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DISTURBANCES IN INTENTIONAL ACTION AMONG PATIENTS WITH FRONTAL LOBES DYSFUNCTION FROM THE SELF-REGULATORY POINT OF VIEW

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Summary. Frontal lobe damage causes a range of impairments in the cognitive, emotional, and motivational functioning of patients and can lead to significant changes in their personality. Some deficits observed in patients with frontal lobe damage include difficulties in intentional action (or goal-directed behaviour), which can be described as impaired self-regulation. Research shows that these aspects of self-regulation may be related to reductions in executive function and in awareness of symptoms, and to disturbances in self-criticism. In examining the process of self-regulation, we refer to the ideas of Albert Bandura, which emphasize the importance of goal-directed behavior in the flexible modification of behavior, including the self-aware and critical correction of difficulties. We also present a literature review of the potential mechanisms underlying such difficulties in patients with damage to the frontal lobe, verifying data on the role of defense mechanisms and neurocognitive deficits.
Key words: frontal lobe dysfunction, self-regulation, intentional action, defensive mechanisms, neurocognitive deficits

Introduction

Many psychological concepts suggest the validity of explaining the effective operation of individuals in terms of chosen goals or intentions (cf. Prochaska & DiClemente, 1983). Intrapsychic resources play a key role here, enabling the analysis and comparison of data in order to modify and optimize strategies of behavior. In Bandura's theory of social learning, self-regulation is one such resource; this concerns exerting spontaneous influence on one's own behavior in a way that is compatible with selected distal and proximal goals (Bandura, 2007).

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Self-regulation can be conceived both structurally and processually: structurally, when it is treated as a specific ability or disposition to activate a specific mental activity (e.g., in the theory of personality traits); processually, as a process in the course of which various mental activities that make up this ability appear. In this article, self-regulation will be understood processually. The initial stage of the self-regulatory process is the ability to monitor one's own mental states in order to more effectively minimize difficulties in a given aspect of functioning, while strengthening resources and fully exploiting the available potential. Monitoring the course of one's own cognitive, emotional, and behavioral processes enables permanent and effective reorganization of existing activities and results to better adapt to existing conditions (Bandura & Perloff, 1967; Bandura, 1991).

Although this process of self-regulation is generally associated with the social learning and cognitive psychology approaches, it finds broad application in explaining certain phenomena in psychopathology: many authors dealing with the neuropsychological mechanisms of disorders have drawn attention to the relationship between the process of self-regulation (including monitoring or self-control) and psychic functions, such as executive functions (Łuria, 1967, p. 123; Muraven & Baumeister, 2000; Barkley, 2001; Baumeister, 2002; Stuss & Anderson, 2004; Hofmann, Schmeichel & Baddeley, 2012; Yeh et al., 2017), consciousness and self-awareness (Łuria, 1976b, pp. 115, 119; Posner & Rothbart, 1998; Goldberg, 2002, pp. 34–35; Banks & Weintraub, 2008; Peters, 2009; Davidson, Schwartz & Shapiro, 2013), and self-criticism (Łuria & Homskaya, 1964; Łuria, 1967, pp. 192–194, 224–225). Deficits in the self-regulatory process and related executive dysfunctions, as well as lack of awareness (Jodzio, 2017, p. 150) and weakened critical attitudes seem to be predictors of significant difficulties in intentional and effective functioning found in people with frontal lobe dysfunction (Borkowski & Burke, 2001; Ackerman, Markiewicz & Gorzelańczyk, 2010); this is outlined in Figure 1.

In Bandura's social learning theory, self-regulation is a broader concept, and changes in the process of self-regulation are accompanied by deficits in other psychological functions. Similarly, Strauman (2017) claims that self-regulation processes play a critical role in the formation of intentional action, and include a range of factors from neurophysiological through psychological (cognitive, emotional-motivational) to interpersonal and social.

