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THE DEVELOPMENT OF NEUROPSYCHOLOGICAL REHABILITATION

An historical examination of theoretical and practical issues

Barbara A. Wilson

A brief history of the growth of neuropsychological rehabilitation

Ancient Egypt

The earliest known description of the treatment of brain injury is from an Egyptian document of 2500–3000 years ago. The papyrus was discovered by Edwin Smith in Luxor in 1862 (described by Walsh, 1987). It describes the treatment of 48 cases of injury of which 27 were brain trauma cases. It contains the first known descriptions of the cranial structures, the meninges, the external surface of the brain, the cerebrospinal fluid and the intracranial pulsations. The word ‘brain’ appears for the first time in any language. The treatment procedures demonstrate an Egyptian level of knowledge that surpassed that of Hippocrates, who lived 1000 years later. Among the first cases described are a man with a gaping wound in his head penetrating the bone of his skull, rending open the brain. It has to be said, however, that the procedures described in the Smith Papyrus were more about treatment than rehabilitation.

A few reports describing treatment appear over the centuries, including a case of Paul Broca’s (1865 and reported in Boake, 1996). Broca was seeing an adult patient who was no longer able to read words aloud. He was first taught to read letters, then syllables before combining syllables into words. He failed however to learn to read words of more than one syllable so the treatment was then switched to a whole word approach and the patient learnt to recognise a number of words.

World War One

Modern rehabilitation, as we understand it, began in World War One (WW1). This was because more soldiers with gunshot wounds to the head survived. During the American Civil War (1861–1865), gunshot wounds to the head were seen in large numbers and, although accurate statistics for mortality rates are not available for the nineteenth century, the survival rate was known to be poor because of infection. Improved antiseptic techniques in the late nineteenth century and more effective neurosurgical procedures led to reduced mortality in WW1. Other contributing factors

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leading to increased survival rates were due to the rifles themselves: muzzle velocity was faster, and bullets were smaller and more deformable. Better helmets also contributed to improved survival rates. Nevertheless, penetrating head wounds still occurred and dedicated brain injury rehabilitation centres were created for the first time (Boake, 1996).

The most important and influential person from that era was Kurt Goldstein, a German neurologist and psychiatrist who was a pioneer in modern neuropsychology. He treated soldiers at the front before sending them to a milieu therapeutic department in Frankfurt where evaluations were performed by psychologists. The Frankfurt centre included a residential hospital, a psychological evaluation unit, and a special workshop for patients to practise and be evaluated in vocational skills (Poser, Kohler and Schönle, 1996). Goldstein made specific recommendations about therapy for impairments of speech, reading and writing (Goldstein, 1919, 1942; Boake, 1996).

Following WW1, Goldstein established *The Institute for Research into the Consequences of Brain Injuries*. It was here that he developed a theory of brain–mind relationships. In 1930 he accepted a position at the University of Berlin, but in 1933, when the Nazis came to power, Goldstein was arrested and imprisoned. After a week he was released on the condition that he would agree to leave the country immediately and never return. For the next year he lived in Amsterdam, wrote his master work, *The Organism*, and then emigrated to the USA in 1935. He became a US citizen in 1940 and died there in 1965.

Walter Poppelreuter, another German neurologist and psychiatrist, carried out investigations of brain-injured soldiers during WW1 and documented the results of loss and impairment of brain function. He published the first book on brain injury rehabilitation in 1917, *Disturbances of Lower and Higher Visual Capacities Caused By Occipital Damage; With Special Reference to the Psychopathological, Pedagogical, Industrial, and Social Implications* (Poppelreuter, 1917 translated into English 1990 by Zihl and Weiskrantz). In this book he described his treatment of soldiers with visuospatial and visuoperceptual disorders. He also discussed vocational rehabilitation. Many of the strategies he described are similar to those in vocational rehabilitation programmes today. He joined the Nazi party in 1931 and died in 1939.

Little brain injury rehabilitation occurred following WW1. Cushing, an American neurosurgeon, said that in the USA, many veterans with brain wounds were awarded a pension inadequate for their degree of disability and sent home with no further rehabilitation (Cushing, 1919). Another American, a psychologist, Franz (1917) suggested that the government set up a national institution to treat soldiers with brain injuries but this never happened.

