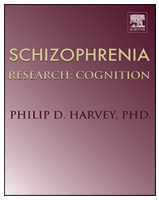
Schizophrenia Research: Cognition 37 (2024) 100311

Contents lists available at ScienceDirect

Schizophrenia Research: Cognition

journal homepage: www.elsevier.com/locate/scog



Longitudinal course of core cognitive domains in first-episode acute and transient psychotic disorders compared with schizophrenia

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ARTICLE INFO

Keywords:
Schizophrenia
First-episode
Acute and transient psychotic disorder
Brief psychotic disorder
Cognition

ABSTRACT

Acute and transient psychotic disorder (ATPD) is characterized by acute onset of psychotic symptoms and early recovery. Contrastingly, schizophrenia (SZ) is a chronic mental disorder characterized by impaired functioning including a deficit in cognition. In SZ, the cognitive deficit is among the core symptoms, but in ATPDs, the existing evidence brings mixed results. Our primary aim was to compare three core cognitive domains (executive functioning/abstraction, speed of processing and working memory) of patients diagnosed with ATPD and SZ over a 12-month period. Moreover, we explored how these diagnostic subgroups differed in their clinical characteristics. We recruited 39 patients with a diagnosis of SZ and 31 with ATPD with schizophrenic symptoms. All patients completed clinical and neuropsychological assessments. At baseline, we used a one-way ANCOVA model with a group as the between-subjects factor. Mixed-model repeated-measures ANOVAs with time as the within-subjects factor and group as the between-subjects factor were run to test the overtime differences. At baseline, we did not find any differences in cognition - with sex, education and age as covariates - between ATPDs and SZ. After one year, all patients showed an improvement in all three domains, however, there were no significant overtime changes between ATPDs and SZ. Regarding clinical profiles, ATPDs demonstrated less severe psychopathology and better functioning compared to SZ both at baseline and after 12 months. The medication dosage differed at retest, but not at baseline between the groups. Our findings suggest clinical differences and a similar trajectory of cognitive performance between these diagnostic subgroups.

1. Introduction

Brief psychotic disorder (BPD) and acute and transient psychotic disorder (ATPD) are two related concepts used to define psychotic disorders with acute onset of the psychotic symptoms and early recovery by Diagnostic and Statistical Manual of Mental Disorders-5 (American Psychiatric Association, 2013) and International Classification of Diseases, version 10 (ICD-10; (World Health Organization, 1992). Compared to SZ, ATPDs are defined by acute onset within 2 weeks and early remission, expected within a 3 months period. The symptoms include delusions, hallucinations, disorganized speech, and grossly disorganized or catatonic behavior (Fusar-Poli et al., 2022). In ICD-10, the disorder comprises six subtypes (F23.x) dependent on whether the features of the disorder are polymorphic, predominantly delusional, or schizophreniform. The onset of ATPDs is typically associated with stressful events (Das et al., 2001; Malhotra and Malhotra, 2003) and abrupt life changes, often tied to a socio-cultural background (Malhotra et al., 2019). The ATPDs seem to be equally prevalent in men and women (Castagnini and Foldager, 2013; Singh et al., 2004) which is in contrast to SZ that tends to be more frequent in young males (Jauhar et al., 2022).

However, although these diagnoses have been introduced more than twenty years ago, the limited research on ATPDs still questions its distinct clinical entity. Relatively high rates of the diagnoses have been reported in migrant populations and developing countries (Castagnini and Fusar-Poli, 2017; Malhotra et al., 2019) supporting the hypothesis that ATPDs are often triggered by life events. Some genetic studies (Kanazawa et al., 2013) presented evidence there may be an overlap

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https://doi.org/10.1016/j.scog.2024.100311
Received 1 December 2023; Received in revised form 3 April 2024; Accepted 3 April 2024

with SZ in cases of ATPDs with schizophrenic symptoms, but the genetic and neurobiological factors of the disorder certainly need more research to present more complex conclusions. Similarly, the research focused on cognitive functioning seems to bring mixed results.

