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Comprehensive behavioral analysis of patients with a major depressive episode

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
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Summary

Background: A major depressive episode diagnosed according to DSM-IV criteria can be accompanied by symptoms that DSM-IV does not include. These symptoms are sometimes classified as comorbidities. Our study assessed altered behavioral modes during a major depressive episode; ie, if 1 or more modes of behavior operated less or even not at all ("never"), or if the operation of others was more frequent or even constant ("always"). We hypothesize that these altered behavioral modes, especially the extreme positions "never" (hypomodes) and "always" (hypermodes) might correlate with depression scores and thus represent a typical symptom of depression.

Material/Methods: We used the 35-item *Salzburg Subjective Behavioral Analysis* (SSBA) questionnaire to measure altered behavioral modes in 63 depressed patients and 87 non-depressed controls. Depression was assessed using the Hamilton Depression Scale.

Results: In our test group (n=63) we found a total of 888 extreme positions. The mean number of extreme positions per patient was 11.15±5.173 (SD). Extreme positions were found in all 35 behavioral modes. The mean Hamilton score was 22.08±7.35 (SD). The association of the incidence of extreme positions and the Hamilton score in our test group was highly significant (Spearman's Rho=0.41; p=.001). In the control group (n=87), only 11 persons were found to display extreme positions, with a total of only 25.

Conclusions: Although this study has several limitations, such as the small sample or the use of a questionnaire in the validation procedure, the significant correlation of extreme positions and the Hamilton score indicate that altered modes of behavior as detected with the *SSBA* might be typical symptoms in a major depressive episode.

key words: **depression • comorbidity • behavior • DSM-IV criteria**

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Background

A major depressive episode diagnosed according to the DSM-IV-criteria can be accompanied by symptoms or psychopathological phenomena that DSM-IV does not include [1]. The classification of these symptoms is often difficult; some specialists speak of an atypical depression or of a comorbidity [2–4]. Possible examples of such symptoms could be anger attacks, distress symptoms like a sudden and periodical reduction of stress tolerance, impulsive-aggressive behavior, and suddenly occurring endorphin- or serotonin-related behavior such as alcohol or drug abuse or abusive equivalents (behavior typical for workaholics, those who jog excessively, etc.). The symptoms have been described as occurring during a depressive episode and have been classified as typical for male depressive syndrome [5,6]. The question is therefore whether these symptoms represent only a comorbidity or whether they should be classified as typical symptoms of depression.

In accordance with our concept of depression, a persons is suffering from a basic depressive disorder if they are unable to produce 1 or more psychobiological modes of behavior such as sleeping, eating, working, etc. ("hypomodes") over a given period of time and/or if they are producing 1 or more modes of behavior constantly ("hypermodes").

This study analyzed the occurrence of hyper- and hypomodes in depressive patients, as these symptoms are not taken into consideration in either the ICD-10 or the DSM-IV studies in general. Our aim was to determine whether these hyper- or hypomodes are just comorbid disorders or whether they represent symptoms of a depression.

The concept of "modes of behavior"

The theoretical background is the concept of modes of behavior that are exhibited within a circadian time scale [7]. In non-depressive persons, the modes of behavior are assumed to operate according to biological needs or cognitive and emotional intentions, depending on their feasibility in the environment [8,9]. If 1 or more modes of behavior do not operate, or the operation of others persists, the psychobiological behavior of this person reveals the existence of a disorder.

Usually people do not think of human behavior as modal, although most would agree that their quality of consciousness is unitary and that they can only do 1 thing well at a time [10]. Table 1 depicts essential modes of behavior [7]. We extended this list to include 35 modes of behavior, and designed a questionnaire to conduct a comprehensive behavioral analysis of patients with a major depressive episode [11]. This questionnaire is now in the validating process.

The selection of a mode of behavior from the repertoire means action selection. Action selection is the task of resolving conflicts between competing behavioral alternatives [12]. Humphries et al [13] argue that a centralized brainstem structure – the medial reticular formation – may possess an action selection mechanism. The attempt to identify this brain structure with a possible action selection role has a long history. The brain structure was first described by the McCulloch group [10] as the generation of modes of behavior in the brainstem. Since then, formal models of the reticular formation have been elaborated [14–16]. The model of Humphries et al. [16] suggests that the co-activation of a set of reticular formation clusters would correspond with the expression of a coordinated behavioral response by animals, including humans. Since cortico-basal ganglia loops may also represent neural substrates for action selection [17], the relationship between selection systems in the reticular formation and basal ganglia remains to be resolved. Importantly, disorders of action selection may contribute to the understanding of brain disorders such as Parkinson's disease, attention deficit hyperactivity disorder [18], schizophrenia [17] and depression [19].

