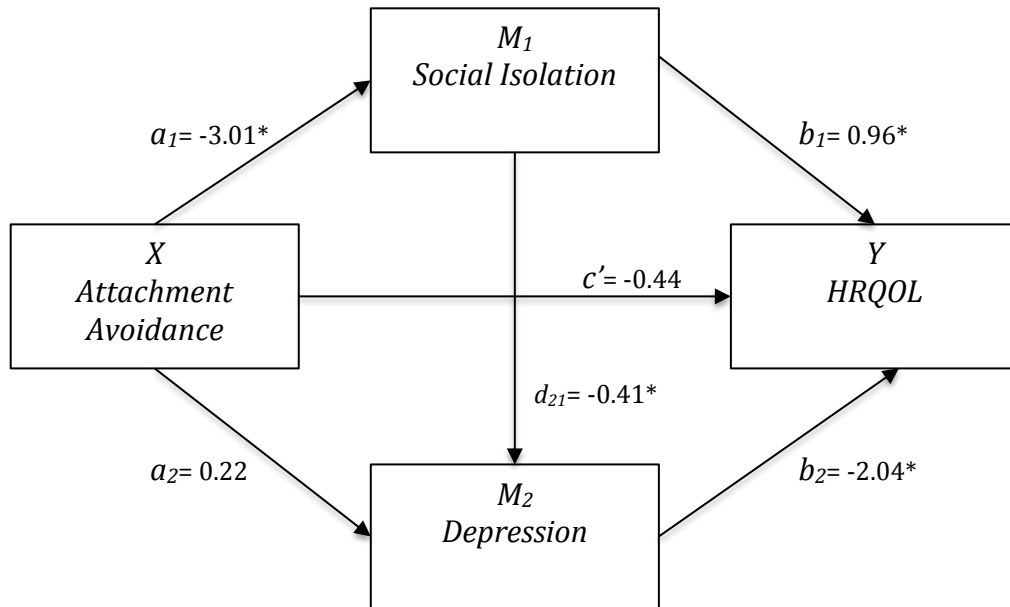


Figure 3: Statistical diagram of the serial multiple mediator model for the effects of global attachment avoidance on HRQOL.

Attachment anxiety. As with attachment avoidance, mediation analysis suggested that attachment anxiety did not exert a significant direct effect on HRQOL after partialling out social isolation and depression ($c' = -1.99$, LLCI = -6.88, ULCI = 2.90). However, with the consideration of social isolation and depression the total effect of attachment anxiety on HRQOL was significant (-6.61 , LLCI = -13.21, ULCI = -0.02), as was the total indirect effect (-4.62 , LLCI = -11.07, ULCI = -1.35). Supporting Hypothesis 5, a significant indirect effect of global attachment anxiety on HRQOL through social isolation was found ($a_1b_1 = -2.32$, LLCI = -6.31, ULCI = -0.16), which

suggests that individuals with increased attachment anxiety have lower HRQOL as a result of greater social isolation. There was no significant indirect effect of attachment anxiety on HRQOL through depression ($a_2b_2 = -.43$, LLCI = -5.19, ULCI = 3.33). However, further support for Hypothesis 5 was found as a significant indirect effect of global attachment anxiety on HRQOL through social isolation and depression ($a_1b_1d_{21} = -2.32$, LLCI = -6.31, ULCI = -0.63) was reported. This suggests that people with increased attachment anxiety have poor HRQOL as a result of greater social isolation, which is in turn associated with higher depression.

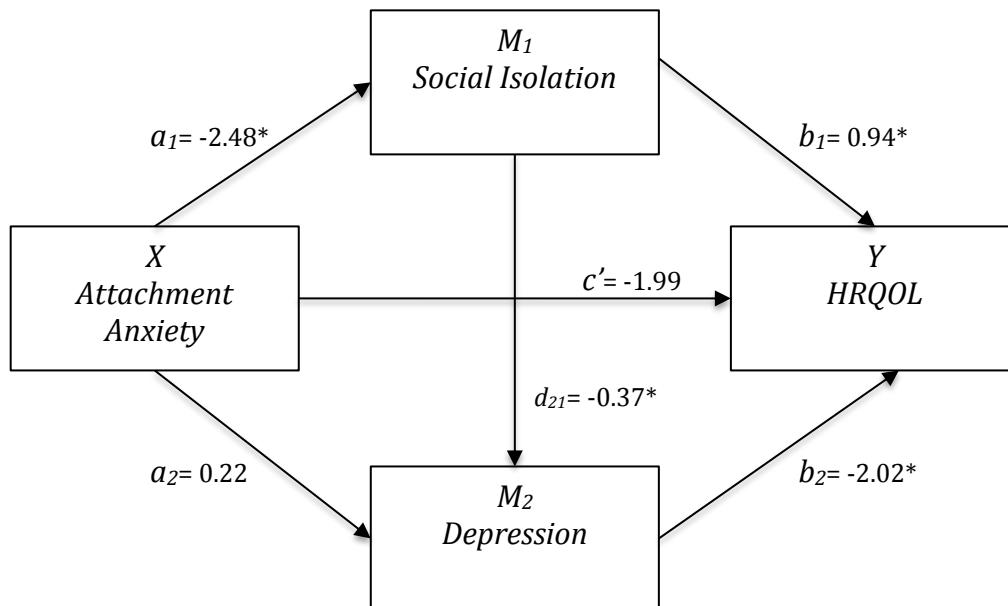


Figure 4: Statistical diagram of the serial multiple mediator model for the effects of global attachment anxiety on HRQOL.

To have more confidence in the above results, which support Hypothesis 5, adult attachment and social isolation were switched in the model. Analysis tested whether global attachment mediated the relationship between social isolation and HRQOL.

Support for this alternative model would suggest a pathway between variables that is not consistent with theoretical predictions. However, neither attachment avoidance nor attachment anxiety mediated the relationship between social isolation and HRQOL either independently (attachment avoidance $a_1b_1 = .05$, LLCI = -0.42, ULCI = 0.57; attachment anxiety $a_1b_1 = .09$, LLCI = -.011, ULCI = 0.43) or through exerting effects on depression (attachment avoidance $a_1b_1d_{21} = -.06$, LLCI = -0.43, ULCI = 0.21; attachment anxiety $a_1b_1d_{21} = .02$, LLCI = -0.21, ULCI = 0.20). Similar to the model proposed originally, depression mediated the relationship between social isolation and HRQOL (attachment avoidance $a_2b_2 = .84$, LLCI = 0.16, ULCI = 1.91; attachment anxiety $a_2b_2 = .75$, LLCI = 0.15, ULCI = 1.82). This suggests that the alternative model was largely unsuccessful.

Reliability and Validity of Measures

The internal consistency as measured by Cronbach's alpha for the independent and dependent variables are presented in Table 9. Using the standard cut-off scores for Cronbach's alpha, which are commonly reported at $> .90$ showing excellent consistency, $.70 - .90$ good consistency, $.60 - .70$ acceptable consistency and $< .60$ poor consistency (Kline, 2000), all the total scores and sub scores demonstrate acceptable to excellent internal consistency among the current ABI sample.

The convergent validity of the QOLIBRI was further assessed in the current research. A Pearson's correlation suggested there was a small but significant positive correlation between the QOLIBRI score and the EQ-5D-3L summary index score ($r(38) = .38$, $p = .014$), which has shown good reliability and validity with a range of samples (Petrou & Hockley, 2005). However, this association was non-significant when utilising Spearman's Rho, although a close to significant p-value indicated a trend, and thus may still indicate good convergent validity.

The construct validity of the QOLBRI and EQ-5D-3L was further explored with this ABI sample through the consideration of hypothesised associations with other outcome measures. As already discussed, the QOLIBRI showed strong positive associations with the HADS-D, HADS-A and the FS. In particular, the social relationship subscale demonstrated a significant association with the FS, indicating those who reported greater satisfaction with their social relationships were less socially isolated. However, it is important to note that the HADS-D was not associated to the emotions subscale of the QOLIBRI as would be expected. The EQ-5D-3L showed a similar association with the HADS and the FS. The health related index was negatively associated with the HADS-D ($r(38) = -.42, p = .002$), whilst question 5 regarding depression and anxiety was positively associated with the HADS-D ($r(38) = .61, p < .001$) and HADS-A ($r_s(38) = -.52, p = .001$) and negatively associated with the FS ($r_s(38) = -.38, p = .016$). Such correlations add weight to the construct validity of both the EQ-5D-3L and the QOLIBRI.

Table 9.

Internal Consistency of Scales

Variable	Cronbach's <i>a</i>
HADS-D	.87
HADS-A	.79
FS	.87
EQ-5D-3L	.62
QOLIBRI	
Cognitive	.89
Self	.88
Autonomy	.84
Social Relationships	.75
Emotions	.82
Physical Problems	.69
QOLIBRI Total	.94
ECR-RS	
Global Attachment Avoidance	.90
Global Attachment Anxiety	.78
Mother Attachment Avoidance	.95
Mother Attachment Anxiety	.93
Father Attachment Avoidance	.97
Father Attachment Anxiety	.98
Partner Attachment Avoidance	.97
Partner Attachment Anxiety	.93
Friend Attachment Avoidance	.94
Friend Attachment Anxiety	.97

Discussion

Overview

This study explored individuals' HRQOL and adult attachment patterns after ABI. Based on previous research several hypotheses were tested, including that (a) higher levels of attachment avoidance and attachment anxiety would be reported after ABI when compared to data from normative samples, (b) there would be differences in self-reported attachment patterns between individuals currently in a romantic relationship and those classified as single after an ABI, (c) attachment anxiety and attachment avoidance would be positively associated with psychological distress, social isolation and lowered levels of HRQOL after ABI, (d) attachment anxiety and attachment avoidance would account for additional variance in HRQOL above psychological distress and social isolation, and (e) a direct and indicated effect through social isolation and psychological distress would be suggested for attachment dimensions on HRQOL.

