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Autism spectrum in patients with schizophrenia: correlations with real-life functioning, resilience, and coping styles

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The members of the Italian Network for Research on Psychoses involved in this study are listed in the Appendix.

Abstract

Background. Previous researches highlighted among patients with schizophrenia spectrum disorders (SSD) a significant presence of autistic traits, which seem to influence clinical and functional outcomes. The aim of this study was to further deepen the investigation, evaluating how patients with SSD with or without autistic traits may differ with respect to levels of functioning, self-esteem, resilience, and coping profiles.

Methods. As part of the add-on autism spectrum study of the Italian Network for Research on Psychoses, 164 outpatients with schizophrenia (SCZ) were recruited at eight Italian University psychiatric clinics. Subjects were grouped depending on the presence of significant autistic traits according to the Adult Autism Subthreshold Spectrum (AdAS Spectrum) instrument ("AT group" vs "No AT group"). Other instruments employed were: Autism Spectrum Quotient (AQ), Specific Levels of Functioning (SLOF), Self-Esteem Rating scale (SERS), Resilience Scale for Adults (RSA), and brief-COPE.

Results. The "AT group" reported significantly higher scores than the "No AT group" on SLOF *activities of community living* but significantly lower scores on *work skills* subscale. The same group scored significantly lower also on SERS total score and RSA *perception of the self* subscale. Higher scores were reported on COPE *self-blame*, *use of emotional support* and *humor* domains in the AT group. Several correlations were found between specific dimensions of the instruments.

Conclusion. Our findings suggest the presence of specific patterns of functioning, resilience, and coping abilities among SSD patients with autistic traits.

Introduction

Autism spectrum disorder (ASD)[1] is a condition characterized by impairment in social communication and interactions, restricted interests, and stereotyped behaviors, eventually associated with intellectual disability and language development alterations. Many authors stressed the presence of shared phenotypical presentations and risk factors between ASD and the schizophrenia spectrum disorders (SSD), a group of disorders that, according to The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), includes schizophrenia (SCZ), other psychotic disorders of the same spectrum (such as schizophreniform disorder, schizoaffective disorder, delusional disorder, etc.) and schizotypal personality disorder.[1–5] Bleuer[6] considered autism a core element of SCZ, and the term "autism" was often used as a synonym of SCZ until Rutter and Kolvin,[7,8] during the 1970s, proposed to consider ASD and SCZ as different disorders. However, these conditions show high comorbidity rates[9–12] and increasing evidence stressed that SCZ should be considered, as ASD, a neurodevelopmental disorder.[13,14] Moreover, several authors[15,16] suggested the presence of shared pathogenetic, neurobiological, and genetics underpinnings between ASD and SSD. For example, MECP2 gene mutations have been linked to a wide range of neurodevelopmental disorders, ranging from ASD, SCZ, and also

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bipolar disorder.[17] However, it should be noted how ASD and SCZ also differ in several features, such as the earlier onset of ASD, which usually appears in childhood, while SCZ usually appears in adolescence or adulthood.[1,13]Moreover, while negative symptoms of SCZ may resemble some ASD-like features, psychotic features are more typically present in SCZ, possibly implying differences in the impact on global functioning and quality of life between the two conditions.[1,13]

