Multi-dimensional recording of long-term treatment of patients with schizophrenic disorders compared to patients with major depression measured with the ASSESS battery

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ABSTRACT

Background: The aim of the study was to validate the course and outcome of treatment in patients with schizophrenic disorders and to compare it with those of patients with depression using a multidimensional assessing approach measuring psychopathological, social and cognitive levels of functioning.

Methods: We recruited N = 86 chronically ill patients, n = 41 with schizophrenic disorders and n = 45 with depression and examined them by means of the ASSESS battery with 5 measuring points within one year.

Results: Psychopathological symptoms and cognitive functioning changed over time, but still remained. Furthermore, changes in functional ability in the psychosocial area were observed in the overall collective. The course of the patients with schizophrenic disorders differed especially from that of the patients with depression in relation to the domain personal relationships. In both groups, symptoms of the disease correlated negatively with cognition and psychosocial functioning. Cognitive deficits were associated with a reduced level of psychosocial functioning.

Discussion: The ASSESS battery proved to be a practicable measuring instrument for complex assessment of the course of the disease in patients with schizophrenic disorders as well as depression. The stable course of symptoms in both disorders as well as psychosocial differences would have to be further confirmed in long term studies to derive necessary treatment recommendations.

1. Introduction

Schizophrenic disorders are a complex psychiatric disease with a wide range of symptoms and a varying course, which is influenced by biological risk factors as well as economic and cultural factors. Depression is also characterized by a non-uniform course with both recurrent and persistent symptoms, influenced by various biological and socio-psychological factors. The differences and similarities between these two disorders have been discussed for long time (Berger et al., 2012).

Schizophrenic disorders are characterized by a variable course, divided into three phases: Prodromal phase, acute phase and initial phase with different outcome, ranging from complete or almost complete remission (in about 50%) to chronically persistent symptoms with the development of a residual state (in 44%) (Berger et al., 2012). It manifests itself in a heterogeneous way through positive symptoms such as delusion, perception disorders, ego disorders, motor restlessness and negative symptoms. In contrast to those positive symptoms, the absence of certain functions and aspects of mental life can also be detected. Approximately 80% of patients with schizophrenic disorders show cognitive deficits, in particular the reduction of attention, semantic memory, working memory, processing speed, and impairment of executive functions (Green and Harvey, 2014; Batanic, 2019). They are among the core symptoms and are present in both the prodromal and acute phase and persist in chronic state (Bergh et al., 2016; Lucas et al., 2004).

In patients with schizophrenic disorders, the disease-related deficits impair their social functioning, i.e. their ability to adequately fulfill their role in society as family members, workers and carers of others. The overall quality of life is negatively affected by this reduction of social functioning. In various studies, a relationship has been found between negative symptoms, cognitive deficits, extrapyramidal motor side effects...
of the medication, as well as affective symptoms such as depression and anxiety, specific personality traits and neuroanatomical changes (reduction of the volume of grey matter in the insula) and quality of life (Hofer et al., 2005a; Hofer et al., 2005b; Sevilla-Llewellyn-Jones et al., 2019; Takahashi et al., 2018; Uwotoko et al., 2015).

In 2005, Andreasen et al. (The Remission in Schizophrenia Working Group) developed operationalized criteria for remission in schizophrenia which have been used for several years evaluating remission in patients with schizophrenic disorders. The measured remission according to these criteria was 40%–60% in different patient groups (Emsley et al., 2011). Complete recovery means not only the remission of acute psychotic symptoms but also the achievement of satisfactory psychosocial functioning in various areas of life such as work, education, interpersonal contacts and self-care and is to be considered as a long-term process (Liberman and Kopelowicz, 2005). Liberman and Kopelowicz published an operationalized definition of recovery, which includes the following criteria: Score ≤ 4 in the Brief Psychiatric Rating Scale in all items of positive and negative symptoms, at least 50 % part-time work or equivalent time in school or training, independent control over finances and medication, meeting with friends or acquaintances once a week, under a time criterion of 2 years (Liberman and Kopelowicz, 2005). The results of a cross-sectional study of patients undergoing outpatient treatment showed that about 45% of the patients met the symptomatic criteria of an Andreasen remission, approximately 32% achieved psychosocial remission (adequate personal hygiene, active participation in everyday activities and family relationships, functioning in various professional and social settings). Only a minority of about 15% of patients achieved a so-called functional remission (simultaneous achievement of symptomatic and psychosocial remission as well as a Global Assessment of Functioning Scale score of ≥60 points). Fixed employment, use of atypical antipsychotics, lower number of psychotropic drugs and lower severity of negative and arousal symptoms were predictive of functional remission (Valencia et al., 2015).