Results suggest that adult attachment patterns present similarly in individuals after ABI as reported patterns in normative samples. As expected, results showed that increased attachment anxiety and avoidance are associated with lower HRQOL after ABI, as well as social isolation and anxiety. No association between depression and attachment patterns was shown. In addition, attachment anxiety and attachment avoidance did not explain additional variance in HRQOL after controlling for psychological distress and social isolation. However, a significant indirect relationship between adult attachment and HRQOL mediated through social isolation and depression was suggested.

Main Findings

Utilising a generic measure of HRQOL, which allows comparison across populations, results from the current research supports evidence demonstrating lower rates of self-reported HRQOL among individuals with ABI when compared to normal samples (Andelic et al., 2009; Jakola et al., 2007; Kiely et al., 2006; Lopez-Bastida et al., 2012; Naess et al., 2006). The mean score of the EQ-5D-3L summary index score was substantially lower than scores previously reported in normative data (Kind et al., 1999). Furthermore, scores on the QOLIBRI from the current sample were comparable to previous data generated from a much larger and solely TBI sample (von Steinbüchel et al., 2010a). Although the mean total score and scores across all 6 subscales were numerically lower in the present sample (with the greatest difference between scores on autonomy and emotions), all scores were within 1 *SD* of the previous data. Moreover, the *SDs* for current QOLIBRI data were similar to those previously reported (Soberg et al., 2013; von Steinbüchel et al., 2010a), although the *SD* for the emotions subscale was numerically larger. This suggests the level and range of HRQOL demonstrated in the current sample is a good representation of the wider ABI population.

Mean scores on the HADS-D and HADS-A from the current sample are similar to previous data using the HADS with TBI samples (e.g. Cooper-Evans et al., 2008), but are lower than scores reported in a larger stroke sample (Pais-Ribeiro et al., 2007). However, although the mean score for the HADS-D was substantially higher than that reported in normative data (Crawford et al., 2001), neither the mean score for the HADS-D or HADS-A exceed the cut-off score ≤ 8 , which is proposed to indicate mild cases of psychological distress (Zigmond & Snaith, 1983). Although this suggests that the average person was not experiencing significant symptoms of depression or anxiety, the percentage of cases exceeding the recommended cut-off score was similar to previous

research with stroke and TBI samples (e.g. Lincoln et al., 2012 von Steinbüchel et al., 2010a). This supports evidence that psychological distress is commonly experienced after ABI (Hackett et al., 2005; Whelan-Goodinson et al., 2009). Furthermore, a much higher percentage of the current sample was experiencing social isolation when compared to normative data (Hawthorne et al., 2009), thus confirming previous research demonstrating that stroke and TBI survivors often experience loneliness (Hoofien et al., 2001; Salter et al., 2008), a lack of purposeful social activity (Bulinsk, 2010; Hinojosa et al., 2011), social disconnection (Levack et al., 2010) and reduced social support (Izaute et al., 2008; Temkin et al., 2009).

Largely, no differences in the rate of HRQOL, depression and social isolation were found between males and females, and individuals with TBI and non-TBI injuries. However, similar to past findings it was demonstrated that women were more likely to experience anxiety than men after injury (Ashman et al., 2004). Similarly, it was shown that individuals who sustained a non-TBI injury were more likely to experience anxiety, but this may be explained by the high number of females in the in the non-TBI group. There was also a non-significant moderate effect of gender on the self subscale of the QOLIBRI, with men reporting greater satisfaction. The outcome variables were not associated with age or time since injury. This cross-sectional data tentatively supports suggestions that a lower level of HRQOL is a stable and lifelong negative outcome after ABI (e.g. Forslund, et al., 2013; Godwin, et al., 2013).

Hypothesis 1. Results from the current study suggest that adult attachment patterns after ABI are similar to those reported in normative samples. Similar to results reported by Fraley, Heffernan, Vicary and Brumbaugh (2011), scores for both the attachment avoidance and attachment anxiety dimensions across the relationship domains

and total scores were commonly low for the current ABI sample. Contrary to Hypothesis 1, this indicates that after ABI individuals often experience secure attachment patterns (low attachment avoidance and attachment anxiety), which is the most frequently reported adult attachment pattern among normative data (e.g. Bakermans-Kranenburg & van IJzendoorn, 2009; Fraley, Heffernan, et al., 2011). Interestingly, the mean score on partner attachment anxiety from the current ABI sample was greater than 2 *SD* from the norm mean, suggesting the possibility that after ABI individuals are less anxiously attached to their partners than the general population. Moreover, the current results do not demonstrate the trend for high father attachment avoidance, which has previously been reported (Fraley, Heffernan, et al., 2011). Further research needs to consider whether these findings are a general trend for ABI survivors, or specific for the current sample.

No causality can be determined from the results due to design limitations. However, the comparable rate of attachment avoidance and attachment anxiety to normative data suggests that attachment patterns are unaffected after ABI for the current sample. Alternatively, the low rates of attachment anxiety and attachment avoidance may be the result of increased patterns of secure attachment after ABI. The lack of correlation between time since injury and attachment avoidance/anxiety suggests that this pattern is relatively stable across the recovery process. It does not appear that higher rates of attachment avoidance and/or attachment anxiety are present during the initial stages of recovery from ABI or many years post injury. However, due to the small sample size of the current study, a limited number of participants were tested either shortly after or conversely many years/decades after their injury, making such conclusions tentative.

It had been hypothesized that higher rates of attachment anxiety and avoidance would be found in the current ABI sample. This proposal had been grounded in Bowlby's (1988) claim that although attachment patterns are largely stable, changes in attachment

patterns can occur after disconfirming life events. It was believed that a trauma such as ABI would be experienced as such a life-altering event. Consequently, results from the current research contradict evidence supporting such an assertion (Davila et al., 1999; Simpson et al., 2003), and research demonstrating higher rates of insecure attachment patterns among individuals experiencing a chronic illness or disability (Agostini et al., 2010; Bennett et al., 2011; Ciechanowski et al., 2004; Ciesla et al., 2004; Pearce et al., 2001; Schmidt, Nachtigall, et al., 2002; Sockalingam et al., 2011). One explanation for these contrasting findings is that ABI specific changes protect individuals' attachment patterns. One such protective factor may be individuals' level of self-awareness. If an individual is unaware of his/her difficulties, they may not experience the ABI as a discomforting life event, which Bowlby (1988) suggested is required for a change in an individual's attachment pattern.

Consequently, results from the present research support previous research suggesting no association between level of security and negative life events (Cozzarelli et al., 2003; Lopez et al., 2002). Results are also similar to findings reported by Li et al. (2008), who indicated that there were no differences in attachment dimensions after stroke when compared to a student population. Although, Li et al. (2008) did indicate a significant difference when utilising a categorical measure, such measures have been criticised for failing to detect subtle differences between categories (Mikulincer & Shaver, 2007) and are no longer recommended within the literature (Ravitz et al., 2010). However, Li et al. (2008) still proposed that the traumatic experience of the stroke left survivors feeling isolated and disillusioned about attachment relationships, which resulted in a more negative view of others (equivalent to high attachment avoidance) and an increased positive view of the self (equivalent to low attachment anxiety). The current results suggest that despite high levels of social isolation, after ABI individuals largely

exhibit secure working models. This indicates that attachment figures are commonly experienced as safe, supportive and available after ABI, and that individuals feel comfortable with interpersonal closeness, whilst simultaneously experiencing a positive self-view as someone who is competent and lovable.

The low level of attachment insecurity reported in the current sample tentatively indicates that attachment patterns are not susceptible to change after an ABI. This suggests that adult attachment patterns are relatively robust and stable after a neurological event compared to other negative life events, such as the diagnosis of cancer or HIV. This, in turn, indicates that it is not the specific negative life event that leads to negative changes in attachment patterns, but how the life event is interpreted and how it affects the individual (Cozzarelli et al., 2003; Fraley, Vicary, et al., 2011). Although high levels of social isolation and depression were experienced by many of the sample it is possible that some other protective factor ensured that secure attachment patterns were maintained. Possible protective factors include variables that are non-condition specific, such as the presence of a significantly strong secure attachment pattern with a family member or romantic partner, which protects against or minimises the impact of other more insecure attachment patterns. Alternatively, the proposed stability of adult attachment may be associated with specific consequences or common biopsychosocial changes experienced after ABI. Further research investigating the stability of adult attachment after ABI is required, followed by research considering a full range of possible condition specific and non-condition specific protective factors.

In agreement with previous research (Bladwin et al., 1996; Fraley, Heffernan, et al., 2011; Klohen et al., 2005) the correlations among the attachment dimensions across different relational domains were positive but not particularly strong for individuals with ABI. However, attachment avoidance to mother and friend and attachment anxiety to

mother and father were significantly associated. This supports the suggestion that although there are common themes in individuals' attachment patterns, there is unique within-person variation and subtle variability in people's working models (Fraley, Heffernan, et al., 2011). Overall, people reported the greatest amount of similarity in the way they related to their mother and father and the least amount of similarity between father and partner and mother and partner. This finding is similar to past research (Fraley, Heffernan, et al., 2011), suggesting that parental attachment representations are more similar than partner and friendship representations.

Similar to attachment patterns found within normative data, correlation between attachment anxiety and avoidance were relatively high in each relational domain. For example, people who tended to be more avoidant in their relationships with their partner, also reported being more anxious about their partner's availability and responsiveness. These correlations are similar to those found in Fraley, Heffernan, et al.'s (2011) study, but are much higher than previous research using longer and less relationship-specific inventories (e.g. Brennan et al., 1998). This supports the claim that although the two dimensions are clearly separable and conceptually independent, they need not be statistically independent (Fraley, Heffernan, et al., 2011). Unlike previous studies (e.g. Fraley, Heffernan, et al., 2011) no significant gender differences in attachment patterns were found, although a non-significant moderate effect of gender on partner attachment anxiety was shown. This suggests a possible trend that women report greater attachment anxiety with partners in the current ABI sample. However, it is important to recognise that the current sample was substantially smaller than that employed in previous research, and a greater number of men to women were tested, again contrasting previous research. Both sampling considerations may explain differences in the current finding compared to Fraley, Heffernan, et al., (2011). There were also no differences in attachment patterns

between those with TBI and those with other ABI. Finally, there were no significant associations between the attachment dimension and age or time since injury for any relationship.