The link between ASD and SCZ has been further confirmed from an epidemiological point of view by a recent meta-analysis conducted by Zheng et al[18] in terms of a higher prevalence of SCZ in patients with ASD as well as of ASD in patients with SCZ. Particularly interesting is the hypothesis of a phenotypical continuum between SSD and ASD[19,20]: according to this conceptualization, ASD and SSD would be different conditions, although part of the same psychopathological spectrum.[3,12,21–24] It should be noted how recently researchers focused their interest in the subthreshold autism dimension, stressing the relevance of autistic-like traits in psychopathology also without the presence of a full-fledged ASD diagnosis.[25]Autistic traits were firstly investigated in first-degree relatives of ASD children, leading to the concept of a "broad autism phenotype" (BAP).[26–29] However, further studies stressed how autistic traits seems to be continuously distributed across general population, being particularly frequent in clinical samples of patients with other kinds of mental disorders.[26–40]The high rates of autistic traits in comorbidity with other psychiatric disorders suggested that multifactorial neurodevelopmental alterations may represent a common vulnerability factor for many psychiatric conditions, including SSD.[41] In this framework, a meta-analysis from De Crescenzo et al[42] confirmed that autistic symptoms are more frequent among SSD patients, highlighting shared cognitive traits between autism and schizophrenic spectra. More limited literature has focused on how autistic traits may influence SSD presentations and global functioning. A lower premorbid adjustment during childhood and adolescence was frequently recorded in SSD patients and it was associated with an earlier onset of disease, more severe negative symptoms, worse prognosis, and functional outcome.[43–51] Rapoport et al[11,52] observed that the presence of autistic traits might be involved in the heterogeneity of premorbid adjustment, clinical expression, and pathological trajectories in SCZ patients. On the other hand, SCZ patients with a preponderance of negative symptoms were reported to show an "autistic-like phenotype."[53] Chisholm et al[54] evidenced, among patients experiencing a first episode of psychosis, that a higher expression of autistic traits was associated with a worse functioning and quality of life, as well as with higher severity of psychotic symptoms. More recently, Vita et al[55] reported that among patients with SCZ the presence of autistic traits was linked to poorer cognitive performance and lower real-life functioning. Conversely, Vaskinn and Abu-Akel[56] reported how, among SSD patients, the presence of autistic traits was associated with a better functioning, hypothesizing that the two conditions may compensate each other. In this framework, increasing research in the field of global functioning and quality of life highlighted the importance of investigating possible protective factors, such as positive coping styles, resilience, and self-esteem. Despite that, resilience factors in autism have been poorly investigated.[57] Previous literature reported how autistic traits, also when sub-threshold, seem to be linked with a lower global functioning and adjustment,[28,29,58] as well as with lower self-esteem, poorer adjustment to stress, and a higher tendency to maladaptive coping styles, leading to a reduced quality of life.[24,59] However, studies in this field were mainly conducted in the general population or in clinical samples of ASD patients, while the influence of ASD or autistic traits on specific patterns of functioning, as well as on resilience and coping styles, in other clinical populations has been scantly investigated, leading to controversial results.[41,60,61]

Similar results have been reported also among SSD patients, which showed higher levels of perceived stigma and lower self-esteem and resilience to stress.[62,63] Among SSD patients, a lower self-esteem has been associated with worse social functioning and quality of life.[64,65] Moreover, lower levels of resilience were linked to a greater functional impairment and higher levels of psychosis.[63,66] Intriguingly, executive functions, which are a feature typically impaired among subjects with autistic traits, were reported to moderate the relationship between subjective experience and social functioning among SSD patients,[67] while both resilience and self-esteem seem to moderate the relationship between perceived stigma and quality of life.[68] Regarding coping styles, a higher prevalence of maladaptive coping strategies was reported among patients with SSD.[69,70] Other authors stressed the relationship between lower self-esteem and maladaptive coping strategies in this population,[71] as well between lower perceived stigma and positive coping.[72,73] According to a recent study by Chen et al,[74] positive coping strategies and resilience may influence the variability in functional impairment among patients with SCZ. Previously some authors, as reported above, focused on the role of autistic traits in influencing clinical presentation and real life functioning and outcome in SSD patients. The aim of the present study was to further deepen the investigation in this field, evaluating how autism spectrum may be linked, among SSD patients, to specific patterns of functioning, focusing on personal resources, and adjustment strategies. In particular, we aimed to evaluate how patients with SSD with or without significant autistic traits may differ with respect to levels of functioning, self-esteem, resilience, and coping profiles.

Methods

Subjects

One hundred and sixty-four outpatients with SCZ were recruited at the University psychiatric clinics of Pisa, Brescia, Cagliari, Catania, L'Aquila, Roma "Tor Vergata," Siena, and Napoli as part of the add-on autism spectrum study of the Italian Network for Research on Psychoses.[51]

Inclusion criteria were a diagnosis of SCZ according to DSM-IV-TR, confirmed with the Structured Clinical Interview for DSM-IV-patient version (SCID-IV-P), an age between 18 and 66 years. Exclusion criteria were as follows: (1) history of head trauma with loss of consciousness; (2) history of moderate to severe mental retardation or of neurological diseases; (3) history of alcohol and/or substance abuse in the last 6 months; (4) current pregnancy or lactation; (5) inability to provide an informed consent; and (6) treatment modifications and/or hospitalization due to symptom exacerbation in the last 3 months. All subjects signed a written informed consent after receiving a comprehensive explanation of the study procedures and goals. The study has been conducted in accordance with the principles of the Declaration of Helsinki (59th World Medical Association General Assembly; October 2008). Approval of the study protocol was obtained from the Ethics Committees of the participating centers.

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Study design

Subjects were grouped depending on the presence of significant autistic traits according to the Adult Autism Subthreshold Spectrum (AdAS Spectrum) instrument. We investigated the relationships between autistic traits and levels of functioning, self-esteem, resilience, and coping styles. Correlations between specific dimensions of the autism spectrum and functioning profiles were also investigated. Further information about the study design is reported elsewhere.[51]

Assessments

Socio-demographic variables were collected in a clinical form, using all available sources of information. In addition, all subjects were asked to fill out questionnaires or answering questions assessing the autism spectrum, real-life functioning, self-esteem, resilience, and coping styles.