The most commonly observed pattern of unipolar depression is a recurrence of often self-limiting depressive episodes lasting 6–9 months. A chronic course with persistent depressive symptoms is observed in about 35% of patients (Berger et al., 2012). Most studies assume a time criterion of 2 years of persistent symptoms without complete remission lasting longer than 2 months (Gelenberg et al., 2006). The chronic state is associated with significant impairment of psychosocial functioning in various areas, and so those affected more often remain single, are unable to pursue full-time employment, are often unemployed and receive social assistance. The above factors lead to a significant reduction in the overall quality of life (Angst et al., 2005; Gilmer et al., 2005; Leader and Klein, 1996). Since therapeutic measures are less promising, the overall prognosis is less favorable in chronic depression than in recurrent depressive episodes (Berger et al., 2012).

Similarly to schizophrenic disorders, a majority of patients with depression suffer from a variety of cognitive impairments. Those affected most frequently report difficulties in concentration, difficulties in making decisions, problems in planning and carrying out actions, and impaired memory. In the depressive episode, disorders of executive functions (in particular reduced word fluency, impairment of working memory, reduced psychomotor speed and disorders of episodic memory) have been observed. Cognitive deficits are seen as a core symptom of the disease and are present before the first episode, in the acute state, and in the remission phase (Rock et al., 2014). They have a negative impact on social and occupational functioning. The effectiveness of antidepressant medication and cognitive behavioural therapy and increase the risk of a relapse of symptoms during the current episode or a later relapse. Depressive symptoms occur in about 60% of patients with schizophrenic disorders over the course of the disease. They can occur in any phase of the disease, but young patients with their first episode are particularly affected in the prodromal phase. The differentiation between independent depressive symptoms, primary negative symptoms and side effects of psychopharmacotherapy often cause diagnostic problems (Unger et al., 2018).

The depressive symptoms in the context of schizophrenic disorders negatively influence various aspects of the overall recovery, such as cognitive functions, psychosocial functioning, risk of relapse, duration of inpatient treatment and response to medication. Furthermore, they contribute to the chronicity of the disease, increase somatic comorbidity and the risk of suicide, and impair the quality of life of those affected (Hoertel et al., 2020; Reine et al., 2003; Sands and Harrow, 1999).

In the extensive, naturalistic empirical studies European First Episode Schizophrenia Trial (Fleischhacker et al., 2005) and Clinical Antipsychotic Trial of Intervention Effectiveness (Schneider et al., 2003), the most commonly used units of measurement to assess the effectiveness of treatment was retention of pharmacotherapy and time to discontinuation of pharmacotherapy, respectively. However, discontinuation of drug therapy by patients has limited significance as a measure of treatment effectiveness, as psychiatrists should change the ineffective treatment on their own initiative, e.g. due to unsatisfactory symptom remission or lack of patient consent before the patient discontinues treatment (Ladea et al., 2015). To date, there are no established measurement tools available to assess the course and effectiveness of treatment for both schizophrenic disorders and depression nor is there a precise definition of effectiveness. For years, attempts have been made to assess the success of treatment as comprehensively as possible, both in the short and long term. For this purpose, effectiveness was defined as the ability of the intervention to cause a desired positive effect. In clinical practice, the effectiveness of treatment is considered to be an improvement in four areas (Nasrallah et al., 2005):

