Advances in Schizophrenia Research

Chapter 5

Understanding and Walk Through Schizophrenia

GREG Mirt[1]; CHEN Linli[2]; XIE Jun[3]; YANG Liqiong[3]; ZHONG Jing[3]; LIU Fangfang[4]; YU Jianping[5]; LIU Xiaolei[6]; WANG Shuai[7*]; XU Fan[8*]

[1]Neuro Occupational Activity Centre Novo mesto, Slovenia, EU

[2]Division of General Practice, West China Hospital, Sichuan University, Sichuan 610041;

[3]School of Pharmacy, Chengdu Medical College, Sichuan, CHINA, 610500

[4]Southwest Minzu University, Sichuan, CHINA, 610041

[5]Department of Public Health, Chengdu Medical College, Sichuan, CHINA, 610500

[6]Department of Neurology, First Affiliated Hospital of Kunming Medical University, Sichuan, CHINA, 610500

[7]Department of Psychology, Chengdu Medical College, Sichuan, CHINA, 610500

[8]Department of Public Health, Chengdu Medical College, Sichuan, CHINA, 610500

*[*]**Co-correspondence to: WANG Shuai,** Department of Psychology Chengdu Medical College Chengdu, Sichuan Province CHINA.*

Phone: +86 28 6273 9710; Email: wshuai86@126.com

***Prof XU Fan,** Department of Public Health Chengdu Medical College Chengdu, Sichuan Province CHINA.*

Phone: +86 28 6273 9397; Email: xufan@cmc.edu.cn

1. Background of Schizophrenia

1.1 Severe Mental disorder

Mental disorder, also called psychiatric disorder or mental illness, is a behavioural or mental pattern that causes significant distress or impairment of personal functioning. Common mental disorders include depression, schizophrenia, bipolar disorder, obsessive compulsive disorder [1]. Stigma and discrimination can add to the suffering and disability associated with mental disorders, leading to various social movements attempting to increase understanding and challenge social exclusion [2]. Furthermore, the treatment of mental disorders brings heavy financial and thought burdens to the society and patients' families [3].

1.2 Incidence rate of Schizophrenia of Worldwide

Schizophrenia, has a greater impact on society, is a severe and polygenic inherited disease with an incidence of appropriately 1% [4]. Globally, an update study showed that prevalent cases of schizophrenia rose from 13.1 million in 1990 to 20.9 million cases in 2016 [5]. Incorporating regional population sizes to estimate prevalent cases shows that East Asia and South Asia carry the largest number of cases, approximately 7.2 and 4.0 million, respectively in 2016 [5]. Oceania had the lowest number of cases, around 28000, and the combined sub-Saharan African regions experienced approximately 1.3 million cases in 2016 [5]. The prevalence of schizophrenia in Australasia, Central Europe, Eastern Europe, Western Europe, Southern Latin America, and High-income North America is 0.1, 0.3, 0.5, 1.2, 0.1, and 1.2 million cases in 2016, respectively [5].

1.3 Key symptoms of Schizophrenia

The core feature of schizophrenia is deficits in cognitive abilities, including working memory, long-term memory, verbal declarative memory, semantic processing, episodic memory, attention, learning (particularly verbal learning) [6]. Schizophrenia is often described in terms of positive and negative symptoms [7]. Positive symptoms are those that most individuals do not normally experience, but are present in people with schizophrenia [8]. They can include delusions, disordered thoughts and speech, and tactile, auditory, visual, olfactory and gustatory hallucinations, typically regarded as manifestations of psychosis [9]. Negative symptoms are deficits of normal emotional responses or of other thought processes [10]. They commonly include flat expressions or little emotion, poverty of speech, inability to experience pleasure, lack of desire to form relationships, and lack of motivation [10]. Negative symptoms appear to contribute more to poor quality of life, functional ability. People with greater negative symptoms often have a history of poor adjustment before the onset of illness, and response to medication is often limited [9].