Autism spectrum

The autism spectrum was investigated by means of the Autism Spectrum Quotient (AQ)[26]and the AdAS Spectrum.[75–77]

The AQ is a widely used questionnaire providing a self-report measure of autistic traits among adults without intellectual impairment.[26] It features 50 questions, assessing 5 different areas: *social skill; attention switching; attention to detail; communication; and imagination.* A score over 32 has been shown to be a useful cut-off for identifying subjects with clinically significant levels of ASD symptoms in the validation study,[26] while subjects scoring 23 or greater have been considered with a possible BAP, that is a variety of subthreshold manifestations of ASD, such as peculiar communication and cognitive processes, strong persistent interests, and rigid and aloof personality.[78] The AdAS Spectrum is a 160-item self-report questionnaire developed with the aim of assessing a broad variety of symptoms and associated manifestations of ASD. It was developed to assess not only full-threshold symptoms, but also subthreshold and partial forms of ASD, as well as isolated autistic traits across the lifetime. Items are grouped into seven domains*: childhood/adolescence, verbal communication, nonverbal communication, empathy, inflexibility and adherence to routine, restricted interests and rumination, and hyper-/hyporeactivity to sensory input.* In the validation study, the AdAS Spectrum showed high internal consistency, sound test–retest reliability (Kunder–Richiardson coefficient = 0.964, Intraclass correlation coefficient= 0.976) and strong convergent validity with alternative dimensional measures of autism. In proceeding with Dell'Osso et al, subjects scoring 44 or above may be considered as having clinically significant levels of autistic traits.[75–77]

Level of functioning and self-esteem

Patients' real-life functioning was evaluated using the Specific Levels of Functioning (SLOF) scale,[79] a 43-item survey assessing the patient's current functioning and observable behavior, with a specific focus on the presence of skills, assets, and abilities rather than deficits. The SLOF was based on the caregivers' judgment about patients' functioning, and therefore it was administered to the caregivers.[51] It is composed of six subscales: (1) *physical functioning*, (2) *personal care skills*, (3) *interpersonal relationships*, (4) *social acceptability*, (5) *activities of community living*, and (6) *work skills.* Each of the 43 questions is rated on a 5-point Likert scale, resulting in a total score ranging from 43 to 215. A higher total score is associated with a better overall functioning of the patients. Self-esteem levels were evaluated with the Self-Esteem Rating scale (SERS), an instrument composed of 40 items organized in a 7-point Likert scale.[80]Score ranges from −120 to +120, positive scores are associated with higher levels of self-esteem.

Resilience and coping abilities

Resilience was evaluated using the Resilience Scale for Adults (RSA),[81] a 33-item scale organized in six dimensions: *perception of self, perception of the future, structured style, social competence, family cohesion, and social resources.* Responses are rated on a 7-point Likert scale, higher scores are associated with higher levels of resilience. The brief-COPE scale was employed for evaluating coping styles. The scale is composed of 28 items organized in 14 domains, which investigates 14 different coping styles: *self-distraction, denial, self-blame, substance use, behavioral disengagement, venting* (which are different dimensions of "avoidant coping"), *active coping, use of emotional support, use of instrumental support, positive reframing, planning, acceptance* (which are different dimensions of "approach coping"), *religion,* and *humor.* Responses are organized in a 4-point Likert scale; higher scores indicate a higher use of a specific coping style.[82]

Statistical analyses

Student's *t*-test or chi-squared tests were used for comparing demographic characteristics and scores reported on psychometric instruments between SCZ patients with and without autistic traits. Pearson's correlation coefficient was used for investigating significant correlations between AdAS Spectrum domains and SLOF, SERS, RSA, and COPE scores. Finally, a logistic regression was performed for identifying the variables best predicting the presence of a comorbid autism spectrum. Statistical analyses were conducted using SPSS, version 20.

Results

Socio-demographic characteristics and autistic symptoms

The sample included 164 patients with SCZ (mean age = 41.8 ± 10.6 years) and it was composed of 122 male (74.4%) and 42 female (25.6%). According to the AdAS spectrum, 65 subjects (39.6%) scored above the threshold for autistic traits (>43), while 99 subjects (60.4%) reported a score ≤ 43: these group were named "AT group" and "No AT group," respectively. Socio-demographic characteristics of subjects with or without autistic traits are displayed in Table 1. No significant differences were found for age, gender, years of education, occupational status (working/not working), and marital status (in a relationship yes/no). AT group reported higher scores than No AT group on all AQ domains but *attention to details* (see Table 2).