Hypothesis 2. Results from the current study do not support Hypothesis 2, which anticipated significant differences in attachment patterns between those in a romantic relationship and those currently single after ABI. Consequently, limited support is found for suggestions of a positive association between secure attachment and marital stability (Mikulincer & Shaver, 2007). Similarly, no evidence is found to support the suggestion that attachment avoidance or anxiety have an effect on relationship dissolution (Ceglian & Gardner, 1999; Hill et al., 1994; Le et al., 2010). In addition, there was no significant difference in levels of psychological distress, social isolation and HRQOL between those in a romantic relationship and those currently single, although a non-significant moderate effect of being in a romantic relationship on the emotional subscale of the QOLIBRI was shown. This suggests a possible trend that those not in a relationship report being more bothered by emotional changes than those with a partner in the current ABI sample. However, these results more generally propose that after ABI marital and romantic relationships do not necessarily provide psychological or physical health benefits (Feeney, 2008) and that they do not dampen the negative impact of stressful life event, as has previously been suggested (Selcuk et al., 2009).

However, relationship status is a very crude measure of how one's relationship may impact on well-being or individual attachment patterns. Although an individual may be in a romantic relationship, the quality and kind of relationship is likely to vary greatly. The categorisation of relationship status does not provide any information on the individuals' level of satisfaction with their romantic relationship. Likewise, many

individuals may be satisfied with not being in a romantic relationship. Relationship satisfaction is important to consider as it has been shown to be negatively impacted after ABI (Burridge et al., 2007) and has been suggested as a significant protective factor in relationship dissolution and breakdown (Hirschberger et al., 2013). Moreover, relationship satisfaction has been shown to be negatively associated with attachment avoidance and attachment anxiety (Collins & Feeney, 2004; Crowley, 2013).

Consequently, future research considering relationship satisfaction may develop an understanding of how adult attachment may impact on relationship breakdown. For example, it is possible that adult attachment is indirectly associated with relationship breakdown, but only through lower rates of relationship satisfaction. However, due to the likely reciprocal relationship between attachment patterns and relationship satisfaction, the increased knowledge of individuals' adult attachment patterns may equally disentangle which couples are likely to experience a decline in marital satisfaction after ABI.

Moreover, although there was no significant difference between outcomes for those individuals in a romantic relationship and those that were single, the current results showed that partner attachment anxiety and partner attachment avoidance were positively associated with social isolation. These moderate associations were larger than the associations between mother, father and friend attachment patterns with social isolation. This indicates that a secure relationship with a romantic partner may act as a significant protective factor in the development of social isolation after ABI. However, due to the current sample size, the two groups (those in a romantic relationship and those single) only consisted of a small number of participants. Consequently, such conclusions are made with relative caution.

Hypothesis 3. As has commonly been demonstrated in the stroke and TBI literature, anxiety and depression were significantly associated in this study (Sagen et al., 2009; Whelan-Goodinson et al., 2009). Both depression and anxiety were also significantly associated with the sense of social isolation, as measured by the FS. This supports evidence indicating that those who experience social isolation after TBI and stroke also experience psychological distress (e.g. Douglas & Spellacy, 2000; Hinojosa et al., 2011; Lewin et al., 2013; Stålnacke, 2007). Furthermore, as previously reported, HRQOL (as measured by the QOLIBRI total score) was inversely related to psychological distress (e.g. Siponkosi et al., 2010; Steadman-Pare et al., 2001) and social isolation (e.g. Carod-Artal & Egido, 2009; Hawthorne et al., 2009) after ABI. Depression yielded the largest association with the total HRQOL score, and a significant association with all six subscales of the QOLIBRI, thus confirming the relationship between depression and the multifaceted nature of HRQOL (von Steinbüchel et al., 2010a). Anxiety and social isolation were similarly associated to the six subscales, but were not associated with the autonomy subscale. This suggests that individuals who are unsatisfied with their independence commonly experience lower moods, but not anxiety or social isolation.

The current results provided mixed support for Hypothesis 3. As predicted, adult attachment anxiety and attachment avoidance both demonstrated a moderate and significant negative association with social isolation. This supports previous research suggesting that individuals with high attachment anxiety and/or attachment avoidance experience the least amount of social support when compared with securely attached individuals (Collins & Feeney, 2004; Ognubene & Collins, 1998; Vogel & Wei, 2005). However, it is often reported that attachment anxiety exhibits the strongest relationship to loneliness and social isolation (Kafestsios & Siderdid, 2006; Wei et al., 2005). This is

believed to be due to the discrepancy between the desire for substantial social support and the actual social support received. In the current research, attachment avoidance was most strongly associated with social isolation.

Taken together, this suggests that after ABI individuals, who demonstrate a highly anxious attachment pattern, characterised by a belief that one is unable to independently manage threat and the utilisations of hyperactivating strategies (such as intensifying support-seeking behaviour) are at a significant risk of experiencing social isolation. It has been reported in the literature that this association is the result of such individuals overwhelming their attachment figures with concerns and problems, as they are unable to self-regulate such worries or feel able to manage threats they experience in their environment. Consequently, attachment figures withdraw their support, as they feel unable to provide the desired level of input requested by the individual. This leads the anxiously attached individuals to increase their efforts to gain further support, which in the style of a *vicious circle* leads to greater social isolation (Lopez et al., 2002; Wei et al., 2003; Wei et al., 2005).

However, it appears that individuals who score highly on attachment avoidance experience the greatest amount of social isolation. This suggests that social isolation is more closely associated to a working model characterised by beliefs that attachment figures are unsafe and untrustworthy, which leads to the utilisation of deactivating strategies such as self-reliance, denial and suppression of attachment needs and independence (Mikulincer et al., 2003). These behaviours result in individuals experiencing limited support as their behaviours actively push support away. They are also unlikely to monitor the availability of attachment figures, as this may reactivate the attachment system (Shaver & Mikulincer, 2004; Wei et al., 2005). Although these behaviours may reduce the level of distress in the short term, it is believed that

uncompromising use of this strategy results in the individual feeling isolated, as individuals with social relationships with the person with ABI struggle to engage and connect with the individual (Wei et al., 2005).

This suggests that there is a significant positive relationship between attachment security and social connectedness after ABI, which supports previous research proposing that securely attached individuals are most likely to seek social support after a traumatic life experience (Schmidt, Nachtigall, et al., 2002). This positive relationship is likely to be grounded in securely attached individuals' working models, which perceive attachment figures as available and supportive, whilst maintaining a positive self-view as someone who is lovable and worthy of support. Consequently, the request and use of social support is neither considered as dangerous, as it is for those who experience high attachment avoidance, nor is the support abused or over used, which can lead to rejection, as for people with high attachment anxiety (Vrtička & Vuilleumier, 2012; Wei et al., 2003; Wei et al., 2005).

Both attachment anxiety and attachment avoidance were also negatively associated with anxiety, suggesting that individuals who experience greater attachment security also experience fewer symptoms of anxiety (e.g. Catanzaro & Wei, 2010). However, contrary to the hypothesis depression was not associated with attachment avoidance or attachment anxiety. This relationship has consistently been demonstrated in the literature, both with normative samples (e.g. Bosmans et al., 2010; Catanzaro & Wei, 2010; Mikulincer & Shaver, 2007; Raque-Bogdan, 2011) and research exploring individuals' distress after a significant life event (e.g. Mikulincer & Florian, 1998; Mikulincer et al., 1998; O'Connor & Elklit, 2008; Sockalingam et al., 2011). However, the relationship between attachment avoidance and depression *was* significant when using Spearman's rho. Although this may suggest a trend in the data, this finding contradicts

previous research indicating that attachment anxiety yields the greatest association with depression (Shaver & Mikulincer, 2007; Wei et al., 2003; Wei et al., 2005). Poignantly, the current research contradicts Li et al., (2008), who demonstrated a positive association between both attachment avoidance and attachment anxiety with depression after stroke. Although the literature suggests that adult attachment patterns are important to consider in regards to depression after a significant life event, it appears that there is no direct or significant relationship between attachment patterns and depression for the ABI sample used in this study.

Finally, a significant but weak negative association between HRQOL (QOLIBRI total score) and both attachment avoidance and attachment anxiety was demonstrated (Bennett et al., 2011; Fagundes et al., 2014; Sockalingam et al., 2011). This contradicts previous research that found that only attachment anxiety was associated to HRQOL (Belizare & Fuertes, 2011; Bodner & Cohen-Fridel, 2010; Hsieh et al., 2013; Martin et al., 2012; Ponizovsky & Drannikov, 2013). Global attachment anxiety was also found to have a moderate significant association to the emotions subscale of the QOLIBRI, and global attachment avoidance was associated with the social subscale. This supports the moderate to strong significant association that was shown between attachment avoidance and social isolation, and suggests that attachment avoidance is important to consider in relation to social relationships and social contentedness after ABI.

Hypothesis 4 and Hypothesis 5. Attachment avoidance and attachment anxiety did not explain any additional variance in HRQOL after ABI. This result contradicts previous studies that have suggested that attachment avoidance and attachment anxiety are both significant and independent predictors of HRQOL above other psychosocial variables, including depression, anxiety and social support (Fagundes et al., 2014;

Ponizovsky & Drannikov, 2013), For example, attachment anxiety has been suggested to be the main factor associated with lower physical HRQOL in a cancer survivor group (Hsieh et al., 2013). Results from the current study suggest that depression and social isolation are the strongest predictors of HRQOL after ABI, supporting previous research that has consistently demonstrated the importance of these key predictor variables of HRQOL after ABI (Hawthorne et al., 2011; Kiely et al., 2006; Steadman-Pare et al., 2001; Tomberg et al., 2007; von Steinbüchel et al., 2010b). However, like attachment patterns, anxiety as measured by the HADS-A did not explain additional variance after ABI. This contradicts previous research that suggests anxiety is an important predictor variable in the efforts to explain variance in HRQOL after ABI (e.g. Hawthorne et al., 2010; von Steinbüchel et al., 2010b).