1.4 Key anatomy structure changed in brain of Schizophrenia

Previous post-mortem and neuroimaging studies show that patients with schizophrenia have slightly larger cerebral ventricles and a decrease in cortical volume than normal [11]. A recent meta-analysis indicated that schizophrenia was associated with significantly greater variability of temporal cortex, thalamus, putamen, and third ventricle volumes [12]. Furthermore, drug-naive first-episode schizophrenia adolescents likely showed decreased gray matter in right superior temporal gyrus and middle temporal gyrus [13]. The findings on brain structural and functional abnormalities are inconsistent.

2. Our Understanding on the Mind of Schizophrenia

The development of Theory of mind (ToM) depends on maturation of several brain systems. ToM is shaped by parenting, social relations, trainings and education. Therefore, it was recognized as one potential target of treatment to improve social functions [14].

Theory of mind encompasses the ability to take the perspective of and understand the mental states of others, including their thoughts, feelings, and beliefs. Many of the researches on individualism and collectivism have been conducted in social and cross-cultural psychology and conceptualization has been put forward. Researchers have only recently begun to examine the social cognitive skills of individuals who vary in the extent to which they display Schizophrenia. The majority of research has examined these traits in relation to overall scores on the symptoms of Schizophrenia. We have examined the relationship between various social cognitive abilities, such as empathy and theory of mind, and degree of Schizophrenia We have found a pattern in which individuals scoring high in Vulnerable behaviours show deficits in theory of mind and empathy, whereas individuals scoring high on Grandiose behaviour appear to perform well on tasks assessing theory of mind, emotional intelligence, and empathy. Here we review our own and other recent research examining theory of mind in individuals as a function of scores on both facets of Schizophrenia.

Theory of mind is characterized as the competence to trait mental states to others in order to anticipate and predict community attitude. That is commonly explored through the bogus model. ToM concerns two processes: the detection (and decoding) of mental states, and preposition about mental states. This latter includes more progressive skills, such as anticipating attitude on the ground of bogus belief. ToM has been judged as too narrow a term, as discounting the relational and emotional aspects of understanding the behaviour of others. Therefore endeavour has been made to dissociate the various conditions or objective of ToM, especially in order to characterize its cognitive and emotional component [6]. Metallization, on the other hand, is a specific form of social cognition based on the performance of imaginative mental activity that allows an understanding of the behavior of other people in terms of their intentions, needs, desires, or goals. Metallization is illustrated as a multidimensional set up incorporating three dimensions: modes (implicit and explicit), two subjects (self and others), and two aspects (cognitive and affective). Also perceptiveness the mental states of others, it subsumes the procedure and renewal of one's own emotions, through obtaining understandings of others' intentions, feelings, and beliefs. The shortfall of ToM has been noticed in Schizophrenia. However, studies of emotional psychopathology (i.e., of anxiety disorders) have shown that there is no change in thick of the clinical and the control group in the basic tests relating to ToM.

A by-product of positive object relations is an integrated sense of self. The individual is

able to cope with ambivalence and with the coexistence of good and bad in individuals and the self. Furthermore, the superego is adaptive and able to cope with disparity between the self and ideal self. Thus, a stable self concept of ToM is formed that can readily regulate self-esteem from within. Individuals who present normal adult narcissism have an inner voice which tells them they are good enough. With this basis, individuals can be active and effective players in their lives, and have a stable moral system while expressing innate drives such as aggression and sexuality in acceptable ways.

Human bodies are certainly social and cultural. Our long infancy and our language-brain attest to that. The human brain had its second great expansion after culture. Brain and body changed physically in the context of culture. Unquestionably, the body and experience are cultural. But this fact is mistakenly interpreted as mere imposition of social and political order. Upon what is this order imposed? External imposition assumes an original body without order, and without interaction. The ego is the extant social order, imposed upon a purely individual, chaotic body consisting of mere autistic “desires”. Later I will question this theory of an unordered and asocial body.

