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Neuropsychodynamically informed psychotherapy approaches to rehabilitation: The
North Wales Brain Injury Service – Bangor University experience 1998 - 2018.

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Abstract:

The North Wales Brain Injury Service was developed 20 years ago, to provide multi-disciplinary community-based neuropsychological rehabilitation to the residents of North Wales. The theoretical underpinning of clinical service delivery is an adapted, slow-stream Holistic Neuropsychological Rehabilitation model. Some of its key aspects include the provision of long-term psychotherapeutic follow-up, to facilitate psychological adjustment, self-awareness, and encourage self-management over time. While financial realities undeniably influenced the way this model was developed (the North Wales Brain Injury Service is a publically funded NHS service), an equally influential factor was a recognition of the central role that neuropsychanalytically informed psychotherapy can play in post-acute neuro-rehabilitation. In post-acute rehabilitation settings, where working psychotherapeutically with problems of self-awareness towards psychological adjustment is central to the clinical model, the relevance of time over intensity of intervention is very important. Over the past two decades the service has evolved in several areas. While the service is multi-professional, this paper mainly reports on the nature of programme developments as regards psychotherapy, resulting from the close collaboration of the North Wales Brain Injury Service with its local academic partner, Bangor University. In this context, five distinctive but inter-related themes of neuropsychanalytically-informed approaches used in the service are discussed.

Clinical and theoretical background

Acquired brain injuries such as stroke, traumatic brain injury, brain infections, and other conditions almost inevitably cause significant long-term psychological impairments in cognition, emotion and behaviour. Most patients make a relatively good physical recovery, but psychologically less so. Clinical services increasingly have to find theoretically sound, cost-effective models to rehabilitate persons who present with long-term psychological difficulties after acquired brain injury.

Interestingly at a governmental policy level in the UK, the chronic nature of problems after brain injury is acknowledged by the National Service for Long Term Neurological Conditions (Department of Health, 2005). However, the reality is that brain injury rehabilitation service provision remains under-developed, poorly resourced, and not always valued (Krug & Cieza, 2017), in particular as regards publically funded post-acute, long-term community rehabilitation and support.

Furthermore, in areas where higher levels of socio-economic deprivation exist, service provision can be further hampered by additional logistical and other challenges.

Another important challenge concerns the development of innovative brain injury rehabilitation approaches.

Neuropsychodynamically informed approaches to rehabilitation may be particularly relevant to the field. Why do we propose this as a specific approach? Several neuropsychodynamic concepts appear to have direct relevance as part of a neuro-rehabilitation approach to the psychotherapeutic management of patients with acquired brain injury. Key features of this approach are an emphasis on emotion (or 'personality'), the self, a person's reflection on their own being and behaviour, or self-

awareness, systemic and relationship aspects, as well as therapeutic strategies that incorporate a non-confrontational approach. Incorporating these into a therapy approach naturally demands a more long-term approach to treatment, which in itself is of course core to neuropsychanalytic work with neurological patients. It is these themes which we would like to further expand upon and report findings from our ongoing research in this paper.

Self-awareness and neuro-rehabilitation

In addition to the more observable physical impairments associated with acquired brain injury, other, more ‘invisible’ difficulties such as, for example, personality change or poor insight, may also occur. Impaired self-awareness is arguably one of the ‘signature’ features of acquired brain injury, and in many ways bears some resemblance to disorders of insight. Clinically problems of self-awareness manifest as a subjective inability reflect and act on behaviour and its consequences. For example, a patient may fail to grasp that her socially inappropriate behaviour resulted in dismissal from work, and instead insist that she was ‘fired because of my poor memory’. Moreover, poor self-awareness can also have an adverse effect on patients’ engagement with rehabilitation (Lam, McMahon, Priddy & Gehered-Schultz, 1998) as well as, for example, employment outcome (Ownsworth, Desbois, Grant, Fleming & Strong, 2006). While admittedly many definitions of self-awareness exist, more generically it is thought of as an ability to consciously process information about the self in a way that reflects a relatively objective view, while simultaneously preserving a unique phenomenological experience or sense of self (Prigatano, 1997).

However, it is important to note that not *all* patients with acquired brain injury necessarily present with altered self-awareness.