These executive functions are defined as mental abilities necessary for formulating goals, planning, and effectively implementing plans (Lezak, Howieson & Loring, 1995; Carpenter, Just & Reichle, 2000; Koechlin, 2016). The processes of self-awareness can signify "the ability to be the object of self-knowledge, conditioning knowledge about your own physical and mental state" (Sitek, Sławek & Wieczorek, 2008, p. 394). According to a number of authors, people with dysfunctions in the frontal lobe appear to have difficulty realizing their own deficits and limitations, and are unable to correct their own mistakes; this is not necessarily the result of deficits in self-consciousness, but rather due to a lack of self-criticism

(Łuria & Homskaya, 1964; Łuria, Pribram & Homskaya, 1964; Łuria, 1967, pp. 192–194, 224–225; Lezak, 1995, p. 94–95, for: Jodzio, 2017, pp. 149–150; Longe et al., 2010).

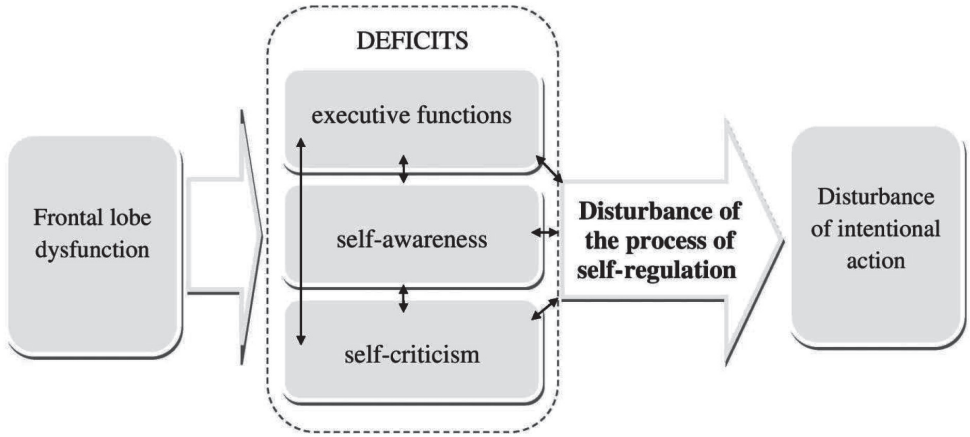

Figure 1. Intermediate role of the self-regulatory process in people with frontal lobe dysfunction

Source: own work.

The clinical image observed in people with frontal lobe dysfunction is ambiguous. In trying to capture the essence of the disorder, researchers see two main sources of conscious, critical action, allowing flexible adaptation to different situations – namely, 1) cooperation of defense mechanisms, and 2) the dominance of neurocognitive changes directly resulting from CNS damage. The aim of this article is thus to describe the issues associated with the disturbances in intentional functioning observed in people with frontal lobe dysfunctions with regard to self-regulatory process, from the psychodynamic and neuropsychological approaches.

Dysfunction of the frontal lobes

Łuria described the role of the frontal lobes in the functioning of the individual in numerous publications (1967, 1969, 1973, 1976a, 1976b). In the work of Pribram and Łuria (1973), three basic functions of the frontal lobe were specified: 1) maintaining optimal cortical tonus, 2) verbalizing task implementation programs, 3) organizing the intellectual activities necessary for solving complex problems. The first function directly deals with the frontal lobes as a highly organized system of self-regulation, whose efficient operation is necessary for carrying out tasks requiring intent, objectives, programs, and plans (Łuria, 1967, p. 123; Pribram & Łuria, 1973, p. 5).

Frontal lobe dysfunction is associated with disturbances in the regulation of speech function, and especially of internal verbalization (Łuria, 1967, pp. 197, 260). Such deficits make it difficult to analyze complex tasks, to choose strategies, and to determine the relationships between initial assumptions and results. The literature also points to three main manifestations of frontal lobe lesions: impairment of problem-solving skills (Łuria, 1973, p. 21), executive dysfunction (Goldberg, 2002, pp. 21–26), and reduction in the ability to abstract (Goldstein, 1936, 1944, 1949).

Damage to specific frontal areas manifests itself as various clinical images of cognitive and emotional disorders. Several frontal syndromes have been identified from the functional profiles of individuals with particular dysfunctions in the prefrontal cortex. Currently, three main syndromes are distinguished: 1) dorsolateral (posterior), 2) medial (internal part), 3) orbitofrontal (Cummings & Mega, 2005, p. 146, for: Jodzio, 2017, p. 153).