It is difficult to arrive at a penetrating understanding of ourselves without becoming ensnared in the difficulties of expressing ourselves verbally. And an awareness of this fact is a critical precondition to overcoming this language barrier. This awareness of language as a problem in the work of self-understanding is the special contribution of phenomenology and existentialism of ToM.

Sometimes emotion seems to be generated and to endure independently from driving a goal, purposelessly. It seems that it starts with no reason, no intended outcome in relation to desired or feared objects, whether in reality or in the mind. That is why clinicians and factor analyses often distinguish between behavior dysregulation and emotion dysregulation. Sometimes, patients feel unable to stop pursuit of a failing goal in order to think of adjustments to its course or to think of priorities to replace it altogether. At other times, patients feel unable to end a seemingly purposeless emotion. They want to modulate it because it colors their current preferences, counter to their conscious reasoning, and it persists irrationally. There are two kinds of such lingering, seemingly purposeless moods. One is a mood of worry and irritability that coincides with rumination about lingering concerns, whose unintended contemplation intrudes recurrently. The second kind is a mood of vigilant anticipation of mistreatment in every relationship. Research in cognitive psychology has shown that such persistent and pervasive moods are initiated by conscious determination of priority to ascertain a current threat of betrayal. Then, they linger and prime attention selectively for negative aspects of unrelated priorities.

Figure 1: Schizophrenia Model

3. Latest Treatment of Physiotherapy on Schizophrenia

Schizophrenia is one of the most severe mental disorders. In the long run, it may extensively affect one's mentality, self-image, and perception of the environment. It impairs everyday functioning and may cause significant disablement. It is characterized by phenotypic and genotypic heterogeneity that is becoming increasingly recognizable. But the knowledge is yet vastly unknown to be opportunely tested in the improvement of therapeutic approaches such as physiotherapy [15].

The circumstance of community with schizophrenia is becoming more and broader in the world. Each year there are people who are commonly less physically active, which is closely connected to health maintaining factors. Therefore, we were wondering what kind of physiotherapy would be appropriate for the people with schizophrenia for a better and independent dealing with this pathology, how to improve the quality of life regarding their physical fitness, strength, balance and flexibility and what to be particularly focused on [16].

Physical therapy and rehabilitation medicine are not in the power to deal medically directly the schizophrenia itself. But that does not mean physiotherapy has no role because it can aid address various co-morbidities, side effects of medications, or aid deal with the bodily weakening in function. Diabetes impacts 6% of patients with schizophrenia, and this is a section that physical therapy can pitch in. According to Dr. Madhu Goel the director of obstetrics and gynecology at Fortis La Femme, diabetes is a metabolic disease and is likely to grab one by the throat if one leads an inactive life. Instruction on diet, workout, and skin records would be very beneficial to these people [17]. Also, patients with schizophrenia see a setback in body function as they age, more so than the usual individual. They may have bone/joint disease, fractures, and degeneration in brain function, Parkinsonism, cerebrovascular accident, spinal cord disorders, and amputations [18].

Moreover the schizophrenia patients are liable to heaviness and also because of additional risk of weight gain associated with antipsychotic treatment. Fogarty et al. showed in his study improvements with schizophrenia patients who were included into 3 months research. Improvements were in reducing weight and reported increased fitness level, exercise tolerance, reduced blood pressure, and upper body and hand grip strength, thirty minutes of exercise of moderate intensity is well received in everyday life of schizophrenia patients.

Physical therapy can be used as a measure of upgrading the quality of life of patients with schizophrenia through enhanced self-esteem, improved mood state. Physiotherapist acts as a facilitator for the improvement of the mental health with the physical health of the patients they are treating. Movement as tactic to cope with schizophrenia conveys the core of what physiotherapists do. As experts in movement and exercise, and with a thorough knowledge of risk factors, pathology and their effects on all systems, physical therapists are the ideal professionals to promote, guide, prescribe and manage exercise activities and efforts. Exercise promotes health, wellbeing and fitness [19].