1. symptoms of disease
2. treatment burden
3. disease burden
4. health and wellness

A group of leading European psychiatrists and psychopharmacologists jointly developed a scale for assessing the effectiveness of treatment for patients with schizophrenic disorders: The ASSeSsment of Effectiveness in Schizophrenia Battery (ASSESS battery). This measuring instrument is intended to enable psychiatrists to assess the effectiveness of treatment in everyday clinical practice, both during remission and in acute relapse (Juckel et al., 2014; Ladea et al., 2015). Five domains were included in this measurement tool: remission of symptoms and retention of psychopharmacotherapy, affective symptoms, cognitive performance, satisfaction with treatment and social skills. To date it was used in a pilot study in a group of male, in- and outpatient patients with schizophrenic disorders, in acute phase as well as in a state of remission, to assess the course and success of antipsychotic therapy (Ladea et al., 2015).

The study presented here is the first application of this scale to a German-speaking sample. Although it was originally developed to assess the course of the disease in patients with schizophrenic disorders, we decided to apply this scale innovatively to patients with depression because of the similarities in the course of the disease described above. The primary aim of the study was to record the course and success of treatment in patients with schizophrenic disorders over a 1-year course with 5 measurement points with the help of the ASSESS battery. We focused mainly whether or not domains of the ASSESS battery change in the same or in different ways in patients with schizophrenic compared to depressive disorders during the 1-year follow-up. The subsidiary research objectives addressed by this paper were identification of differences in various variables, especially cognitive performance and social skills between these two groups and finding out possible interactions with temporal development.

2. Methods

2.1. Study design and participants

The research project was designed as a prospective longitudinal study and carried it out from December 2016 to June 2018 in the psychiatric
outpatient clinic of a psychiatric hospital in North-Rhine Westphalia in Germany. Patients with a diagnosed schizophrenic disorders and as a control group, participants with a depressive disorder were examined. Both groups were interviewed at 5 measuring points within 12 months (at recruitment, after 1, 3, 6 and 12 months). The assessment took about 1.5 h at each time point. Furthermore, the project was conducted as a naturalistic study as the data were collected during routine medical visits. The study was reviewed and approved by the Research Ethics Committee of the Medical Faculty of the Ruhr University Bochum (Reg.-No.: 16-5790). All recruited patients gave written informed consent.

We included a total of N = 86 patients in the study, n = 41 of them with schizophrenic disorders and n = 45 with depression. The diagnosis was based on the ICD-10 criteria for schizophrenic disorders (F20.XX) and for unipolar depression (F32.XX, F33.XX). The participants had to be at least 18 years of age and not older than 65 years and had to have sufficient knowledge of German language. As exclusion criteria the following were set: state of agitation, acute suicidal tendency, addictive illness without abstinence, organic brain damage, pre-diagnosed dementia, mental disability. A total of 3 patients did not complete the examination (dropout rate 2.85%).

2.2. The ASseSment of EffectiveneS in Schizophrenia Battery (ASSESS battery)

The following scales were originally integrated into the ASSESS battery:

10 items of the Positive and Negative Syndrome Scale (PANSS) (Kay et al., 1987): for the assessment of positive symptoms: P1 delusions, P2 formal thinking disorders, P3 hallucinations; for the assessment of negative symptoms: N1 effect flattening, N4 social passivity and apathy, N6 lack of spontaneity and fluency of speech; for the assessment of general psychopathological symptoms: G2 anxiety, G5 mannerisms and unnatural posture, G6 depression and G9 unusual thinking content. For the ASSESS battery, the selected items are based on criteria of remission presented by Andreasen et al. but have been extended to include the items depression and anxiety (Andreasen et al., 2005). The assessment is carried out in a semi-structured clinical interview with the inclusion of further information, e.g. by nursing staff or relatives. The indication of symptoms is divided into 7 levels of severity (from 1 = “not present” to 7 = “extremely severe”). In order to enable the evaluation of the results, the subscales of positive, negative and general psychopathological symptoms were created analogous to the complete version of the PANSS. The Brief Assessment of Cognition in Schizophrenia scale (BACS) (Keefe et al., 2004, 2008) is used to assess cognitive performance in patients with schizophrenic disorders. In this short, approximate 35-minute, effective procedure, the following cognitive functions are examined: processing speed (using the following tests: verbal and letter fluency, token motor task, symbol coding), reasoning and problem solving (using the Tower of London test), verbal memory (using list learning) and working memory (using digit sequencing). The total BACS value is calculated by adding the sub-scores and adjusting them to the age and sex of the participants. The German version of the BACS has been successfully validated (Sachs et al., 2011). In our analysis, we used Z scores of the BACS total scale and subscales.

The Personal and Social Perfromance scale (PSP scale) is a measuring instrument for assessing social skills and patient-relevant initial parameters with proven reliability, validity and sensitivity (Morosini et al., 2000). The rating is based on four main areas: a) socially useful activities, including work and study, b) personal and social relationships, c) self-care, and d) disruptive and aggressive behavior. All four areas are rated in six levels according to their severity, from “absent” to “extremely serious”. Based on the different assessments in the individual areas, an average score is calculated within 10 intervals. In order to adjust this roughly oriented result, other areas of the patient's social competence are then considered, which ultimately results in a final score between 1 and 100 points. The German version has already been validated several years ago and successfully used since then (Juckel et al., 2008).

Satisfaction with drug treatment is assessed using the Medication Satisfaction Questionnaire (MSQ) (Vernon et al., 2010). This measuring instrument is based on the patient’s answers to 3 questions concerning general satisfaction with drug therapy, which are rated on a 7-point scale from “very dissatisfied” to “very satisfied”. A 1-item version was used in this study.

2.3. Additional measuring instruments

The patients with schizophrenic disorders were also examined with the complete German version of the 30 items PANSS (Gerholdt et al., 1999). In the control group of patients with depression, the 17-item version of the HAMD (Hamilton Depression Scale) (Hamilton, 1960) and the BDI –II (Beck Depression Inventory) (Beck et al., 1961) were used.

2.4. Statistical analysis

We carried out the statistical analysis using the SPSS Version 25. When describing the sample population, we calculated descriptive statistics with mean, range and standard deviation for interval scaled variables and frequencies for nominal and ordinal scaled variables. In order to identify correlations between the individual factors, Pearson was used for interval scaled variables and the Spearman Rho for ordinal variables. The differences between both at baseline were examined using the independent t-test for interval-scaled variables, the Mann-Whitney-U test for ordinal variables and Chi² test for nominal variables regarding sociodemographic and anamnestic data. Furthermore, we calculated ANCOVAs to analyses group differences at baseline regarding the ASSESS scales while including possible effects of covariates. For the main question, whether the different aspects of the ASSESS battery changed over time and to examine group differences in the time course, we calculated mixed ANOVAs. For ordinarily scaled variables we calculated Friedman tests as a non-parametric method and corrected for multiple testing using Bonferroni.

3. Results

3.1. Sample statistics and correlations for the total sample

Table 1 shows the sample description regarding sociodemographic and anamnestic data of the both groups in comparison as well as results on the analysis of group differences. There were significant differences between both groups in terms of gender, marital status, number of children, employment status and retirement due to psychiatric disorder, with groups of patients with schizophrenic disorders showing more pronounced impairments than patients with depression (see Table 1). Furthermore, the group of patients with schizophrenic disorders showed a significantly earlier onset of the disease, longer duration of the disease, higher number of inpatient treatments and more frequent application of polypharmacotherapy than patients with depression. Instead, patients with depression more frequently participated in additional psychotherapy.