In dorsolateral frontal lobe syndrome, the mental changes include components of executive dysfunction: switching attention, finding optimal strategies for solving problems, searching for specific contents in memory (Krudop et al., 2015; Jodzio, 2017, p. 153). Research also points to a decreased efficiency of working memory (Brunoni & Vanderhasselt, 2014; Yoon, Grandelis & Maddock, 2016), loss of insight, decreased abstraction ability (Jodzio, 2017, p. 153), and cognitive control disorder (MacDonald et al., 2000).

Dysfunction of the medial region of frontal lobe manifests itself in a general slowing of information processing and operations (Jodzio, 2017, p. 73). Emotional and social difficulties in decision-making are also noticeable (MacPherson, Phillips & Della Sala, 2002), and some people display deficits of social cognition (Razafimandimby et al., 2016). Other research indicates that there is increased activity in the medial region during the initial stage of problem solving (Pouget, Murthy & Stuphorn, 2017).

The orbitofrontal syndrome is characterized by disturbances in the emotional and social spheres: excessive impulsivity, emotional shallowness, loss of self-control, lack of insight, disturbances in the adequate assessment of social situations (Cummings & Mega, 2005, for: Jodzio, 2017, p. 153), disruption of self-awareness in regulating one's own emotional states (Beer et al., 2006). As a consequence, the ability to initiate and maintain interpersonal relations is disrupted (Perry et al., 2016).

The variability of symptoms may be due to dysfunctions within particular areas of the frontal lobe and damage to frontal connections with other structures. Dysfunction in the frontal lobes also appears in a wide group of patients, not only in those with focal damage to frontal structures, but also in patients addicted to psychoactive substances, schizophrenic patients, and even those with borderline personality disorder and other mental and behavioral disorders.

Dysfunction of the frontal lobes and the operation of defense mechanisms in the context of self-regulation processes

Research suggests that both psychodynamic and neurobiological mechanisms interact in forming the clinical image of the disorders found in patients with frontal lobe dysfunction (Cooke et al., 2005; Northoff & Boeker, 2006; Northoff et al., 2007; Kernberg, 2014; Rice & Hoffman, 2014; Palombo, 2016; Salone et al., 2016). According to the psychodynamic approach, defense mechanisms are activated in response to conflicts between the libidinous drive and aggression, or conflicts between the mental instances of the id (following the pleasure principle) and the ego (following the rational sphere of the individual, the reality principle) (Cierpiałkowska, 2012, pp. 72–74).

In people with CNS pathologies, there is a disturbance of equilibrium between the id and the ego. This is one of the factors in the formation of cognitive, emotional-motivational, and social disorders. At the same time, the type and nature of the deficits assumes a different dimension in various mental disorders and behavior, and may depend on the operation of individual defense mechanisms. Defense reactions in the form of denial, rationalization, and projection are found in people addicted to alcohol (Duffy, 1995; Rinn et al., 2002; Cierpiałkowska, 2010; Evren et al., 2012), dissociation (Bell et al., 2011) in patients with DSM-IV cluster A and B personality disorder (Kleindienst et al., 2011; Barnow et al., 2012) and with schizophrenia (Laddis & Dell, 2012).

According to Figure 1 and Feinberg's model of the neuropathology of the self (2011, 2013), an optimal course of the self-regulatory process and the adequate operation of defense mechanisms allow the individual to deal with internal conflicts by reorganizing action strategies in order to achieve the selected goal. It presents the hierarchical order of formation of disorders hindering deliberate and effective action from deficits in cognitive processes (executive functions), through the difficulties associated with self-awareness of symptoms, monitoring, the operation of defensive, adaptive, and motivational mechanisms, to the emergence of syndromes including delusional anosognosia (Feinberg, 2011, 2013).

Some research has suggested a neuronal basis for defense reactions. The mechanism of sensomotor regression (catatonia) involves changes in the orbitofrontal area and in the premotor and motor cortices (Northoff & Boeker, 2006; Northoff et al., 2007). The initial manifestation of this dysfunction is a reduction in emotional arousal and self-esteem (Northoff et al., 2007). Denial may then result from a lack of insight or from disruption in the process of integrating, differentiating, and searching for data in the memory, secondarily disrupting the executive skills (Rinn et al., 2002).