In SZ, cognitive deficit is among the core symptoms of the disorder and it appears to be one of the first signs in individuals who are later diagnosed with the disorder (Green, 2006). In general, the impairment has a significant impact on functioning which is the reason for cognitive deficit being an important treatment target (Nuechterlein et al., 2011; Green, 2006; Kalisova et al., 2023). However, the exact characteristic of cognitive deficit remains unclear as recent studies highlight its heterogeneity in terms of severity, domains, stability, etc. (Owen et al., 2016; Rodriguez et al., 2017).

In ATPDs, some studies reported less impaired cognitive functioning in comparison with SZ while others found no difference in cognitive variables (Ayesa-Arriola et al., 2016; Kitamura et al., 2007; Ngoma et al., 2010). The study by Ayesa-Arriola et al. (2016) examined whether there were distinguishable neurocognitive profiles in diagnostic subgroups of first-episode psychosis. The results suggested that participants with brief psychotic disorder performed globally better when compared to a SZ subgroup and some indications of domain-specific differences were also observed. Participants with ATPD performed better in two 'core' cognitive domains, processing speed and executive functioning, with the former difference being preserved even after controlling for cognition-modulating variables (sex, age, education, and premorbid IQ).

Contrasting results were presented by Ngoma et al. (2010), who compared three patient groups: BPD, SZ and schizophreniform disorder in a third world country. The study reported no difference between the three groups in any cognitive domain. The authors argued that such findings may be due to testing methods, suggesting that the "Weschler Adult Intelligence Scale—Revised (WAIS-R)" is not useful in discriminating SZ from other psychoses. Their results were in accordance with Kitamura et al. (2007), who also found that intelligence performance measured with the WAIS-R could not distinguish between SZ and non-schizophrenic psychotic disorders. However, the study mixed multiple diagnoses in the non-schizophrenic subgroup including "psychotic disorder due to a general medical condition" and "psychotic disorders not otherwise specified".

For symptomatology and functioning, studies showed that individuals diagnosed with ATPDs or BPD demonstrated less severe symptoms compared to those diagnosed with SZ (Ayesa-Arriola et al., 2016; Kitamura et al., 2007). Lyne et al. (2012) found that the negative symptoms were less frequent in BPD than in SZ and similarly Jäger et al. (2003) and Ngoma et al. (2010) reported fewer negative symptoms and better functioning in ATPDs compared to SZ and schizoaffective disorder.

The present study aimed to compare participants with recent-onset SZ and ATPD with schizophrenic symptoms on their performance in the three core cognitive domains - processing speed, working memory, and executive functioning/abstraction over a 12 months period. We hypothesized that: 1) at baseline, participants with ATPD would be less impaired in all three cognitive domains compared to participants with SZ, and 2) over time, participants with ATPD would demonstrate a more substantial improvement in all cognitive domains compared to participants with SZ. We controlled for several covariates, including age, education, and sex. We also explored how these subgroups differed with respect to their clinical characteristics, including overall symptomatology and functioning, duration of untreated psychosis (DUP), and antipsychotic medication dosage.

2. Methods

The data analyzed in this study were collected as a part of a larger multimodal database entitled "Early Stage of Schizophrenia Outcome", which is being conducted at the National Institute of Mental Health (NIMH CZ) in Klecany, Czech Republic. The study aims to improve the early detection of psychosis. This paper reports results of two repeated assessments performed within this study: clinical and neuropsychological.

2.1. Participants

The participants ($N = 70$) had a clinical diagnosis of SZ (F20.0; $n = 39$, 55.7 %) or ATPD (F23.1 and F23.2; $n = 31$, 44.3 %) based on the diagnostic interview and collateral information following the ICD-10 criteria (Jakobsen et al., 2005; Fusar-Poli et al., 2016). The initial diagnoses were re-evaluated and confirmed by the attending psychiatrists at retest, which followed after an average of 13.16 ± 1.83 months from the baseline assessment. Patients whose diagnosis changed over the year were not included in the dataset.

The SZ and ATPD groups did not differ with regard to their age (SZ: $M = 26.61$, $SD = 6.03$; ATPD: $M = 29.21$, $SD = 9.59$; $p = .512$), years of education (SZ: $M = 14.82$, $SD = 3.65$, ATPD: $M = 14.95$, $SD = 2.77$; $p = .681$), and sex (SZ: 25 (64.1 %) males; ATPD: 13 (41.9 %) males; $p = .091$).