Bridging the gap between physical and mental health can be done by a physical therapist. People who stay active are more likely to keep working, engaging and enjoying without having to depend on others. They are fit for life. Inactivity causes disability and contributes to millions of deaths around the world every year. It can lead to diabetes which as we said before counts for 6 % of schizophrenia patients. It has been established that regular physical activity has a positive influence on the symptoms of schizophrenia.

Physical activity expends a concrete outcome on mental health. Performing strength training 2-3 times a week, as this naturally advance the effects of aerobic exercise. Having examined the articles dealing with the description of researches and their results, we have found out that there are positive effects of physiotherapy and exercising on the health of the elderly, which is manifested in prevention against falls, other injuries and chronic diseases. Furthermore, disease symptoms are corrected and exposure for an early set of mortality with schizophrenia patients is decreased. Motion and mental state are associated in e research. Individual activity in physiotherapy is articulated as sensation of mental and somatic wellness. Motion is related to the somatic image, a person’s self-belief, the connection between individual and another, and how an individual relates to time. This connection in physiotherapy is articulated mainly in the area of psychiatric physiotherapy, putting the body as a full, the lived body, and feelings connected to the body in focus. In the area of psychiatric physiotherapy, human motion is explained as body movements and concepts like body awareness and body experience rather than specific human movements. There is becoming visible that evidence regarding physiotherapy system may be adequate for patients with mental problems.

Range of motion restraint, particularly trunk, hip, and knee flexion and ankle plantar

flexion contractures, will negatively control the location of the centre of gravity in relation to the base of support. Active range of motion (AROM) testing should, accordingly, focus on evaluating trunk, hip, and knee extension and ankle dorsiflexion. Evaluating neck motions let on the clinician to detect potential conflicting reaction in the sense of ischemic reactions during patient-controlled AROM [20]. It further delivers to detect if patients will be able to assume the test positions needed in further tests. Cervical AROM tests may also signal upper cervical hypomobility. AROM tests also signal indications on physical durability and coordination deficits in the form of ataxia or abnormal involuntary motions in patients with mental syndromes. Episodic cessation of extensor muscle activity occurs when the patient holds the arms outstretched with wrists and fingers extended causing the hands to fall into flexion followed by a return to the extended position. Myoclonus is a rapid twitch-like muscle contraction: It can result from the same conditions causing asterixis or with Schizophrenia [21]. Chorea can occur in patients with Wilson's disease, acquired hepatocerebral degeneration, and also Schizophrenia. Chorea is characterized by rapid, irregular muscle jerks, occurring unpredictably and involuntarily in different body parts. An ischaemic response during cervical AROM testing or the presence of abnormal involuntary motions during AROM testing of the limbs indicates the need for a long term physiotherapy treatment with people with Schizophrenia [22].

PT management indications for patients with Schizophrenia:

Benign paroxysmal positional vertigo:

- Intermittent, severe positioning-type dizziness [23]
- Precipitated by positioning, movement, or other stimuli (see below)
- Short latency: 1-5 seconds
- Brief duration: < 30 seconds
- Fatigable with repeated motion
- Associated signs and symptoms: nystagmus, nausea, and at times vomiting
- Occurs in people over age 40 with peak incidence of onset in the sixth decade
- Rare in people under 20
- Medical history of head trauma, labyrinthine infection, surgical stapedectomy, chronic suppurative otitis media, and degenerative changes to the inner ear Posterior semicircular canal.