Weakened self-regulation processes in people with frontal lobe dysfunctions can be explained in the context of defensive coping with disruptions to self-awareness. The model of total and partial disturbances of self-awareness, along with the division into nondefensive and defensive ways of coping, was described by Prigatano

(2009, 2012). This research points to the dominant defensive role of coping, because such patients blame others for their limitations, do not see the need to participate in rehabilitation, and describe themselves as unable to deal with the situation (Prigatano & Schacter, 1991; Prigatano, 2009, p. 303, 2012, 2014). Pąchalska, Kaczmarek, and Kropotov (2014, pp. 212–215) have also drawn attention to the defensive attitude in patients who assign difficulties to more external factors than internal ones.

An attempt to explain the processes of self-awareness in the context of defense reactions seems necessary to gain a fuller understanding of the pathomechanism of disorders observed in patients with frontal lobe dysfunctions (Herzyk, 1999, 2016; Feinberg, 2013; Poczobut, 2014). Although this approach has met with criticism (Bisiach & Geminiani, 1991), some researchers (Mograbi & Morris, 2013; Turnbull, Fotopoulou & Solms, 2014; Sims, 2016) have argued that adopting a psychodynamic perspective better explains the essence of the emotional difficulties stemming from disturbances in the process of self-awareness. Anosognosia can then be understood in a broader perspective, not only as a neurocognitive deficit.

Dysfunction in the frontal lobes and neurocognitive deficits in the context of self regulatory processes

The neuropsychological approach focuses on the description and explanation of mental disorders (cognitive, emotional, and motivational) and the behavior that directly results from brain damage. As a result of dysfunction in the frontal lobes, the patient's clinical image may determine the individual frontal syndrome, whether dorsolateral, orbital, or medial. Depending on the type of the frontal syndrome and the level of pathological changes of the CNS, the quality of purposeful and effective actions may vary in individual patients. Table 1 lists the neurocognitive deficits present in people with focal damage to the frontal lobes. However, these disorders may also occur in people addicted to psychoactive substances (Moreno-López et al., 2012; Wilson, Sayette & Fiez, 2014) or with other mental and behavioral impairments (Marsh et al., 2014).

According to research, dysfunctions in purposeful action may result from executive dysfunctions (e.g., disorders in initiation and monitoring). Research points to the direct role of executive functions and the indirect influence of the mechanism of denial on the formation of processes responsible for purposeful and effective operation (Ownsworth, McFarland & Young, 2002). According to other reports (Beer et al., 2003), in people with damage to the orbital part of the frontal lobes, self-consciousness deficits of emotional states are noticeable and significantly interfere with the self-regulation process. As a result of weakened insight, these people can lose the ability to effectively regulate their cognitive and emotional states, especially in social situations. In patients with right frontal lobe damage, there are also deficits in self-awareness and decision making, which leads to disorders in the optimal regulation of their own mental and behavioral states (Stuss & Levine, 2002).

Table 1. Difficulty in purposeful action: damage localization and clinical image

Authors, year	Study group	Location of lesions	Clinical image
Cipolotti et al., 2018	Subjects with focal damage to frontal lobe (n = 34), posterior part of the brain (n = 19); control group (n = 39)	Frontal lobes of both hemispheres	Executive function disorders
Hebscher et al., 2016	Subjects with focal damage to frontal lobes (n = 27)	Ventromedial prefrontal cortex	Disturbed monitoring ability due to metacognitive deficits and/or confabulations
Hochman et al., 2015	Subjects with focal damage to frontal lobes (n = 5), basal ganglia (n = 5); control group (n = 10)	Dorsomedial region of the frontal lobe	Deficits in the speed of error correction
Massimo et al., 2015	Subjects with dysfunctions in the frontotemporal area (n = 18); control group (n = 17)	Frontotemporal area, demyelinating lesions in the prefrontal cortex	Impaired goal-oriented behavior, difficulties in executive functions, such as initiation, planning, action (motivation)
Robinson et al., 2013	Subjects with focal damage: within the frontal lobes (n = 37), in other parts of the brain (n = 25)	Prefrontal cortex of the ventromedial and dorsolateral areas	Impairment of executive functions in the implementation, organization and monitoring of goal-oriented activities (understanding the process of self-regulation and insight as components of executive functions)
Hoerold, Pender & Robertson, 2013	Subjects with focal damage to the frontal lobe: right hemisphere (n = 7), left hemisphere (n = 12); patients with focal damage to other structures: right hemisphere (n = 12), left hemisphere (n = 14)	Prefrontal cortex of both hemispheres (in the case of monitoring deficit, there was a predominance of right prefrontal cortex dysfunction)	Disorders in the process of consciousness, such as in metacognition and the ability to monitor mistakes