Why is self-awareness so important to consider in neuro-rehabilitation? For an answer to this question, we need to briefly consider the main models of neuropsychological rehabilitation. Unsurprisingly several theories and models of neuro-rehabilitation exist. Fortunately, Wilson (1997 & 2002) provides us with comprehensive reviews of the main models and theories underpinning a range of clinical interventions. To summarise, the generic neuropsychological rehabilitation models very broadly comprise behavioural, cognitive, compensatory and Holistic approaches to rehabilitation (Wilson, 1997). Some of these models emphasize practice to reduce impairment, whilst others follow a more psycho-educational approach, employing compensatory strategies intended to improve outcome, rather than attempting to directly target impairments. Other models follow a mixed approach, for example combining elements of cognitive behaviour therapy (CBT) and principles of behaviour modification.

On the other hand, patients' need for adjustment and emotional re-integration are central to some other models, most notably the various Holistic rehabilitation models. More specifically, the development of self-awareness is a core target for Holistic models, which view self-awareness as a fundamental prerequisite for patients' successful engagement in other interventions. Holistic rehabilitation programmes were developed in the U.S. by Yehuda Ben-Yishay and George Prigatano from around the late 1970s and early 1980s (Sarajuuri and Koskinen, 2006). While in theory it may appear as if there is no overlap between different models, in

practice this is mostly not the case. It is acknowledged that in clinical practice it would be unlikely that a single model or theory can guide all treatment plans, and clinicians often have to integrate different models and theories (Wilson, 2002; 2005).

Despite some variation – for example, in length of time that clinical input is provided and emphasis placed on types of interventions – most Holistic neuro-rehabilitation programmes provide a combination of group therapy as well as individual psychotherapy sessions. Targeting cognitive, behavioural, and emotional difficulties are crucial clinical pillars in these programmes. Central to all interventions is the drive of working towards improving self-awareness. Typically, work-trials, or facilitating a return to education, are provided towards the end of most of these programmes. As a rule, Holistic programmes require high frequencies and intensities of sessions, which demand a very high staff-patient ratio. For this and other reasons Holistic neuropsychological rehabilitation programmes are often very costly. Almost all of the classic Holistic rehabilitation models make clear that they are time-limited.

Bearing in mind cost and other factors, Holistic rehabilitation programmes are not easy to replicate in the community, where the high staff-patient ratios, providing a consistent therapeutic milieu, and intensity of interventions are difficult to achieve. One further fundamental difference is that community-based rehabilitation often takes a much longer-term view of patient care and support. Despite these obstacles, in particular the high cost involved, there is an increasing desire to provide neuro-rehabilitation in the community where patients and their families live long after hospital-based rehabilitation has ended. For example, the British Psychological Society Division of Neuropsychology (2005) outlined a proposed model of services

for people with acquired brain injury. Interestingly, this report also emphasised the potential value of non-residential longer-term community brain injury rehabilitation.

Notwithstanding some of the obstacles and inbuilt limitations to providing Holistically orientated neuropsychological rehabilitation in community settings, there are also good reasons to consider what these services might be able to offer that could potentially be better than more traditional models. Looking at the evidence for such approaches to service delivery, community rehabilitation, including Holistic approaches (E.g. Cicerone, Mott, Azulay & Friel, 2004), appear to be effective, even many years post-injury (Powell, Heslin & Greenwood, 2002). Additional to considering research evidence, at the time of developing the North Wales Brain Injury Service's clinical model, the first author posited that problems of self-awareness and psychological adjustment were likely to require a considerable length of time to alter, irrespective of the intensity of interventions. (Coetzer, 2006). Thus length of time was conceptualized as representing a distinct, separate factor from intensity (frequency) of interventions. Closely related, the issue of a model providing a fixed number of sessions (episode of care) versus an open-ended model of care, was also defined as a separate generic factor to be considered when developing a post-acute community-based brain injury rehabilitation service.