At baseline, medication data were collected for 69 participants, of whom all used antipsychotic medication in the form of monotherapy ($n = 50$, 72.4 %) or polytherapy ($n = 19$, 27.6 %). Atypical antipsychotics were used in all cases and mostly included olanzapine (28 cases). Typical antipsychotics were used in three cases (one each of: haloperidol, levomepromazine, and zuclopenthixol) and always as part of polytherapy. Two participants with a diagnosis of SZ and five participants with ATPDs were no longer using any antipsychotic medication at the retest assessment. Others were receiving monotherapy ($n = 30$, 58.8 %) or polytherapy ($n = 16$, 31.4 %). Atypical antipsychotics were again prescribed in all cases but this time, aripiprazole was the most common (24 cases). The chlorpromazine equivalents of the antipsychotic drugs used plus other clinical characteristics, and their between-group comparisons are available in Table 2.

The participants were assessed in a clinically stable condition. Exclusion criteria included psychiatric comorbidities (other than nicotine dependence), neurological disorders, traumatic brain injuries and disorders of childhood development (ADHD, learning disabilities, etc.). The local Ethics Committee approved the study and all participants signed an informed consent form.

2.2. Clinical assessment

During a structured clinical interview, experienced psychiatrists collected demographic (age, education, sex assigned at birth) and basic clinical data, including the estimated DUP (defined here as the difference between the time when psychotic symptoms first appeared and the time when antipsychotic treatment was initiated), duration of antipsychotic treatment (prior to the baseline assessment) and antipsychotic medication type and dose (converted to chlorpromazine equivalents following the guidelines by Gardner et al. (2010)). Symptom severity was evaluated with the Positive and Negative Syndrome Scale (PANSS; Kay et al., 1987). The Global Assessment of Functioning (GAF; Hall, 1995) was also administered; it is a numeric scale used to subjectively rate social, occupational, and psychological functioning with a range from 100 (extremely high functioning) to 1 (severely impaired). The Mini-International Neuropsychiatric Interview (M.I.N.I.) was used to confirm the absence of psychiatric comorbidities among the participants.

2.3. Neuropsychological assessment

Trained psychologists administered neuropsychological tests in a separate session that took 150 min on average to complete. Test selection derived from the current state of knowledge in the fields of neuropsychology and SZ research (e.g., Dickinson et al., 2006; Lezak et al., 2012; Nuechterlein et al., 2004), but depended also on

availability, since some neuropsychological measures have not been validated for the Czech socio-cultural environment at the start of data collection (Rodriguez et al., 2017). This study focused on the results obtained from tests of processing speed (SPOP), working memory (WM), and executive functioning/abstraction (EXEC) (see Table 1 for the domains' composition).

2.4. Statistical analysis

Statistical analysis was conducted in SPSS (version 28) with the significance level set at $p < .05$. Effect sizes were estimated using partial eta squared (η^2).

2.4.1. Sample characteristics

Group differences in demographic and clinical characteristics were assessed using a chi-squared test for categorical variables, Mann-Whitney *U* test for ordinal or non-normally distributed variables, and two-tailed, independent-samples *t*-tests for continuous variables. The Holm-Bonferroni correction for multiple testing was applied to the *p*-values obtained for individual PANSS scales. Note that these tests were explorative, and were meant to provide context for the interpretation of the main analyses rather than to test any hypotheses.

2.4.2. Cognitive differences between SZ and ATPD; baseline

Raw scores from the neuropsychological tests were converted to *z*-scores using the *M*s and *SD*s of healthy controls from the ESO database ($N = 117$; Rodriguez et al., 2017). The controls had no psychiatric or neurological anamnesis, and no family anamnesis of psychotic disorders (F2x). Relevant *z*-scores were then averaged to obtain the cognitive domain scores.