With 90.2% (n = 37), the majority of patients with schizophrenic disorders had dominant negative symptoms according to the PANSS. The majority of patients with depression showed mild to severe symptoms (HAMID: 4,4% none (n = 2), 33,3% mild (n = 15), 28,9% moderate (n = 13), 33,3% (n = 15) severe. BDI-II: 31,7% minimal (n = 13), 22,0% mild (n = 9), 19,5% moderate (n = 8), 26,8% severe (n = 11).

At baseline correlations between the different ASSESS battery (sub) scales were calculated for the total sample and are shown in Table 2.
found significant negative correlations between all ASSESS PANSS subscales and BACS score. There also was a significant negative correlation between all ASSESS PANSS subscales and the PSP score. Furthermore, there was a significant positive correlation between the BACS score and the PSP score. The MSQ value correlated significantly negative with all ASSESS PANNS subscales.

3.2. Group differences and covariates in ASSESS scales at baseline

To compare both groups regarding the scales and subscales of the ASSESS battery we conducted ANCOVAs using the age of onset, duration of disease in years, number of medications, number of antipsychotics and number of inpatient treatments as covariates. The results for all subscales can be found in Table 3. As can be seen, the both group at baseline differed significantly regarding the positive and negative symptoms assessed with the ASSESS version of the PANSS. Furthermore, total scores of the PSP and the BACS also differed significantly for both groups. We also conducted a Mann-Whitney-U test regarding possible differences in the MSQ item, which did not reveal a significant difference between the two groups at baseline ($U = 751.00, p = .114$).
Furthermore, the conducted ANCOVAs also showed that (after correction using Bonferroni) the included covariates in general had no clear significant effect on the group differences found here. Only the number of medication did have an effect on the values in the PSP – on the total score as well as the subscales social activities and personal relationships – and on the total score of the BACS.

Figure 1 shows the course of the values in both groups across the times of measurement. The patients with schizophrenic disorders showed a higher level of positive and negative symptoms assessed with the PANSS, whereas patients with depression showed a higher level of psychosocial functional level assessed with the PSP as well as cognitive functioning level assessed with the BACS.

3.3. Group comparison in temporal development of ASSESS scales

Table 4 shows the results of the mixed ANOVAs, which we conducted to examine the temporal development of the ASSESS scales and subscales and to analyze whether this development might differ between both groups.

There was a significant effect of time on the negative symptoms and the general psychopathology assessed with the PANSS and Figure 1 shows that these did decrease over time. Still, there was no significant interaction between the effects of time and group indicating a decrease in both groups.

Furthermore, the total score of the PSP as well as the subscales personal relationships, self-care and aggressive behavior did significantly change over times of measurement. As in Figure 1 can be seen for the total PSP score there was a tendency for patients with schizophrenic disorders do show a higher improvement in level of psychosocial functioning, but after Bonferroni correction results could not show a significant interaction between the effects of time and group.

Regarding the level of cognitive functioning we found similar results. There was a significant effect of time and Figure 1 shows, that BACS score improved during the assessed time period. Still, there was no significant interaction between the effects of time and group, indicating an improvement in both groups.

We conducted separate Friedman tests regarding the MSQ item for the total samples and each group individually to assess a possible development here. But not significant change could be found here on any level (total sample: χ² (4) = 2.95, p = .566, patients with schizophrenic disorders: χ² (4) = 3.95, p = .412, patients with depression: χ² (4) = 2.95, p = .651).

4. Discussion

The presented study aimed to use the ASSESS battery to record the temporal course of schizophrenic disorders and depression including possible differences as well as to investigate correlations between different domains of the disease and psychosocial life.

After statistical analysis, it was found that in nearly all aspects assessed with the ASSESS battery – psychopathology, psychosocial level of function and cognitive level of functioning - there were significant changes within the temporal course, even though symptoms in general did remain over time. Furthermore, the temporal course of schizophrenic disorders was similar to that of depression, though there were persistent differences between both groups in all domains. Patients with schizophrenia had more pronounced cognitive deficits and reduced social functioning than patients with depression. In both groups, patients who suffered more pronounced symptoms, especially negative symptoms, showed more marked cognitive and psychosocial deficits. Furthermore, cognitive deficits were associated with reduced psychosocial functioning. In contrast to the other domains there was no significant change in regard to satisfaction with medication in neither of the two groups.