World War Two

With the start of the second world war there was, again, a need for specialised centres to treat individuals with gunshot wounds to the head. While most people received only physiotherapy for motor difficulties, those with significant cognitive or behavioural impairments were sent to mental institutions. The most famous neuropsychologist who came to the fore in World War Two (WW2) was Alexander Romanovich Luria from what was then the Soviet Union. He is often called the grandfather of neuropsychology. Born in Kazan, Luria went to Kazan University at the age of 16 and obtained his degree in 1921 at the age of 19. While still a student he established the Kazan Psychoanalytic Association and planned on a career in psychoanalytic psychology. His earliest research sought to establish objective methods for assessing Freudian ideas about abnormalities of thought and the effects of fatigue on mental processes. Then came WW2 and Luria led a research team at an army hospital looking for ways to compensate for psychological dysfunctions in brain damaged patients. The tragic availability of people with various forms of traumatic brain injury provided him with voluminous materials for developing his theories of brain function and methods for the remediation of deficits. Luria always believed that psychological research should be for the

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benefit of humankind (Luria 1979) and argued that we should look at the person in his or her social context. His legacy is very much in evidence today.

In the United Kingdom, Oxford was a specialist centre for the treatment of soldiers injured in WW2. The head neurosurgeon, Cairns, realised that the sooner wounds to the head were treated, the better the prognosis. He sent out Mobile Neurosurgical Units, which performed operations on the injured soldiers as close as possible to the battlefield. The patients were then sent back by air for fuller treatment in Oxford. This, together with the fact that penicillin had been developed and was being used, meant that the mortality rate for those with traumatic brain injuries dropped from 50 per cent in WW1 to 5 per cent in WW2 (Quare, 2003). The Morris car factory was also based in Oxford where Lord Nuffield, the head of Morris motors, was persuaded to develop machinery to produce the metal plates used in the repair of skull damage.

A friend of Luria's, the British psychologist Oliver Zangwill (1913–1987), is sometimes known as the father of British neuropsychology. He worked in Bangour Hospital just outside Edinburgh with British soldiers who had survived brain injuries during WW2. An important paper by Zangwill (1947) on rehabilitation of people with brain injury appeared in which he discussed, among other things, the principles of re-education. He referred to three main approaches: compensation, substitution and direct retraining. As far as we know, he was the first to categorise approaches to cognitive rehabilitation in this way. The questions he raised are still pertinent today. For example, in the 1947 paper he wrote 'We wish to know in particular how far the brain injured patient may be expected to compensate for his disabilities and the extent to which the injured human brain is capable of re-education' (Zangwill, 1947, p. 62). This question is as relevant now in the twenty-first century as it was during WW2.

By compensation Zangwill meant the 'reorganisation of psychological function so as to minimise or circumvent a particular disability' (Zangwill, 1947, p. 63). He believed that compensation for the most part took place spontaneously, without explicit intention by the patient, although in some cases it could occur by the patient's own efforts or as a result of instruction and guidance from the psychologist/therapist. Examples of compensation offered by Zangwill include giving a person with aphasia a slate to write on or teaching someone with a right hemiplegia to write with his or her left hand.

Substitution was 'the building up of a new method of response to replace one damaged irreparably by a cerebral lesion' (Ibid., p. 64). He recognised that this was a form of compensation but taken much further. Lip reading for people who are deaf and Braille for people who are blind would be examples of substitution.

The highest form of training, however, was direct retraining. Unlike compensation and substitution, which were the methods of choice for functions that 'do not genuinely recover' (Ibid., p. 65), some damaged functions could, perhaps, be restored through training. As he said, 'direct, as opposed to substitutive training has a real though limited part to play in re-education' (p. 66).

In the United States of America, meanwhile, the most influential people were Cranich and Wepman, who both worked with language impaired people (Cranich, 1947; Wepman, 1951), and Aita, who set up a day treatment programme for men with penetrating injuries to the brain (Aita, 1946, 1948). Aita established a post-acute head injury rehabilitation programme in a military general hospital that used an interdisciplinary system of care. Patients were treated by a team of physical and occupational therapists, psychologists, vocational specialists, a social worker, a physician and a case manager. Relatives also participated in the programme and therapeutic trials were conducted at home. Job therapy was established, which resulted in 60 per cent of patients having enrolled in school or returned to work on follow-up. Once again, at the conclusion of the war, these rehabilitation programmes were closed down.

