APPLYING THE COMPREHENSIVE MODEL OF NEUROPSYCHOLOGICAL REHABILITATION TO PEOPLE WITH PSYCHIATRIC CONDITIONS

Fabricia Q. Loschiavo-Alvares, Jessica Fish, Barbara A. Wilson

Abstract

Objective: Neuropsychological rehabilitation (NR) is a broad field that requires a wide theoretical base encompassing frameworks, theories, and models from many different areas. The comprehensive model of NR proposed by Wilson (2002) addresses many of the processes involved from assessment to treatment; it recognises that rehabilitation encompasses cognitive, emotional, psychosocial difficulties; it considers also premorbid personality, learning strategies and evaluation. The model, however, was designed for people with acquired brain injuries. Then, the objective of this study was adapt the Wilson's original model, in order to increase its relevance for the NR of people with psychiatric disorders.

Method: it was conducted a narrative review of the literature concerning NR in psychiatric disorders.

Results: it was incorporated several additions to the Wilson's model, as presented in sequence: clinical history; expected and observed cognitive profile; neuropsychiatric monitoring over time and pharmacological interventions; what is the prognosis; functional status (International Classification of Functioning); coping, anxiety, mood and Quality of Life assessments; and rehabilitation process.

Conclusion: this paper outlines this broader model of NR in psychiatric groups. Considering the additions that have been made, this expanded model provides a theoretical and clinical reference for clinicians who work with these groups.

Key words: neuropsychological rehabilitation, cognitive rehabilitation, bipolar disorders, depression, schizophrenia, cognition

Declaration of interest: none

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Introduction

In 2002 Wilson published a model of cognitive rehabilitation arguing that "Cognitive rehabilitation is a field that needs a broad theoretical base incorporating frameworks, theories, and models from a number of different areas". No one model or group of models is sufficient to address the complex problems facing people with cognitive problems consequent upon brain injury" (Wilson 2002). Models and theories influencing cognitive rehabilitation include those of cognition, assessment, recovery, behaviour, emotion, compensation and learning. Wilson synthesised these individual models and theories into a comprehensive model of cognitive rehabilitation, which has been used to plan rehabilitation programmes for people with acquired brain injury (Wilson et al. 2013). As far as we know, this comprehensive model has not been employed in rehabilitation for people with psychiatric disorders, despite the fact that cognitive impairments are common in these populations and contribute to restrictions in everyday life functioning (Rosenheck 2006, Samuelson et al. 2006, Corrigan et al. 2007, Grant and Adams 2009, Bearden et al 2011, Volkow et al 2011).

As cognitive functioning is a significant predictor of a positive prognosis in psychiatric treatment (Corrigan et al. 2007), neuropsychological rehabilitation (NR) is an important aspect of treatment. Furthermore, patients with psychiatric disorders have similar cognitive difficulties to survivors of brain injury (Silverstein and Wilkniss 2004, Galletly and Rigby 2013, Torrent et al. 2013). Cognitive impairment is an important determinant of poor engagement with vocational rehabilitation services and failure to maintain employment (Gold et al. 2002, O'Connor et al. 2011). Considering this, research into measures to improve cognition, is driven by the hope that such improvements might lead to better long-term economic and functional prognosis, together with greater opportunities for social inclusion (Galletly and Rigby 2013).

NR is an active process in capacity building of people with cognitive deficits caused by acquired brain injury or psychiatric disorders. The aim is to help them acquire adequate levels of social, physical and psychological functions (Wilson 2005). NR aims to maximize cognitive functions through enhancing well being, improve activities of daily living and social relationships, and minimize the consequences of cognitive deficits. This allows patients to find the appropriate means to achieve their specific functional goals (Ben-Yishay

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2008). The functionality and quality of life of patients with neurological and psychiatric disorders can be improved through the use of psychological, cognitive and behavioral techniques. The ultimate goal of NR is to enable people to return to their own most appropriate environments (Wilson, 2004). In view of the functional impact of cognitive impairments caused by psychiatric disorders, the relevance of NR for this population should be considered. In that way, Wilson's model (2002) may be usefully applied to psychiatric patients, with some important modifications. This paper aims to describe an extension of Wilson's original model, to improve our understanding of holistic NR for subjects with psychiatric disorders. In order to achieve this objective, it was conducted a narrative review of the literature, as presented above.

Cognitive deficits in psychiatric disorders, cognitive remediation and related literature

Most psychiatric disorders include disruption of some aspect of cognition, with a considerable variability among individuals (Galletly and Rigby 2013). Increasing evidence indicates that these deficits may a) predispose individuals to developing a psychiatric disorder b) be an early marker of subsequent illness, c) help maintain the disorder, and d) predict the likelihood of recovery (Etkin et al. 2013). Indeed, cognitive functioning in some psychiatric disorders predicts the course of the long-term illness (Silverstein and Wilkniss 2004) independent of symptoms that may be more characteristic or diagnostic of the illness (eg, hallucinations in schizophrenia, mood regulatory problems and rumination in depression).It is important to be aware of the cognitive profiles associated with a specific condition, in order to plan assessments and tailor rehabilitation programmes.