The North Wales Brain Injury Service

The active service design and development of the North Wales Brain Injury Service (NWBIS) commenced during 1998. The NWBIS is an outpatient multi-disciplinary

community NHS brain injury service and its development has been described in greater detail elsewhere (Coetzer, Vaughan, Roberts & Rafal, 2003; Coetzer, 2008). North Wales is a rural area of the United Kingdom. It is an area of considerable natural beauty. Agriculture and tourism are some of the main areas of economic activity. The infrastructure, for example roads and train links, are not extensively developed everywhere and in some areas the levels of socio-economic deprivation is relatively high. These and many other factors, such as for example epidemiology, population needs, and financial constraints all had to be considered at the time the service was developed. The clinical model of NWBIS can best be described as providing low-intensity, long-term, slow-stream Holistic rehabilitation to patients of all ages who have suffered an acquired brain injury. Psychotherapy provision is a key component of the programme. The NWBIS is multidisciplinary, and the team consists of clinical neuropsychology, neurology, occupational therapy, social work, physiotherapy, speech and language therapy and assistant psychology. The service is neuropsychology led and managed.

The NWBIS accepts referrals for patients across the age range, with confirmed moderate to severe acquired (non-progressive) brain injuries. Conditions commonly seen include traumatic brain injury, cerebro-vascular accidents, brain tumours, post-neurosurgery patients and brain infections. Referrals are initially screened by the multi-professional team, and in many cases, hospital records including scans are requested and reviewed as part of the diagnostic process before referrals are accepted. If accepted, patients are seen for a first clinical assessment, and if required further discipline-specific assessments are completed to determine each patient's unique needs. Accordingly, patients' rehabilitation input is entirely individualised. Over the

past 20 years, since its inception during April 1998, the NWBIS has received approximately 4,000 referrals, and offers on average between 3,000 and 3,500 appointments per year. It is clearly now an established service with a sustained impact on the delivery of assessment and rehabilitation within the local NHS. But how has the service evolved over the past two decades, and in particular, as regards the psychological care of our patients and their families?

Neuropsychodynamically informed approaches to psychotherapy

Although the Holistic model of neuro-rehabilitation informs clinical service delivery in the NWBIS, it is titrated to include only central components of the model, and provided slow-stream. Similar to most Holistic programmes, rehabilitation interventions are delivered both individually and in groups. For patients whose rehabilitation goals include a desire to go back to work, study, or volunteering, occupational therapy interventions focus on this aspect of rehabilitation, and can also involve collaboration with other service providers. Cognitive, behavioural, physical and psychological difficulties are targeted during interventions and an attempt to improve patients' self-awareness permeates most interventions. Although much is known on the topic of impaired self-awareness (Ham, Bonnelle, Hellyer et al, 2014; Robertson & Schmitter-Edgecombe, 2015; Prigatano, 1997 & 2005), even more remains a mystery. Impaired self-awareness is thus a good example of the many enigmas of clinical practice, and therefore a vital arena for sharing clinical knowledge, and conducting neuroscience research. Areas like this lend themselves to cross-fertilisation and collaboration between those involved in patient care, service development and research.

From its inception in 1998, the NWBIS has been research active. Initially this was the result of a mutually beneficial partnership with the service's local academic institution, Bangor University, to facilitate the recruitment of difficult to recruit academics and clinicians to both institutions. However, very soon the collaboration between the NWBIS and Bangor University also became important in contributing to specific aspects related to some of the clinical research questions within the service. Inevitably these types of questions arise when new clinical models, theories or services are developed. Some of these, for example, were related to clinical audit, or epidemiology (in particular the local incidence and prevalence of traumatic brain injury), while other questions focussed on treatment approaches, for example looking at existing rehabilitation models, and considering the evidence-base for certain types of interventions.

NWBIS assistant psychologists, and post-graduate students from the School of Psychology at Bangor University (Doctorate in Clinical Psychology and PhD students), have carried out a range of studies within NWBIS, supervised by the group of research-active neuropsychologists and neurologists working in the service. Small-scale projects have typically involved clinical audit (e.g. Coetzer & Coates, 2011; Evans-Roberts & Pierce, 2015); larger projects have collected epidemiological data, and contributed to the development of new assessments or assess the psychometric properties of existing measures, and evaluate clinical interventions carried out as part of the continual development of the NWBIS rehabilitation program. Because assessment is key to the formulation of rehabilitation plans, we will describe some of the findings around new assessment tools and approaches in a bit more detail.