*The development of NR****The Yom Kippur War***

Yet another armed conflict that had a big influence on brain injury rehabilitation was the Yom Kippur War (YKW) of 1973. Yehuda Ben-Yishay (born 1933), an American Israeli, was invited back to Israel after the war to work on a joint project of the Israeli Ministry of Defense and the New York University Institute of Rehabilitation Medicine. A day treatment programme, influenced by the work of Goldstein, was established in 1975 in Tel Aviv. This was the forerunner of holistic programmes. Ben-Yishay (1996) describes how the Tel Aviv programme began. He said that he had already treated some Israeli soldiers sent to New York for rehabilitation prior to the YKW and realised that a different kind of approach to the rehabilitation then available was needed. About 250 soldiers sustained a brain injury in the YKW and had received good physical care but were 'unable to resume productive lives, primarily because of residual neurobehavioural, cognitive and psychological problems' (pp. 327–328). With backing from people in New York and Israel, the therapeutic community and holistic treatment style were born.

More recent times

Although some people were working on the rehabilitation of cognitive problems prior to 1976, the first programme to call itself a 'Cognitive Rehabilitation' programme would appear to be the one opened by Leonard Diller (born 1924) in New York in 1976 (Diller, 1976). Diller was also one of the first to publish studies on unilateral neglect (Diller and Weinberg, 1977). Diller and Ben-Yishay have worked closely together for many years and the former was one of Ben-Yishay's main supporters in setting up the Israeli programme. Goldstein (1919, 1942) and later Ben-Yishay (1996) recognised that cognition, emotion and behaviour are interlinked, hard to separate and should be addressed together in rehabilitation programmes. This is the core of the holistic approach to be further discussed later in the chapter. One of the best-known holistic programmes is that of George Prigatano (1986). His centre in Oklahoma City was greatly influenced by Ben-Yishay (Prigatano 1986); later he took it to Phoenix, Arizona. In turn, Prigatano influenced Anneliese Christensen, who introduced a similar centre in Denmark in 1995 (Christensen and Teasdale, 1995), and Wilson and her colleagues who opened the Oliver Zangwill Centre in Cambridgeshire, England in 1996 (Wilson et al., 2000).

Theoretical developments within neuropsychological rehabilitation

At the beginning of this section, a few words are needed about the meaning of the term 'rehabilitation' and its practice. Rehabilitation is *not* synonymous with recovery, if by this we mean getting an individual back to what one was like before the injury or illness. Neither is it synonymous with treatment (treatment is something we *do to* people or *give to* people, such as when we administer drugs or surgery). Rehabilitation is a *two way interactive process* whereby survivors of brain injury work together with professional staff and others to achieve their optimum physical, psychological, social and vocational well-being (McLellan, 1991).

The British Society of Rehabilitation Medicine (BSRM) and Royal College of Physicians (RCP) in the United Kingdom define rehabilitation as 'a process of active change by which a person who has become disabled acquires the knowledge and skills needed for optimal physical, psychological and social function' and in terms of service provision this entails 'the use of all means to minimise the impact of disabling conditions and to assist disabled people to achieve their desired level of autonomy and participation in society' (BSRM/RCP National Clinical Guidelines, 2003, p. 7).

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Early approaches to rehabilitation

One of the first attempts to provide a model for treatment was Powell (1981), who listed six procedures ranging from the non-intervention strategy (letting nature take its course), to practice (which he felt was the most widely used strategy), to medical, biochemical and surgical treatments that can sometimes be combined with other therapeutic treatments (Durand, 1982). Although these procedures may have described the state of play at that time, they were more a list of headings than theoretical models. Closer to the latter in the sense of providing theories of treatment are the five steps of neuropsychological interventions suggested by Gross and Schutz (1986). These are:

- 1 Environmental control.
- 2 Stimulus-response (S-R) conditioning.
- 3 Skill training.
- 4 Strategy substitution.
- 5 Cognitive cycle.

Gross and Schutz claim that these guidelines are hierarchical so that patients who cannot learn are treated with environmental control techniques; patients who can learn but cannot generalise need S-R conditioning; patients who can learn and generalise but cannot self-monitor should be given skill training; those who can self-monitor will benefit from strategy substitution; and those who can manage all of the above and are able to set their own goals will be best suited for treatment that is incorporated within the cognitive cycle model.