Two models were constructed for each of the cognitive domain scores: a one-way ANOVA with group as the between-subjects factor, and an ANCOVA which additionally controlled for age, education, and sex. The one-way ANOVA was used in place of a *t*-test to allow for an easier comparison of the two models; the purpose of this model was simply to clarify the extent to which the findings of the follow-up ANCOVA relied on the use of the covariates (Simmons et al., 2011). The ANCOVA represented our main analysis. The covariates for this test were selected based on their previously established confounding role in cognitive functioning (Ayesa-Arriola et al., 2016). The omission of confounds can lead to increased error variances, which is why in this study, the base ANOVA was not considered a reliable indicator of between-group differences in cognitive function. Other potentially cognition-modulating variables - including the PANSS total score and DUP (Ayesa-Arriola et al., 2016) - could not be included as covariates on account of them not being independent of the group effect (Schneider et al., 2015). Per-group Spearman's correlations with Holm-Bonferroni corrections were instead performed to determine the extent to which the two clinical variables (PANSS, DUP) may have contributed to the cognitive domain scores. Other assumptions were also checked in prior, including the assumption of homogeneity of regression slopes.

Table 1
Neuropsychological tests and the domains they measured.

Cognitive domain	Included tests (scores)
Speed of processing (SPOP)	WAIS-III: Digit-Symbol Coding; SCWT (word score, colour score); Verbal Fluency (phonemic and categorical); TMT A (in seconds)
Working memory (WM)	WAIS-III: Digit Span, Letter-Number Sequencing; SCWT (colour-word score); TMT B (in seconds)
Executive functioning/ abstraction (EXEC)	WAIS-III: Comprehension, Picture arrangement, Similarities; Tower of London (total score)

Note. WAIS-III = Wechsler Adult Scale of Intelligence-Third Revision; SCWT = Stroop Color and Word Test, TMT = Trail Making Test.

2.4.3. Cognitive differences between SZ and ATPD; over time

Mixed-model repeated-measures ANOVAs with time as the within-subjects factor and group as the between-subjects factor were run for the three domain scores. No covariates were included in these models since preliminary checks suggested that none of the ones that were previously utilized (age, education, sex) or considered to be (PANSS total score, DUP) were significantly related to the over-time changes in any of the cognitive variables (i.e., retest – baseline difference scores, all $ps > .05$). Assumption checks yielded no cause for concern.

3. Results

3.1. Clinical characteristics

Table 2 lists the clinical characteristics of the SZ and the ATPD subgroup at baseline and retest, as well as the between-group comparisons of these characteristics, where relevant. As can be seen from the table, the SZ group was characterized by a longer DUP and a greater PANSS total score. Overall functioning was also significantly lower in SZ both at baseline and retest assessments. Medication dosage was approximately equivalent at baseline but higher for the SZ group at retest.

3.2. Cognitive differences between SZ and ATPD; baseline

Participants with ATPD obtained higher scores in SPOP compared to SZ, but this difference was only significant when the covariates (age, years of education, and sex) were not included in the model. As also shown in Table 3, participants with ATPD tended to obtain higher scores in WM and EXEC, but no significances were observed for these domain scores.

In participants with SZ, there was a significant correlation between the PANSS total score and the domain scores: WM ($r = -0.357$, $p = .026$), SPOP ($r = -0.322$, $p = .045$) and EXEC ($r = -0.447$, $p = .005$). WM domain was also significantly related to DUP in the SZ group ($r = 0.362$, $p = .023$). No such correlations between cognitive domains and clinical variables (PANSS, DUP, medication) were observed in the ATPD group at baseline. However, in the ATPD group, there was a significant correlation between overall functioning (GAF) and PANSS total score ($r = -0.658$, $p = .000$) and two domains: EXEC ($r = 0.468$, $p = .008$) and SPOP ($r = 0.461$, $p = .009$). In participants with SZ, we did not find any correlation between GAF and clinical or cognitive variables.

3.3. Cognitive differences between SZ and ATPD; over time

Table 4 shows the full results of the mixed-model repeated-measures ANOVAs for each cognitive domain score. These results suggested that the participants in this study showed a significant improvement in all three cognitive domains irrespective of their diagnosis. The improvements seen for SPOP and WM were associated with comparatively larger effect sizes.

