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Positivity, daily time use, mood, and functioning in patients with schizophrenia spectrum disorders: Results from the diapason multicentric study

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Abstract

Background: Positivity (POS) indicates the proclivity to see life and experiences in a positive light. There is limited research on its effects on individuals with Schizophrenia Spectrum Disorders (SSD). Very little is known about the relationship between POS and daily activities in people with SSD.

Aim: The study aims to compare the POS rated by patients with SSD with those obtained in an Italian normative sample matched by age and sex and to use the Ecological Momentary Assessment (EMA) to investigate the association between POS and daily time use (i.e. productive activities, leisure activities), functioning and mood in individuals with SSD.

Method: 620 SSD patients were recruited from mental health services in Italy as part of the DiAPASon project. POS, symptom severity, functioning, and quality of life (QoL) were assessed. POS scores were compared to a normative sample of 5,002 Italian citizens. Additionally, a subset of 102 patients underwent 7-day assessments using mobile EMA.

Results: People with SSD did not significantly differ from the Italian normative sample in POS levels (0.035, $p = .190$). POS showed a significant inverse association with support network (−0.586, $p = .036$) and symptomatology (BPRS −0.101; 95% $p < .001$; BNSS $B = -0.113$, $p < .001$). A significant direct association was found between POS and QoL ($B = 0.310$, $p < .001$) and functioning ($B = 0.058$, $p < .001$). In the subsample using EMA, POS ratings showed significant associations with Positive Emotions ($B = 0.167$, $p < .001$) and Negative Emotions ($B = -0.201$, $p < .001$).

Conclusion: People with SSD exhibited comparable levels of POS to the normative sample. Higher POS was linked to better functioning, QoL, fewer severe symptoms, and increased positive emotions. However, it did not relate to increased productivity or engagement in leisure activities. Further research is needed to understand the relationship between POS and time use in individuals with SSD.

Keywords

Activities of daily living, ecological momentary assessment, mood, positive attitude, schizophrenia

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Background

Positivity (POS) indicates the 'proclivity to see life and experiences in a positive light', and is defined as 'a quite pervasive mode of viewing and facing reality that affects the ways people evaluate their subjective experiences' (Caprara et al., 2012, p. 702). POS refers to individuals' positive outlook towards life and their experiences (Caprara et al., 2012). It influences subjective well-being, providing a sense of control, hope, and coping abilities. It also helps mitigate the effects of reduced social interaction. POS is stable across individuals (Caprara et al, 2009; Livi et al., 2018) and correlates with age, personality traits, health, and socioeconomic position (Alessandri et al., 2015; Caprara et al., 2016; Heikamp et al., 2014; Lauriola & Iani, 2015; Tabernero et al., 2021).

Limited research exists on POS among individuals with mental disorders, particularly SSD. Some studies indicate that individuals with SSD may struggle to experience positive emotions, potentially due to negative symptoms (Blanchard et al., 2001; Gard et al., 2007; Kring & Caponigro, 2010).

Other studies have suggested that individuals with SSD may have a diminished capacity to anticipate and experience positive outcomes, which can contribute to their challenges with motivation and goal-directed behavior (Foussias et al., 2009; Strauss et al., 2013). People with SSD often have reduced positivity and limited research exists on the relationship between POS and daily activities in this population (Strauss et al., 2017). In the DiAPAson project, we recruited SSD patients from 37 mental health services in Italy and used the Positivity Scale (P-Scale) to explore POS. Employing Ecological Momentary Assessment (EMA), we collected real-time data on their experiences, emotions, symptoms, and behaviors (Granholm et al., 2008; Myin-Germeys & Kuppens, 2022; Najas-Garcia et al., 2018; Wee et al., 2019).

During the DiAPAson study recruitment, we conducted a 5-wave survey on the psychosocial impact of the COVID-19 (Bikbov et al., 2022; Caserotti et al., 2022; de Girolamo et al., 2022; Zarbo et al., 2022) pandemic in the Italian general population. In the last two waves, we administered the P-Scale to compare scores between individuals with SSD and a matched sample from the general population.