Regarding the temporal development of the assessed domains, there is a lot of literature that confirms these results. The authors of a meta-analysis, which dealt with the long-term (minimum 5-year follow-up) psychopathological outcome of schizophrenic disorders, found that the outcome of schizophrenic disorders is mainly heterogeneous, less favorable overall than for affective disorders, and the psychopathological symptoms of the disease appear to be stable over the course of the disease (Lang et al., 2013). The results of another meta-analysis, which examined the psychopathology in a short-term (up to 5 years) and long-term (over 5 years) course of schizophrenic disorders, showed that shortly after the onset of the disease, the positive symptoms either decrease or remain stable and the negative symptoms tend to remain at the same level. In the longer term, only fluctuations in positive symptoms are observed, with relatively stable negative symptoms (Heilbronner et al., 2016). In contrast, no change in positive symptoms was observed in the investigated sample. One possible explanation for this could be that the patients with schizophrenic disorders had an average of 20 years of medical history and showed residual persistent positive symptoms.

Whereas in this study cognitive performance did change at least to some extent, the stability of cognitive deficits, both in patients with schizophrenic and depressive disorders, has been proven in numerous studies (Bergh et al., 2016; Rock et al., 2014). It should be mentioned here that the symptoms of the disease correlated significantly with cognitive performance. The reduction of depressive, positive and negative symptoms was associated with improvement in cognitive functioning. In clinical practice, the fluctuations in cognitive performance and the reduction of deficits after treatment are often observed, especially in patients with depression. Cooperation in carrying out the assessment can be made difficult by the symptoms of the disease, such as...
Some authors report that cognitive performance, as mentioned previously, remains at a stable level in the further course of the study. In contrast, other authors postulate a progressive reduction in cognitive performance over time in patients with schizophrenic disorders is not very pronounced. In addition, the impairment of functional ability was most obvious in patients with schizophrenia and least obvious in patients with depression, in line with the psychopathological findings. It can be concluded that, similar to the results of the study presented, changes in social functioning in the area of personal relationships can be expected in chronically ill patients as well.

A prospective study investigated cognitive functions in 20-year follow-up in patients with pre-diagnosed schizophrenia, other psychotic disorders and depressive disorders without psychotic symptoms. In the majority of the patients from all groups, an improvement in cognitive performance was observed in the short-term course (2 years after the acute episode). During further evaluation sessions at intervals of 4.5, 7.5, 10 and 20 years, no significant change in cognitive performance was observed in both the groups with schizophrenia and depression and in patients with other psychotic disorders (Bonner-Jackson et al., 2010). Overall, however, the study situation regarding the deterioration of cognition over time in patients with schizophrenic disorders is not very constant. Some authors report that cognitive performance, as mentioned above, after a slight to moderate worsening after the first episode, remains at a stable level in the further course of the study. In contrast, other authors postulate a progressive reduction in cognitive performance over time was relatively short at one year, the results described above do not allow a clear statement to be made whether the cognitive deficits will remain at the same level or whether there will be a further decline in performance as the disease progresses.

In correspondence with our results on improvement of psychosocial level of functioning, the work of Ohi and colleagues provides interesting results (Ohi et al., 2019). The authors investigated the influence of IQ, activities of daily living, disease symptoms and medication on social activity in patients with schizophrenia in a 1.5-year study. The sample consisted of inpatients and outpatients in a chronic and symptomatically stable mental state with an average duration of the illness of about 10 years. The authors found a significant improvement in social functioning after 1.5 years and postulated that this effect was due in particular to an improvement in interpersonal communication. It can be concluded that, similar to the results of the study presented, changes in social functioning in the area of personal relationships can be expected in chronically ill patients as well.