Schizophrenia

Cognitive impairments are considered a core feature of schizophrenia (Mueser and McGurk 2004, Kahn and Keffe 2013) and are an important predictor of functional outcomes, social problem solving, performance in daily activities after disease onset (Green et al. 2000), life satisfaction and the ability to return to work or school (Fujii et al. 2004, Nuechterlein et al. 2011). Several studies have suggested that cognitive deficits are important determinants of impairments in most functional domains and are, therefore, targeted for treatment in schizophrenia (Buchanan et al. 2005, Wykes et al. 2011, Barlati et al. 2013, Thorsen et al. 2014).

Cognitive impairments in schizophrenia are present at the onset of the illness, persist throughout the lifespan, are strongly associated with functional disability, and are largely resistant to treatment (Barch et al. 2009). Several studies have shown any impaired cognitive domains in schizophrenia, namely: perception, working memory, verbal and visual learning, speed of processing, reasoning, problem solving, attention, executive functions, long-term memory, and social cognition (Nuechterlein et al. 2004, Barch et al. 2009, Harvey and Bowie 2012, Barlati et al. 2013). Problems with social cognition include impairments in facial affect recognition, perceiving and interpreting social cues, and the ability to make appropriate causal attributions for events (Couture et al. 2006).

A recent metanalysis, Fioravanti et al. (2012) has demonstrated higher effect sizes considering the different cognitive domains. Concerning the measures of memory functioning, the comparison between 2,066 people with schizophrenia and 1,366 normal subjects (47 studies, 3,432 total cases) produces an effect size = − 1.22 [-1.44, -1.01]; for the global cognitive functioning, evaluated by IQ measures (102 studies, 8,416 total cases), the effect size was −0.96 [-1.07, -0.85], the data concerning executive functions were studied in 67 studies for a total of 5,257 cases and the effect size found was −1.10 [-1.27, -0.92]. Specifically about attention, from 76 studies for a total of 5,333 cases the effect size demonstrated was 0.99 [0.86, 1.12]. People with schizophrenia have a slower reactivity to stimuli than normal cases and in particular there is a slight stronger tendency of this to happen among the inpatients. Finally, considering language, this functioning was evaluated in 70 works for a total of 6,396 cases with an effect size equal −0.99 [-1.10, -0.87] (2012). It is important to highlight that both neurocognitive and social cognitive deficits described above are thought to underlie the severe functional disabilities associated with schizophrenia, and several studies have shown that cognitive deficits are related to social deficits and poorer outcomes in different functional domains (Green et al. 2000, Bowie et al. 2006). The influence of cognition on functional outcomes may occur through its influence on functional capacity, understood as the ability to perform critical everyday living skills (Green et al. 2008).

Bor et al. (2011), conducted a study which investigated the impact of cognitive remediation therapy (CRT) on cerebral activation using functional magnetic resonance imaging (fMRI) in patients with schizophrenia. After the intervention, the clinical group that received the cognitive remediation exhibited brain over-activations in the left inferior/middle frontal gyrus, cingulate gyrus and inferior parietal lobule for the spatial task. Similar but nonsignificant over-activations were observed in the same brain regions for the verbal task. Moreover, CRT patients significantly improved their behavioural performance in attention and reasoning capacities. In accordance with these results, CRT leads to measurable physiological adaptation associated with improved cognitive ability. Same findings were described by Penadés et al 2002, which have founded an increase in executive functions after neuropsychological intervention, which was related to a reduction of the cognitive hypofrontality after the treatment.

Considering the above, due to the increased focus on cognitive deficits in schizophrenia, significant efforts to treat these cognitive and functional impairments have been made (Silverstein and Wilkniss 2004). Many studies have been designed to investigate the efficacy of NR in schizophrenia. Wykes et al. (2011) in their meta-analysis have shown good evidence of moderate effect sizes for durable cognitive benefits and functional improvements following rehabilitation. As another example, Levaux et al. (2012) presented a case study of a 42 year old lady with schizophrenia who underwent a twice weekly intervention for three months. In accordance with these authors, after cognitive and functional assessment, concrete objectives were targeted for the person's everyday complaints. Strategies were constructed based on an analysis of the cognitive profile, daily life functioning, and processes involved in activities. In the next step, the intervention was tailored to her specific goals (e.g., following and retaining television or radio programs, following and retaining conversations, reading and maintaining text information, and remembering appointments, dates and activities). As results, cognitive and everyday functioning improved following the program and persisted at three year follow up. In this perspective, these findings provide suggestive evidence that an individualized and everyday approach may be a useful alternative in order to obtain a meaningfully lasting transfer of training to daily life.

Then, NR has been considered as a promising approach to optimize real-world functioning in these patients (Barlati et al. 2013).