The present study has two main objectives. Firstly, we aimed to compare P-Scale scores in patients with SSD to an age- and sex-matched normative sample in Italy, hypothesizing lower scores in patients. Secondly, we utilized EMA to investigate how POS impacts time utilization, mood, and functioning in individuals with SSD. Our hypothesis suggests a positive correlation between P-Scale scores and activity, functioning, and positive emotions, while anticipating a negative correlation with psychopathology measures such as BPRS and BNSS. Higher psychopathology scores would indicate lower P-Scale scores

Method

Study setting: DiAPAson

In Italy, people with SSDs are treated by 123 Departments of Mental Health (DMHs). DMHs offer various forms of outpatient, hospital, and residential facilities (RFs). RFs provide support and supervision for individuals with high needs, severe psychopathology, and low functioning, who may have difficulty managing their symptoms and daily activities on their own (de Girolamo et al., 2022; Martinelli, Iozzino, et al., 2022; Martinelli, Killaspy, et al., 2022; Ministero della Salute, 2022). The DiAPAson project (Mayeli et al., 2023; Oliva et al., 2023; Zarbo et al, 2022, 2023) included 20 DMHs and 17 RFs located in different regions of Italy. DMHs recruited both outpatients and residents, while RFs only residents. In total, 98 RFs were involved in this research project, recruiting a mean of 3.3 ($\pm$2.6) residents (roughly 25% of the facility residents) on a mean number of 12.8 ($\pm$5.7) residents: hence, we recruited about 27% of patients in each RF. Sample size calculation was thoroughly described in the study protocol (de Girolamo et al., 2020).

DiAPAson procedure and participants

Participants were invited by treating clinicians at each study center and provided informed consent. Local Ethical Committees approved the study. Outpatients with SSD were approached consecutively until the recruitment target was reached, while residential patients were invited based on an alphabetical list until the target was achieved.

We included patients with a DSM-5 SSD diagnosis (American Psychiatric Association [APA], 2013) who were 20 to 55 years old, able to speak and write in Italian. We excluded patients who were unable to provide informed consent or who reported severe cognitive deficits (i.e., a Mini-Mental State Examination corrected score lower than 24), a recent diagnosis (last 6 months) of substance use disorder according to DSM-5 criteria (APA, 2013), a history of clinically significant head injury, or cerebrovascular/neurological disease. From October 2020 to October 2021 620 patients with a diagnosis of SSD were recruited for participating in the study.

Patients included in the DiAPAson were thoroughly evaluated with several standardized instruments; details about the assessment can be found in the study protocol (de Girolamo et al., 2020) and Supplemental Table S1. Some of the assessment tools were completed by the treating clinician, while Research Assistants helped the patients complete self-reported questionnaires.

Assessment of daily time use and mood

The ecological EMA study was conducted on a subset of patients (N = 102, 16.2%) in treatment at 10 DMHs, due to

organizational and financial limitations. The EMA monitoring was preceded by a briefing session in which the research assistant gave instructions about the procedures and how to effectively perform them. The monitoring was followed by a debriefing section in which the same research assistant collected information on study acceptability and feasibility. During the debriefing session, outpatients received € 25.00 for travel expense reimbursement.

Daily time use (i.e., daily activities) and emotions were assessed with a questionnaire on a smartphone-based application for EMA, developed ad hoc for the project. The mobile application was composed of three sections: current activities, social contacts, and emotions. The first section asked 'What are you doing right now?' and the participants could choose one or more of the following activity categories: sleeping; staying sick in bed; eating/drinking/having breakfast or snack; self-caring (washing, dressing, go to the doctor, etc.); working or doing internship; studying/attending training courses, cleaning, cooking, tidying up the house or car, shopping; taking care of someone or something (people, animals, plants); voluntary working; doing leisure activities (e.g. having a social life, playing, chatting, reading, going to the cinema, playing an instrument, etc.); thinking, resting, doing nothing (without sleeping); doing sports or physical activity; getting around (on foot or by bicycle, car, public transport); watching TV or listening to the radio; participating to religious activities (e.g. going to mass, pray, etc.).

The second section asked 'Who are you with right now?' and the participants could choose 'Alone' or 'With other people'.