Comparison of levels of functioning and self-esteem between groups

When considering the SLOF, patients in the AT group reported significantly higher scores on *activities of community living* subscale but significantly lower scores on *work skills* subscale. AT group scored significantly lower also on SERS total score (see Table 3).

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Table 1. Comparisons of Socio-Demographic Characteristics Between Groups.

	AT Group (N = 65)	No AT Group (N = 99)	χ^2	*P* Value
Sex—N (%)				
Male	44 (67.7)	78 (78.8)	2.536	.159
Female	21 (32.3)	21 (21.2)		
In a relationship—N (%)				
Yes	10 (15.4)	12 (12.1)	0.360	.715
No	55 (84.6)	87 (87.9)		
Occupational status—N (%)				
Working	13 (21)	24 (24.5)	0.265	.747
Not working	49 (79)	74 (75.5)		
			t	*P* Value
Age, y (mean ± SD)	42.23 ± 10.58	41.47 ± 10.68	−0.445	.657
Education (mean ± SD)	11.38 ± 3.20	10.66 ± 3.22	−1.421	.157

Abbreviation: SD, standard deviation.

Table 2. Comparisons Between SCZ Patients with and without AT on AQ Scores.

	AT Group (N = 65)	No AT Group (N = 99)	*t*	*P* Value
AQ (mean ± SD)				
Total	24.15 ± 7.22	19.60 ± 7.50	−3.862	**<.001**
Social skills	5.12 ± 2.70	3.55 ± 2.69	−3.665	**<.001**
Attention switching	5.88 ± 1.91	5.13 ± 2.21	−2.227	**.027**
Attention to details	3.17 ± 2.47	3.08 ± 2.15	−0.236	.814
Communication	4.58 ± 2.07	3.67 ± 2.33	−2.578	**.011**
Imagination	5.40 ± 2.68	4.17 ± 2.29	−3.135	**.002**

Abbreviations: AQ, Autism Spectrum Quotient; SCZ, schizophrenia; SD, standard deviation.
p values <.05 are marked in bold.

Table 3. Comparisons Between SCZ Patients with and without AT on SLOF and SERS Scores.

	AT Group (N = 65)	No AT Group (N = 99)	*T*	*P* Value
SLOF (mean ± SD)				
Physical functioning	23.77 ± 1.66	24.19 ± 1.14	1.944	.054
Personal care skills	31.91 ± 3.09	31.35 ± 4.364	−0.951	.343
Interpersonal relationships	23.94 ± 5.83	22.71 ± 6.68	−1.214	.227
Social acceptability	32.85 ± 2.58	33.05 ± 2.75	0.478	.633
Activities of community living	47.27 ± 6.25	43.90 ± 9.46	−2.725	**.007**
Work skills	19.05 ± 4.94	20.82 ± 5.95	1.992	**.048**
Total	179.08 ± 17.58	175.66 ± 22.31	−1.075	.284
SERS (mean ± SD)				
Total	13.69 ± 46.56	31.48 ± 34.90	2.633	**.010**

Abbreviations: SCZ, schizophrenia; SERS, Self-Esteem Rating scale; SLOF, Specific Levels of Functioning; SD, standard deviation.
p values <.05 are marked in bold.

Correlations of autism spectrum symptoms with levels of functioning and self-esteem

Correlations of AdAS Spectrum with SLOF and SERS scores were reported in Table 4. Significant positive correlations were found between SLOF *activities of community living* subscale and AdAS Spectrum *nonverbal communication, inflexibility and adherence to routine, restricted interests and rumination, hyper-/hyporeactivity to sensory input* domain scores. Positive correlations were found also between AdAS Spectrum *hyper-/hyporeactivity to sensory input* domain and both SLOF *personal care skill* and *Interpersonal relationships* scores. Significant negative correlations were reported between SLOF *physical functioning* subscale and AdAS Spectrum

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Table 4. Correlations of the AdAS Spectrum with SLOF and SERS.