Bipolar Disorders

Considering bipolar disorders (BD), the presence of depression, mania, and residual dysthymia is associated with more severe cognitive impairments than estimates of baseline functioning or when the patient is seen during periods of euthymia (Hsiao et al. 2009, Loschiavo-Alvares et al. 2013). These are already present early in the course of BD (Arango et al. 2013). In addition to the presence of severe mood episodes, the disorder is also associated with varying degrees of psychotic symptoms, neurocognitive impairments, and loss of functioning (Aminoff et al. 2013).

In studies of people with BD, persistent cognitive deficits are found, not only in the phases of mania and depression, but also during remission of symptoms (Martinez-Aran et al. 2004). Torres et al. (2007) have provided evidence of trait-like neuropsychological deficits in BD involving impairments in attention, processing speed, memory, and executive function. In a meta-analysis conducted (Robinson et al. 2006) was indicated the presence of deficits in immediate and delayed verbal memory skills, executive function, attention and psychomotor skills were found in subjects in the euthymic phase. In accordance with the DSM-5, there are four types of BD: Bipolar I, Bipolar II, Bipolar not otherwise specified and Cyclothymic Disorder. In relation to the different cognitive subtypes in BD, Bipolar I is characterized by worse performance on episodic memory skills, working memory, psychomotor and executive functions, while in type II, deficits were evident in working memory and psychomotor functions only (Hsiao et al. 2009). Comparative studies indicate that this diagnostic category is associated with psychotic episodes and hospitalizations, to a greater extent than Bipolar I (Merikangas et al. 2011). Also, there is strong evidence that cognitive impairments and functional disability persist during relatively symptom-free periods, affecting up to sixty percent of people with a bipolar diagnosis (Tohen et al. 2003).

Efforts to improve the prognosis and functional outcomes in bipolar disorder have prompted the interest and development of neuropsychological rehabilitation programmes, which comprises neurocognitive techniques, training psychoeducation on cognitive-related issues as well as problem-solving within an ecological framework, having as an ultimate goal the improvement of everyday functioning (Martinez-Aran et al. 2011). Until recently, there were few studies which investigated the neuropsychological rehabilitation in bipolar disorder (BD). The investigation conducted by Deckersbach et al. (2010) explored whether a new cognitive remediation treatment designed to treat residual depressive symptoms as well as addressed to cognitive impairment would be associated with improvement in psychosocial functioning in individuals with bipolar disorder. It found that 18 individuals with BD both at the end of treatment, as well as at the 3-months follow-up, showed lower residual depressive symptoms, and increased occupational, as well as overall psychosocial functioning. These findings have suggested that treating residual depressive symptoms and cognitive impairment may be an avenue to improving occupational and overall functioning in individuals with bipolar disorder. Torrent et al. (2013) sought to assess the efficacy of functional remediation on functional improvement in a sample composed by euthymic patients with BD. This was a multicenter, randomized, rater-blind clinical trial involving 239 outpatients. The sample was divided into three groups; functional remediation (n=77), psychoeducation (n=82) and usual treatment (n=80) over a period of 21 weeks. The results have shown that functional remediation differed significantly from treatment as usual, but not from psychoeducation. In a recent investigation Loschiavo-Alvares and Neves (2014) aimed to assess the efficacy of NR on executive functions, quality of life and coping strategies in a sample of euthymic patients with bipolar disorder both type I and type II. In this study 50 outpatients with DSM-V bipolar disorder were recruited. NR plus Pharmacotherapy Group (n=20) was compared with a Pharmacotherapy Control Group (n= 30) over 14 weeks. The NR protocol was divided into three modules. The first was directed toward mood monitoring, the following focused on executive functions, and the third addressed attention and memory rehabilitation. The results showed greater improvements for the NR group, highlighting the efficacy of neuropsychological rehabilitation and its superiority when it was compared with treatment as usual, which was pharmacotherapy only. Taken together, the results presented above corroborates the positive impact of NR as a treatment that improves the functional outcome of patients with bipolar disorder.

Depression

It is well established that people with depression are subject to multiple cognitive deficits. The impairments have been found in a broad range of neuropsychological tests and in various cognitive domains, such as executive functions, psychomotor speed, and episodic memory (Kalska et al. 2013). Impairments may occur in patients under medication as well as in drug-free patients (Porter et al. 2003), in younger or elderly subjects (Purcell et al. 1997), or in different depression severity levels or subtypes. Some of these deficits may persist even upon clinical recovery (Austin et al. 2001).

There is no doubt that people with major depression perform more poorly on cognitive tests while in a depressed mood state than when they are in partial or full remission (Crocker et al. 2013, Porter et al. 2013). The relationships between emotion and cognition, and motivation and cognition, and how these relate to brain mechanisms are receiving increasing attention in the clinical research literature. It has also been postulated that deficits in specific executive functions (e.g., inhibition, shifting) are, at least partly, responsible for key cognitive, emotional, and motivational features of psychopathology, including cognitive biases, motivation-related dysfunction, and impaired emotion-regulation abilities (Gotlib et al. 2010). Impairments in concentration and attention, as well as learning and memory, and, to some extent, executive functioning, have been reported to be worse when the patient is depressed than when partially recovered (Kalska et al. 2013).