The third section showed seven emotions (i.e., happy, sad, tired, relaxed, nervous, quiet, full of energy) and asked the participant how he/she felt that emotion at that moment. The participant had to push on the screen and select the measure of that emotion on a bar from 0 (*not at all*) to 100 (*a lot*). All EMA items were chosen from an official 'Experience Sampling Method (ESM) Item Repository' (https://osf.io/kg376/) which provides detailed info (including psychometric information) about all items used in different EMA studies.

Notifications appeared 8 times a day, from 8 a.m. to 12 p.m., for 7 consecutive days. Notifications were semi-randomized (i.e., were randomly sent within the scheduled time slots) in the following time slots: 8 to 10 a.m., 10 to 12 a.m., 12 a.m to 2 p.m., 2 to 4 p.m., 4 to 6 p.m., 6 to 8 p.m., 8 to 10 p.m., 10 to 12 p.m. A reminder notification appeared after 15 minutes. The participant had a maximum of 30 minutes to reply.

Study setting: The COMIT study

The data of the general population examined in this study come from the fourth and fifth waves of the 'Monitoring Knowledge, risk perceptions, preventative behaviours and trust to inform pandemic outbreak response' project (Caserotti et al., 2022). As part of this broader data collection effort, coordinated by the WHO Regional Office for Europe (Bikbov et al., 2022; Caserotti et al., 2022; de Girolamo et al., 2022; Zarbo et al., 2022) the 142-item WHO questionnaire was administered to 5,002 Italian citizens aged 18 to 70 in May 2021 and March 2022. The sample was stratified by gender, age (18–34 years, 35–44 years, 45–54 years, 55–70 years), geographical area (Northwest, Northeast, Center, South, and Islands), population of place of residence (above and below 100,000 inhabitants), education level (up to lower middle school, beyond lower middle school) and employment (employed, not employed) to achieve national representativeness. In addition to the WHO questionnaire, during the fourth and fifth waves, we also administered the P-Scale. As the data collection was conducted in Italy, all measures were translated to – and administered in – Italian. The English version of the official study protocol is available on the WHO website (https://www.isrctn.com/ISRCTN21141466). More details about the COMIT Study and the WHO questionnaire used in this survey can be found in Supplemental Document 1.

The study was approved by the Ethics Committee at IRCCS Fatebenefratelli (protocol 286/2020, registration ISRCTN 26200758) and all participants gave their informed consent before participation.

The Positivity Scale (P-Scale)

The P-Scale is an eight-item questionnaire developed by Caprara et al. (2012) as a direct measure of POS. The 8 items are rated on a 5-point scale from 1 (*strongly disagree*) to 5 (*strongly agree*) with higher scores indicating one's higher POS.

Statistical analysis

Descriptive statistics were presented as counts and percentages for categorical variables and mean, standard deviations (SD), median, and range, for continuous variables. The normality distribution of continuous variables was tested both using the Kolmogorov-Smirnov test and by observing the empirical distributions and their residuals. Out of the 5,622 subjects included in the final database (620 patients and 5,002 healthy control subjects), a matching procedure was conducted using SAS software to pair 620 patients from the DiAPAson study with 5,002 healthy controls from the COMIT study.

The matching process involved the use of the 'psmatch' procedure in SAS, where patients were matched based on their sex and age. After applying the matching algorithm with a greedy method and a caliper of 10, a total of 620 patients were successfully paired with 3,881 healthy control subjects, resulting in a well-balanced study population.

We tested the measurement invariance of the P-Scale items across the DiAPAson and COMIT samples using Multigroup Confirmatory Factor Analysis (MCFA) within the framework of the structural equation model (Millsap, 2012). Measurement invariance examines whether a psychological scale produces equivalent scores when administered to two groups of individuals who have the same latent trait level (e.g., positivity) but may differ in a characteristic unrelated to the latent trait, such as the presence or absence of a clinical diagnosis (Mellenbergh, 1989). It's important to note that if patients in the DiAPAson sample report lower average scores on the P-Scale, it does not necessarily indicate a lack of measurement invariance.