Posterior semicircular canal [24]

- Patients complain of dizziness when they quickly transfer to a supine position, especially

when the head is turned to the affected side. ISBN 10: 1892734036

• Positive response of vertigo and apogeotropic torsional nystagmus on ipsilateral Hallpike-Dix maneuver

Cervicogenic dizziness [25]

• Intermittent positioning-type dizziness

• Precipitated by head and neck movement [26]

• No latency period: onset of symptoms is immediate upon assuming the provoking position

• Brief duration but may last minutes to hours

• Fatigable with repeated motion

• Associated signs and symptoms: nystagmus, neck pain, suboccipital headaches, sometimes \\paraesthesiae in the trigeminal nerve distribution

• Possible lateral head tilt due to tightness of the sternocleidomastoid or upper trapezius

• Possible forward head posture

• Medical history of cervical spine trauma and degeneration

• Motion dysfunction in the upper cervical segments on AROM and PIVM testing

• Positive neck torsion test: nystagmus with reproduction of dizziness.

Musculoskeletal syndrome

• Subjective complaints of weakness, unsteadiness

• Insidious onset

• Postural deviations negatively affecting the location of the center of gravity in relation to the base of support: trunk flexion, hip flexion, knee flexion, and ankle plantar flexion contractures

• Decreased trunk extension, hip extension, knee extension, and ankle dorsiflexion on ROM testing

• Loss of strength and endurance in anti-gravity muscles • Impaired joint position sense lower extremity [27].

4. Physiotherapy Technology used in Treatment

Modern technologies, which target physical therapy, are old already more than 20 years. Electrotherapy, therapeutic ultrasound, laser, TECAR therapy which is deep diathermy and manual therapy especially for musculoskeletal syndromes. In the works of most researchers it is fundamentally important technology the effectiveness of physiotherapy and rational approach of the therapy itself. However because treating Schizophrenic people, safety of users of physiotherapy technology as well as the legal, ethical and professional aspects of its usage should be carefully thought and if applicable carefully administered [27].

5. Respiratory Physiotherapy

Very important part of therapy for people with Schizophrenia is relaxation. That is why we have to know how to breathe correctly. Specific inspiratory muscle training (IMT) can improve the function of the inspiratory muscles. POWER Breathe Kinect has recently developed IMT device that applies a variable resistance provided by an electronically controlled valve (variable flow resistive load).

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8. Reference

1. Telles-Correia D, Saraiva S, Goncalves J: Mental Disorder-The Need for an Accurate Definition. Frontiers in psychiatry 2018, 9:64.

2. Stolzenburg S, Freitag S, Evans-Lacko S, Muehlan H, Schmidt S, Schomerus G: The Stigma of Mental Illness as a Barrier to Self Labeling as Having a Mental Illness. The Journal of nervous and mental disease 2017, 205(12):903-909.

3. Whiteford HA, Degenhardt L, Rehm J, Baxter AJ, Ferrari AJ, Erskine HE, Charlson FJ, Norman RE, Flaxman AD, Johns N et al: Global burden of disease attributable to mental and substance use disorders: findings from the Global Burden of Disease Study 2010. Lancet (London, England) 2013, 382(9904):1575-1586.

4. Wang S, Li W, Zhao J, Zhang H, Yang Y, Wang X, Yang G, Lv L: Association of estrogen receptor alpha gene polymorphism with age at onset, general psychopathology symptoms, and therapeutic effect of schizophrenia. Behavioral and brain functions : BBF 2013, 9:12.

5. Charlson FJ, Ferrari AJ, Santomauro DF, Diminic S, Stockings E, Scott JG, McGrath JJ, Whiteford HA: Global Epidemiology and Burden of Schizophrenia: Findings From the Global Burden of Disease Study 2016. Schizophrenia bulletin 2018, 44(6):1195-1203.

6. Elvevag B, Goldberg TE: Cognitive impairment in schizophrenia is the core of the disorder. Critical reviews in neurobiology 2000, 14(1):1-21.