	SLOF						SERS
AdAS Spectrum	Physical Functioning	Personal Care Skills	Interpersonal Relationships	Social Acceptability	Activities of Community Living	Work Skills	Total
Childhood/adolescence	**−0.249***	−0.021	−0.097	**−0.188***	0.103	**−0.206***	−0.098
Verbal communication	−0.058	0.035	−0.039	−0.012	0.110	**−0.224***	**−0.181***
Nonverbal communication	−0.135	0.098	0.006	−0.109	**0.208***	−0.125	**−0.163***
Empathy	−0.011	0.036	0.069	0.080	0.146	−0.009	−0.129
Inflexibility and adherence to routine	−0.088	0.114	0.053	−0.035	**0.160***	−0.132	−0.105
Restricted interests and rumination	−0.090	0.144	0.079	−0.016	**0.225***	−0.066	−0.105
Hyper-/hyporeactivity to sensory input	**−0.167***	**0.159***	**0.201***	−0.043	**0.176***	−0.053	−0.102

Abbreviations: AdAS, Adult Autism Subthreshold Spectrum; SERS, Self-Esteem Rating scale; SLOF, Specific Levels of Functioning.
*$P < .05$.
Statistically significant correlation coefficients are marked in bold.

childhood/adolescence, *hyper-/hyporeactivity to sensory input* domains, as well as between SLOF *work skills* subscale and AdAS Spectrum *childhood/adolescence, verbal communication* domains. AdAS Spectrum *childhood/adolescence* domain score was also negatively correlated with SLOF *social acceptability* subscale score. Finally, significant negative correlations were found between SERS total score and AdAS Spectrum *verbal communication* and *nonverbal communication* domains.

Comparison of resilience ability and coping styles between groups

When comparing RSA and COPE scores, we found significantly lower scores on RSA *perception of the self* dimension among patients in the AT group. This group scored significantly higher also on COPE *self-blame*, *use of emotional support*, and *humor* domains (see Table 5).

Correlations of autism spectrum symptoms with resilience ability and coping styles

Correlations between AdAS Spectrum and scales measuring resilience and coping styles are shown in Table 6. AdAS Spectrum *verbal communication* domain showed significant negative correlations with RSA *perception of the self*, *social competence*, and *social resources* subscales, while AdAS Spectrum *nonverbal communication* domain was negatively correlated only with RSA *perception of the self* and *social competence* domains. Significant negative correlations were found also between AdAS Spectrum *empathy* domain and RSA *perception of the self* and *perception of the future* subscales. When considering the COPE, significant positive correlations were found between AdAS Spectrum *nonverbal communication* and COPE *self-distraction*, *self-blame*, and *use of emotional support* dimension, while AdAS Spectrum *empathy* domain was negatively correlated with COPE *active coping* dimension. AdAS Spectrum *inflexibility and adherence to routine* and *restricted interests and rumination* domains were both significantly and positively correlated with COPE *use of emotional support* and *humor* dimension; AdAS Spectrum *inflexibility and adherence to routine* domain was also significantly correlated with COPE *use of instrumental support*, while AdAS Specrum *restricted interest and rumination* domain was positively correlated also with COPE *self-blame* dimension.

Logistic regression

We performed a multiple logistic regression analysis with the presence of autism spectrum (according to AdAS Spectrum cut-off) as the dependent variable. We chose to use as independent variables the factors for which a significant difference between groups was observed on *t*-test analyses, and in particular SLOF *activities of community living* and *work skills* scores, SERS total score, RSA *perception of the self*, COPE *self-blame*, u*se of emotional support*, and *humor* scores. Results showed that the variables significantly predictive for the presence of an autism spectrum were SLOF *work skills* and SERS total scores (higher scores indicating higher levels of functioning and self-esteem) as negative predictors (odds ratio [OR] = 0.837, 95% confidence intervals [CI] = 0.764-0.916 and OR = 0.985, 95% CI = 0.973-0.997, respectively) and SLOF *activities of community living* score as positive predictor (OR = 1.148, 95% CI = 1.072-1.229) (see Table 7).

Discussion

According to previous literature,[18,42,52,54,83] this study showed that a significant proportion of patients with SCZ has significant levels of autistic traits, as evaluated with both the AdAS Spectrum and the AQ.

Levels of functioning and self-esteem

Our results highlighted specific profiles of functioning in SCZ patients with autistic traits, allowing us to hypothesize that these features could play a significant role in determining the global adjustment. Despite overall functioning, as evaluated by the total SLOF score, did not differ significantly between AT/No AT patients, the autistic dimension was shown to affect more subtle dimensions of functioning assessed by SLOF subscales, such as *activities of community living* and *work skills* domains. In particular, subjects with high autistic traits were shown to have better performances in the *activities of community living* subscale, whose scores were also positively correlated with those reported on four AdAS Spectrum domains (*nonverbal communication*, *inflexibility and adherence to routine*, *restricted interests and rumination*, and *hyper-/hyporeactivity to sensory input*). To some extent, these data are in line with Vaskinn and Abu-Akel study,[56] which evidenced a

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Table 5. Comparisons Between SCZ Patients with and without AT on RSA and COPE Scores.