Although these 'models' sound plausible, it is doubtful whether therapists would be able to determine whether or not a patient can learn or generalise. We know, for example, that patients in coma are capable of *some* degree of learning (Boyle and Greer, 1983; Shiel et al., 1993). In addition, it has been long known that we can teach generalisation (Zarkowska, 1987). Despite these reservations, Gross and Schutz's attempts were useful in encouraging therapists at the time, to think about ways of tackling problems in rehabilitation. They remain, however, 'ways to treat' rather than models from which it is possible to theorise or conjecture.

Cognitive functioning

Perhaps the area where theory has been most influential in rehabilitation is in cognitive functioning, particularly in the treatment of people with language and reading disorders. As Baddeley (2014) has indicated, a model can be thought of as a representation that can help us to understand and predict related phenomena. It was in aphasia therapy that models, in this sense, first made their appearance (Coltheart, 1991; Seron and Deloche, 1989). Coltheart argued that in order to treat a deficit it is necessary to fully understand its nature and to do this one has to have in mind how the function is normally achieved. Without this model, one cannot determine what kinds of treatment would be appropriate. This sounds plausible but the model is perhaps limited in rehabilitation because, although models of language and reading allow us to understand the nature of the deficit or *what* is wrong, they do not tell us *how* to put things right. Furthermore, people undergoing rehabilitation rarely have isolated deficits such as difficulty understanding reversible sentences or passive sentences, which the models proposed by Coltheart identify. Most individuals will have additional cognitive deficits such as slowed information processing or poor memory, attention or executive deficits. They are also likely to have emotional, social and behavioural problems. In rehabilitation, patients are more likely to require help with everyday problems, such as using the telephone, rather than solely help with the impairment identified by the models. It needs to be understood that although there is little doubt that theoretical models from cognitive neuropsychology have been influential in helping us to understand

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and explain related phenomena and develop assessment procedures (Wilson and Patterson, 1990), they are insufficient for developing rehabilitation programmes (Wilson, 2002).

Learning

Baddeley (1993) said ‘A theory of rehabilitation without a model of learning is a vehicle without an engine’ (p. 235). He went on to say that in rehabilitation there is difficulty distinguishing between learning and memory. Memory (at least episodic memory), he suggests, is the ability to recall personally experienced events while *learning* is any system or process that results in the modification of behaviour by experience.

Learning theory and behaviour modification are intrinsically linked and have been used in rehabilitation, including cognitive rehabilitation, for many years. Goodkin (1966) was one of the first to explicitly advocate behavioural techniques with brain injured adults. The behavioural strategy operant conditioning was initially applied to motor problems, but Goodkin (1966) later applied it to help a stroke patient with dysphasia improve language skills. It was not until the late 1970s, however, that behavioural models and techniques began, in earnest, to be applied to cognitive problems (Ince, 1980).

Today, behavioural approaches are widely used in rehabilitation to help reduce or compensate for cognitive deficits. Alderman and his colleagues, for example, showed ingenuity in applying strategies from behavioural psychology to patients with both executive problems and behaviour problems (Alderman et al., 1995; Alderman and Ward, 1991).

Behaviour therapy and behaviour modification techniques have been adapted and modified to help people with memory, perceptual, language and reading disorders (Wilson, 1999). These techniques are incorporated into cognitive rehabilitation because they provide a structure, a way of analysing cognitive problems, a means of assessing everyday manifestations of cognitive problems, and a means of evaluating the efficacy of treatment. They also supply us with many strategies, such as shaping, chaining, modelling, desensitisation, flooding, extinction, positive reinforcement, response cost and so forth, all of which can be adapted to suit particular rehabilitation purposes.

Emotion

Social isolation, anxiety, depression and other emotional problems are common in survivors of brain injury (Williams, 2003; Wilson et al., 2009, 2013). Recognising and dealing with the emotional consequences of brain injury has become increasingly important in recent years. Prigatano (1999) suggests that rehabilitation is likely to fail if we do not deal with the emotional issues. Consequently, an understanding of theories and models of emotion is crucial to successful rehabilitation.