Mediation analysis utilising multiple OLS regressions with a bootstrapping procedure (Hayes, 2013; Preacher & Hayes, 2004) also suggests that attachment anxiety and attachment avoidance do not exert a significant direct effect on HRQOL after partialling out social isolation and depression. However, two significant indirect paths considering the relationship between adult attachment and HRQOL after ABI were found. Firstly, a significant indirect effect for both global attachment anxiety and global attachment avoidance on HRQOL through social isolation was demonstrated. Secondly, a significant indirect effect of both global attachment avoidance and global attachment anxiety on HRQOL through the relationship between social isolation and depression was also demonstrated. This second path supports results suggesting that social isolation mediates the relationship between attachment anxiety and attachment avoidance with depression (Chi et al., 2010; Larose & Berniers, 2001; Li et al., 2008; Moreira et al., 2003; Rodin et al., 2007). However, no significant direct path was present for either attachment anxiety or attachment avoidance with depression, which has previously been

shown for attachment anxiety (Vogel & Wei, 2005). Consequently, no significant indirect effect of attachment avoidance and attachment anxiety on HRQOL solely through depression was found.

These findings from the current mediation analysis suggest that people with increased global attachment avoidance or attachment anxiety experience greater levels of social isolation after ABI. This experienced social isolation directly and negatively impacts HRQOL, or alternatively affects HRQOL through increasing levels of depression, as the model tentatively suggests that it is social isolation that causes individuals to experience low moods and depression. Thus, although there was no association between adult attachment patterns and depression, the study suggests that attachment anxiety and attachment avoidance may predict depression after ABI, but that social isolation is a prerequisite. The resulting depression subsequently reduces the ABI survivor's HRQOL.

Such findings support claims that attachment avoidance may be associated with lower levels of HRQOL because of individuals' limited use of social support (Sockalingam et al., 2011). However, it is proposed that global attachment anxiety is also associated to HRQOL due to similar experiences of social isolation and limited social connections. As previously discussed, social isolation is likely to develop due to different reason for individuals with high levels of attachment avoidance and those with high levels of attachment anxiety. For those high-scoring for attachment anxiety, the association is most likely rooted in the rejection by attachment figures due to unrealistic demands and high expectations, and for attachment avoidance, such patterns are likely to be grounded on the perception of support as dangerous with the emphasis instead placed on independence (Lopez et al., 2002; Wei et al., 2003; Wei et al., 2005). In addition, activated working models leading to negative views of the self or others are likely to

contribute to psychological distress. For example, Ponizovsky & Drannikkov suggests that attachment anxiety is likely to be associated to HRQOL, as attachment anxiety underlies the most dysfunctional and unstable interpersonal relationships, which will contribute to psychological distress and thus HRQOL.

According to the social identity theory, social isolation and limited social connections are likely to have a negative impact on an individual's sense of identity (Tajfel & Turner, 1986), as the individual is unable to develop a social self concept, protect self-esteem or place themselves within the society. The preservation and/or the development of a positive sense of self is considered a crucial process in recovery after stroke and TBI (Gracey et al., 2008; Nochi, 2000). Moreover, group memberships and social connectedness is proposed to provide actual physical and psychological support during developmental transitions, illness, and injury (Cohen, 2004) and contribute to positive adjustment and problem-solving, whilst buffering against the effects of stress after TBI and stroke (Cobb, 1976; Tomberg et al., 2005; Tsouna-Hadjis et al., 2000). Such processes help conceptualise how social isolation is likely to impact on an individual's level of HRQOL after ABI, and suggest that when faced with a significant life transition belonging to social group/s has a positive impact on well-being (Jones et al., 2010). Moreover, Haslam et al. (2008) found that multiple and maintained group memberships play a significant role in predicting well-being after stroke. Such research supports the current mediation model that suggests that social isolation impacts depression after ABI, which in turn impacts HRQOL.

The mediating model also supports suggestions that a more secure attachment pattern is associated with better HRQOL (Bennett et al., 2011; Ponizovsky & Drannikkov, 2013; Sockalingam et al., 2011). It has been suggested that for individuals with lupus, this association is due to individuals with secure attachment patterns being

more likely to experience positive adjustment, higher levels of rehabilitation success, better coping resources and better control of physical outcomes (Bennett et al., 2011). Moreover, considering Lazarus' (1993) coping model it can also be hypothesised that individuals with secure working models are likely to experience difficulties and stresses in their environment as manageable and less threatening. Working models associated with secure attachment are believed to act as a protective factor for both personal coping resources, such as self-esteem, and environmental resources, such as social support, which impact on individuals' appraisal of perceived threat (Mikulincer & Florian, 1998). Consequently, secure individuals will have greater confidence in their coping resources and will feel more equipped to manage such difficulties (Alexander et al., 2001). Thus, after ABI individuals with a secure attachment are more likely to feel able to manage with the psychosocial, cognitive and financial difficulties that may be experienced. Consequently, such threats may not feel as overwhelming, and thus self-reported levels of HRQOL may be higher for those with low levels of attachment avoidance and attachment anxiety.

However, it is important to remember that although the mediation is a casual model, the current study employs a non-experimental design. Consequently, although the current research provides support for the proposed model, with adult attachment affecting social isolation, which in turn affects HRQOL either independently or through psychological distress, further research is required utilising a more traditional experimental design with greater control and manipulation of the variables (Wu & Zumbo, 2004). Support for the current model is gained through the consideration of an alternative model, which explored the possibility that social isolation affected adult attachment patterns, which in turn affected HRQOL. There was little support for such a model. However, future research also needs to consider other variables that may play a

mediating role between the current variables of interest (Hayes, 2013). For example, self-criticism is proposed to be associated with higher rates of attachment anxiety and attachment avoidance (Zuroff & Fitzpatrick, 1994) and is suggested to fully mediate the relationship between attachment anxiety and psychological distress (Catanzaro & Wei, 2010). Furthermore, the relationship between attachment anxiety and psychological distress is fully mediated by individuals' perceived ability to problem solve (Wei et al., 2003). Although attachment avoidance was only partially mediated by both variables, as psychological distress has been shown to be strongly associated to HRQOL in the current research, such mediating variables must be considered in the future.

Reliability and Validity of the Current Measures

The internal consistency of all the measures and subscales used in the current research were shown to be good to excellent. Only the EQ-5D-3L showed a lower rate of internal consistency, but it still demonstrated adequate reliability (Kline, 2000). Therefore, these findings support previous research documenting the promising reliability of the QOLIBRI (Soberg et al., 2013; von Steinbüchel et al., 2010a), and for the first time demonstrate the reliability of the measure within a broader ABI sample. The research also shows for the first time that ECR-RS has promising reliability with ABI samples, and supports previous evidence for internal consistency and reliability of the EQ-5D-3L and FS (Hunger et al., 2012; Hawthorne, 2006; Pickard et al., 2007). However, the test-retest reliability of the measures was not considered in the current study, thus research further considering the reliability among an ABI sample is required.

Due to the recent development of the QOLIBRI, research considering the scale's validity is still in its infancy. However, the convergent validity of the QOLIBRI was further supported with a significant yet modest association with the EQ-5D-3L. The EQ-

5D-3L has previously shown good reliability and validity with a range of patient samples (Petrou & Hockley, 2005), including stroke patients (Hunger et al., 2012). The construct validity of the QOLIBRI and EQ-5D-3L were further explored through the consideration of hypothesised associations with other outcome measures. The QOLIBRI total showed strong positive associations with the HADS-D, the HADS-A and the FS. In particular, the social relationship subscale demonstrated a significant association with the FS. However, it is important to note that the HADS-D was not associated to the emotions subscale of the QOLIBRI as would be expected (von Steinbüchel et al., 2010a). The EQ-5D-3L showed similar association with the HADS and the FS. Such expected correlations add weight to the construct validity of both the EQ-5D-3L and the QOLIBRI for an ABI sample, supporting previous research exploring the measures in solely stroke or TBI samples (Hunger et al., 2012; Soberg et al., 2013; von Steinbüchel et al., 2010a).

Implications

Based on the current findings it is suggested that attachment patterns are important to consider and measure during the psychological assessment of individuals following ABI. Such information may help professionals to identify those individuals who are most likely to experience social isolation, and consequently, lower HRQOL. A similar recommendation has been made when assessing the psychological wellbeing and HRQOL of cancer survivors (Hsieh et al., 2013). It is important to recognise the substantial clinical utility of such information. Knowledge of individuals' attachment patterns can help professionals to understand patients' likely response to psychotherapy and other rehabilitation interventions, to regulate the engagement of both the patient and therapist in treatment, to anticipate the types of treatment behaviours and possible therapeutic ruptures, and to estimate individuals' prognosis in treatment (Daniel, 2006;

Ponizovsky & Drannikov, 2013). Indeed, it has been demonstrated that individuals who rate themselves as securely attached experience a strong therapeutic alliance (Mikulincer et al., 2013; Smith, 2010) and obtain better treatment outcomes (Byrd et al., 2010; Levy et al., 2011).

Providing training on adult attachment patterns to multidisciplinary teams may also prove to be clinically beneficial. Many professionals involved in the care of ABI patients have limited knowledge of important psychological models and processes that can affect the therapeutic relationship and rehabilitation outcomes. Consequently, increasing the teams' understanding of how individuals' working models (either developed during childhood, or perhaps modified as a result of the ABI) can affect treatment may support fresh perspectives on challenging behaviours and ways to engage with the individual. Importantly, teaching may help professionals foster more empathy for displays of such challenging treatment behaviours after ABI (Laaksonen & Ranta, 2013). For example, professionals may display more tolerance to unrealistic demands made by highly anxiously attached individuals (Wei et al., 2005) and be more patient with highly avoidant individuals' tendency to continually reject support (Ciechanowski et al., 2004; Dozier, 1990; Marmarosh et al., 2009). It is essential that on-going support be offered to such individuals who are less likely to engage. Over time, as they begin to trust the rehabilitation professionals and feel more secure and safe in their presence, they may feel more able to engage in support.