Cross-diagnostic comparisons

All the symptoms highlighted above are seen in several psychiatric conditions, such as depression, BD and schizophrenia. They are intrinsically related to functional impairments, such as occupational problems, and difficulties in psychosocial functions (Green 2006, Martinez-Aran et al. 2007, Gruber et al. 2008, Tabarés-Seisdedos et al. 2008, Martino et al. 2009, Bowie et al. 2010, Sumiyoshi 2013).

A cross-diagnostic comparison of subjects with schizophrenia (SZ), schizoaffective disorder (SZA), and

bipolar disorder (BD) found neurocognitive deficits in all clinical groups,with the patients with schizophrenia being most severely affected (Reichenberg et al. 2008). Several studies, however, have shown no qualitative or quantitative cognitive profile differences between BD and SZ patients (Mojtabai et al. 2000, McClellan et al. 2004, Balanzá-Martinez et al. 2005, Simonsen et al. 2011). In a recent study, Levandowski et al. (2011) investigated the neurocognitive functioning and symptoms in participants with SZ (n=25), SZA (n=29), BD with psychosis (n=31) and in healthy controls (n=20). The cognitive domains assessed were verbal memory, executive functions, fluency and attention. They found that all patient groups performed worse than controls on all measures, and scored between one and two standard deviations below the mean on all measures except Trails A. Specifically, patients with SZ performed worse than patients with BD or SZA on one measure of executive functioning (Trails B) but not another (Stroop Color-Word Interference). Another result was that negative symptoms, but no other clinical symptoms, predicted neurocognitive outcomes on measures of executive functioning and selective attention, and this association remained significant after controlling for diagnosis. However, there was no association between negative symptoms and visual or verbal learning and memory, verbal fluency, or processing speed. These findings suggest that negative symptoms should be considered in a proposal of a protocol of NR.

As shown above, the overall profile of cognitive impairments appears similar in depression, BD and SZ, particularly during symptomatic periods, however they are worse in patients with SZ. In patients with acquired brain injury, these impairments would be considered "fronto-striatal", regarding the functions attributed to anterior cingulate, dorsolateral and orbitofrontal circuits (Philip and Harvey 2012). Considering the information presented above, the overall level of impairments appears to be less in the two mood disorders than in schizophrenia, both during episodes and during periods of relative remission of clinical symptoms (Reichenberg et al. 2009, Wingo and Harvey 2009).

Revisions to the model

Clinical History

In psychiatric diseases, there is a correlation between illness severity and psychosocial functioning (Wingo and Harvey 2009, Bowie et al. 2010). Younger age of onset disrupts psychosocial development at an earlier stage, altering the trajectory of educational, professional, and interpersonal growth (Post et al. 2010). In addition, psychiatric illness early in life is likely to carry deleterious effects on identity development (Corrigan 2004). Coupled with the stigma associated with mental illness generally, these internal effects may hamper efforts to achieve social adjustment (Vazquez et al. 2010). Further challenges come from recurrent mood episodes (mania and depression) and frequent hospitalizations over the course of illness, which can disrupt educational and vocational pursuits as well as the development of interpersonal relationships (Wingo et al. 2010). Residual symptoms between mood episodes also impede efforts to reengage with psychosocial demands (Levy et al. 2011), and thereby make functional recovery after hospital discharge more challenging (Yatham et al. 2009). Finally, episodes of psychosis and chronic substance misuse contribute to an erratic course of development (Hua et al. 2011), as well as emotional and behavioral lack of control. Taken together, all of these factors affect psychosocial functioning and development of psychiatric diseases and so should be considered when planning treatment.

Neuropsychological assessment in psychiatric disorders

It is important for the clinician establishing a NR program to consider the individual's cognitive profile and consequent functional impairments. This information, added to the clinical history, provides a starting point for designing the intervention program.

The neuropsychological assessment batteries used in studies with psychiatric disorders have been adapted from clinical neuropsychology, which assesses and identifies the profile of neuropsychological strengths and weaknesses of an individual (Caldirola et al. 2013). In the previous sections of this paper we have discussed the different cognitive profiles as well as the main cognitive ability areas commonly impaired in depression, BD and schizophrenia.

Considering the neuropsychological assessment applied for psychiatric disorders it should include areas of functional significance such as general intellectual ability, attention/speed of information processing, memory, attention, working memory, motor speed, visuospatial ability, perception, language and executive functions (Robinson and Thompson 2006, Bora et al. 2009, Fusar-Poli et al. 2012).

A key issue, to be highlighted, is the fact that real world disabilities may be directly influenced by deficits in functional capacity (Patterson et al. 2001). This capacity is valued by the ability to perform everyday living skills, social activities and vocational abilities (Harvey et al. 2007). Therefore, performance-based measures of everyday functioning are more directly related to everyday functioning than the performance in neuropsychological tests (Leikker et al. 2009). Consequently, functional assessments are essential in providing complementary information to neuropsychological assessments. Additionally, we should include mood, coping, and other psychological measures as appropriate to the condition. The expected profiles for the different disorders need to be borne in mind, but clearly there is also considerable variation, and it is eminently possible for an individual's profile to look very different to the broad expectation.