Ever since Beck’s highly influential book on *Cognitive Therapy and the Emotional Disorders* appeared in 1976, cognitive behavioural therapy (CBT) has become one of the most important and best validated psychotherapeutic procedures (Salkovskis, 1996). An update of Beck’s model appeared in 1996 (ibid.). One of its major strengths has been the development of clinically relevant theories. There are several theories not only for depression and anxiety but also for panic, obsessive-compulsive disorders and phobias. Mateer and Sira (2006) suggest that CBT is well suited for improving coping skills, helping clients to manage cognitive difficulties, and addressing more generalised anxiety and depression in the context of a brain injury.

A more recent development, utilising many of the techniques in CBT, is Compassion Focused Therapy (CFT). Based on the work of Gilbert (2005), CFT emphasises the emotional experience associated with psychological problems. It draws on social, evolutionary (especially attachment theory) and neurophysiological approaches to change disturbed feelings. One difference between CBT and CFT is that the focus differs. CFT promotes the development of such emotions as kindness, care, support, encouragement and validation as part of the experience of psychological interventions.

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For example, if a client identifies some negative thoughts and then can generate alternatives, they are trained to bring into being feelings of warmth, kindness, understanding and support for these alternatives. This approach has been used for those with traumatic brain injury (Ashworth, Gracey and Gilbert, 2011; Ashworth, 2014). Integral to the CFT approach is the view that we can be kind, compassionate and understanding towards ourselves, or we can be critical and even self loathing. People high in self-criticism may experience a range of mental health difficulties, whereas those who are self-compassionate are far more resilient to these problems (Gilbert, 2010). One simple CFT approach is to identify self-criticism and help people refocus on self-compassion. Ashworth (2014) reports on patients who benefited from CFT (see too Chapter 26 this volume).

Analytic psychotherapy is also used in rehabilitation, particularly in the United States of America. Perhaps the best-known proponent of this for the treatment of people surviving TBI is Prigatano. He describes his approach (based on the Milieu Therapy Approach of Ben-Yishay) in his book *Principles of Neuropsychological Rehabilitation* (Prigatano, 1999).

One study looked at the effects of a rehabilitation programme offering psychotherapy and cognitive rehabilitation compared to cognitive rehabilitation alone. The former group showed significantly improved emotional functioning, including lessened anxiety and depression. The authors concluded that ‘Cognitive behavioral psychotherapy and cognitive remediation appear to diminish psychologic distress and improve cognitive functioning among community-living persons with mild and moderate TBI’ (Tiersky et al., 2005, p. 1565). In short, dealing with the emotional consequences of brain injury may make all the difference between a successful and an unsuccessful outcome.

Assessment

Clinical neuropsychologists are heavily engaged in assessment, that is, the systematic collection, organisation, and interpretation of information about a person and his or her situation (Sundberg and Tyler, 1962). Typically, several theoretical approaches are used in these assessments. These include (i) the psychometric approach based on statistical analysis, (ii) the localisation approach whereby the examiner attempts to assess which parts of the brain are damaged, (iii) assessments derived from theoretical models of cognitive functioning as mentioned above, (iv) definition of a syndrome through exclusion of other explanations, such as poor eyesight and impaired naming ability to account for failure to recognise objects as seen in agnosia, and (v) ecologically valid assessments which predict problems in everyday life.

Neuropsychological assessments, however, cannot provide all the information required for cognitive rehabilitation. Although tests enable us to build up a picture of the brain injured person’s strengths and weaknesses, they are unable to pinpoint in sufficient detail the nature of the everyday problems faced by the person and the family. We need to know (i) what problems are causing the greatest difficulty, (ii) what coping strategies are used, (iii) whether the problems are exacerbated by anxiety or depression, (iv) if this person can return to work and so forth.

Answers to such questions can be obtained from more functional or behavioural procedures including direct observation (in either natural or simulated settings) or through self-report measures or interviewing techniques. Chapter 3 of Wilson (2009) discusses assessment procedures in more detail. See, too, Chapter 4 in this volume.