As depression is demonstrated to be the largest predictor of HRQOL in the current study, it suggests that interventions focusing on the reduction of psychological distress and the development of psychological well-being are important for professionals to understand while working with individuals with ABI. Whilst a range of interventions have been suggested to be beneficial for individuals' well-being after ABI, including

Compassion Focused Therapy (Ashworth, Gracey, & Gilbert, 2011) and Narrative Therapy, focusing on changes to the individual's identity (Block & West, 2013; Nochi, 2000), Cognitive Behavioural Therapy (CBT) appears to gain the most support within the literature. Growing evidence suggests that CBT is able to reduce symptoms of depression and anxiety, whilst improving psychosocial functioning after ABI such as TBI or stroke (Anson & Posnford, 2006; Waldron, Casserly, & O'Sullivan, 2013).

However, the current model suggests that services involved in the care of individuals with ABI should focus on improving their sense of social connectedness, as the reduction of social isolation has a significant impact on depression and HRQOL. As there is often a greater reliance on family members to provide social support after ABI (Morton & Wehman, 1995; Verhaeghe et al., 2005), family interventions and systemic therapy may provide one possible option in regards to improving social connectedness. However, although evidence for the use of specific family interventions is strong when considering the treatment of long-term chronic diseases (Martire et al., 2004; Shields et al., 2012), at present there is no strong evidence supporting any specific family intervention for families after ABI (Kreutzer et al., 2009). Future research considering family interventions after ABI should also consider attachment patterns, as the success of family involvement in treatment or direct family intervention may be mediated through individuals' attachment patterns. For example, the involvement of a family member in an individual's rehabilitation program may be detrimental if there are high levels of attachment anxiety and attachment avoidance. In such instances, specific family or individual therapy targeting insecure attachments may be beneficial. For example, CFT includes working at the attachment system level, with the therapist explicitly focused on providing a secure working base for patients to support individuals in feeling comfortable giving and receiving support from others and themselves (Gilbert, 2010).

The current research also supports treatments directly targeting social connectedness. This includes the *Academy of Life Programme*, which aims at socially reintegrating TBI individuals back into the community (Bulinski, 2010). Although no direct measure of depression or HRQOL was included in the research, the programme has been demonstrated to improve social functioning and reduce social isolation (Bulinski, 2010). Moreover, treatment focusing on social connectedness through the assignment of peer support mentors within the community has been shown to improve patients' mood, coping, perceived social support and HRQOL (Hanks, Rapport, Wertheimer, & Koviak, 2012; Hibbard et al., 2004; Struchen et al., 2001).

The importance of social connectedness also suggests that individuals should be engaged in community rehabilitation where possible after ABI. Community rehabilitation is suggested to improve social and leisure functional ability, and more general measures of psychological well-being after ABI (Hartman-Maeir, Soroker, Ring, Avni, & Katz, 2007; Powell, Heslin, & Greenwood, 2002). Moreover, in a recent review it has been suggested that comprehensive-holistic rehabilitation programs, with an emphasis on community functioning, should be considered the treatment standard for ABI. Such programmes have been demonstrated to improve outcomes in a range psychosocial factors (Cattelani, Zettin, & Zoccolotti, 2010). Although treatments focusing on social connectedness are likely to be more costly, the literature and the current research suggests that it is essential that such programs are funded and utilised by health care services.

Cattelani, Zettin and Zoccolotti (2010) also recognised the importance of rehabilitation services establishing a therapeutic milieu. It is proposed that in ABI rehabilitation the group setting in itself (including peer feedback and professional modelling) can be a vehicle for change, as along as the individual experiences interpersonal connections (Ben-Yishay, 1996). This suggests that treatment should not

only aim to increase individuals' connection to their family, peers and community, but also to support individuals to develop connections with other service users to maximise the experience of rehabilitation. It has recently been proposed that such rehabilitation programmes have the potential to provide a *secure base* as well as a place of belonging for individuals with ABI (Ashworth, Clarke, Jones, Jennings, & Longworth, 2014).

A therapeutic milieu is only developed if there is a supportive, structured (consistent), and repetitive (predictable) environment. These characteristics are very similar to those required from a caregiver to establish a secure attachment. The potential for rehabilitation services to provide a secure attachment has rarely been considered in past research (Ashworth et al., 2014; Goodwin, Holmes, Cochrane, & Mason, 2003). However, it is reported that patients place a significant emphasis on developing a trusting and safe relationship with the service, which is subsequently perceived as an essential process to foster full engagement with the service (Ashworth et al., 2014). As has been suggested for individual therapy, treatment outcomes may be grounded in the formation of a secure attachment with the overall service. This suggests that rehabilitation services should invest time and effort in providing individuals a secure based, which could help establish a therapeutic milieu and provide the individual the security with which fully to engage in interventions, which may otherwise be perceived as extremely threatening. Alongside the current research, this suggests that not only may social isolation and psychological distress be important to consider during treatment, but also individuals' attachment patterns.

Limitations

As a result of the time constraints of the current research and the common difficulties recruiting individuals with ABI, the sampling inclusion and exclusion criteria

were extremely broad and inclusive. This ensured an adequate sample size was collected to secure statistical power. Although only 40 participants were recruited for the study, three short of the target sample, this provided favourable power calculated with g*power (Faul et al., 2007), utilising the effect size derived from the multiple regression. However, as a result of the broad inclusion criteria, the current sample was very heterogeneous. This included a wide range of injury location, cause of injury and time since injury. The lack of control of such variables may impact on the validity of the results, as it is difficult to infer the impact of such characteristics on the outcome variables of interest e.g. HRQOL and adult attachment. However, the heterogeneous nature of the sample can be considered a relative strength of the study. All the services involved in the recruitment of participants utilise similarly broad inclusion criteria. Consequently, the current sample can be considered representative and generalizable to of the population of interest. However, it is important to recognise that the current sample did not include individuals coping with difficulties associated with ABI isolated in the community without the support of a rehabilitation service. Such individuals may experience greater negative outcomes and different patterns in attachment. Moreover, the individuals who volunteered for the research may represent a subgroup of ABI survivors who attended the included services. For example, those who volunteered may have felt more comfortable talking about their injuries, or possibly have experienced less difficulties compared to those who did not participate. It is also possible that there is an under-representation of highly avoidant individuals in the study, as such individuals may have felt threatened by the research and declined to participate. The current sample was also predominately male, whilst the majority of the normative sample was female. Consequently, attachment patterns reported in the current sample may exhibit a difference compared to healthy

controls once gender has been considered. Further research with a stricter control over sample characteristics is required.

Although the current research considered possible differences between TBI and non-TBI injuries (suggesting no differences in attachment patterns or HRQOL), tighter control on injury location and type of injury may have been warranted. In a recent review (Vrtička & Vuilleumier, 2012) it is proposed that individuals' attachment patterns are influenced by the encoding of *approach* (safety) versus *aversion* (threat) tendencies in social encounters, suggesting the activation of a network of subcortical and cortical limbic areas. These affect evaluation mechanisms are reported to be modulated by complex cognitive control processes and emotional regulation capacities. Together, this suggests that networks in the medial prefrontal cortex, superior temporal sulcus and the temporal parietal junction are important to consider for adult attachment. Although the current research considers psychosocial factors that may be related to adult attachment (and thus HRQOL after ABI), it is also possible that damage to specific areas of the brain may play an integral role in the display and formation of adult attachment after ABI.

Furthermore, the current study did not control for injury severity. Although the majority of TBI participants were deemed to have a severe injury based on self-reported estimations of PTA and length of unconscious (Green et al., 2001), similar estimations are not routinely used for other ABIs, such as injuries resulting from vascular events or infections. However, there are mixed findings on the association between injury severity and HRQOL after TBI. Some research suggests a positive relationship (Hu et al., 2012; Gosman-Hedström et al., 2008), while other research suggests a negative relationship (Forslund et al., 2013; Siponkoski et al., 2013). Recently, it has been proposed that it is not the level of injury severity that is associated with HRQOL, but the individuals' level of self-awareness of deficits (Sasse et al., 2012). It was beyond the scope of the current

research to take into consideration participants' awareness, but as already discussed it is important to recognise that participants' level of self-awareness of deficits might not only have impacted upon scores on HRQOL, but also upon patterns of attachment.

It is hypothesised that low self-awareness may act as a protective factor in regards to negative psychosocial outcomes, as such individuals experience less threat and distress compared to those who maintain a substantial level of insight (Sasse et al., 2012). Subsequently, such individuals may not experience the ABI as a discomforting life event, which Bowlby (1988) suggested could modify or change individuals' attachment pattern. Moreover, without the experience of threat individuals are unlikely to engage in hyperactivating or deactivating strategies (Shaver & Mikulincer, 2002), which are associated to negative outcomes (Berry & Kingswell, 2012; Lopez et al., 2001; Mikulincer, 2007). This possibility may explain why the current results suggest that there are no changes in individuals' pattern of attachment after ABI, contradicting previous research considering other significant life events, as the development of cancer or other chronic conditions are unlikely to impact on one's level of awareness. Furthermore, it has been shown that self-awareness may impact the validity of HRQOL measures after a brain injury. However, when examining the contribution of depressive symptomatology and self-awareness, it was depression and not self-awareness that was significantly associated with subjective self-reports of memory and HRQOL (Goverover & Chiaravalloti, 2014).

For the current research the impact of participants' cognitive function regarding their ability to comprehend and complete the questionnaires was not formally assessed. Instead, subjective clinical judgment from each participant's rehabilitation service about their ability to complete questionnaires was used. Moreover, due to cognitive difficulties the questionnaires were not always completed in a standardised format. Many of the

participants required the questions to be read aloud, to be provided with alternative phrasing to specific questions, or to be given additional instructions. For such reasons results from the current research should be considered with caution as validity cannot be guaranteed. However, it is important to remember that it is standard practice to complete and utilise data from self-reported measures after ABI (Coetzer, 2010). To minimise the impact of ABI related difficulties on the validity of measures used, questionnaires were selected on the previous validation with ABI samples (e.g. HADS; Sagen et al., 2009; Schonberfer & Ponsford, 2010). Only the EQ-5D-3L lacked strong evidence of the validity of the measure among ABI samples.