Pharmacological Interventions

Atypical antipsychotic drugs (AAPDs), sometimes called "second generation" antipsychotics, represent those exerting an antipsychotic efficacy at doses that do not cause extrapyramidal side effects (Meltzer 2002, Sumiyoshi 2008, Sumiyoshi 2013). Adopting clozapine as the prototype, this class of agents include risperidone, olanzapine, quetiapine, ziprasidone, aripiprazole, perospirone, blonanserin, paliperidone, iloperidone, asenapine, and lurasidone (Sumiyoshi 2013). AAPDs share certain pharmacologic profiles in common, e.g., a relatively greater affinity for serotonin-5-HT2A receptors relative to dopamine-D2 receptors (Stockmeier et al. 1993, Keefe et al. 2007).

In turn, typical antipsychotic drugs (TAPDS), such as perphenazine, have been reported to show cognitive benefits considering processing speed, reasoning, working memory, verbal memory and vigilance in schizophrenia with a small effect size (Keefe et al. 2007). Importantly, studies (Woodward et al. 2005, Crespo-Facorro et al. 2009) reported an advantage of AAPDs over TAPDs in terms of enhancing cognition, particularly

on the Finger Tapping Test, Trail Making Test B, and Rey Complex Figure Test with a moderate effect size both in controlled and uncontrolled trials. However, there have been challenges to the pro-cognitive efficacy of AAPDs. For example, improvement of verbal memory by treatment with risperidone or olanzapine has been suggested to be no better than that of practice effects in normal controls (Goldberg et al. 2007).

Indeed, this subject remains an issue in neuropsychiatry. High levels of total anticholinergic burden have been associated with reduced benefit from cognitive remediation (Vinogradov et al. 2009). This is not surprising given the consistent correlations detected between memory impairments and high levels of circulating anticholinergics (Vinogradov et al. 2009, Harvey and Strassnig 2012). This total anticholinergic burden can result from treatment with medications aimed at reduction of extrapyramidal symptoms, along with other medications that have substantial anticholinergic effects, such as antipsychotics. Given the level of effort required from patients and service providers to deliver cognitive remediation, it is important to consider reducing pharmacological impediments (Harvey and Strassnig 2012). Taken together, the data must be cautiously considered both because the studies methodology, and also because of the difficulty in identifying cognitive improvements, as well as function recovery (Silverstein and Wilkniss 2004).

Overall Prognosis

Whereas the original model included consideration of how much recovery to expect after brain injury, it is more relevant in psychiatric disease to consider the prognosis, particularly concerning neuroprogression. This term has been used to define the pathological reorganization of the central nervous system along the course of severe mental disorders (Gama et al. 2013). Specifically, in BD, neural substrate reactivity is changed by repeated mood episodes, promoting a brain rewiring that leads to an increased vulnerability to life stress (Vieta et al. 2012). Here, it is important to consider "allostatic load" (Kapczinski et al. 2008), that is, the capacity to achieve stability through change (McEwen et al. 1993). Allostatic or adaptive systems have a fundamental role in responding to a variety of situations other than strictly physiological changes, such as being awake or asleep, exercising, coping with noise, infection, hunger, etc. In order to perceive or anticipate demands, there is a need to change internal parameters to maintain normal functioning. Initially allostatic mechanisms are protective for the organism; however there is a cost to pay for this forced re-setting of parameters, especially if allostatic processes become extreme or inefficient (Kapczinski et al. 2008). In other words, the allostatic load is the 'wear and tear' of the body and brain which results from chronic overactivity or inactivity of the physiological systems involved in adapting to environmental challenges (McEwen and Wingfield 2003).

Some neuropsychiatric illnesses have been investigated in the light of allostatic load paradigms, in particular Alzheimer's disease (Swaab et al. 2005), post-traumatic stress disorder (Glover 2006), substance use disorders (Zimmermann et al. 2006) and major depression (McEwen 2003). As far as we are aware, although BD is cited as an entity in which allostasis and allostatic load may play a role (Arnone et al. 2009), there has been no formal synthesis of the relevance of allostatic processes in the course of BD. For example, chronic mood instability generates physiological stress with neurotoxic effects, leading to neurological damage and cognitive decline over the course of illness (McEwen and Wingfield 2003).

Considering BD, evidence for possible effects of stress on the brain comes from neuroimaging studies that found morphological abnormalities. In a recent review, BD is associated with whole brain and prefrontal lobe volume reductions, along with volume increases of the lateral ventricles (Arnone et al. 2009). There is evidence that these and related brain abnormalities in BD are associated with both cognitive (Strakowski et al. 2005) and psychosocial decline (Forcada et al. 2010). Taken together, these studies suggest a stress-related cognitive, neurological, and psychosocial decline in people with BD who suffer from a more severe course of illness. As the physiological effects of stress are neurotoxic and lead to cognitive decline over time it is very important to consider all the clinical variables to establish the prognosis regarding cognitive rehabilitation (Levy et al. 2012).