Table 1. Frequencies of the modes of behavior within an approximately 4-week cycle (Iberall & McCulloch, 1969).

Modes of behavior	Percent of time
Sleeps	30
Eats	5
Drinks	1
Voids	1
Sexes	3
Works	25
Rests (no motor activity, indifferent Internal sensory flux)	3
Talks	5
Attends (indifferent motor activity Involved sensory activity)	4
Motor practices (runs, walks, plays, etc.)	4
Angers	1
Escapes (negligible motor and sensory input)	1
"Anxious-es"	2
"Euphorics"	2
Laughs	1
Aggresses	1
Fears, fights, flights	1
Interpersonal attends (body, verbal or sensory contact)	8
Envies	1
Greeds	1
Total	100±20% of time involvement

Aim of the study

Own previous data showed that patients with a major depressive episode suffered from a severe displacement of

Table 2. SSBA (Salzburg Subjective Behavior Analysis). Has the frequency of the following behaviors changed during the last 2 weeks in comparison to normal? If so, how frequently do you do or feel the following: Please give an example, if you choose NEVER or ALWAYS.

No.	Behavior	Never	Less often	No change	More often	Always	Example
1	Sleep						
2	Vomit						
3	Feel alert + focused						
4	Feel greedy						
5	Feel generous						
6	Eat						
7	Bowel urgency						
8	Move around						
9	Feel stiff (not able to move)						
10	Feel afraid						
11	Feel happy						
12	Deal with problems, situations, people						
13	Avoid people						
14	Perform sexual activity						
15	Perform mental / intellectual activity						
16	Drink						
17	Urge to urinate						
18	Quarrel						
19	Feel peaceable						
20	Feel like fighting						
21	Feel resigned and non-resistant						
22	Feel jealous						
23	Feel indulgent						
24	Work						
25	Rest						
26	Talk						
27	Listen						
28	Feel pleased						
29	Feel annoyed/irritated						
30	Laugh						
31	Cry						
32	Communicate with others						
33	Seclude yourself						
34	Feel cheerful						
35	Feel sad						

Table 3. Descriptive data (A) and correlations (B) for the patient group.

A	Total test group (N = 63)			
	Minimum	**Maximum**	**Average**	**Standard deviation**
Hamilton-Score	11	42	22.08	7.351
Extreme positions	2	34	11.15	5.173

	Women (n=39; aged 22–59; avg. 43.97 years)			
	Minimum	**Maximum**	**Average**	**Standard deviation**
Hamilton-Score	11	42	21.23	7.720
Extreme positions	2	34	11.35	5.659

	Men (n=24; aged 23–58; avg. 44.3 years)			
	Minimum	**Maximum**	**Average**	**Standard deviation**
Hamilton-Score	11	36	23.62	6.264
Extreme positions	3	16	10.61	4.042

B			**Hamilton-Score**	**Frequency of extrem positions**
Spearman's rho	Hamilton-Score	Correlation Coefficient	1.000	.408
		Sig. (2-tailed)	.	.001
		N	63	63
	Frequency of extrem positions	Correlation Coefficient	.408	1.000
		Sig. (2-tailed)	.001	.
		N	63	63

their behavioral pattern – not only regarding the aspect of "unable to do", but also the aspect of showing an "urge to be doing something constantly" [20].

Based on these preliminary results, the present investigation, using an extended questionnaire, assesses once again whether the behavior of depressed persons is affected in domains to which the current diagnostic manuals do not refer. We hypothesize that in patients suffering from a depressive disorder, the number of altered behavioral modes correlates with the patients' depression.

We expected the depressed patients to have significantly greater changes in their modes of behavior and to respond more frequently with the extreme positions of "never" and "always" in the SSBA than did the control group. Therefore, our study may help determine whether symptoms such as altered behavioral modes are comorbid symptoms, or whether they should be regarded as typical symptoms of depression.

Material and Methods

We used the *Salzburg Subjective Behavioral Analysis* (SSBA) questionnaire (Table 2). The SSBA consists of 35 items describing 35 different modes of behavior. We asked whether the frequency of the listed modes of behavior had changed during the preceding 2 weeks in comparison to the person's normal subjective feeling of well-being. Each question had a choice of 5 possible answers, ranging from "no change", "less often", and "more often" to the extreme positions "never" and "always".

The SSBA questionnaire was used as a structured interview together with the Hamilton Rating Scale for Depression (HAM-D17) on 63 male and female in-patients and out-patients at the time of their treatment at the University Clinic for Psychiatry I at the Christian Doppler Clinic/Salzburg/Austria.