Finally, limitations regarding the design and statistical analysis must be raised. As previously discussed, the current study is cross-sectional in design. Consequently, no inference about causation can be confidently determined from the results. Although mediation analysis is a causal model (Hayes, 2013), results from the current study can only suggest the possible direction of causality. However, the model suggested gains strength as limited support for the proposed alternative model was found. Furthermore, the statistical analysis in the current research was explorative in nature. Although specific research questions were raised and answered, to the author's current knowledge this was the first research considering adult attachment patterns and HRQOL after ABI. Consequently, there were many areas of interests, utilising questionnaires with multiple subscales. Although multiple testing and extensive analysis of small sample sizes significantly increases the chance of making a Type II error, it is proposed that adjusting for this error can restrict the development of novel hypotheses, which in turn can hinder the progress of new areas of research (Nakagawa, 2004). However, conclusions drawn from the current research are tentative due to the high risk of a Type II error. Future research is needed to confirm and support the conclusions drawn.

Future Research

To the author's current knowledge this is the first study to consider adult attachment patterns and HRQOL after an ABI. Consequently, there are many avenues for future research. As discussed, in future efforts should be made to increase the confidence in the causal model proposed in the current research. However, developing a study with a strong experimental design may prove difficult. Researchers will face specific challenges in incorporating randomised sampling and directly manipulating the independent variable (e.g. development of an ABI). Although predictions of attachment prior to injury may warrant consideration, it is likely to prove difficult to ensure the validity of such estimations. Despite such difficulties, future research considering the temporal ordering of the questionnaires may provide greater control and confidence in proposed findings (Hayes, 2013; Wu & Zumbo, 2004).

As previously discussed, future research should also include a measure of relationship satisfaction (e.g. Relationship Assessment Scale, Hendrick, 1988). This may help understand the association between attachment patterns, relationship status and outcomes after ABI. Moreover, future research should explore individuals' attachment to their actual rehabilitation service, and consider if a strong secure attachment is a significant predictor to HRQOL and/or a protective factor for the development of insecure attachment patterns with other attachment figures. It has been suggested that the ECR-RS can be adapted to any social or family relationship (Fraley, Heffernan, et al., 2011); consequently, the current author sees no reason why the questionnaire could not be adapted to include attachment to a rehabilitation service.

Further research exploring possible explanations for the presence of low attachment anxiety and avoidance after ABI is required, as this contradicts previous research considering attachment patterns after a significant life event (Sockalingam et al.,

2011). ABI specific protective factors should be considered, which may include individuals' level of self-awareness (Sasse, et al., 2012). Self-awareness is also believed to be a precondition for emotional empathy (Decety & Meyers, 2008), which is a form of social cognition. Social cognition may be an important variable to consider as it has been suggested significantly to impact on level of social participation and QOL after brain injury (Dahlberg et al., 2006).

It is commonly reported that individuals' level of social communication is negatively affected after a stroke or TBI (McDonald & Flanagan, 2004; Rousseaux, Daveluy, & Kozlowski, 2010), particularly when the right frontal lobes are damaged (Haxby Hoffman, & Gobbin, 2002; Tranel, Bechara, & Denburg, 2002). Such difficulties include expression and recognition of emotion, (Hopkins, Dywan & Segalowitz, 2002; Milders, Fuchs & Crawford, 2003), evaluating social information and utilising one's theory of mind (Crawford & Channon, 2002), inferring meaning of verbal and non-verbal behaviours (McDonald & Flanagan, 2004), generating appropriate prosody (Heilmann, 2014), and inhibiting inappropriate social behaviours (Beer, John, Scabini, & Knight, 2006). Such difficulties are believed to have a significant impact on relationships after ABI, as the ability to communicate with loved ones is disrupted (McDonald, 2013). For example, difficulties with social communication after ABI may affect significant others' attachment patterns with the individual, as the individual is unable to display empathy. It has been shown that spousal relationship quality is hampered in patients with frontal lobe damage and associated difficulties (Burrige et al., 2007). It is also possible that the individual may struggle to interpret subtle changes in their social relationships. In turn, this may affect whether an individual experiences the ABI as a life-disconfirming event, which Bowlby (1988) suggested could lead to modifications in attachment patterns. If individuals do not experience such changes they may rely on pre-injury schemas of

relationship interactions and attachment patterns. This may explain the similar levels of attachment anxiety and attachment avoidance compared to normal samples. The inclusion of a social communication measure such as The Awareness of Social Inference Test (McDonald, Flanagan, Rollins, & Kinch, 2003) in future research may be beneficial. Research may also benefit from considering non-ABI specific variables that possibly impact patterns of adult attachment and HRQOL. Self-criticism, and perceived ability to problem solve are two variables that may warrant further exploration (Catanzaro & Wei, 2010; Wei et al., 2003).

It is also essential to remember the dyadic nature of adult attachment, and that individuals' working models are not developed in social vacuums. Instead attachment patterns are grown and developed through the two-way relationship between the individual and the attachment figure (Bowlby, 1969). Consequently, future research should consider the attachment patterns of ABI survivors' primary carer and/or significant other. Caregivers can experience increased levels of psychological distress, family burden and diminished social interactions (Engström & Söderberg, 2011; Ponsford & Schönberger, 2010). A secure attachment pattern may protect caregivers from experiencing such negative outcomes, which in turn may have a positive impact on the survivor's outcome (Vangel, Rapport, & Hanks, 2011). Moreover, both attachment anxiety and attachment avoidance lead to an increase in destructive and coercive conflict management strategies (Selcuk et al., 2010). In addition, anxiously attached people place a considerable amount of importance on partners' supportive behaviour and perceive it to be less adequately available (Campbell, Simpson, Boldry, & Kashy, 2005), whilst avoidant attached individuals are less likely to be influenced by changes in their partner's positive affect cycles (Butner et al., 2007). Not only may such attachment patterns exhibited by the ABI survivor impact the caregiver, but also the caregiver's attachment

patterns may have significant impact on the survivor's well-being and subsequently their HRQOL.

Conclusion

This is the first study simultaneously to consider individuals' self-reported level of HRQOL and adult attachment patterns after ABI. Contrary to the predictions, it was demonstrated that patterns of attachment anxiety and attachment avoidance were similar to healthy samples. Consequently, results do not support previous research reporting higher rates of insecure attachment patterns among individuals who experience significant negative life events or chronic condition. Results also suggested there were no significant associations between depression and either dimension of adult attachment after ABI. However, attachment anxiety and attachment avoidance were both associated with anxiety, social isolation and HRQOL. Despite the significant associations with HRQOL, attachment anxiety and attachment avoidance did not explain any additional variance in the variable after controlling for psychological distress and social isolation. It was demonstrated that depression was the largest predictor of HRQOL after ABI, although social isolation was also found to be a significant predictor in the first model. Finally, mediation analysis suggested there was a significant indirect relationship between adult attachment and HRQOL mediated through social isolation and/or the association between social isolation and depression.

Although limited causal inference can be made from the current research, findings suggest that adult attachment patterns may play key a role in understanding important outcomes after ABI, including self-reported measures of HRQOL. Although no direct interaction was demonstrated, assessing adult attachment patterns may support professionals in predicting those who are most likely to experience reduced HRQOL after

ABI. It is concluded that adult attachment patterns and closely associated psychosocial difficulties must be targeted during intervention. Rehabilitation services and day centres for individuals with ABI may find it beneficial to focus efforts on providing individuals with opportunities to enhance social connectedness and the experience of a secure base where they can feel safe, secure and understood in the context of their trauma.

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Appendices

Appendix A

Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983). Not included due to copyright restrictions.

Appendix B

Quality of Life in Brain Injury (von Steinbüchel et al., 2010a, b). Not included due to copyright restrictions.

Appendix C

The Experiences in Close Relationships—Relationship Structures Questionnaire (Fraley, Heffernan *et al.*, 2011). Not included due to copyright restrictions.

Appendix D

The Friendship Scale (Hawthorne, 2006). Not included due to copyright restrictions.

Appendix E

The EQ-5D-3L (EuroQoL, 1990). Not included due to copyright restrictions.

Appendix F

Information sheet.



Department of Psychology

Royal Holloway, University of London
Egham, Surrey TW20 0EX, UK

Adult Attachment and Quality of Life After an Acquired Brain Injury

Information Sheet

My name is Joe Deakins and I am a trainee clinical psychologist at Royal Holloway, University of London. I would like to invite you to take part in my educational research study, which is part of my clinical doctorate qualification.

Before you decide, I would like you to understand why this study is being done and what would be involved for you during the research process. One of our team will go through the information sheet with you and answer any questions you have. We'd suggest this should take about 5-10 minutes.

What is the purpose of this study?

This educational study aims to explore the relationship between adult attachment, psychological distress, social isolation and quality of life after brain injury. I would greatly appreciate your participation as the knowledge generated by the study may help professionals in the future to better identify those individuals who require greater support after injury and help develop ideas for successful rehabilitation.

Why have I been invited?

You have been invited to take part in this study because you have sustained an acquired brain injury. It is hoped that between 40-50 other participants with a history of an acquired brain injury will be recruited for this study.

Do I have to take part?

No. It is up to you to decide to participate in the study, as participation is completely voluntary. As well as this information sheet you will have the study described to you. You will then have time to think about your participation and have an opportunity to ask any questions, before making a decision.

What will happen to me if I take part in this study?

- You will be met by myself, or an agreed alternative health care professional for a one off session at your current service or support group
- You will have another opportunity to ask any questions you might have about the study
- You will be supported to complete the study and subsequently debrief
- This one off session will take between 40 minutes to 1 hour 20 minutes

What will I have to do if I take part in this study?

- You will be asked to provide some basic information (e.g. age, marital status, date of injury)

- You will be supported to complete five questionnaires, with a combined total of 99 questions

Will I be offered support?

Yes. Should you choose to take part in the study, you will be supported throughout the process. This may include help filling out the questionnaires, or understanding some of the questions. Large size text questionnaires will also be available for those who require them.

