

Evaluation of the relationship between cognitive functioning in patients with borderline personality disorder and their general functioning

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Summary

Aim. The purpose of the study was to examine the relation between cognitive functioning in people with borderline personality disorder and their overall functioning level, as well as psychopathology intensification specific for this type of disorders.

Method. 64 patients aged 18–55 ($M = 30.09$) with borderline personality disorder (emotionally unstable personality – borderline type in the ICD-10) were examined. The study used: demographic-descriptive questionnaire, SCID II, Borderline Symptom Checklist-23, and Global Assessment of Functioning (GAF). For cognitive assessment, The Rey Auditory Verbal Learning Test, The Rey–Osterrieth Complex Figure test, TMT A, TMT B, verbal fluency test, Stroop test and Frontal Assessment Battery (FAB) were used.

Results. The average GAF score in the sample was $M = 43.65$. Significant differences between the comorbidity group and non-comorbidity group were observed with respect to the GAF scores (Mann-Whitney $U = 300.500$, $p = 0.008$) as well as a number of significant ($p < 0.05$) correlations between the level of cognitive functions and functioning in patients with no co-morbidity.

Conclusions. Clinically significant disturbances in general and social functioning persisted in the group of subjects with borderline personality disorder. The obtained data seem to suggest that the cognitive functions affect the overall functioning only in patients with psychiatric co-morbidity. In people without psychiatric co-morbidity there is a relationship of cognitive functions only with certain aspects of psychopathology specific to BPD.

Key words: cognitive functions, borderline personality disorder

Introduction

ICD-10 identifies two types of emotionally unstable personality disorders: impulsive and borderline type (borderline personality disorder – BPD), where the borderline type is characterized by a higher psychopathology level specific to BPD, and lower level of general functioning [1]. Generally, borderline personality disorder symptoms can be divided into symptoms linked to emotions, behavior disorders, identity and interpersonal relations [2]. Patients with BPD display a distinct tendency for impulsive behavior with no consequences anticipation, their mood is unstable, shaky and chimeric, and they also have a tendency for emotional outbursts and inability to control their impulsive actions. Moreover, they differ from other clinical groups, as well as from healthy individuals, in terms of neurocognitive functioning. The hyperactivity of noradrenergic system and the hypothalamic–pituitary–adrenal axis is symptomatic [3, 4]. The symptoms are related to the lowered inhibitory control (limited flexibility in reactions to changing environmental conditions) and also with the disruptions in the cognitive processing (mainly the “top-bottom”), which can lead to emotional dysregulation present in BPD. It is believed that the negative emotional context may change the cognitive processing through dysmodulation of brain regions responsible for emotional regulation, impulse control, executive functions and memory [5, 6]. The difficulties in interpersonal relationships, commonly present in BPD patients, are often linked with the occurrence of emotional dysregulation of behavior and with social cognition and metacognition disorders [7].

There are different etiological theories explaining the abnormal patterns of interpersonal and cognitive functioning in BPD. One of them is the biosocial model of disorder development, which emphasizes the role of environmental and biological factors leading to emotional dysregulation [8–10]. Emotion regulation concept would refer to the ability to modulate emotional reactions as a response to environmental stimuli, both through their reinforcement and reduction. The model assumes that the ability to effectively control emotions is subject to cognitive resources access [9, 10], involved in repeated cognitive assessment of emotional stimuli, suppression or modification of emotional reactions, and this fact could mean that functioning impairment at least partially results from the occurrence of cognitive dysfunctions [11, 12]. Despite the hypotheses that the symptoms present in BPD result partially from cognitive processing impairment, there is no research that confirm the influence of cognitive functions on global functioning in people with BPD. The main goal of this study was to test the relationship between general functioning in BPD patients and the level of psychopathology specific for this type of personality disorders as well as cognitive functioning.

Material and methods

64 patients (58 females and 6 males) aged 18–55 ($M = 30.09$) with BPD (based on ICD-10), hospitalized in the Department of Psychiatry (Medical University of Warsaw), were examined. The criteria for inclusion in the study were as follows: diagnosis of emotionally unstable personality disorder – borderline type (ICD-10), made on the basis of structured medical interview (conducted by a designated psychiatrist) and confirmed by clinical interview SCID-II, conducted by a psychologist (it was important to confirm diagnosis with both classifications), lack of significant vision and hearing impairment, stable psychic and somatic state. The study has been approved by the Bioethical Committee of Medical University of Warsaw. The participation in the study was voluntary, all of the patients had been informed about its purpose and they gave an informed consent to participate.

The first trial was made of 79 participants, but in the final results, since some of the answers had been omitted, only the patients with complete questionnaires were considered.