The measurement invariance of the P-Scale would only be compromised if the scale resulted in lower scores for DiAPAson participants compared to COMIT participants, despite equal levels of latent positivity. In such a case, the P-Scale scores would not accurately reflect the latent positivity levels of DiAPAson participants and would carry a different meaning than the P-Scale scores for COMIT participants, making interpretation inconsistent between the two groups. The measurement invariance tests through MCFA involve the following steps: (1) testing the hypothesized factor model separately on each sample, and (2) comparing a series of nested MCFA models to examine the tenability of configural, metric, and scalar invariance. Configural invariance assesses whether items exhibit the same configuration of salient and nonsalient loadings (λ) across groups (Steenkamp & Baumgartner, 1998). Metric invariance tests the equivalence of loadings across groups, determining if the same items are equally good measures of the underlying construct in both samples. Scalar invariance imposes constraints on item intercepts (τ) and ensures the equality of scale origin between groups, which is necessary to compare latent means across groups. It's important to note that scalar invariance does not need to be fully established. If the majority of items demonstrate measurement invariance, latent means can still be compared (Kline, 2023). Thus, in this study, we will test for between-group differences in latent positivity while allowing for partial measurement scalar invariance (also referred to as strong invariance) (Dimitrov, 2010).

For the model, MCFA has employed the Robust Full Information Maximum Likelihood algorithm (Mplus estimator = MLM) to generate chi-square values and standard errors robust to non-normality. As the chi-square statistic is sensitive to sample size, we supplemented it with other fit indices, including the Comparative Fit Index (CFI), Tucker Lewis Fit Index (TLI), and Root Mean Square Error of Approximation (RMSEA) with associated 95% confidence intervals (CI). A CFI and TLI greater than .95 and an RMSEA lower than .08 were considered acceptable criteria for good model fit (Kline, 2023). Given the large differences in group sizes between the DiAPAson and COMIT samples, the power of MCFA can be reduced. To address this issue, we followed a procedure described by Yoon and Lai (2018). This involved repeating the steps 1,000 times with different subsamples of the COMIT sample, each of which had the same size as the total DiAPAson sample, using the Monte Carlo function in Mplus. The output of this analysis differed slightly from the usual MCFA output, as it included the mean and SD.

Furthermore, we expressed the difference between patients of the DiAPAson sample and healthy controls of the COMIT sample, in terms of P-Scale total score and single items, using as effect size, the Cohen's *d*. A d of 0.2 or smaller is considered to be a small effect size, a *d* of around 0.5 is considered to be a medium effect size, and a *d* of 0.8 or bigger is considered to be a big effect size (Cohen, 1992).

To assess the association between sociodemographic and clinical variables, daily life activities and positive and negative emotions, using EMA, and P-Scale score we performed linear regression, and univariate models.

All statistical tests were two-sided, and a *p*-value of $\leqslant .05$ was deemed significant. The data analysis has been done using the software SPSS 28.0 (IBM Corp, 2021), SAS for the matching procedure, and the program Mplus 8.33 (Muthén & Muthén, 2017) for the MCFA models.

Results

Sociodemographic and clinical characteristics of patients with SSD

The study sample consisted of 620 enrolled patients, with a mean age of 41.3 years (*SD* = 9.5). The majority of patients were male (68.1%), single (91.3%), and unemployed (61.2%). Approximately 55.3% of the participants resided in Residential Facilities (RFs), while the remaining 44.7% received outpatient treatment. A significant proportion of patients had a support network (69.9%) and exhibited satisfactory collaboration skills (81.5%). The Brief Psychiatric Rating Scale (BPRS) yielded a mean total score of 46.9 (*SD* = 14.8), while the Brief Negative Symptom Scale (BNSS) yielded a mean total score of 22.8 (*SD* = 15.7). The mean total score for the Scale of Independent Functioning (SLOF) was 178.7 (*SD* = 18.2). Patients self-reported a mean total score of 60.3 (*SD* = 14.6) on the World Health Organization Quality of Life (WHOQOL) (2020) questionnaire (Table 1). The sociodemographic and clinical characteristics of the subsample of patients assessed with EMA closely mirrored those of the overall group of patients with SSD (Supplemental Table S2).