The time x group interaction effect was non-significant for all cognitive domains: SPOP, WM and EXEC, suggesting that participants with SZ and ATPD improved at a similar rate in a one year span across these domains (see Fig. 1).

4. Discussion

In this study, we examined cognitive functioning of patients with a recent-onset SZ and ATPDs with schizophrenic symptoms over 12 months. The patients were evaluated on neuropsychological and clinical measures at baseline and retest with an emphasis on the core interrelated cognitive domains (Frischkorn et al., 2019; McCabe et al., 2010): speed of processing, working memory and executive functioning/abstraction. Additionally, we explored the clinical features of our patients at baseline and retest by assessing the differences in the two

Table 2
Sample characteristics ($N = 70$) at baseline and retest.

Variable	Baseline			Retest		
	M ± *SD*		Comparison	*M* ± *SD*		Comparison
	SZ ($n = 39$)	ATPD ($n = 31$)	p	SZ ($n = 39$)	ATPD ($n = 31$)	p
DUP (in months)	4.26 ± 4.34	0.53 ± 0.43	<.001*	–	–	–
Treatment duration (in months)	3.29 ± 4.09	1.42 ± 1.19	.072	-	-	-
CPZ EKVI (mg)	424.23 ± 248.19	374.90 ± 196.32 ($n = 30$)[a]	.486	283.00 ± 223.79 ($n = 37$)[a]	154.70 ± 134.48 ($n = 30$)[a]	.012[2]*
GAF	64.62 ± 17.12	74.52 ± 13.42	.007*	73.56 ± 15.61	84.93 ± 09.92	.001*
PANSS total	59.92 ± 15.90	47.00 ± 13.52 ($n = 30$)	.003*	48.53 ± 13.58 ($n = 38$)	40.43 ± 10.79	.009*
Positive	11.97 ± 4.41	09.83 ± 3.07	.039*	9.36 ± 3.84	8.17 ± 1.80	.238
Negative	17.67 ± 6.55	12.29 ± 4.80	<.001*	14.61 ± 5.57	10.80 ± 4.23	.004*
General	30.28 ± 8.43	24.87 ± 7.23	.010*	24.56 ± 6.58	21.47 ± 5.93	.028*

Note. DUP = duration of untreated psychosis; CPZ EKVI = medication converted into chlorpromazine equivalents; PANSS = The Positive and Negative Syndrome Scale; GAF = Global Assessment of Functioning Scale; CGI-S = The Clinical Global Impression (illness severity component); SZ = participants diagnosed with schizophrenia; ATPD = participants diagnosed with acute and transient psychotic disorder.
[a] CPZ EKVI values were coded as missing for participants for whom full medication data (type and dose) were not collected.
* $p < .05$.

Table 3
Baseline comparisons of cognitive domain scores between diagnostic groups.

Cognitive domain score	SZ ($n = 39$)	ATPD ($n = 31$)	Model 1 - ANOVA			Model 2 – ANCOVA (age, education, sex)		
	M ± *SD* [Adjusted *M* ± *SE*][a]	*M* ± *SD* [Adjusted *M* ± *SE*][a]	*F*(1, 69)	p	η^2	*F*(1, 69)	p	η^2
SPOP	−1.19 ± 0.79 [−1.14 ± 0.12]	−0.75 ± 0.83 [−0.81 ± 0.13]	5.018	.028*	.069	3.486	.066	.051
WM	−1.14 ± 0.89 [−1.17 ± 0.12]	−0.87 ± 0.78 [−0.84 ± 0.14]	1.724	.194	.025	3.270	.075	.048
EXEC	−0.98 ± 1.04 [−0.96 ± 0.15]	−0.79 ± 1.04 [−0.81 ± 0.17]	0.530	.469	.008	0.423	.518	.007

Note. SPOP = speed of processing; WM = working memory; EXEC = executive functioning; SZ = participants diagnosed with schizophrenia (F20); ATPD = participants diagnosed with acute and transient psychotic disorder (F23).
[a] These values were adjusted at the following covariate levels: education = 14.87, age = 27.76.
* $p < .05$.