Functional Status – International Classification of Functioning Core Sets

The World Health Organization's International Classification of Functioning (WHO-ICF) is a descriptive system that can be a useful way of analyzing illness. This system highlights the fact that cognitive impairments are conceptual constructs derived from behavioural observations, and that the associated disabilities are not themselves specifically attributable to a single cognitive deficit (Wade and Halligan 2004). The ICF is designed to record and organize a wide range of information about health and health-related states (Cieza et al. 2004). The classification is intended for use in multiple sectors that include, besides health, education, insurance, labour, health and disability policy, and statistics. In the clinical context, it is intended for use in needs assessment, matching interventions to specific health states, rehabilitation and outcome evaluation. Regarding the clinical purposes, and in line with the concept of condition-specific health status measures, it would thus seem most helpful to link specific conditions or diseases to salient ICF categories of functioning (Stucki et al. 2002).

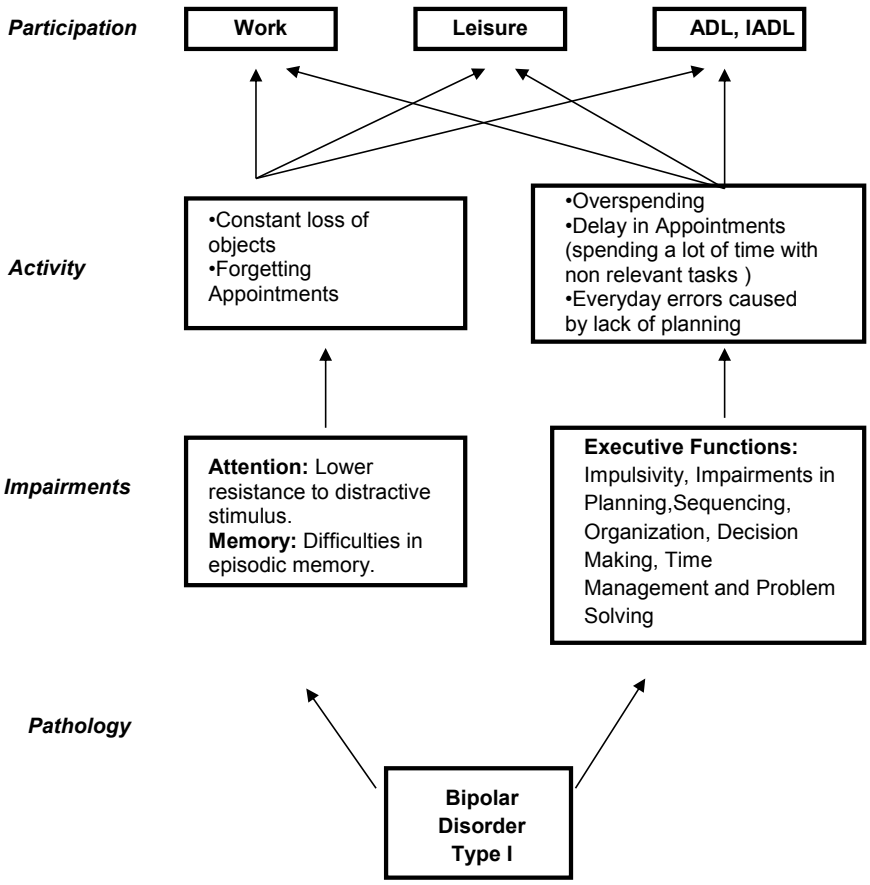
The World Health Organization's International Classification of Functionality (ICF) distinguishes three levels of functional deficits: impairment, disability and handicap (ICF Research Brand). It is important to note that these three levels do not relate to different aspects, but rather different categories of impact of the same specific health problem, in the area of NR this would be deficits in cognitive functions. "Impairment" occurs at a physical, structural, organ, or systematic level and involves a missing or malfunctioning body part or system (for example, a person with a lesion of the hippocampus would consequently have memory impairment). "Activity" refers to abnormalities, changes or restrictions in the interaction between a person and his/her environment or physical contexts (i.e. changes in the quality or quantity of behaviour). It involves disturbed function in performance of usual age appropriate activities, such as Impairments in activities of daily living (ADL) and instrumental activities of daily living (IADL), for example: difficulty to remember appointments, constant lost of objects, overspending. "Participation" refers to changes, limitations in the position of the person in their social context. It involves disturbed function in the performance of social roles. In this perspective, the overall focus of neuropsychological

rehabilitation programs is to reduce the disability and handicaps. Therefore regarding to cognitive deficits, the ICF highlights the fact that cognitive impairments are conceptual constructs that are derived from behavioural observations, and that the associated disabilities are not in themselves specifically attributable to a single cognitive deficit which corroborates the necessity of a broad intervention (Arthanat et al. 2004). Therefore, the main objective in the NR is the development of a set of more adaptative and functional behaviors, quality of life, independence and autonomy (Arthanat et al. 2004, Wade 2005). An example of clinical reasoning for NR, considering the model proposed by ICF, is explained in the figure below, and as pointed above, the NR intervention must be directed towards activities and participation levels (**figure 1**).