The study used: demographic-descriptive questionnaire, Borderline Symptom Checklist-23 (BSL-23), and the Global Assessment of Functioning Scale (GAF), whilst for the cognitive assessment the Rey Auditory Verbal Learning Test (RAVLT), the Rey–Osterrieth Complex Figure Test (ROCFT), TMT A and B, verbal fluency test (phonemic and semantic), Stroop Test, and Frontal Assessment Battery were used [13–17]. The cognitive assessment tools were selected in a way to assess the basic cognitive functioning domains. Time required to finish the test was approximately 60–90 minutes. The neuropsychological examination, as well as the obtained results assessment, was conducted by the psychologist. The clinical assessment including psychopathology specific for borderline personality disorder was performed with SCID-II and Borderline Symptom Checklist-23 (BSL-23). The overall functioning assessment was carried out with the use of the Global Assessment of Functioning (GAF) ordinal scale with 10 defined ranges, where the result includes three aspects of functioning: psychopathological, socio-interpersonal and professional aspect [18]. The GAF result was assessed on 0–100 scale, where 100 meant an outstanding functioning, lack of pathologies, whilst 0 – an extremely impaired functioning. The GAF scale for each patient was filled according to the APA instructions (2000) by the psychiatrist and the psychologist together.

The level of symptoms typical of BPD was assessed with Borderline Symptom Checklist-23 (BSL-23) [19]. It is a self-descriptive scale (23 questions with 5-item scales), which assesses the symptoms severity, subjective mood (scale 0–100%), and the intensification of self-destructive behaviors resulting from BPD (11 questions with 5-item scales) – the indicators for these factors are respectively: overall BSL result, BSL mood assessment and BSL destructive behaviors.

Within the cognitive assessment procedure framework, the RAVLT (consisting in reading the series of 15 words (list A) to the patient, whose goal was to recall

as many of them as possible) was conducted. The examiner would read 5 series of words so that the subject would have an opportunity to learn the test material. Next, the examiner would read out a different list (list B) once and ask the subject to repeat as many words as possible. Then, the subjects were asked to recall the A list words. After approximately 30 minutes, the examiner would ask the subject to spontaneously recall the A list words.

In the ROCFT, the subjects were to copy a complex figure and then recall it from memory after 3–5 minutes. The number of the figure elements that were recalled correctly, directly and after the delay, was the test performance indicator. In the TMT A and B the time required to connect the points in the given test material was the test performance indicator. In the verbal fluency test the F, A, S, animals and sharp objects model was used. The test performance indicator was the number of elements listed by the subject in 1 minute.

The Stroop test measures verbal operation memory. The level of the test performance depends on efficient attention functions, mainly the concentration, selectivity, and cognitive control strength. It enables to gain information regarding the cognitive plasticity and automatic impulsive reactions inhibition [15, 16, 18]. The indicator of Stroop test performance was the time required to read out the word list from the appropriate board.

Frontal Assessment Battery is a screening method for the frontal functions assessment including: conceptualization, mental flexibility, motor programming, susceptibility to interference, inhibitory control, and independence of the environment. The test performance indicator is the overall result within the range between 0 and 18 points. All of the subjects were undergoing a pharmacological treatment and psychological support.

The obtained results were analyzed statistically with SPSS statistics 18 and Statsoft STATISTICA. To assess the significance of differences between distributions obtained in each group nonparametric Mann-Whitney U test was used, while correlations were assessed with Spearman's Rho.

Results

The descriptive characteristics of subjects with BPD

The mean age in the examined group was $M = 30.09$. The duration of borderline personality disorder symptoms was between 3 and 35 years, the mean years of education was $M = 13.07$, the mean number of hospitalizations – $M = 2.94$, the mean result of the Global Assessment of Functioning Scale (GAF) was $M = 43.65$. Among the subjects 57.8% ($N = 37$) declared heterosexual orientation, 12.5% ($N = 8$) – homosexual, 25% ($N = 16$) – bisexual, 3.1% ($N = 2$) – asexual, whilst 1.5% ($N = 1$) had difficulty with declaring orientation. In the examined group, 35.9% ($N = 23$) of the subjects were in

a relatively stable relationship, whilst 64.1% (N = 41) of the subjects were not capable of keeping lasting partner relationships. 89.1% (N = 57) of the subjects lived in a city, 9.5% (N = 6) in the country, and 1.7% (N = 1) resided in a support institution. Merely 22.2% (N = 14) worked for a living, the rest 77.8% (N = 50) did not work. In the group that was not capable of making a living, 12.7% (N = 8) of people were receiving a pension, 9.5% (N = 6) – a constant benefit, whilst 52.4% (N = 33) were supported by their families, and 3.2% could not specify their source of income. All of the subjects were in a stable somatic state. 70.3% (N = 45) of subjects did not suffer from somatic diseases, whilst the rest was receiving a somatic disease treatment. Among the closest family of 49.2% (N = 31) of participants there were mental disorders diagnoses in the past, whilst 50.8% (N = 32) of participants did not confirm the occurrence of such disorders within their families.