Comparison of the P-Scale in the DiAPAson sample with the COMIT sample

As a preliminary step to test measurement invariance between the two samples, we conducted four Confirmatory

Table 1. Sociodemographic characteristics of the diapason sample.

	DiAPAson sample (*N* = 620)
Sex, *n* (%)	
Males	422 (68.1%)
Females	198 (31.9%)
Age (years)	
M (*SD*)	41.3 (9.5)
Median (range)	43 (18–55)
Education (years)	
M (*SD*)	11.7 (3.1)
median (range)	12 (1–23)
Marital status, *n* (%)	
Single/divorced or widowed	576 (93.0%)
Married or cohabiting	43 (7.0%)
Working status	
Working/studying	163 (26.3%)
Not working/studying	456 (73.7%)
Living situation	
RFs	313 (50.5%)
Private accommodation	307 (49.5%)
Support network	
Family/friends highly collaborative	244 (39.5%)
Family/Friends interested but not supportive	225 (36.4%)
Family/friends potentially available	74 (12.0%)
Absence of social support	75 (12.1%)
Collaboration skills	
Actively seeks treatment, willing to collaborate	325 (52.5%)
Wants to be helped, but lacks motivation	185 (29.9%)
Passively accepts the treatment/ intervention	69 (11.1%)
Does not show attention or compreh. for treatment efforts	37 (6.0%)
Actively refuses the treatment/ intervention	3 (0.5%)
Duration of illness (years)	
M (*SD*)	18.2 (9.5)
Median (range)	19 (0–49)
BPRS	
M (*SD*)	46.9 (14.8)
Median (range)	44 (24–105)
BNSS	
M (*SD*)	22.8 (15.7)
Median (range)	21 (0–78)
SLOF	
M (*SD*)	178.7 (21.2)
Median (range)	181 (95–215)
WHOQOL	
M (*SD*)	60.3 (14.6)
Median (range)	60 (6–100)

Factor Analyses (CFAs) separately to verify an adequate fit in the DiAPAson study sample, $\chi^2(18, N=620)=77.40$, $p<.01$, CFI = 0.961, TLI = 0.939, RMSEA = 0.073 [CI = 0.057, 0.090], SRMR = 0.034; and on the COMIT study sample, $\chi^2(18, N=3{,}881)=405.3$, $p<.01$, CFI = 0.955, TLI = 0.930, RMSEA = 0.074 [CI = 0.068, 0.081], SRMR = 0.033. In all samples, the one-factor model resulted in an adequate fit (Supplemental Table S3).

The configural invariance model showed a good fit to the data (Table 2). We therefore proceeded with tests of measurement invariance, by constraining factor loadings to be equal across studies (i.e., the metric invariance model). In testing this model, we also freed the variances of the latent positivity factor (Millsap, 2012). As shown in Table 2, this model showed a good fit and was not substantively different from the configural model according to the nonsignificant partial chi-square test and to the partial CFI. Unstandardized and completely standardized loadings estimate from this model are reported in Table 3. Next, we constrained item intercepts to be equal across samples (i.e., the scalar invariance model). In this model, we freed the latent means of the latent Positivity factor in the COMIT sample, keeping the same mean fixed to zero in the DiAPAson sample. Accordingly, the estimated means in the COMIT sample can be interpreted as the difference relative to the DiAPAson sample. Moreover, because the measurement unit corresponds to the standard deviation of self-rated factors, these scores correspond to standardized mean differences.

This model showed a good fit. However, it was substantively different from the configural model (Table 2). Partial metric invariance was established after allowing items PO1, PO4, and PO6 to have different loadings for the DiAPAson and the COMIT study (Table 2). According to the effect size devised by Pornprasertmanit (2022), differences in intercept estimated for these items were moderate (Pornprasertmanit, 2022), and suggested that subjects in the DiAPAson study rated these items related to the optimism component of positivity systematically more positively than individuals in the COMIT study. Lifting equality constraints allows us to reliably evaluate differences in latent means between the two samples because in this way these items do not participate in defining the factor mean difference. This estimated difference resulted was negligible according to Cohen (1992) and not statistically significant (0.035, $p = .190$) (Table 4).