7. Anderson A, Wilcox M, Savitz A, Chung H, Li Q, Salvadore G, Wang D, Nuamah I, Riese SP, Bilder RM: Sparse factors for the positive and negative syndrome scale: which symptoms and stage of illness? Psychiatry research 2015, 225(3):283-290.

8. Frith C, & Done, J: Positive Symptoms of Schizophrenia. British Journal of Psychiatry 1989, 154(4):569-570.

9. Lewine RR, Fogg L, Meltzer HY: Assessment of negative and positive symptoms in schizophrenia. Schizophrenia bulletin 1983, 9(3):368-376.

10. Andreasen NC: Negative symptoms in schizophrenia. Definition and reliability. Archives of general psychiatry 1982, 39(7):784-788.

11. Stefan MD, Murray RM: Schizophrenia: developmental disturbance of brain and mind? Acta paediatrica (Oslo, Norway : 1992) Supplement 1997, 422:112-116.

12. Brugger SP, Howes OD: Heterogeneity and Homogeneity of Regional Brain Structure in Schizophrenia: A Meta-analysis. JAMA psychiatry 2017, 74(11):1104-1111.

13. Zhang Y, Zheng J, Fan X, Guo X, Guo W, Yang G, Chen H, Zhao J, Lv L: Dysfunctional resting-state connectivities of brain regions with structural deficits in drug-naive first-episode schizophrenia adolescents. Schizophrenia research 2015, 168(1-2):353-359.

14. Hajduk M, Krajcovicova D, Zimanyiova M, Korinkova V, Heretik A, Pecenak J: Theory of mind - not emotion recognition - mediates the relationship between executive functions and social functioning in patients with schizophrenia. Psychiatria Danubina 2018, 30(3):292-298.

15. Schizophrenia Prevention-Risk Reduction Approaches. [http://www.schizophrenia.com/prevention.htm]

16. Lundy-Ekman L: Neuroscience: Fundamentals for Rehabilitation.; 1998.

17. Fogarty M, Happell B: Exploring the benefits of an exercise program for people with schizophrenia: a qualitative study. Issues in mental health nursing 2005, 26(3):341-351.

18. Sernyak MJ, Leslie DL, Alarcon RD, Losonczy MF, Rosenheck R: Association of diabetes mellitus with use of atypical neuroleptics in the treatment of schizophrenia. The American journal of psychiatry 2002, 159(4):561-566.

19. Baloh RW: Vertigo. Lancet (London, England) 1998, 352(9143):1841-1846.

20. Huijbregts P, Vidal P: Dizziness in Orthopaedic Physical Therapy Practice: Classification and Pathophysiology. Journal of Manual & Manipulative Therapy 2004, 12(4):199-214.

21. Dvorak J: Epidemiology, physical examination, and neurodiagnostics. Spine 1998, 23(24):2663-2673.

22. Saeed AB, Shuaib A, Al-Sulaiti G, Emery D: Vertebral artery dissection: warning symptoms, clinical features and prognosis in 26 patients. The Canadian journal of neurological sciences Le journal canadien des sciences neurologiques 2000, 27(4):292-296.

23. Tinetti ME, Williams CS, Gill TM: Dizziness among older adults: a possible geriatric syndrome. Annals of internal medicine 2000, 132(5):337-344.

24. Simon RP, Aminoff MJ, Greenberg DA: Clinical Neurology. CT: Appleton & Lange; 1999.

25. Eaton DA, Roland PS: Dizziness in the older adult, Part 2. Treatments for causes of the four most common symptoms. Geriatrics 2003, 58(4):46, 49-52.

26. Fetter M: Assessing vestibular function: which tests, when? Journal of neurology 2000, 247(5):335-342.

27. Zaffaroni M, Baldini SM, Ghezzi A: Cranial nerve, brainstem and cerebellar syndromes in the differential diagnosis of multiple sclerosis. Neurological sciences : official journal of the Italian Neurological Society and of the Italian Society of Clinical Neurophysiology 2001, 22 Suppl 2:S74-78.