The relations between global functioning and clinical and demographic data

The initial analysis of the collected data concerned the relations between the GAF result and significant data describing the study group. Although there were no significant relations between the general functioning rate and the number of education years, there were weak correlations between the GAF, the number of children, the number of hospitalizations and the time elapsed since the first hospitalization (Table 1).

Table 1. Correlations between the GAF result and the demographic variables

	GAF
Age	0.133
Years of education	0.137
Number of children	0.264*
Number of hospitalizations	-0.306*
Time elapsed since the first hospitalization	-0.331*

* Significance level $p < 0.05$; own elaboration

Subjects with BPD showing better functioning have statistically more offspring than the subjects functioning within lower GAF results range. Better functioning subjects also experienced less hospitalizations and statistically shorter time elapsed since their first hospitalization (this fact may reflect the less frequent contact with stationary treatment institutions).

The relations between global functioning and neuropsychological tests

Among the memory and learning tests (both in terms of visual and verbal-linguistic modality), there was a weak correlation between the GAF result and the recalling without delay subtest. The other verbal memory indicators did not reveal significant correlations

with the GAF result (Table 2). This would suggest either an incidental correlation, or a specificity of the recalling without delay subtest, which simultaneously measured learning ability, interference susceptibility and the ability to recall from memory.

Table 2. Correlations between the GAF result and memory tests results – Spearman's rho

	GAF
RAVLT sum 1–5	0.188
RAVLT recall without delay	0.257*
RAVLT after delay	0.228
RAVLT list B	0.241
ROCFT copy	0.084
ROCFT reproduction	0.235

* Significance level $p < 0.05$; own elaboration

Among the executive functions tests, there was a correlation between the GAF result and third part of Stroop test, measuring the inhibitory control. The correlation coefficient suggests that the shorter the time in the third part of Stroop test, the better the functioning in everyday life (Table 3).

Table 3. Correlations between the GAF result and the executive functions tests – Spearman's Rho

	GAF
TMT A	0.079
TMT B	-0.003
Stroop 1	-0.228
Stroop 2	-0.253
Stroop 3	-0.301*
FAB	0.171

* Significance level $p < 0.05$; own elaboration

No significant correlations between the GAF result and phonemic and semantic fluency tests were found.

In order to exclude the influence of psychiatric disease coexistence on the BPD patients' functioning, the subjects were divided in two groups: people with adaptation crisis typical of personality disorders ($N = 29$) and people with additionally diagnosed mental disorders (i.e. anxiety, mood, or substance use disorders). Significant differences were found between the mentioned groups in terms of the GAF result (Mann-Whitney $U = 300.5$, $p = 0.008$) – subjects with psychiatric comorbidity functioned significantly worse than subjects with no such comorbidity. Correlations between cognitive functions and indicators of crisis were also verified (Table 4).

Table 4. Correlations between the selected clinical assessment and cognitive functions indicators – Spearman's Rho

	overall BSL result	BSL mood assessment	BSL destructive behaviors
Fluency "f"	-0.126	-0.230	-0.126
Fluency "a"	-0.018	-0.116	-0.018
Fluency "s"	0.131	-0.141	0.131
Fluency "animals"	-0.055	-0.031	-0.055
Fluency "sharp objects"	-0.226	-0.116	-0.226
RAVLT sum 1–5	0.178	0.218	0.178
RAVLT recall	0.230	0.108	0.230
RAVLT after delay	0.330*	0.204	0.330*
RAVLT list B	0.157	0.206	0.157
ROCFT Copy	0.036	0.043	0.036
ROCFT Copy type	-0.092	-0.017	-0.092
ROCFT Reproduction	0.240	0.125	0.240
ROCFT Reproduction type	-0.109	-0.012	-0.109
TMT A	-0.074	-0.121	-0.074
TMT B	0.074	-0.090	0.074
Stroop 1	0.061	-0.044	0.061
Stroop 2	0.042	-0.033	0.042
Stroop 3	-0.014	-0.187	-0.014

* Significance level $p < 0.05$; own elaboration

Significant positive correlations were found between verbal learning efficiency, the general level of borderline symptoms, and the level of destructive behaviors. The results could suggest that the better the learning efficiency in a person, the higher the destructive behaviors tendency and the level of pathology specific for BPD.