In an attempt to develop an assessment tool mid-way between formal testing and bedside testing, a new TBI cognitive screening assessment has been validated on the NWBIS population (Vaughan, Neal, Mulla, Edwards & Coetzer, 2016). The Brain Injury Cognitive Screen (BICS) is a brief slideshow-based assessment of memory, attention and executive function that is sensitive to cognitive impairment following moderate to severe TBI and ABI. The BICS Card Selection test is similar in principle to the Wisconsin Card Sorting Test (WCST), but designed to provide a less demanding and briefer assessment of set shifting. The Card Selection scores of NWBIS patients with focal brain lesions were closely related to their WCST performance, and were particularly low in individuals with frontal lobe injury (Neal, 2005).

In a related study, the ecological validity of the Delis-Kaplan Executive Function System (Delis, Kaplan & Kramer, 2001; DKEFS) assessment was evaluated by correlating NWBIS patient scores with their scores from the Dysexecutive Questionnaire (Wilson, Alderman, Burgess et al, 1996; DEX) and the European Brain Injury Questionnaire (Teasdale, Christensen, Wilmes et al, 1997; EBIQ) (Rushe, 2006). These analyses revealed that DKEFS scores were largely unrelated to the severity of difficulties experienced by the patients and their family in everyday life. Our interpretation, which correlates with clinical experience, is that patients may appear relatively normal in everyday common-sense decision making, or of normal cognitive capacity as reflected by neuropsychological test scores, whilst having many difficulties navigating interpersonal situations. The latter is of particular relevance for psychotherapeutic work. In a more recent assessment-based study, ABI participants'

subjective reports of cognitive impairment were found to be unrelated to objective cognitive measures. However, their subjective impairments were closely related to self-reported depression and anxiety, suggesting that emotion, rather than objective impairment, may be an important influence on patients' appraisals of their cognitive impairments (Byrne, Coetzer & Addy, 2017).

A few illustrative examples of other collaborative research projects between the partners include the following. The obstacles associated with returning to paid employment following brain injury developed is an area of special interest: for example, Coetzer, Carroll & Ruddle (2011) reported an association between post-injury depression and unemployment; in a qualitative study, Hooson, Coetzer, Stew and Moore (2012) explored difficulties specifically associated with returning to work following brain injury, and identified areas in which rehabilitation support is particularly needed. As regards cost-effective interventions for depression after brain injury, our recent meta-analysis found that exercise is a potentially beneficial intervention for this population (Perry, Coetzer & Saville, 2018). A literature review regarding alcohol misuse and traumatic brain injury found that up to half of all injuries involved intoxication, and a pre-morbid history of alcohol misuse, which was also associated with poorer outcomes generally (Parry-Jones et al., 2006). Parry-Jones, Vaughan, and Cox (2004) obtained positive results with a traumatically brain injured participant who misused alcohol, in an ABA single case study of motivational interviewing. However, research has not been limited to only traumatic brain injury or stroke, and some projects have involved other neurological populations. For example, Cole & Vaughan (2005a, 2005b) considered the feasibility of adapting Cognitive Behaviour Therapy (CBT) to treat depression associated with Parkinson's Disease,

and reported a single-case intervention series that produced selective improvements in depressive symptoms.

Whilst the NHS-university partnership continues to be an important influence on the work of the NWBIS, its contribution to the design and development of the service was not, of course, novel or unique. At around the same time NWBIS was developed, Wilson and colleagues (2000) also reported on the value of clinical-academic collaboration in their Holistic rehabilitation centre in the East of England. However, with time, and with the NWBIS becoming more active in delivering an assessment and rehabilitation service to increasing numbers of patients with acquired brain injury, more novel research questions started to emerge from our daily clinical practice. As mentioned at the start of this paper, many patients make a relatively good physical recovery. Perhaps unsurprisingly then, the majority of these new research questions related to the more ‘invisible’ aspects of brain injury rehabilitation practice, and in particular, the *psychological* rehabilitation of patients. Below we briefly report on five research themes which were very influential on the delivery of psychological therapy becoming more neuropsychodynamically informed in our service over the past two decades.