What will happen if I don't want to carry on with the study?

You can stop the study at any time for any reason. You will be thanked and will be allowed to leave. Data collected from the questions that you have completed will be destroyed and not be used in the final research. You will also not be forced to answer any of the questions. You may miss a question if you want to.

What are the possible benefits of taking part?

We cannot promise the study will help you, but the information gathered from this study is hoped to improve the treatment of people with acquired brain injury. Moreover, all participants who participate in the study will be entered into a prize draw to win one of 5, £10 Amazon vouchers.

What are the possible risks of taking part?

Some people may find the questionnaires upsetting because they consider sensitive issues that arise after an acquired brain injury. Therefore, every participant will be debriefed after complete the questionnaires, which will provide a time to discuss any feelings that arise from the questionnaires and consider any further support that may be required.

Will my taking part in the study be kept confidential?

Yes. We will follow ethical and legal practice and all information about you will be handled in confidence. However, your current brain injury service (e.g. the service you will be recruited through) will be made aware that you agreed to complete the research. However, the results from your completed questionnaires will not be available to them, or any other person unless you specifically ask for them to be informed. This will be discussed at end of the research.

What will happen to the data after completing the study?

After the questionnaires are completed, nobody except my supervisors and myself will be allowed to see your completed questionnaires. Furthermore, to ensure confidentiality you will be known only by a number so that your data cannot be identified. This will ensure that the information is completely confidential. Your completed questionnaires will be kept in a locked filing cabinet. This anonymised information will be stored safely for fifteen years and then destroyed. Consent forms will be stored safely for two years and then destroyed. *Note-* copies of this anonymous data may be made available to other bodies for further (secondary) research.

What will happen to the results of the study?

The results from this study will be submitted to relevant academic journals for other professionals to read. Published information will be anonymous and it will not be possible to identify individuals. You will be offered the chance to receive a summary of these results after you have completed the research. This summary will be sent to you after the study is completed.

Who has reviewed the study?

This study has been reviewed and approved by the psychology department internal ethical procedure at Royal Holloway, University of London and NRES Committee London-Westminster (NHS ethics committee). This project is fully supervised.

Further information

1) General information about study

If you would like any independent additional information about research in general, please contact the local Patient Advice and Liaison Service's (PALS) on 0800 013 2511 or ccs-tr.pals@nhs.net

2) Specific information about this study

If you would like any additional information about this current study please contact me (Joe Deakins) on 01784 414012

3) Advice on participation in this current study

If you would like to discuss your participation in this current study with someone independently and not involved with the project, please talk to some one from your current service.

Who should I approach if I am unhappy with the study?

If you have a concern about any aspect of this study, or are unhappy with your treatment during the study you can contact me (Joe Deakins) on 01784 414012.

Please keep this information sheet for reference.

You do not have to take part in this study if you don't want to. If you decide to take part you may withdraw at any time without having to give a reason. Your decision whether to take part or not will not affect your treatment and care in any way.

Appendix G

Consent Form.



Department of Psychology

Royal Holloway, University of London
Egham, Surrey TW20 0EX, UK

Adult Attachment and Quality of Life After an Acquired Brain Injury

CONSENT FORM

Patient Identification Number for this trial:..... Name of
Researcher:

Please initial all boxes

1. I confirm that I have read and understand the information sheet
VERSION 5 (23/11/13) for the above study. I have had the
opportunity to consider the information, ask questions and have had
these answered satisfactorily.

2. I understand that my participation is voluntary and that I am free
to withdraw at any time without giving any reason, without my
medical care or legal rights being affected.

3. I understand that the data and information I provide for this
research will be anonymised and stored securely.

4. I understand that relevant sections of my medical notes and data
collected during the study, may be looked at by individuals from

Royal Holloway, University of London, from regulatory authorities or from the NHS Trust, where it is relevant to my taking part in this research. I give my permission for these individuals to have access to my records.

5. I agree to my current rehabilitation service/support group being informed of my participation in the study.

6. I agree to take part in the above study.

Name of Participant

Date

Signature

Name of Person
taking consent.

Date

Signature

NB: This consent form will be stored securely and separately from the anonymised data generated by this research.

Appendix H

Royal Holloway, University of London Ethics approval.

Ref: 2013/079R1 Ethics Form Approved

Psychology-Webmaster@rhul.ac.uk [Psychology-Webmaster@rhul.ac.uk]

Sent: 27 November 2013 17:55

To: nwjt079@rhul.ac.uk; [Langdon, D](#)

Cc: PSY-EthicsAdmin@rhul.ac.uk; [Leman, Patrick](#); [Lock, Annette](#)

Application Details: View the form click [here](#) Revise the form click [here](#)

Applicant Name: **Joe Deakins**

Application title: **Adult Attachment and Quality of Life (QOL) After a Traumatic Brain Injury**

Appendix I

Westminster's National Research Ethics Service LREC ethics approval



NRES Committee London - Westminster

Research Health Authority
Ground Floor, Skipton House
80 London Road
SE1 6LH

Telephone:
Facsimile:

09 July 2013

Mr Joe Deakins
Trainee Clinical Psychologist
Camden and Islington NHS
Royal Holloway, University of London
Egham Hill
Egham, Surrey
TW20 0EX

Dear Mr Deakins

Study title:	Questionnaire based study exploring health related quality of life and adult attachment after a traumatic brain injury
REC reference:	13/LO/0746
Protocol number:	NA
IRAS project ID:	119538

Thank you for your letter of 02 July 2013 and subsequent email correspondence, responding to the Committee's request for further information on the above research [and submitting revised documentation].

The further information was considered [in correspondence] by a sub-committee of the REC. A list of the sub-committee members is attached.

We plan to publish your research summary wording for the above study on the NRES website, together with your contact details, unless you expressly withhold permission to do so. Publication will be no earlier than three months from the date of this favourable opinion letter. Should you wish to provide a substitute contact point, require further information, or wish to withhold permission to publish, please contact the Co-ordinator Mrs. Alison O'Kane, NRESCommittee.London-Westminster@nhs.net.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation [as revised], subject to the conditions specified below.

Ethical review of research sites

NHS sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

Non-NHS sites

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission ("R&D approval") should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements.

Guidance on applying for NHS permission for research is available in the Integrated Research Application System or at <http://www.rdforum.nhs.uk>.

Where a NHS organisation's role in the study is limited to identifying and referring potential participants to research sites ("participant identification centre"), guidance should be sought from the R&D office on the information it requires to give permission for this activity.

For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.

Sponsors are not required to notify the Committee of approvals from host organisations

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

<i>Document</i>	<i>Version</i>	<i>Date</i>
Covering Letter		11 April 2013
Evidence of insurance or indemnity		01 August 2012
Investigator CV		11 April 2013
Other: CV of supervisor Dawn Langdon		11 April 2013
Other: Debriefing information sheet		11 April 2013
Other: Poster 1	1	11 April 2013
Other: Poster 2	1	11 April 2013

Other: EQ-5D	Validated	
Other: ECR-RS	Validated	
Other: FS	Validated	
Other: QOLIBRI	Validated	
Other: HADS	Validated	
Other: Evidence of peer review		26 February 2013
Participant Consent Form: clean and tracked changes	4	08 July 2013
Participant Information Sheet: including Opt-in form	1	11 April 2013
Participant Information Sheet: for services	1	11 April 2013
Participant Information Sheet: clean and tracked changes	4	08 July 2013
Protocol	1	11 April 2013
REC application		02 May 2013

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Reporting requirements

The attached document "*After ethical review – guidance for researchers*" gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- Progress and safety reports
- Notifying the end of the study

The NRES website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

Feedback

You are invited to give your view of the service that you have received from the National Research Ethics Service and the application procedure. If you wish to make your views known please use the feedback form available on the website.

Further information is available at National Research Ethics Service website > After Review

13/LO/0746	Please quote this number on all correspondence
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We are pleased to welcome researchers and R & D staff at our NRES committee members' training days – see details at <http://www.hra.nhs.uk/hra-training/>

With the Committee's best wishes for the success of this project.

Yours sincerely



Dr L Alan Ruben
Chair

Email: NRESCommittee.London-Westminster@nhs.net

*Enclosures: List of names and professions of members
 who submitted written comments
 "After ethical review – guidance for
 researchers"*

*Copy to: Prof Andrew MacLeod
 Mr Stephen Kelleher, Cambridge and Peterborough Foundation Trust*

NRES Committee London - Westminster

Research Health Authority
Ground Floor, Skipton House
80 London Road
SE1 6LH

Tel: 02079722571

12 December 2013

Mr Joe Deakins
Trainee Clinical Psychologist
Camden and Islington NHS
Royal Holloway, University of London
Egham Hill
Egham, Surrey
TW20 0EX

Dear Mr Deakins

Study title: Questionnaire based study exploring health related
quality of life and adult attachment after a traumatic brain
injury
REC reference: 13/LO/0746
Protocol number: NA
Amendment number: 1
Amendment date: 09 December 2013
IRAS project ID: 119538

The above amendment was reviewed by the Sub-Committee in correspondence.

Ethical opinion

The members of the Committee taking part in the review gave a favourable ethical opinion of the amendment on the basis described in the notice of amendment form and supporting documentation.

Approved documents

The documents reviewed and approved at the meeting were:

Document	Version	Date
Participant Consent Form	5	23 November 2013
Participant Information Sheet: Information for the service	2	23 November 2013
Debrief form	3	23 November 2013
Poster 1	3	23 November 2013
Protocol	2	23 November 2013
Opt in form	3	23 November 2013

Notice of Substantial Amendment (non-CTIMPs)	1	09 December 2013
Poster 2	3	23 November 2013
Participant Information Sheet	5	23 November 2013

Membership of the Committee

The members of the Committee who took part in the review are listed on the attached sheet.