Participants were consecutive adult patients meeting the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV) criteria for MDD. All patients were interviewed face-to-face by a psychiatrist with clinical and research experience in MDD, who received training from the developer of the questionnaire (B. Mitterauer). Participants were excluded if they were younger than 18 years or older than 65 years of age. Other reasons for exclusion from the study included current and previous primary Axis I diagnoses other than MDD, or serious medical illness.

The control group consisted of 87 employees and undergraduate students of the University of Salzburg who did not meet criteria for MDD.

All participants were informed that their test results would be kept confidential and that they could withdraw from the study at any time. They then provided consent before completing the questionnaire. This study was conducted from December 2007 to May 2009.

Due to the ordinal level data in the SSBA, Spearman correlations were used.

Results

Of the 63 persons in the patient group, 39 were female (age range: 22–59; *M*=43.97 years) and 24 were male (age range: 23–58; *M*=44.3 years). The primary psychiatric diagnoses (DSM-IV) included 296.32 Major Depressive Disorder, Recurrent, Moderate (17 f, 10 m), 296.33 Major Depressive Disorder, Severe Without Psychotic Features (4 f, 6 m), 296.22 Major Depressive Disorder, Single Episode, Moderate (12 f, 4 m) and 296.23 Major Depressive Disorder, Single Episode, Severe Without Psychotic Features (6 f, 4 m).

All patients answered with extreme positions (never/always) and we found a total of 888 of such positions. The mean number of extreme positions per patient was M=11.15 (SD=5.17). Extreme positions were apparent in all 35 behavioral modes. The mean Hamilton score in the patient group was M=22.08 (SD=7.35). The correlation between the number of extreme positions in the SSBA and the Hamilton score was highly significant (r=0.41, p=.001). No substantial gender differences were found. Descriptive data are outlined in Table 3.

The control group (n=87) consisted of 58 women (age range: 20.5–56.6; *M*=29.11 years) and 29 men (age range: 24–53.5; *M*=8.59 years). Only 11 persons in the control group responded with extreme positions and we found a total of only 25. All other answers given by the control group were "less often", "more often", and "no change".

Discussion

Although this study has several limitations (relatively small sample size, questionnaire still in the validation procedure, only HAM-D applied), the association of the frequency of extreme positions in the SSBA and the Hamilton score indicates that this questionnaire may be able to identify core symptoms of a major depressive episode. Moreover, the comprehensive behavioral analysis of the patients revealed a severe displacement of the normal behavioral pattern that is usually not explored and often not reported by the patients. Whereas persistent anxiety (HAM-D), hypersomnia (DSM-IV) and hyperphagia (atypical depression) are included in current diagnostic instruments, we found in addition "hyper- and hypomodes" to which diagnostic criteria do not refer.

Extreme positions in the SSBA were apparent in all 35 behavioral modes, which is an unexpected result. It concerned emotional, cognitive, communicative and psychobiological domains. Some of the "hypermodes" seem to be paradoxical to depression and usually represent symptoms of a manic or bipolar state such as the constant urge to smile, communicate or speak [21].

Other "hypermodes" such as the urge to work (workaholic), the craving for objects (chocoholics, oniomania) or excessive internet use are commonly classified as symptoms of addictions and interpreted as comorbidities of depression [22–26].

We also assessed higher rates of pollakisuria and diarrhea without an organic substrate, which are usually classified as psychosomatic disorders.

Interestingly, if somatic and psychotherapeutic treatment is ineffective, antidepressive medication can sometimes improve these disorders [27–31], which might indicate that these are symptoms of depression.

In spite of methodological limitations, our data show that altered behavioral patterns significantly correlate to depression scores. These results indicate that "hypomodes" and "hypermodes", may not represent comorbidity or even manic symptoms, but are typical symptoms of depression. This may open up a new perspective in the study of depressive behavior.

Conclusions

These reported clinical results are preliminary, since the investigation is solely based on a questionnaire conducted as a structured interview without biological parameters. In addition, the underlying brain model must be further elaborated to include the effects of synaptic imbalances on action selection in depression.

Depression research also focuses on disorders of glial-neuronal synaptic interactions [32–34] and on white matter abnormalities [35,36].

Given the fact that action selection represents a complex dynamic mechanism, functional magnetic resonance imaging could provide some evidence as to when and where the pattern of neuronal processing switches if an action selection occurs from one mode of behavior to another mode [17]. In this case, a biological parameter for the behavioral analysis of patients with depression would be available. Moreover, computer simulations modeling the action selection in psychobiological disorders [12] and in depression [19] may also contribute to our understanding of depression.

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