The differences between both groups across the assessed domains, especially psychopathology, are also similar to results of other studies. Kingston and colleagues investigated the functional outcome of depression with psychotic symptoms, bipolar affective disorders, schizoaffective disorders and schizophrenia in a 6-year follow-up (Kingston et al., 2018). In all sub-scores of the PANSS, the sample of patients with schizophrenia achieved the highest mean values, followed by schizoaffective disorders. The group of patients with depression showed the least pronounced symptoms. In addition, the impairment of functional ability was most obvious in patients with schizophrenia and least obvious in patients with depression, in line with the psychopathological findings. According to the authors, the differences between the samples were more quantitative than qualitative, with an overlap between the individual clinical pictures. It could be an indication for similarity and continuity between these disorders.

The results on correlations between the assessed domain also are confirmed by already existing studies, including important insights on the course of many years with an increase in hypofrontality, which would correspond to the original term “dementia praecox”. The authors of the meta-analysis already quoted (Heilbronner et al., 2016) noted that fluctuations in executive functions caused by the influence of medication in the short-term course (up to 5 years) can occur. In contrast, in late adulthood (> 65 age) there is a progressive impairment of cognitive performance due to continuous neurodegeneration. As the mean age of the recruited sample in our study was around 50 years and the follow-up time was relatively short at one year, the results described above do not allow a clear statement to be made whether the cognitive deficits will remain at the same level or whether there will be a further decline in performance as the disease progresses.

Reduced drive, psychomotor retardation and lack of motivation, particularly in the case of a severe episode. Since the sample was recruited from chronically ill patients, no change in the course of the disease with regard to psychopathology could be observed, and thus cognitive performance remained at the same level.

A prospective study investigated cognitive functions in 20-year follow-up in patients with pre-diagnosed schizophrenia, other psychotic disorders and depressive disorders without psychotic symptoms. In the majority of the patients from all groups, an improvement in cognitive performance was observed in the short-term course (2 years after the acute episode). During further evaluation sessions at intervals of 4.5, 7.5, 10 and 20 years, no significant change in cognitive performance was observed in both the groups with schizophrenia and depression and in patients with other psychotic disorders (Bonner-Jackson et al., 2010). Overall, however, the study situation regarding the deterioration of cognition over time in patients with schizophrenic disorders is not very constant. Some authors report that cognitive performance, as mentioned above, after a slight to moderate worsening after the first episode, remains at a stable level in the further course of the study. In contrast, other authors postulate a progressive reduction in cognitive performance over

### Table 4. Group comparison in temporal development of ASSESS (sub-)scales.

| ASSESS PANSS                  | Effect of time | Interaction of time X group |
|------------------------------|----------------|-----------------------------|
| Positive                     | 1.70           | .188                        | .866                        |
| Negative                     | 17.2           | .001                        | .036                        |
| General psy.path.            | 4.18           | .006                        | .048                        |

| PSP                          | Effect of time | Interaction of time X group |
|------------------------------|----------------|-----------------------------|
| Total score                  | 15.29          | .001                        | .086                        |
| Social activities            | 2.52           | .072                        | .340                        |
| Pers. relationships          | 14.94          | .001                        | .036                        |
| Self-care                    | 11.33          | .001                        | .050                        |
| Agg. behaviour               | 4.44           | .003                        | .089                        |

| BACS                         | Effect of time | Interaction of time X group |
|------------------------------|----------------|-----------------------------|
| Total score                  | 7.71           | .001                        | .090                        |

Note: AO = age of onset, DD = duration of disease (in years), NM = number of medication, NA = number of antipsychotics, IT = number of inpatient treatments.
individual heterogeneity. Studies confirming such heterogeneity can be found in the literature. For example, in the study of (Bozilas et al., 2004), the correlation between the severity of negative symptoms and semantic knowledge, verbal memory and acoustic attention was found in patients with schizophrenia. In contrast, positive symptoms were associated with impairment of semantic knowledge and psychomotor speed. In most studies with patients with depressive disorders, associations between the severity of depression and certain domains of cognition were observed. These results suggest that cognition impairment is more isolated than generalized. Overall, the findings are contradictory and inconsistent (McDermott and Ebmeier, 2009). The correlation between negative symptoms in patients with schizophrenia and depressive symptoms in affective disorders and cognitive functions has been well investigated and confirmed in numerous studies (Bergh et al., 2016; Lucas et al., 2004).