There are generally agreed lists of ICF categories that can serve as Brief ICF Core Sets to be rated in all patients included in a clinical study with a condition, or as Comprehensive ICF Core Sets to guide multidisciplinary assessments in patients with that condition. A Brief ICF Core Set for a specific condition comprises a list of ICF categories with as few categories as possible to have practical applicability, but as many as necessary to be sufficiently comprehensive to describe and to encompass the expected spectrum of problems in functioning of patients with a specific condition (Cieza et al. 2004). The development of the ICF Core Sets involved a formal decision-making and consensus process integrating evidence gathered from preliminary studies and expert opinion (Cieza et al. 2004). Considering the clinical needs the ICF Core Sets has direct implications for the establishment of goal setting that should influence treatment decisions (Wade and Halligan 2004, Wade 2005). There are many ICF Core Sets for different conditions, such as neurological conditions, cancer, and mental health. Regarding the last area, there are Core Sets for bipolar disorder, schizophrenia and depression. The brief ICF Core sets for bipolar disorder, in accordance with the ICF Research Branch, encompasses nineteen items divided in body functions (e.g. energy and drive functions, attention, memory, emotional and thought functions), activities and participation (e.g. solving problems, carrying out daily routine, handling stress, acquiring, keeping and terminating a job) and environmental factors (e.g., drugs, friends, societal attitudes). For depression there are ICF Core Sets as well as the brief version, which is composed of thirty one items such as energy level, motivation, psychomotor functions, thinking, solving problems, making decisions, washing oneself, individual attitudes of immediate and extended family members (ICF Research Branch). Even in specific conditions for which there are no established core sets, research has shown that the ICF Checklist can be valuable. These include dementia (Hopper 2007), schizophrenia (Switaj et al. 2012), major depression and anxiety disorders (Balestrieri et al. 2013). In those studies the authors have found that the ICF provides a good outcome monitoring and evaluation tool for the assessment of response to treatment.

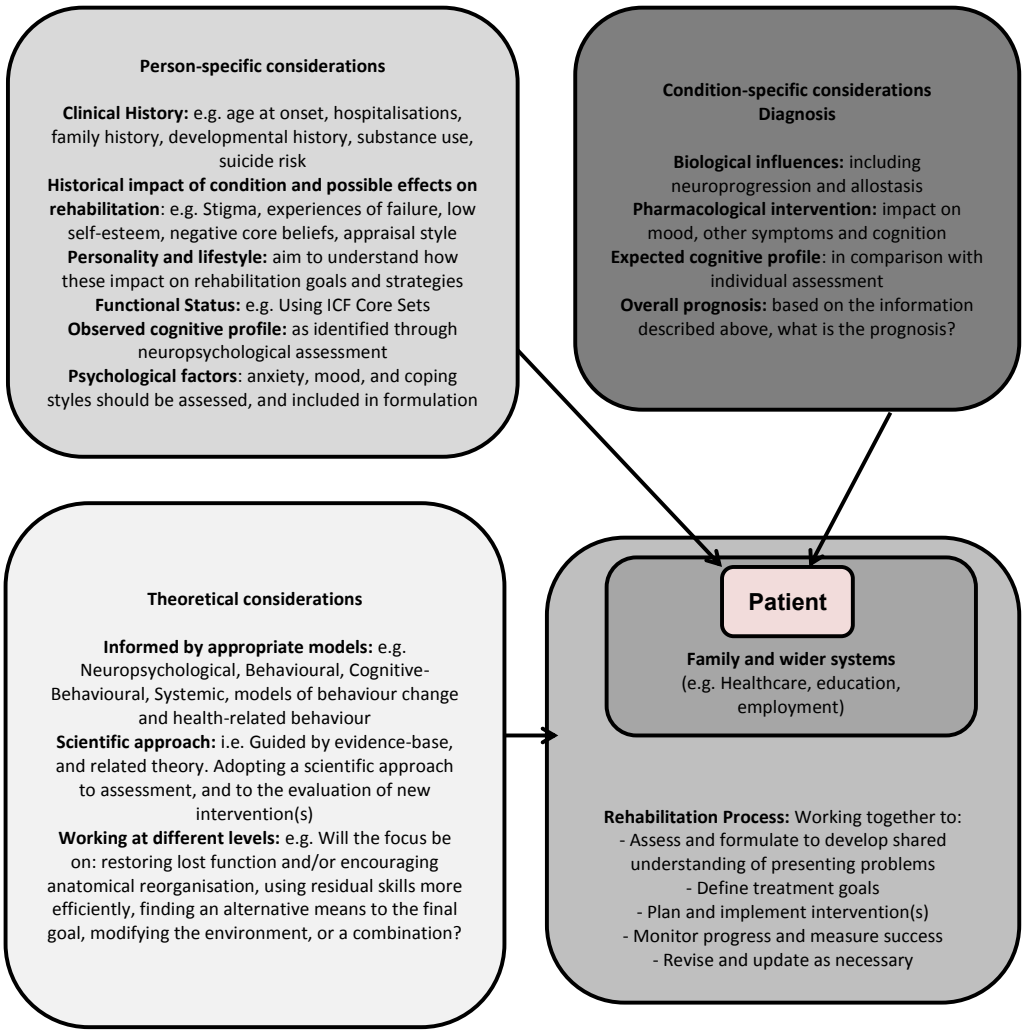
In a recent investigation Baletrieri et al. (2013) assessed the reliability and the convergent validity of the Italian version of Mini-ICF-APP, a short instrument for rating activity and participation restrictions in psychiatric disorders. This study comprised 120 people diagnosed with schizophrenia, major depression, bipolar I disorder and anxiety disorders. The Mini-ICF – APP was compared to the Brief Psychiatric Rating Scale (BPRS), the Clinical Global Impression Scale (CGI-S), the Personal and Social Performance Scale (PSP) and the