Theme 1: Non-confrontational approaches to working psychologically with impairments of self-awareness

One of the pillars of neuropsychodynamic work concerns *how* therapy is delivered. Let us now return to the common obstacle many rehabilitation

professionals face in their daily work – helping patients who present with problems of self-awareness to engage with rehabilitation interventions. For example, patients may ‘talk the talk but not walk the walk’ – reporting during therapy sessions that they will implement cognitive rehabilitation strategies, but then never follow through outside of the clinic environment, and crucially, show no or limited emotional understanding of their failures. Clearly problems of self-awareness, given that in most instances it cannot be quickly ‘fixed’, have implications not only for overall programme design, but also the very nature of *how* existing interventions are delivered. Some of the more common interventions to work with difficulties related to poor self-awareness, include psycho-educational approaches, such as the NWBIS Understanding Brain Injury education group, or the individual psychotherapy interventions offered to many of our patients. A consistent generic theme to these NWBIS interventions for self-awareness is its non-confrontational, insight-based approach. However, it is not only these more commonly used interventions for self-awareness that have benefitted from subtle developments to make insight and the provision of a non-confrontational approach central to their delivery.

An approach developed directly from NWBIS clinical practice concerns how neuropsychological testing is used as a vehicle for working on self-awareness. In a non-confrontational approach, and to facilitate emotional insight, role reversal is used to provide feedback of test results. Patients are asked to imagine they tested the clinician, and accordingly, to provide the feedback they envisage most accurately reflected the actual testing session (Coetzer & Balchin, 2014). Furthermore, for some patients, using neuro-imaging findings has proved useful to help increase their understanding of the nature of their brain injury, its symptoms, and per implication,

their level of self-awareness. Incorporating neuro-imaging results in feedback sessions, and providing patients with tangible, more easily retained visual information, in a non-confrontational approach to increase self-awareness, has been a further research-driven clinical innovation in the service (Roberts et al, 2006). Nevertheless, the reality is that, however interventions to alter self-awareness are configured or delivered, they appear to almost inevitably require much more time to effect change than many of the other psychological impairments secondary to acquired brain injury. Furthermore, in the spirit of neuropsychanalytic work, our own work suggests a non-confrontational approach is beneficial to for example avoid defensiveness and non-engagement. However, as many clinicians would testify, such an approach requires time. In view of this, at the time of designing the NWBIS rehabilitation model, the provision on long-term rehabilitation and follow-up was thought to be intricately related to the modification of self-awareness.

Theme 2: A focus on long-term psychotherapy follow-up

Neuropsychanalytic work places at the centre patients' sense of self, and their subjective insight into the self. As already suggested, in view of its adaptation for slow-stream community-based delivery, the NWBIS model of service delivery differs from many other Holistic programmes. Some of the differences include the highly individualised and psychologically informed nature of input, versus a set, time-limited intervention. Indeed, any combination of therapies might be offered in NWBIS. Crucially though, patients are not discharged from the service, and are not offered a predetermined and fixed number of consultations, or length of time of input. Instead of a fixed period of intervention, compared to other Holistic programmes, the

intensity (number of sessions per time period) is much lower, with a maximum of approximately 2 sessions per week (about 2-3 hours), but almost always less. To some extent providing less might actually be a sensible approach for delivering psychotherapy interventions in this unique clinical population (Coetzer, 2015). As regards the potential effectiveness of such long-term, low-intensity programme, Coetzer and Rushe (2005) reviewed early outcome data, and found that a small sample of patients with traumatic brain injury seen at NWBIS for rehabilitation reported improved psychosocial outcome, including those more than two years post-injury, with effect sizes ranging from 0.25 to 0.54 (Cohen's *d*).

To achieve the generic NWBIS programme's aims of improving self-awareness, facilitating psychological adjustment, and reducing the reliance or excessive dependence on healthcare, over the longer term the number of consultations offered to a patient is gradually tapered, up to the stage where persons are encouraged to take responsibility for self-management. In particular, therapists strive to prepare patients psychologically to recognise early signs of problems, and refer themselves back to the service should this be required, rather than to adopt a more passive approach of waiting for input or appointments. A passive approach of waiting or denying emerging problems can be seen as a manifestation of poor self-awareness in itself, although it may also be maintained by the environment (when programme models fail to incorporate psychological preparation). Long-term improvement after neurological injury or illness can be very slow, and hence careful titration of input over time may be more sensible in this setting. Such an approach incorporates the emphasis placed on long-term work within the neuropsychanalytic literature.