Table 4
Results of the mixed-method repeated-measures ANOVAs that were conducted for each cognitive domain.

Effect	SPOP			WM			EXEC		
	F(1,68)	p	η^2	*F*(1, 68)	p	η^2	*F*(1, 66)	p	η^2
Between-subjects									
Group	6.935	.010*	0.093	2.861	.095	0.040	0.947	.334	0.014
Within-subjects									
Time	11.605	.001*	0.146	13.947	<.001*	0.170	20.932	.001*	0.241
Time × group	0.492	.485	0.032	0.712	.402	0.010	0.519	.474	0.008

Note. SPOP = speed of processing; WM = working memory; EXEC = executive functioning.
* $p < .05$.

diagnostic subgroups in overall symptomatology and functioning, DUP, and antipsychotic medication dosage. At baseline, we found no significant difference in working memory, speed of processing and executive functions/abstraction - with age, education and sex as covariates - between ATPDs and SZ. On average, the patients showed a significant improvement across all three cognitive domains over the one-year period. However, the overtime change in cognitive performance did not differ between the subgroups as both ATPDs and SZ seemed to improve at a similar rate.

The results from the baseline neuropsychological assessment do not suggest any detectable differences in cognition between ATPDs and SZ. When controlled for sex, age and education, the patient subgroups did not differ in any of the measured cognitive domains. Our findings contrast with the study by Ayesa-Arriola et al. (2016), which showed a difference in one cognitive domain, specifically speed of processing, between ATPDs and other diagnostic subgroups including SZ. However, despite sharing the same statistical approach as Ayesa-Arriola et al. (2016), in that study, each domain was represented only by a single test score. Another study which compared patients with BPD and SZ also found no differences in cognitive functions between the subgroups (Lee et al., 2016), although the authors only used five individual tests not categorized into cognitive domains. Ngoma et al. (2010) who analyzed cognition in three diagnostic subgroups: BPD, schizophreniform disorder, and SZ similarly concluded that there were no major differences in verbal, visual, and working memory, attention, visuomotor control, motor speed, verbal fluency and executive functioning while also