Figure 1. *An hypothetical case of a patient with bipolar disorder type I in ICF perspective*



Social and Occupational Functioning Assessment Scale (SOFAS).The Mini-ICF-APP score for people with SZ was higher, while that of anxious patients was lower than in the other diagnoses. Intra-class correlations (ICC) revealed a significant inter-rater agreement for total score (ICC 0.987) and for each item of the Mini-ICF-APP. The test-retest agreement was also highly significant (ICC 0.993). The total score of the Mini-ICF-APP obtained good negative correlations with PSP (r = -0.767) and with SOFAS scores (r = -0.790). The distribution items of the Mini-ICF-APP showed some skewness, indicating that self-care (item 12) and mobility (item 13) were amply preserved in most patients. The Mini-ICF-APP total score was significantly correlated with both CGI-S (r = 0.777) and BPRS (r = 0.729). Thus, the Mini-ICF-APP scale seemed to be well suited to everyday psychiatric practice as a means of monitoring changes in psychosocial functioning, in particular in people with schizophrenia.

Figure 2. *A Model of Neuropsychological Rehabilitation in Psychiatric Conditions*



Understanding how anxiety, depression and coping styles may affect behaviour, adaptation, and rehabilitation outcomes

Since anxiety is common in people with neuropsychiatric disorders and the most common behavioral response to anxiety is avoidance, people with psychiatric conditions who experience cognitive impairment may tend to withdraw from psychosocial demands that evoke anxiety to decrease their experiences of social failure (Lee et al. 2010). More broadly, the cognitive demands of everyday life can create anxiety that exacerbates cognitive deficits, limits functional ability, reduces motivation, and leads to avoidance of psychosocial engagement. In schizophrenia research, several studies suggest that an avoidant coping style mediates the link between neurocognitive impairment and psychosocial functioning (Leikker et al. 2009, Harvey et al. 2010). Although there is little direct evidence that psychosocial avoidance plays a similar role in people with bipolar disorder, this hypothesis remains viable, given the similarities between cognitive impairment in that disorder and schizophrenia (Leifker et al. 2009, Lee et al. 2010). In summary, the interplay between anxiety and cognitive impairment may further limit functional capacities and exacerbate psychosocial decline, and this has to be considered by the clinicians that work with NR for that population.

As pointed above, the focus of the intervention must be directed to outcomes at the activity or participation levels of the World Health Organization (WHO) International Classification of Functioning, Disability and Health (ICF) framework (Berry et al. 2017). NR is multidimensional in scope and methodology, including

a plethora of approaches and models with which to conceptualise and target functional difficulties (Wilson 2008). In this sense it is important to highlight the holistic model proposed by Prigatano (2013). This model approaches address cognitive, social, emotional, and functional aspects and necessarily embraces both group and individual therapy components, which are very important considering all the occupational functioning. Regarding the psychotherapeutic approach it is corroborated its potential to modify dysfunctional neural circuits associated with the disorder in question, by the detectable changes in the brain comproved by neuroimaging techniques (Peres et al. 2008, Barsaglini et al. 2014). Then the psycotherapy and the underlying mental processes significantly influences the various levels of brain functioning (e.g. molecular, cellular, neural circuit) and brain plasticity (Beauregard 2009) and because of this also influences the neuropsychological functioning, as demonstrated by Gabbard (2000). Considering the relevance, the psychotherapy is one of the pillars of NR.

The new extended model is presented on page 89 (**figure 2**).

Conclusions

This paper aimed to expand Wilson's 2002 model to guide NR in psychiatric conditions as well as to provide a theoretical and clinical reference for clinicians who work with these groups. Additions have been made to take into account characteristics of neuropsychiatric patients explained in this paper. NR is an experience-based process which incorporates cognitive, emotional and behavioural processes. These include learning, practicing and developing skills and habits, implementing strategies and developing mechanisms for coping and adaptation in a variety of settings, with different people and many types of treatment techniques.

The present study sought to describe and extend the Wilson's Model, and efforts have been made to make it broader, relevant and clinical feasible to a greater number of patients.

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