Association between sociodemographic and clinical variables and P-Scale score

Table 5 shows the associations between P-Scale scores and sociodemographic and clinical variables. No significant associations were found between P-Scale and sociodemographic variables, except for the support network with a significant inverse association ($B = -0.586$; [95% CI = −1.136, −0.037]; $p = .036$). A significant inverse association was observed between the P-Scale scores and the

Table 2. Results from measurement invariance of the P-Scale items across the DiAPAson and COMIT samples.

	χ^2	*df*	CFI	TLI	RMSEA	SRMR
M1. Configural						
Average est.	159.03	36	0.958	0.934	0.074	0.006
SD	18.93		0.006	0.01	0.005	0.004
M2. Metric invariance						
Average est.	172.19	43	0.955	0.942	0.069	0.042
SD	19.64		0.007	0.009	0.005	0.004
M3. Scalar						
Average est.	258.36	50	0.928	0.919	0.082	0.059
SD	22.91		0.008	0.009	0.005	0.004
M4. ScalarPartial (item1, item 4, item 6)						
Average est.	181.23	47	0.954	0.945	0.068	0.045
SD	20		0.007	0.008	0.005	0.004
	$\Delta\chi^2$	Δdf	*p*	ΔCFI	ΔTLI	$\Delta RMSEA$
M2 versus M1	13.16	7	0.068	−0.003	0.008	−0.005
M3 versus M2	86.17	7	0.000	−0.027	−0.023	0.013
M4 versus M4	9.04	4	0.060	−0.001	0.003	−0.001

Note. χ^2 = Chi-square; CFI = Comparative Fit Index; TLI = Tucker-Lewis Fit Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual; Average Est = Average Estimate; *SD* = Standard Deviation; M1–M4 = Model1 to Model 4.

Table 3. Parameter estimates from the best fitting measurement invariance model of the P-Scale items across the DiAPAson and COMIT samples.

	λ	τ		$\Delta\tau_{g1,g2}$
	G1,G2	*G1*	*G2*	
PO1. I have great faith in the future	0.80 (.65)	3.45	3.05	0.30
PO2. I am satisfied with my life	1.02 (.75)	3.23		0.00
PO3. Others are generally here for me when I need them	0.59 (.46)	3.86		0.04
PO4. I look forward to the future with hope and enthusiasm	0.92 (.67)	3.63	3.18	0.33
PO5. On the whole. I am satisfied with myself	1.06 (82)	3.52		0.00
PO6. At times. the future seems unclear to me (reverse scored)	0.53 (.38)	3.05	2.67	0.27
PO7. I feel I have many things to be proud of	0.92 (.74)	3.60		−0.04
PO8. I generally feel confident in myself	0.98 (.73)	3.45		0.02

Note. Valued within brackets are completely standardized loadings. All loadings and intercepts are significant ($p < .05$). One estimate means an invariant parameter. Two columns means that a parameter is not invariant across DiAPAson (i.e., *G1*) and COMIT (i.e., *G2*) groups. These values are on a standardized scale and thus, according to Cohen (1992) values of .20, .50, and .80 can be interpreted as small, medium, and large. λ = loadings; τ = intercepts; $\Delta\tau_{g1,g2}$ = Standardized differences between intercepts.

Table 4. Comparison of P-Scale scores in the DiAPAson sample and in a sample of the Italian general population matched by sex and age.

	DiAPAson sample *N* = 620	COMIT sample *N* = 3,881	*p*	Effect size
PO1. I have great faith in the future	3.5 (1.3)	3.2 (1.2)	**<.001**	**0.227**
PO2. I am satisfied with my life	3.2 (1.3)	3.4 (1.2)	**0.030**	**0.123**
PO3. Others are generally here for me when I need them	3.9 (1.2)	3.9 (1.1)	0.443	0.009
PO4. I look forward to the future with hope and enthusiasm	3.6 (1.3)	3.3 (1.2)	**<.001**	**0.238**
PO5. On the whole. I am satisfied with myself	3.5 (1.2)	3.7 (1.1)	**0.018**	**0.139**
PO6. At times. the future seems unclear to me (reverse scored)	3.0 (1.3)	2.7 (1.2)	**<.001**	**0.224**
PO7. I feel I have many things to be proud of	3.5 (1.2)	3.7 (1.0)	**<.001**	**0.188**
PO8. I generally feel confident in myself	3.5 (1.3)	3.6 (1.1)	0.135	0.084
Positivity Scale Total score, *M* (*SD*)	**27.6 (6.9)**	**27.4 (6.3)**	0.190	0.035

Note. Bold values denote statistical significance at the $p < .05$ level.