	AT Group (N = 65)	No AT Group (N = 99)	*t*	*P* Value
RSA (mean ± SD)				
Perception of the self	17.88 ± 5.41	19.48 ± 4.84	1.974	**.050**
Perception of the future	10.57 ± 4.34	11.52 ± 4.18	1.403	.163
Structured style	13.12 ± 3.43	13.28 ± 3.19	0.290	.772
Social competence	19.35 ± 5.40	19.85 ± 5.78	0.547	.585
Family cohesion	20.52 ± 5.58	21.23 ± 5.17	0.834	.406
Social resources	25.32 ± 5.87	26.03 ± 5.48	0.784	.434
COPE (mean ± SD)				
Self-distraction	5.35 ± 1.90	4.82 ± 2.01	−1.705	.090
Denial	4.18 ± 1.91	3.87 ± 1.84	−1.058	.282
Self-blame	5.02 ± 1.96	4.39 ± 1.81	−2.085	**.039**
Substance use	2.80 ± 1.54	2.61 ± 1.33	−0.856	.393
Behavioral disengagement	4.02 ± 1.91	3.85 ± 1.56	−0.613	.541
Venting	4.92 ± 1.94	4.46 ± 1.76	−1.565	.119
Active coping	5.55 ± 1.99	5.53 ± 1.93	−.092	.927
Use of emotional support	5.51 ± 1.97	4.52 ± 1.86	−3.266	**.001**
Use of instrumental support	5.71 ± 1.93	5.09 ± 2.07	−1.918	.057
Positive reframing	5.28 ± 1.81	5.19 ± 1.88	−0.287	0.774
Planning	5.20 ± 1.93	5.28 ± 1.94	0.268	.789
Acceptance	5.83 ± 1.75	5.60 ± 1.80	−0.827	.410
Religion	4.92 ± 2.31	4.26 ± 2.26	−1.815	.071
Humor	4.14 ± 1.70	3.56 ± 1.66	−2.176	**.031**

Abbreviations: RSA, Resilience Scale for Adults; SCZ, schizophrenia; SD, standard deviation.
p values <.05 are marked in bold.

better functioning and social cognition among patients with SCZ and autistic traits, hypothesizing that these conditions may compensate each other and lead to a better adjustment at least in some tasks. On the other hand, AT group reported poorer performance in the *work skills* subscale, in line with other studies which highlighted a lower functional outcome among SCZ patients with autistic traits.[51,53] A possible explanation of our results is that some discrete autistic dimensions, such as the adherence to routines or the focus on restricted interests, may actually help individual's functioning in simple tasks, whereas a detrimental effect of autistic traits may prevail in more complex activities, such as those explored in the *work skills* dimension of SLOF, ultimately resulting in an impaired ability to work that is in line with previous literature.[58,84,85] However, it should be noted that, while working skills can be more easily ascertained, the assessment of community living skills of the patients might be more exposed to biases depending from the subjective judgment of the caregivers. The score reported on SLOF *work skills* subscale was negatively correlated with those reported on AdAS Spectrum *verbal communication* and *childhood/adolescence* domains, highlighting that reduced work skills were related to a higher impairment in verbal communication, as well as with higher autistic traits during childhood/adolescence. This result add to previous studies, which reported poorer academic performances among patients in the autism spectrum with greater verbal communication difficulties,[84,85] while Bechi et al[52] reported how autistic traits may influence since childhood the social functioning of the subjects. Interestingly, a negative correlation was found also between AdAS spectrum *childhood/Adolescence* domain and *social acceptability* and *physical functioning* subscales of SLOF. This result is strikingly in line with Bejerot et al[86] who reported an association between autistic traits and both a worse physical performance and the risk of being bullied since childhood in a sample of university students. The poorer physical performance associated with autistic traits is not surprising in light of the clumsiness commonly described among the core characteristics of high functioning autistic subjects.[87] The lower social acceptability among SCZ patients with high autistic traits during childhood is instead worth of special attention given the potential impact of autistic traits in the outcome of SCZ patients since childhood as observed by Bechi et al.[52] Another result emerging from our data is the lower level of self-esteem in the group with high autistic traits, as assessed by the SERS questionnaire. Besides corroborating previous literature,[64,65,88–90] our data further clarify the relationship between AT and self-esteem, showing that lower levels of this latter were related to a greater impairment on verbal and nonverbal communication skills, as demonstrated by the negative correlations reported between SERS scores and AdAS Spectrum *verbal communication* and *nonverbal communication* scores. In line with Hillier et al,[91] this result might suggest that impaired communication skills are likely to undermine self-perception and self-esteem among SCZ patients, also suggesting a possible target of intervention in similar clinical samples.