Identity

There are many theories and models addressing identity, most of which are comprehensively addressed in an excellent book by Ownsworth (2014). A few are summarised here and also described in Wilson et al. (2015). Social identity theory (Tajfel and Turner, 1979) refers to a person’s self-concept derived from his or her perceived membership of a relevant social group. According to this

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theory and to the theory of self-categorisation (Jetten et al., 2012), group memberships are integral to our sense of self and are not easily separable. When people are forced, for example, to give up work they lose their professional identity and may suffer loss of self-esteem. Loss of group membership may mean less social support, poorer quality of life and an impaired sense of well-being. Haslam et al. (2008) applied social identity theory to survivors of stroke. They suggested that membership of multiple groups buffered people against the negative effects of brain injury. Ownsworth (2014) reminds us that an injury to the brain can affect virtually any aspect of functioning and, at the deepest level, can alter one's sense of self or the essential qualities that define who we are. As one of the Oliver Zangwill clients said, 'I live in the ruins of my old self'. Claire, a woman with severe prosopagnosia and loss of knowledge of people, feels she has lost the essence of her former self, saying she feels she has crash landed in someone else's life (Wilson et al., 2015).

One influential model from recent years is the 'Y' shaped model (Gracey, Evans and Malley, 2009). This model suggests that 'A complex and dynamic set of biological, psychological and social factors interact to determine the consequences of acquired brain injury' (p. 867). The model integrates findings from psychosocial adjustment, awareness and well-being. It is, essentially, an attempt to reduce the discrepancy between the old 'me' and the new 'me'. Addressing issues in identity has become increasingly important in rehabilitation with the 'Y' shaped model, a mainstay at the Oliver Zangwill Centre. See, too, Chapter 27 in this volume, which addresses identity.

The holistic approach

Ben-Yishay and Prigatano (1990) provide a model of hierarchical stages in the holistic approach through which the patient must work in rehabilitation. These are, in order, engagement, awareness, mastery, control, acceptance and identity. One of the main messages of this approach is that it is futile to separate the cognitive, social, emotional and functional aspects of brain injury given that how we feel affects how we behave and how we think. Holistic programmes, explicitly or implicitly, tend to work through Ben-Yishay's hierarchical stages and are concerned with: (i) increasing the individual's awareness of what has happened to him or to her; (ii) increasing acceptance and understanding of what has happened; (iii) providing strategies or exercises to reduce cognitive problems; (iv) developing compensatory skills; and (v) providing vocational counselling. All holistic programmes include both group and individual therapy. Cicerone et al. (2005, 2011) provide evidence for the effectiveness of holistic approaches when they say in their 2011 paper: 'Comprehensive-holistic neuropsychologic rehabilitation is recommended to improve post acute participation and quality of life after moderate or severe TBI' (p. 526).

Why we need numerous theories and models in rehabilitation

People with brain injury are likely to have several cognitive problems (for example with attention, memory, executive functions, word finding, etc.). They are also likely to have additional non-cognitive problems such as anxiety, depression, social skills deficits and so forth. Consequently, it is unlikely that any one theory, model or framework can address all of these difficulties. To be wedded to a single approach is likely to lead to poor clinical practice. Rehabilitation needs a broad theoretical base or bases (Wilson, 2002) and, to this end, Wilson (ibid.) published a provisional, synthesised model incorporating many areas that need to be considered when planning rehabilitation programmes.

Any rehabilitation programme needs to begin with the patient and his or her family: what are their needs, what do they hope to achieve, what is most important to them and what is their cultural background? The nature, extent and severity of brain damage has to be determined. We need to be aware of recovery patterns. Cognitive, emotional, psychosocial and behavioural problems need to be assessed. Theories and models of language, reading, memory, executive functioning, attention and

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perception are available to enable us to understand patterns of functioning. Assessment tools allow us to determine cognitive, emotional, behavioural and social difficulties. Behavioural or functional assessments can be used to complement standardised assessment procedures. We should be cognisant of theories of learning. Finally, any interventions need to be evaluated.

Summary

This chapter has looked at some of the most salient historical contributions to modern neuropsychological rehabilitation, recognising such people as Goldstein, Poppelreuter, Luria, Zangwill, Ben-Yishay, Diller and Prigatano. Some of the influential theories and models influencing current rehabilitation practice have been described, including those from cognitive functioning, learning, emotion, assessment and identity. The holistic approach to rehabilitation is recommended and evidence for its effectiveness cited. Finally, we addressed the need for a broad theoretical base (or several bases) when planning and implementing rehabilitation programmes, to ensure good clinical practice.

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