R&D approval

All investigators and research collaborators in the NHS should notify the R&D office for the relevant NHS care organisation of this amendment and check whether it affects R&D approval of the research.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

We are pleased to welcome researchers and R & D staff at our NRES committee members' training days – see details at <http://www.hra.nhs.uk/hra-training/>

13/LO/0746:	Please quote this number on all correspondence
--------------------	---

Yours sincerely



**Dr Alan Ruben
Chair**

pp. Laura Hewitt

E-mail: nrescommittee.london-westminster@nhs.net

Enclosures: List of names and professions of members who took part in the review

*Copy to: Mr Stephen Kelleher, Cambridge and Peterborough Foundation Trust
Prof Andrew MacLeod*

Appendix J

R&D sites specific ethics approval



St George's Joint Research & Enterprise Office (JREO)

Ground Floor, Hunter Wing, St George's University of London,
Cranmer Terrace, Tooting, London SW17 0RE

Direct Line: 020 8725 3784
Email: ksuomi@sgul.ac.uk

16/08/2013

Mr Joe Deakins
Royal Holloway, University of London
Egham Hill
Egham
Surrey
TW20 0EX
UK

Dear Mr Joe Deakins

PROJECT TITLE	Questionnaire based study exploring health related quality of life and adult attachment after a traumatic brain injury
REC Reference	13/LO/0746
JREO Reference	13.0130
CSP Reference (if applicable)	N/A
Sponsor	Royal Holloway University
Principal Investigator (PI):	Mr Joe Deakins

Notification of St George's Healthcare NHS Trust host site permission

Permission for the above research has been granted on the basis described in the application form, protocol and supporting documentation. The documents reviewed and approved were those specified in the ethics approval letter dated 09/07/2013. The protocol version approved is version 01 dated 11/04/2013

This approval also covers the approved minor amendment dated 15/08/2013 and associated documents

Permission is granted on the understanding that the study is conducted in accordance with the Research Governance Framework, and NHS Trust policies. Permission is only granted for the activities for which a favourable opinion has been given by the REC. The permission may be invalidated in the event that the terms and conditions of any research contract or agreement change significantly and while the new contract/agreement is negotiated.

The research sponsor, the Chief Investigator, or the local Principal Investigator, may take appropriate urgent safety measures in order to protect research participants against any immediate hazard to their health or safety. The JREO should be notified that such measures have been taken. The notification should also include the reasons why the measures were taken and the plan for further action. The JREO should be notified within the same time frame of notifying the REC.

All amendments to this study (including changes to the local research team) need to be submitted in accordance with the guidance on IRAS. In addition any changes to the status of a study should be notified to the JREO.

Please note that the JREO is required to monitor research to ensure compliance with the Research Governance Framework and other legal and regulatory requirements.

Any intellectual property that is identified should be discussed with the JREO prior to any disclosure of this information by publication or presentations to ensure that all rights are protected.

At study closure, the JREO together with the approving ethics committee should be notified that the study is closed. Study findings should be disseminated as identified in the original ethics application (including participants where appropriate). Study files should be appropriately archived.

Please contact the JREO if you require any further guidance or information on any matter mentioned above. We wish you every success in your research.

Yours sincerely



Kirsti Suomi
On behalf of SGUL/SGHT
Joint Research and Enterprise Office

Copy to: Martin van den Broek

Dear Mr Joe Deakins

PROJECT TITLE:	Questionnaire based study exploring health related quality of life and adult attachment after a traumatic b injury
REC Reference:	13/LO/0746
JREO Reference:	13.0130
CSP Reference:	
Sponsor:	Royal Holloway University of London
Host Site	St George's Healthcare NHS Trust
Principal Investigator (PI):	Mr Joe Deakins

Acknowledgement of Amendment No 1

Thank you for your correspondence with regards to the amendment for the above named study.

The documents reviewed and approved were those specified in the ethics amendment approval letter dated 12/12/2013. The protocol version approved is version 2 dated 23/11/2013.

The JREO can confirm that this amendment does not affect current permission for the study, and is happy to approve the amendments with respect to risk assessment, research governance and cost implications.

Please contact the JREO if you require any further guidance or information on any matter mentioned above. We wish you every continuing success in your research.

Please note that no hard copy of this email will be sent.

Yours sincerely

Kirsti Suomi
On behalf of SGUL/SGHT
Joint Research and Enterprise Office

29 August 2013

Mr Joe Deakins
Trainee Clinical Psychologist
Camden and Islington NHS Foundation Trust
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Egham Hill
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RMG Office
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CB2 8FH
camstrad@cambridgeshire.nhs.uk

Direct dial: 01223 725466

Dear Joe Deakins

Re: Questionnaire based study exploring health related quality of life and adult attachment after a traumatic brain injury

Re: L01300/REC13/L0/0746

Your proposal has been reviewed by the Medical Director of Cambridgeshire Community Services NHS Trust.

I am pleased to inform you that Cambridgeshire Community Services NHS Trust has given permission for the following research to take place.

This permission is subject to the enclosed standard terms and conditions and conditional upon you notifying the research governance team of any changes to the study-related paperwork.

Unless we hear from you within a month of this letter, we will assume that you are abiding by these conditions.

The project must follow the agreed protocol and be conducted in accordance with Trust policy and procedures in particular in regard to data protection, health & safety and information governance standards. The research team are required to follow the reasonable instructions of the research site manager and can contact the RMG office for RMG advice or the Trust RMG lead in relation to queries on local policy.

On completion of clinical trials of interventional medicinal products/devices participants need to be aware that local Trust prescribing policy and formulary applies therefore participants cannot expect to continue on the research trial product/device on completion of the trial.

Approval is subject to adherence to the Data Protection Act 1998, NHS Confidentiality Code of Practice, the Human Tissue Act 2004, the NHS Research Governance Framework for Health and Social Care, (2nd edition) April 2005, the Mental Capacity Act and any further legislation released during the time of this study. Approval for Clinical Trials is on the basis that they are conducted in accordance with European Union Directive and the Medicines for Human Use (Clinical Trials) Regulations 2004 principles, guidelines and later revisions, and in accordance ICH Good Clinical Practice.

Members of the research team must where instructed have appropriate substantive or honorary research contracts or letters of access with the Trust prior to commencing work on the study,

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additional researchers who join the study must also hold a suitable contract or letter of access before they start.

You will be required to complete monitoring information during the course of the research, as requested by the RMG office. Cambridgeshire Community Services NHS Trust reserves the right to withdraw research management approval for a project if researchers fail to respond to audit and monitoring requests.

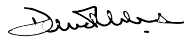
Should any adverse incidents occur during the research, Cambridgeshire Community Services NHS Trust Incident and Near Miss Reporting Policy should be used, the RMG Office informed and incident procedures adhered to at the research site.

If you make any amendments to your project, please ensure that these are submitted to the research ethics committee and the RMG office and that any changes are not implemented until approval has been received.

We welcome feedback about your experience of this review process to help us improve our systems. May I take this opportunity to wish you well with your research and we look forward to hearing the progress and outcomes for the study.

Please contact the RMG team should you have any queries.

Yours sincerely,



Dr David Vickers
Medical Director
Cambridgeshire Community Services NHS Trust

cc: Professor Andrew MacLeod

19 December 2013

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Dear Mr Deakins

Re: Substantial Amendment 1

Re: Questionnaire based study exploring health related quality of life and adult attachment after a traumatic brain injury

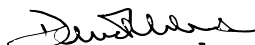
Re: L01300 / 13/LO/0746

The amendment for the above research project has been reviewed for Cambridgeshire Community Services NHS Trust in accordance with the Department of Health Research Governance Framework.

Please accept this letter as confirmation of the Trust's governance review.

We would welcome feedback about your experience of this review process to help us improve our systems. May we take this opportunity to wish you well with your research and we look forward to hearing the outcomes.

Yours Sincerely



Dr David Vickers
Medical Director
Cambridgeshire Community Services NHS Trust

cc: Andrew MacLeod

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Appendix K

Individual tables showing Pearson's Correlations Between Father/Partner/Friend Attachment Avoidance and Father/Partner/Friend Attachment Anxiety, and HRQOL, Psychological Distress and Social Isolation.

Pearson's Correlations Between Father Attachment Avoidance and Father Attachment Anxiety, and HRQOL, Psychological Distress and Social Isolation

Variable	Father Avoidance	Father Anxiety	HADS-A	HADS-D	FS
Father Avoidance	-	-	.21	.13	-.13
FatherAnxiety	.60**	-	.26	.12	-.08
QOLIBRI					
Cognition	-.10	-.13	-	-	-
Self	-.12	-.06	-	-	-
Autonomy	-.07	-.07	-	-	-
Social	-.04	-.08	-	-	-
Emotions	-.14	-.37*	-	-	-
Physical	-.02	-.13	-	-	-
Total Score	-.13	-.16	-	-	-

* $p < .05$, ** $p < .01$

Pearson's Correlations Between Partner Attachment Avoidance and Partner Attachment Anxiety, and HRQOL, Psychological Distress and Social Isolation

Variable	Partner Avoidance	Partner Anxiety	HADS-A	HADS-D	FS
Partner Avoidance	-	-	.32	.23	-.57**
Partner Anxiety	.54**	-	.36*	.30	-.49**
QOLIBRI					
Cognition	-.23	-.23	-	-	-
Self	-.20	-.12	-	-	-
Autonomy	-.01	-.23	-	-	-
Social	-.42	-.04	-	-	-
Emotions	-.13	-.21	-	-	-
Physical	-.34*	-.30	-	-	-
Total Score	-.28	-.24	-	-	-

* $p < .05$, ** $p < .01$

Pearson's Correlations Between Friend Attachment Avoidance and Friend Attachment Anxiety, and HRQOL, Psychological Distress and Social Isolation

Variable	Friend Avoidance	Friend Anxiety	HADS-A	HADS-D	FS
Friend Avoidance	-	-	.10	.12	-.45*
Friend Anxiety	.26	-	.12	.13	-.06
QOLIBRI					
Cognition	-.32*	-.21	-	-	-
Self	-.09	-.18	-	-	-
Autonomy	-.08	-.09	-	-	-
Social	-.18	-.07	-	-	-
Emotions	-.06	-.28	-	-	-
Physical	-.06	-.07	-	-	-
Total Score	-.16	-.21	-	-	-

* $p < .05$, ** $p < .01$