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Table 6. Correlations of the AdAS Spectrum with RSA and COPE.

	RSA					
AdAS Spectrum	Perception of the Self	Perception of the Future	Structured Style	Social Competence	Family Cohesion	Social Resources
Childhood/adolescence	−0.090	−0.026	0.006	−0.086	−0.056	−0.076
Verbal communication	**−0.213***	−0.213	−0.213	**−0.213***	−0.152	**−0.156***
Nonverbal communication	**−0.205***	−0.152	−0.010	**−0.164***	−0.072	−0.061
Empathy	**−0.222***	**−0.178***	−0.139	−0.117	−0.015	−0.032
Inflexibility and adherence to routine	−0.063	−0.065	0.089	−0.031	0.009	0.059
Restricted interests and rumination	−0.016	−0.068	0.054	−0.004	−0.001	0.010
Hyper-/hyporeactivity to sensory input	−0.041	−0.067	0.050	0.073	0.107	0.054

	COPE						
AdAS Spectrum	Self-Distraction	Denial	Self-Blame	Substance Use	Behavioral Disengagement	Venting	Active Coping
Childhood/adolescence	0.041	0.008	0.109	0.124	0.042	0.059	0.022
Verbal communication	0.014	0.106	0.031	0.085	0.027	0.123	−0.072
Nonverbal communication	**0.161***	0.048	**0.170***	0.117	0.035	0.058	0.073
Empathy	−0.107	−0.006	0.114	0.108	−0.093	0.060	**−0.155***
Inflexibility and adherence to routine	0.130	0.056	0.117	0.034	−0.070	0.139	0.096
Restricted interests and rumination	0.118	0.124	**0.158***	0.039	0.053	0.097	0.048
Hyper-/hyporeactivity to sensory input	0.056	−0.101	0.111	0.021	−0.070	0.078	−0.007

	COPE						
AdAS Spectrum	Use of Emotional Support	Use of Instrumental Support	Positive Reframing	Planning	Acceptance	Religion	Humor
Childhood/adolescence	0.151	0.035	−0.056	0.051	0.111	−0.025	0.025
Verbal communication	0.096	−0.012	−0.052	−0.054	0.053	0.018	0.082
Nonverbal communication	**0.230***	0.105	0.042	0.072	0.079	0.100	0.027
Empathy	−0.003	−0.022	−0.027	−0.032	−0.074	0.042	0.067
Inflexibility and adherence to routine	**0.220***	**0.185***	0.087	0.108	0.151	0.144	**0.194***
Restricted interests and rumination	**0.252***	0.133	0.058	0.075	0.065	0.104	**0.199***
Hyper-/hyporeactivity to sensory input	0.142	0.084	−0.043	0.001	0.143	0.136	−0.013

Abbreviations: AdAS, Adult Autism Subthreshold Spectrum; RSA, Resilience Scale for Adults.
*$P < .05$.
Statistically significant correlation coefficients are marked in bold.

Resilience

Somehow consistently with the results reported on SERS, patients in the AT group showed worse scores in the *perception of the self* subscale of RSA, which explores a group of dimensions that are known to act as resources of resilience. In agreement with other studies,[63–68,92,93] correlation analyses between AdAS Spectrum and RSA domains scores confirm the critical role of communicative impairment with respect to low self-perception, low self-esteem, and low social competence in SCZ patients, as indicated by the negative correlations between both domains exploring communication (verbal and nonverbal) of AdAS Spectrum and *perception of the self* and *social competence* subscales of RSA. This also add to previous data by our group indicating a relationship between impaired communication and both lower functional adjustment and suicide,[29,36] which was in turn related to worse self-perception in other studies,[94] highlighting the multifaceted impact of communication skills on global functioning and mental health.

Coping styles

Our study also showed that the presence of significant levels of autistic traits among SCZ patients was associated with a unique pattern of coping strategies, as evaluated by the COPE scale. In particular, subjects in the AT group were significantly more likely to use *self-blame, humor*, and *emotional support* as coping strategies. Coping strategies based on humor have been reported to be

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Table 7. Logistic Regression Analysis with the Presence of Autistic Traits (According to AdAS Spectrum Cut-Off) as Dependent Variable and SLOF *Activities of Community Living* and *Work Skills* Scores, SERS Total Score, RSA *Perception of the Self*, COPE *Humor*, *Self-Blame*, *Use of Emotional Support* and *Humor* Scores as Independent Variables.