The results of this study confirm the hypothesis that the symptoms of the disease are associated with psychosocial functioning. The negative influence of the symptoms, especially the negative, but also the positive symptoms on psychosocial functioning, has now been documented in several studies (Norlelawati et al., 2015; Ohi et al., 2019; Wittorf et al., 2008). Furthermore, a strong correlation between cognitive performance and psychosocial level of functioning was found, whereby better cognitive performance was associated with better psychosocial functioning. These results are consistent with numerous studies showing the negative influence of cognitive deficits on the ability to perform daily activities, professional performance, social functioning and adherence to drug therapy in patients with schizophrenic disorders (Kitchen et al., 2012). Regarding the interaction of cognition and psychosocial functioning in patients with depression there are contradictory results in the literature, but most authors stress the association of cognitive deficits with the deterioration of psychosocial functioning in major depression (Jaeger et al., 2006; Knight and Baune, 2018).

5. Limitations

This research project has several limitations. Firstly, the sample was based on outpatients who had a long-term course of disease and were in a relatively stable condition. In the study, only those participants were recruited who showed sufficient compliance and motivation, so the results presented cannot be representative of the whole population of patients with schizophrenic and depressive disorders. In particular, the generalization to acutely ill patients are limited. Secondly, the sample size to some extent limits the generalization of the results, though as calculated in a previous sample size calculation the sample sizes were sufficient enough for the conducted analysis. Thirdly, the limited follow-up time of one year does not allow conclusions to be drawn about the long-term course of the disease. There was no blinding during the research project. The study data were collected exclusively by one rater, so that an objective validation of the tests carried out and interrater reliability were not given. Age was a covariable.

6. Conclusions and outlook

In summary, the following conclusions can be drawn from the study presented:

- In chronically ill patients, both with schizophrenic disorders and depression, the psychopathological symptoms and cognitive function changed over time, even though existing deficits remained. Furthermore, a change in psychosocial functioning can be expected, especially in the interpersonal sphere.
- The temporal course of schizophrenic disorders did not differ from that of depression regarding cognitive performance and psychopathological symptoms, but results indicated a differing course in relation to a domain of social functioning, i.e. personal relationships.
- Patients with schizophrenic disorders had stronger psychopathological symptoms and showed more pronounced cognitive deficits and reduced social functioning than patients with depression.
- The symptoms of the disease, especially the negative symptoms, correlate negatively with cognitive performance and psychosocial functioning. Furthermore, cognitive deficits are associated with reduced psychosocial functioning.

The goals of successful treatment have become more ambitious in recent years. In order to be able to reliably evaluate the success of the treatment, it is necessary to measure the changes in the course of the disease comprehensively in different outcome areas: psychopathology, cognition, social functional level, side effects and tolerance of the medication. Due to the holistic aspect of the ASSESS battery and its practicability, it could be a solution to improve the assessment of the course of schizophrenic disorders. Furthermore, the development of a version adapted to the depressive symptoms, e.g. with certain items of the HAMD scale, could be an interesting research perspective. Thus, the application of the ASSESS battery could play an important future role in the assessment of treatment effectiveness in clinical practice.

Declarations

Katarzyna Szyzsko vel Chorazy; Georg Juckel: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Simone Agnes Elkmann: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Udo Schneider: Conceived and designed the experiments.

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Data availability statement

Data will be made available on request.

Declaration of interest's statement

The authors declare no conflict of interest.

Additional information

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