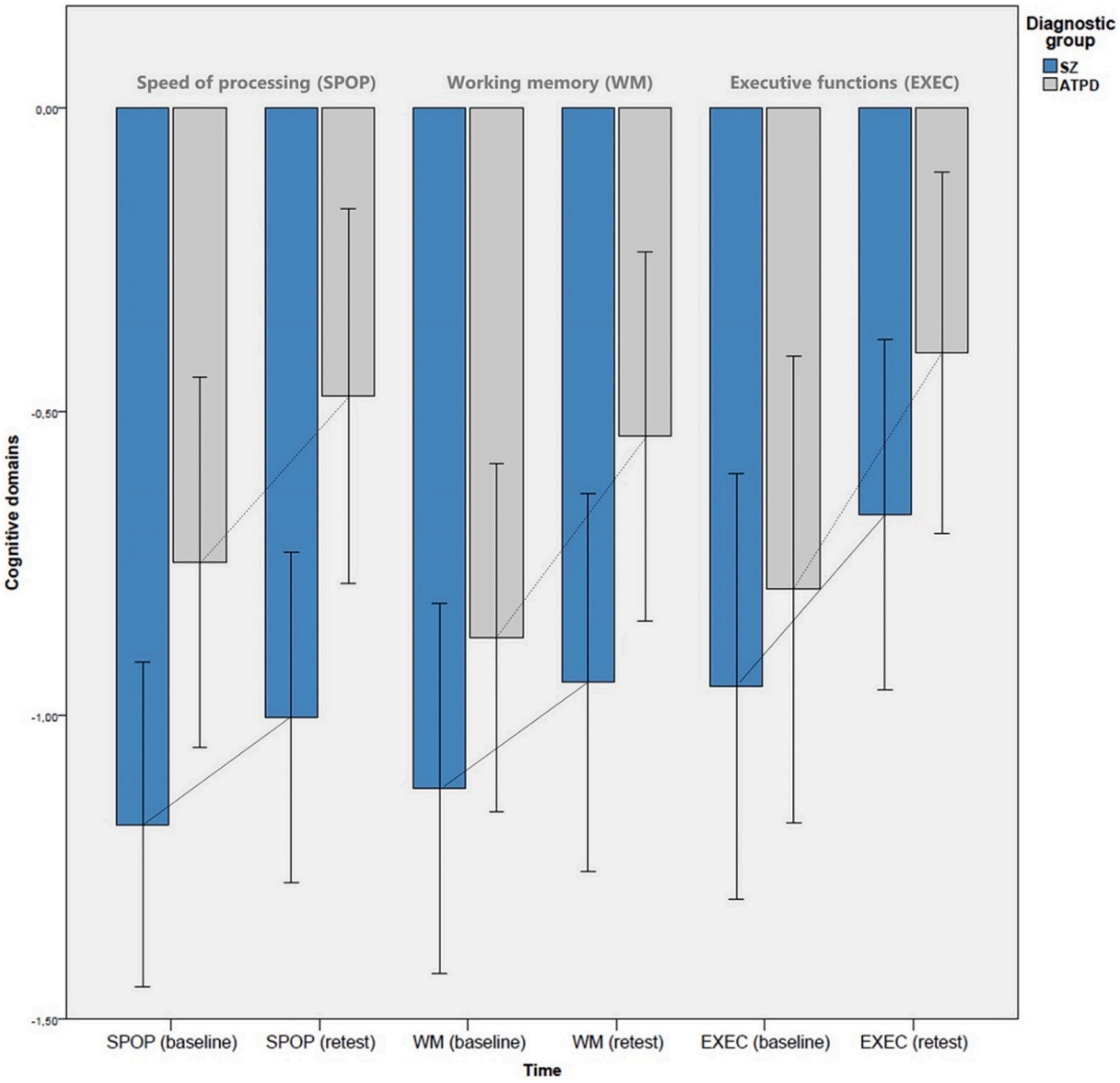

Fig. 1. All cognitive domains - speed of processing, working memory and executive functions/abstraction improved at a similar rate without significant differences across the two diagnostic groups (N = 70).
Note. Error bars show the 95 % confidence intervals.
SZ = participants diagnosed with schizophrenia; ATPD = participants diagnosed with acute and transient psychotic disorder.

controlling for age, gender and education.

In our study, the follow-up neuropsychological assessment was conducted approximately 12 months from the baseline and regardless of their diagnosis, all patients improved their cognitive functioning in all three domains. Nevertheless, we did not find any significant differences in the overtime changes between ATPDs and SZ. Following the graphic representation of the cognitive performance, it seemed that the ATPD subgroup showed a slightly more improvement from the baseline to retest in executive functions/abstraction, but the result failed to reach a significance level.

In general, the trajectory of cognitive functioning in first-episode patients seems to yield heterogeneous findings. Rodríguez-Sánchez et al. (2008), who examined the one-year course of cognitive functioning in individuals diagnosed with first-episode SZ, showed that the patients improved in all cognitive domains after one year. Contrary, a systematic review from 2011 argued that neuropsychological deficits tend to remain relatively stable over time up to 10 years (Bozikas and Andreou, 2011). A recent longitudinal study (Huang et al., 2022) evaluated cognition of patients at 6- and 12-months follow-ups and suggested that a trajectory of the performance depended on distinct neurocognitive subgroups. After one year, the cognitively preserved subgroup remained on the normal level of cognitive functioning while both moderately and severely impaired subgroups slightly improved, but failed to reach normal levels.

Regarding the specific domains and their trajectory, the findings also seem to be inconclusive and diverse. A meta-analytic study from 2014 (Bozikas and Andreou, 2011) found significant improvements in all cognitive domains except for working memory. Contrastingly, there are studies which highlight an over-time improvement in working memory, however, these improvements were often preceded by interventions targeting cognitive functioning (Levaux et al., 2009; Subramaniam et al., 2014). For executive functioning, the results seem to be mixed too as some studies report longitudinal stability while others found an improvement in this specific domain (Stirling et al., 2003; Hill et al., 2004; Hoff et al., 2005; Szöke et al., 2008).