	B (SE)	Odds Ratio	95% CI	*P*
SLOF activities of community living	0.138 (0.035)	1.148	1.072–1.229	**.000**
SLOF work skills	−0.178 (0.046)	0.837	0.764–0.916	**.000**
SERS total score	−0.015 (0.006)	0.985	0.973–0.997	**.011**
RSA perception of the self	0.020 (0.046)	1,021	0.933–1.116	.654
COPE humor	0.117 (0.119)	1.125	0.890–1.421	.326
COPE self-blame	0.080 (0.115)	1.083	0.864–1.357	.102
COPE use of emotional support	0.177 (0.109)	1.194	0.965–1.477	.489
Constant	−4.930 (1.696)	0.007		**.004**

Abbreviations: AdAS, Adult Autism Subthreshold Spectrum; CI, confidence intervals; RSA, Resilience Scale for Adults; SE, standard error; SERS, Self-Esteem Rating scale; SLOF, Specific Levels of Functioning.
p values <.05 are marked in bold.

alternatively linked to positive or negative outcomes[95,96] in the scientific literature, and further studies should be focused on clarify the implications of this specific coping styles. The greater likelihood to use emotional support in order to cope with life events is somehow consistent with previous studies indicating that autistic traits are positively associated with maladaptive emotionally based coping styles and negatively related to adaptive strategies that use social diversion.[97,98] Intriguingly, both COPE *self-blame* and *use of emotional support* dimensions were positively correlated with the *nonverbal communication* and *restricted interests and rumination* domains of AdAS Spectrum, confirming the detrimental role of communication deficit and rumination above other autistic dimensions in the ability to positively adjust to events, as already shown in other patients groups.[99]

Predictive factors for the presence of autistic traits

According to the results of the regression analysis, among the dimensions of functioning and personal resources that showed significant differences between groups, those with a higher association with the presence of an autism spectrum seemed to be the levels of self-esteem, as measured by the SERS, and the levels of work skills and functioning in activities of community living, as measured by the SLOF. In particular, while SLOF work skills and SERS total score were negative predictive factors, SLOF activities of community living score was a positive predictive factor of the presence of autistic traits.

Globally, these results suggest that among SCZ patients a pattern of lower work skills but higher functioning in activities of community living, together with lower levels of self-esteem, should be considered suggestive of a possible unrecognized autism spectrum in comorbidity.

A better understanding of specific patterns of functioning, resilience, and coping styles among patients with SCZ and autism spectrum may allow clinicians to identify in an early stage this specific population, eventually developing more targeted therapeutic and management strategies for improving patients' adjustment, clinical, and functional outcome.[52–55]

Limitations

Our study suggests a possible role of autistic traits in shaping the functioning and the adjustment of patients with SCZ, even when a clear autistic symptomatology is not evident or is concealed by the severity of the psychotic disorder. Still, the results presented here need to be considered in light of some necessary limitations. First of all, the cross-sectional design prevents any conclusion about cause-effect relationships. Second, the inclusion in the study also of self-report questionnaires might have led to an underestimation or an overvaluation of symptoms by the patients. In particular, although self-report instruments may allow avoiding operator-dependent selection biases, they prevent a formal validation of the clinical condition according to standardized diagnostic criteria.[100] Moreover, in this study, we did not specifically evaluate the presence of negative symptoms in patients with SCZ, and the use of self-report instruments may have prevented us to identify potential overlapping features between ASD and negative symptoms. These limitations concerning the use of self-report instruments are of specific relevance among subjects with autistic traits, due to their difficulties in self-assessment of abilities and lack of introspective accuracy.[101] Further limitations are represented by the relatively limited sample size and by the specific patient population, which is affected by a chronic, severe psychopathology. Moreover, the sample was composed mostly by males (122 M vs 42 F), eventually leading to gender biases in our results. In the context of the above limitations, results from our study may deepen the knowledge on the relationship between SCZ and autism spectrum, raising the awareness of clinicians on the widespread occurrence and functional impact of autistic traits also in this kind of patients.

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Appendix

The following members of the Italian Network for Research on Psychoses contributed to this study: Stefano Barlati, Cassandra Ariu, Pier Paolo Faresin (University of Brescia), Federica Pinna, Michele Muscas, Luca Marras (University of Cagliari), Laura Fusar Poli, Teresa Surace, Carmen Concerto (University of Catania), Laura Giusti, Anna Salza, Valeria Bianchini (University of L'Aquila), Luigi Giuliani, Francesco Brando, Chiara Coccia (University of Campania, Naples), Giorgio Di Lorenzo, Cinzia Niolu, Michele Ribolsi (Tor Vergata University of Rome), Arianna Goracci, Alessandro Cuomo, and Simone Bolognesi (University of Siena).

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