The role of self-criticism in the context of self-regulation processes has not been very well specified. Łuria (1967) indicated two main symptoms of behavioral disorders resulting from frontal lobe damage: 1) loss of initiative (lack of spontaneity), 2) lack of critical attitude towards one's own actions, as a result of which the patient's behavior easily loses purposeful character and becomes a series of separate, immediate reactions to individual stimuli (often external and perseverative). According to Łuria, these two basic symptoms of damage are closely related to disorders in the mechanism of the self-regulation system (1967, pp. 225–260).

Summary

From the perspective of the self-regulation concept, the disorders observed in people with frontal lobe dysfunctions relate in particular to executive dysfunction, self-awareness, critical attitude hindering the adaptive adaptation to the situation, and purposeful and effective action. If patients do not see their own abilities and limitations, and perhaps overestimate them, they will be unable to self-reflexively and critically strengthen their own resources, perceive and revise mistakes, and accept feedback for reorganizing their actions.

The question remains of whether people with frontal lobe dysfunctions can improve their behavior, despite their strong anxiety attitude (as the disorder is the result of a defensive reaction), or how much self-correcting is significantly impeded by neuropsychological deficits (as the disorder is a direct result of CNS damage)? These two sources generate a different mechanism that creates difficulties in purposeful action. The role of the defense mechanisms (especially denial) is generally considered in the context of self-awareness disorders, while from the neuropsychological perspective the disturbance of the self-regulation process is largely connected with executive deficits.

Researchers also indicate differences in the clinical image of patients depending on the location and type of changes in the frontal lobes, as well as the accompanying lesions on other structures (cortical and subcortical). What is more, the participation of other mental processes and a broader explanation of the process and structure of self-regulation (including self-control and emotional-motivational processes) could be addressed in other publications. These issues, however, have a number of potential implications. Bearing in mind the complexity of the described difficulties in the context of the self-regulation process, assisting people with frontal lobe dysfunction to recovery their effective implementation ability will depend on the use of various therapeutic and treatment methods (see Strauman, 2017).

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PROBLEMATYKA ZABURZEŃ OBSERWOWANYCH U OSÓB Z DYSFUNKCJĄ W PŁATACH CZOŁOWYCH Z PERSPEKTYWY KONCEPCJI SAMOREGULACJI

Streszczenie. Dysfunkcja w płatach czołowych doprowadza do pojawienia się szerokiego spektrum zaburzeń poznawczych i emocjonalno-motywacyjnych, zakłócając codzienne funkcjonowanie jednostki. Jednym z kluczowych deficytów są trudności w działaniu celowym, które mogą być ujmowane z perspektywy procesu samoregulacji. Badania wskazują również na zależności między zaburzeniem procesu samoregulacji a deficytami funkcji wykonawczych, samoświadomości czy samokrytycyzmu. Analizując proces samoregulacji, odwołano się do koncepcji Alberta Bandury, akcentując ważność działania celowego – ukierunkowanego na elastyczne modyfikowanie swojego zachowania, w tym świadomego i krytycznego korygowania trudności. W artykule przedstawiono również potencjalne źródła opisywanych trudności u osób z uszkodzeniem płatów czołowych, weryfikując dane dotyczące znaczenia zarówno mechanizmów obronnych, jak i neuropsychologicznych uwarunkowań.
Słowa kluczowe: dysfunkcja płatów czołowych, samoregulacja, celowe działanie, mechanizmy obronne, deficyty neuropoznawcze

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