However, there are also broader, systemic factors to consider when working psychotherapeutically with neurological patients.

Theme 3: Systemic and relationship-focussed psychotherapy after brain injury

Neuropsychanalysis, whilst focussed on the self or subjective experiences of persons, also acknowledges that these aspects are played out within the social context of relationships. Impairments of self-awareness and other neurobehavioural changes impact on family relationships and caregiving, as well as being an obstacle to engagement in rehabilitation. It is widely recognised that a moderate to severe acquired brain injury causes psychological stress within the family. At the same time, the family plays a pivotal role in the rehabilitation process. Relatives provide long-term care and support whilst also adjusting to changes in their own roles at home, at work, as a parent or as a partner, whilst often coping with financial strain, social alienation and isolation. It is recognised that supporting a person with a brain injury is a particularly challenging form of caregiving, and one that does not appear to become easier with time (Kreutzer et al., 2009a). The NWBIS recognises that the quality of life and psychological well-being of the injured person often depends on the psychological health and coping skills of their family caregivers (Evans-Roberts, Weatherhead & Vaughan, 2014). In an attempt to educate and support family members under these difficult circumstances, the service offers family interventions to individual caregivers, couples, families, and groups of relatives at any time point of the rehabilitation process.

Several NWBIS studies have attempted to more broadly capture the impact of community brain injury rehabilitation on patients and their families. Early

investigations evaluated clinical outcomes for patients (e.g., Coetzer & Rushe, 2005) and for relatives (Smith, Vaughan, Cox, McConville, Roberts, Stoddart & Lew, 2006). The former study (Coetzer & Rushe, 2005) found that over the longer term (2 years +) relatives did not view outcome after brain injury as positively as patients did, whereas Smith and colleagues found that community-based interventions with relatives of patients produced benefits in a few areas, including relatives' emotional acceptance. Relatives tend to find personality changes and aggressive behaviour after brain injury particularly troublesome. A recent meta-analysis provided evidence that psychological interventions yield moderate sized reductions in ABI-related aggression (Byrne & Coetzer, 2016). Not all research in the service has been quantitative in nature. Qualitative research methods have also been used to capture the experience of rehabilitation and adjustment to brain injury (e.g. Roblin, 2015).

The development of psycho-education and psychological support for family caregivers attending NWBIS is another area of clinical interest within the service (e.g. Evans-Roberts, Weatherhead & Vaughan, 2014) that has been investigated in several studies. In an exploration of relationships between the severity of ABI symptoms and caregiver well-being, John (2007) confirmed the established finding that caregivers of people with more severe difficulties and caregivers with higher levels of unmet family need had poorer mental health and general well-being. Symptom severity was also associated with lower levels of caregiver emotional acceptance, and with avoidant coping. Emotional acceptance was found to mediate the impact of symptom severity on caregiver anxiety, well-being and functioning. In a similar study, Davies (2007) found that avoidant coping and low emotional acceptance were associated with high levels of expressed emotion in the family.

These findings had implications for family interventions, such as the Acceptance and Commitment Therapy (ACT) group for families developed within NWBIS (Williams, Vaughan, Huws & Hastings, 2014). In this study, Williams and colleagues found that emotional avoidance was exacerbated by the emotional needs of their cared-for relative, and that avoidant coping was often resistant to therapeutic change. In a further study of family caregivers, inter-disciplinary team community rehabilitation was associated with higher levels of emotional acceptance, family function, and met family need, compared to rehabilitation based on outpatient clinic (Smith et al., 2006).

Naturally, time points or stages have to be considered in the overall rehabilitation journey, from acute, to post-acute, to long-term community care. The NWBIS has also led the innovation of neuropsychology services for acute stroke inpatient care in North Wales. Under NWBIS' supervision and management, two clinical psychologists have developed neuropsychological assessment and rehabilitation services for stroke. They have worked with the specialist stroke team to develop the team's awareness of the impact of stroke on cognition and emotion, and to support the team in providing psychological care to patients and their families. The service was developed and extended to provide a psychologically-informed Early Supported Discharge service (Evans-Roberts et al., 2015).