Analysis of the correlation was performed with a division into subgroups of people with psychiatric comorbidity, and without it. In people without psychiatric comorbidity, there was no relation between the global functioning assessment and the results of neuropsychological tests. However, significant relations were found in the group with comorbidity between the GAF result and the level of individual cognitive functions. This applies to RAVLT recall without delay (0.36^{*1}), RAVLT list B (0.46^{**}), the time needed to complete 2 parts of Stroop Test (-0.38^{*}), the Frontal Assessment Battery overall result (0.48^{**}) and fluency "sharp objects" (0.36^{*}). In the group without comorbidity the BSL overall result correlated significantly with time needed to complete

¹ * $p < 0.05$; ** $p < 0.01$

Stroop Test (0.44 *) and the result of the FAB (-0.42*). In this group also a subjective assessment of mood in the BSL showed a significant correlation with a score of RAVLT scales 1–5 (0.42 *). In the group with comorbidity the only relation of the level of crisis symptoms with cognitive function was the relationship between BSL destructive behaviors with RAVLT recall after delay (0.42*).

Discussion

The purpose of the study was to examine the correlations between the clinical and psychopathological traits in subjects with BPD and their cognitive functioning. Similarly to the longitudinal McLean Study of Adult Development (MSAD) and the Collaborative Longitudinal Personality Disorders Study (CLPS), this study revealed significant clinical disorders in global and social functioning in the BPD group [20–25]. In this study merely 22.2% of subjects were capable of earning a living independently, whilst 35.9% of subjects were in relatively stable relationships. The results are similar to those obtained in CLPS, where merely 20% of patients with BPD functioned properly. In terms of cognitive functioning of people with BPD the past results are ambiguous. Some of the research did not find differences in cognitive functioning between people with BPD and healthy individuals [26–31]. There are, however, studies on cognitive functioning of patients with BPD that revealed differences between subjects with BPD and healthy controls in terms of frontal lobe dysfunction (attention, memory, executive functions, processing speed, and visuospatial abilities) [32]. The available meta-analyses confirmed the existence of a moderate dysfunction in terms of attention (working memory component) in 10 studies comparing neurocognitive functioning in people with BPD and healthy individuals [33]. One of the possible explanations for this lack of agreement in this matter is that so far little attention has been paid to assessment of global functioning, as well as the influence of BPD specific psychopathology on neurocognitive assessment in this group. Considering that cognitive efficiency in BPD may depend on the severity of symptoms, and not on the existence of basic cognitive deficits *per se*, unambiguous results of cognitive assessment could be related to the mental state of patients with BPD. The results of the recent studies indicate that emotional instability or high reactivity characteristic of BPD people may have an important role in neurocognitive processing [3]. Despite the hypotheses that BPD symptoms might be related to cognitive processing dysfunction, the presented study did not confirm the existence of numerous correlations between cognitive functioning in patients with BPD and the level of overall psychopathology specific for this group. An exception turned out to be the correlation between the overall BPD symptoms severity and destructive behaviors with the verbal learning and memory recall. Surprisingly, the correlation turned out positive (better learning efficiency accompanies increased psychopathology level). Such increased cognitive processes efficiency is

sometimes related to a phenomenon known as “apparent competence” [34], which may occur in case of experiencing intensive, strong anxiety, which may also occur during cognitive assessment. It consists in presenting apparent competence that occurs in people with BPD only in structured task situations, and is impossible to present in natural situations. The results presented here could confirm the existence of the “apparent competence” phenomenon in people with BPD.

General functioning revealed weak correlations with learning processes and inhibitory control.

The results suggested better global functioning in patients who displayed better learning abilities and more efficient inhibition of automatic reactions. The correlation between inhibitory control and general functioning appears easier to explain (ease of adaptation, more efficient “top-down” processes), especially since there are reports that the ability to keep efficient control is subject to cognitive resources access [35], and these resources may suppress, reinforce, or modify emotional reactions [36].

An analysis of relationships between cognitive functions and the level of specific psychopathology as well as the global level of functioning in groups with psychiatric co-morbidity and without comorbidity revealed interesting relationships. Among people without psychiatric comorbidity there was no relationship between cognitive functions and global functioning, while in patients with psychiatric comorbidity there were relationships between these factors – the strongest of which involve executive function, “frontal”. In the group without comorbidity executive functions were found to be linked to the overall level of psychopathology, and in the group with comorbidity, the efficiency of memorizing proved to be associated with high levels of destructive behaviors. These results suggest that cognitive functions affect the functioning of people with BPD mostly when they suffer from a psychiatric comorbidity. In patients without comorbidity they are associated with some aspects of specific psychopathology, but not with general functioning.

This study is not free from significant limitations. The most important of them is the lack of a control group, resulting in the inability to fully extrapolate the results of the study to the clinical context. Another important limitation was the fact that the sample consisted almost entirely of women.

Conclusions

Clinically significant disturbances in general and social functioning persisted in the group of subjects with borderline personality disorder. Only slightly more than one-third of the respondents were able to establish satisfying intimate relations and maintain relatively stable relationships. The obtained data seem to suggest that the cognitive functions affect the overall functioning only in people with psychiatric comorbidity. In people without psychiatric comorbidity they are correlated only with certain aspects of psychopathology specific to BPD.

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