Besides cognitive performance, the exploration of clinical

characteristics revealed some other significant differences between our ATPD and SZ subgroups. At baseline, ATPDs showed less pronounced overall symptomatology, a shorter DUP and better functioning compared to patients with SZ. The average DUP for ATPDs was about half of one month while in SZ, the mean duration was approximately four months. Such finding supports the hypothesis that the ATPD diagnosis has often been defined by a sudden onset followed by disruptive and stressful life changes (Malhotra et al., 2019). The medication dosage did not differ between the subgroups at baseline which is accordance with Ngoma et al. (2010) who also did not find any difference between BPD and SZ in antipsychotic medication.

The findings of less severe psychopathology and better functioning in ATPDs are also consistent with present literature (Ngoma et al., 2010; Korver-Nieberg et al., 2011; Lyne et al., 2012; Lee et al., 2016; Ho et al., 2022). Specifically, in our study, ATPDs showed less positive, negative and general symptoms on the PANSS scale compared to SZ at baseline and the significant difference in negative and general symptomatology prevailed at retest as well. Additionally, ATPDs demonstrated a significantly lower level of the antipsychotic medication dosage and better functioning compared to patients diagnosed with SZ at the 12 months follow-up.

However, our findings should be interpreted in light of the following limitations. While this study is, to the best of our knowledge, the first longitudinal research focused specifically on the comparison of cognitive performance in ATPDs and SZ, the sample size is relatively small and the findings would benefit from a larger population. A larger sample size would have allowed us to detect smaller differences between groups, utilize more complex analytic procedures, and ultimately draw more reliable results (Tran, 2014). Our study also did not cover all cognitive domains, the overall cognitive index and did not include a control group.

At the moment, the absence of longitudinal studies and mixed results cannot answer the question of ATPDs being a distinct entity in regards to cognition. Altogether, our findings suggest that ATPDs and SZ may differ in respect to the clinical presentation rather than cognitive functioning. However, the comparison with present literature is complicated not only due to lack of studies, but also the diagnostic variability of ATPDs in research. Following the ICD-10 criteria, we assessed a relatively homogenous group of ATPDs with schizophrenic symptoms, but various studies either not specify the ATPD subtypes or include other psychotic disorders in their population.

We hope that future research attempts to replicate and extend our findings. For instance, by expanding the time period of the assessments measuring the cognition not only after one year, but also further in time to see whether the trajectory of both subgroups remains similar or not. Future studies with sufficiently powered samples may also wish to control for the effects of additional intervening variables. For example, it may be beneficial to consider the impact of the patients' COVID-19 anamnesis. COVID-19 can result in enduring cognitive impairment (Tavares-Júnior et al., 2022; Sobrino-Relaño et al., 2023), which could confound any potential differences in the cognitive trajectories of individuals with SZ and ATPDs. Indeed, individuals with severe mental disorders may be more likely to fall ill with COVID-19 (Taquet et al., 2021). Another confounding variable might be premorbid IQ or premorbid functioning, which is also closely related to cognitive performance in SZ (Herrero et al., 2020; Rodriguez et al., 2022).

Funding

This work was supported by the Czech Science Foundation as the project GA ČR nr. 21-03615S "The Association between Cognition and Cognitive and Brain Reserve in First-Episode Schizophrenia Spectrum Disorders: A Prospective Study". This study was also supported by the Ministry of Health of the Czech Republic, grant nr. NU22-D-135 "Cognitive functioning after a COVID-19 diagnosis in individuals with schizophrenia".

CRediT authorship contribution statement

Karolína Knížková: Writing – original draft, Investigation, Conceptualization. **Barbora Keřková:** Writing – original draft, Methodology, Investigation, Formal analysis. **Monika Večeřová:** Writing – review & editing, Investigation. **Petra Šustová:** Investigation, Conceptualization. **Juraj Jonáš:** Investigation. **Aneta Siroňová:** Methodology, Data curation. **Aleš Hrubý:** Methodology. **Mabel Rodriguez:** Writing – review & editing, Supervision, Project administration, Funding acquisition, Conceptualization.

Declaration of competing interest

No potential conflict of interest was reported by the authors.

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