Time since injury also intimately permeates the internal psychological processes of many patients. One of these processes relates to how sense of loss might manifest over time during psychotherapeutic work with neurological patients. Neuropsychoanalytic work with patients includes therapeutic interventions focussing on loss and grief after brain injury (for example, see Kaplan-Solms & Solms, 2000,

for a case report). Similarly, our clinical work and research have also explored this important area of neuropsychanalysis.

Theme 4: Sense of loss after acquired brain injury

The assessment of grief following brain injury, as well as the investigation of relationships between grief, loss and self-awareness, have both developed as a distinctive NWBIS research theme (e.g. Coetzer & Corney, 2001; Coetzer, 2004; Coetzer, 2006). For example, the Brain Injury Grief Inventory (BIGI, Coetzer, Vaughan & Ruddle, 2003), which was developed and validated for clinical use in NWBIS (Ruddle, Coetzer & Vaughan, 2005) provides grief severity scores representing loss and adjustment separately. Further research has investigated relationships between these aspects of grief and other outcomes. For example, self-ratings of loss were found to correlate with anxiety, whilst adjustment and depression were inversely related (Coetzer, Ruddle & Mulla, 2006). Carroll & Coetzer (2011) examined relationships between identity change, depression, grief, self-esteem and self-awareness, and reported a significant association between perceived identity change and both loss and adjustment grief measures.

A number of reviews continued the research theme of loss and adjustment, which have clear implications for psychotherapy. Psychological dimensions such as concreteness and self-concept have been considered in relation to grief and psychological adjustment, along with their implications for psychotherapy practice (e.g. Coetzer, 2006; Salas, Vaughan, Shanker & Turnbull, 2013; Salas & Coetzer,

2015; Salas, 2016). Myles (2004) described a therapeutic approach to the loss of sense of self that often follows brain injury, based on Relational Frame Theory. This approach facilitates acceptance and adjustment through contact with a sense of self that may be relatively unaffected by brain injury (described as the self that exists ‘behind the eyes’). This perspective is unchanged by disability and is less vulnerable to negative self-evaluation than the content of self-concept. This sense of self may be less vulnerable to negative self-evaluation associated with injury and disability, compared to the sense of self-based on the content of self-concept.

Naturally, a sense of loss and grief, and their related phenomenological experiences, are not the only emotions relevant to the rehabilitation of patients with acquired brain injury. Furthermore, it is not only the *experience* of emotion which is relevant to psychological therapy with neurological patients. How emotions are *managed* after brain injury, which is central to psychotherapy in general, is particularly important when working with persons who have suffered acquired brain injury. *Cognitive* processes such as memory, which are intimately related to emotions and their regulation after brain injury, are also considered here in more detail. In summary, our work around the neuropsychanalytically-informed theme of loss and grief has led us to look more closely at the very important aspect of how these emotions might be managed, as well as potential cognitive aspects contributing to its clinical manifestation. The final theme thus reports some of our work in these core neuroscience areas that are of direct relevance to the practice of psychological therapy after brain injury.

Theme 5: A closer focus on emotion and its regulation

Several of our research initiatives have investigated issues of direct importance in relation to brain injury and psychotherapy. For example, a key strand has been a focus on emotion regulation: impairment in this capacity is a common consequence of damage to prefrontal cortex, including issues such as impaired emotional reactivity (the increased experience of emotions) and poor emotion regulation (such as the down-regulation of sadness). In doing this, we have studied the neural basis of activities that are central to the concerns of patients with brain injury and their families, and are often core to psychotherapeutic interventions (Salas, Radovic, Castro, & Turnbull, 2015). This includes investigating phenomena such as response modulation (Salas et al, 2016), reappraisal (Salas, Gross, & Turnbull, 2014), and the larger themes of concrete thinking (Salas, Gross, Rafal, Viñas-Guasch, & Turnbull, 2013; Salas, Vaughan, Shanker, & Turnbull, 2013) and confabulation (Turnbull & Salas, 2017). In addition to experimental work with patients, we have published detailed case reports (Salas, Radovic et al., 2014; Salas, Casassus, & Turnbull, 2016), which have allowed us to better describe the lived experience of an under-investigated aspect of brain injury. This work has implications for the literature on executive function and emotion regulation, the debate on the neural basis of emotion, and has much relevance for neuropsychological rehabilitation. Inevitably though, emotional experience is closely associated with self-awareness.

Our previous studies of self-awareness interventions considered the impact of neurological scan results feedback (Roberts, Rafal & Coetzer, 2006), and also compared the effects of psycho-education and mindfulness interventions (Vaughan, Evans-Roberts, Coetzer, & Turnbull, 2018). These interventions all produced

improvements in self-awareness, but also very interestingly, mood. Relationships between self-awareness, mood, and cognitive function were examined in both studies. In addition to the issue of mild to moderate deficits in awareness seen after closed head injury, NWBIS has also been involved in research into the more extreme variant of poor awareness: anosognosia, as seen after acute stroke. In an experimental study (Nardone et al, 2007), patients with anosognosia showed increased response latencies to disability-related words, a finding which supports the claim of implicit awareness of their deficit. This forms one strand of a research account of the role of emotion in anosognosia, where the core deficit might be regarded as impairment in emotion regulation, linked to the aversive consequences of bringing deficit-related thoughts to consciousness (see Turnbull et al, 2014 for review).

More recently, an interesting new research stream has been developed, to look much more closely at how the existing psycho-education groups are used in the NWBIS. In a pioneering study which is a joint collaboration between the NWBIS of Betsi Cadwaladr University Health Board NHS Wales, and the School of Psychology at Bangor University, the service's psycho-education groups have been modified to now specifically target patients' capacity to regulate their emotions, and its effect on their self-awareness. This research will seek to map the regulation of emotions to executive functions, and (unusually in a neurological intervention study) investigate role of the therapeutic alliance for any improvement. We plan to eventually make the intervention materials available to professionals on completion of the trial.

A further strand of basic research, with applied consequences, has been on the theme of amnesia. This research demonstrated that individuals with profound amnesia

for episodic material appear to preserve the capacity to recall material of an emotional nature (Turnbull & Evans, 2006; Evans-Roberts & Turnbull, 2011). In the last few years we have been able to extend this research theme into the domain of psychotherapy, capitalising on the fact that emotion-related memory is most likely an ability at the heart of developing and sustaining interpersonal relationships. In a pioneering study of a profoundly amnesic patient in psychotherapy (Moore et al, 2017) we have been able to document preservation of emotion-related memories, which form the foundation of what appears to be a functioning therapeutic alliance. Findings of this sort have important implications for the role of transference in the therapeutic relationship, and raises questions concerning the mechanism of therapeutic action in psychotherapy, including the possible unimportance of episodic memory for many elements of therapeutic change. In summary, our more recent work has attempted to not only *identify* correlates (for example cognitive) of neuropsychanalysis, but increasingly to focus research on the *translation* into neuropsychanalytically informed therapeutic interventions in the clinic.

Conclusions

This paper briefly reviewed the relevant clinical and theoretical background to the development of the NWBIS and the evolution into its current model of service delivery. We report how through an academic partnership between NWBIS and Bangor University the early development of its modified Holistic rehabilitation programme was influenced and shaped. The second part of our paper described more specifically how the provision of psychoanalytically informed psychotherapy

interventions has evolved through this clinical practice – research active collaboration over two decades since the inception of the NWBIS. Five research themes are described, with some of their key findings, to more clearly illustrate how the partnership pushed forward the development of psychotherapy interventions for patients with acquired brain injury.

These five themes core research themes of the NWBIS - Bangor University partnership include working with self-awareness in novel ways, providing long-term psychotherapy as opposed to time-limited ('conveyer belt') approaches, addressing specifically emotional regulation as constituting a core source of patients and their relatives' distress, working more systemically with patients and their families and those around them, and the role of grief and loss in psychological adjustment after brain injury. These themes, while appearing separate in clinical practice, are inter-related when providing neuropsychanalytically informed interventions. Some of our research, for example the work on emotional regulation and emphasis on length of time as core components of psychotherapy interventions in this population, can also potentially further develop existing Holistic models of rehabilitation. We acknowledge our research are by far not the only relevant themes to neuropsychanalytically informed psychotherapy interventions, nor for that matter, *any* psychological therapy provided to this clinical population, but merely hope that our work will serve to further stimulate others' clinical and research innovations for patients and their families.

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