Table 5. Association between sociodemographic and clinical variables and P-Scale score.

	B	95% CI	*p*-Value
Sex (male)	0.327	[−0.849, 1.504]	.585
Age (years)	0.016	[−0.042, 0.074]	.591
Education (years)	−0.084	[−0.262, 0.094]	.356
Marital status (married or cohabiting)	0.902	[−1.250, 3.053]	.411
Working status (working/studying)	1.049	[−0.192, 2.290]	.097
Living situation (outpatients)	−0.554	[−1.651, 0.543]	.322
Support network[a]	−0.586	[−1.136, −0.037]	**.036**
Duration of illness (years)	0.015	[−0.043, 0.073]	.615
BPRS	−0.101	[−0.138, −0.065]	**<.001**
Depression/anxiety	−2.918	[−3.562, −2.274]	**<.001**
Positive symptoms	−1.078	[−1.635, −0.522]	**<.001**
Negative symptoms	−0.908	[−1.467, −0.349]	**.001**
Maniac excitement	−0.160	[−0.874, 0.553]	.660
Cognition	−0.521	[−1.236, 0.193]	.153
BNSS	−0.113	[−0.146, −0.079]	**<.001**
Alogia	−0.475	[−0.830, −0.121]	**.009**
Anhedonia	−1.226	[−1.575, −0.878]	**<.001**
Distress	−0.738	[−1.057, −0.419]	**<.001**
Avolition	−1.162	[−1.503, −0.820]	**<.001**
Blunted affect	−0.540	[−0.897, −0.183]	**.003**
Asociality	−1.174	[−1.519, −0.829]	**<.001**
SLOF	0.058	[0.033, 0.084]	**<.001**
Physical functioning	1.025	[−0.305, 2.356]	.131
Personal care skills	0.709	[−0.160, 1.577]	.109
Interpersonal relationships	1.867	[1.214, 2.520]	**<.001**
Social acceptability	0.794	[−0.412, 2.001]	.196
Activities of community living	1.080	[0.306, 1.853]	**.006**
Work skills	1.089	[0.565, 1.613]	**<.001**
WHOQOL	0.310	[0.281, 0.338]	**<.001**
Physical health	0.207	[0.179, 0.235]	**<.001**
Psychological health	0.280	[0.259, 0.301]	**<.001**
Social relationships	0.163	[0.139, 0.187]	**<.001**
Environment	0.197	[0.165, 0.229]	**<.001**

Note. Linear regression univariate models with P-Scale as dependent variable and relevant factors as independent variables. Bold values denote statistical significance at the $p < .05$ level.
[a]From 1 = *Family/friends highly coll.* to 4 = *No social support*.

BPRS total ($B = -0.101$; [95% CI = −0.138, −0.065]; $p < 0.001$) and the following BPRS subscales: Depression and anxiety ($B = -2.918$; [95% CI = −3.562, −2.274; $p < .001$); Positive symptoms ($B = -1.078$; [95% CI = −1.635, −0.522]; $p < .001$); and Negative symptoms ($B = -0.908$; [95% CI = −1.467, −0.349]; $p = .001$).

A significant inverse association was also found between the P-Scale scores and BNSS scores ($B = -0.113$; [95% CI = −0.146, −0.079], $p < .001$), as well as all BNSS subscales.

A significant direct association was reported between the P-Scale scores and the SLOF scores ($B = 0.058$; [95% CI = 0.033, 0.084]; $p < .001$) and in the following SLOF subscales: Interpersonal Relationship ($B = 1.867$; [95% CI = 1.214, 2.520]; $p < .001$); Activities of Community Living ($B = 1.080$; [95% CI = 0.306, 1.853]; $p = .006$); and Work Skills ($B = 1.089$; [95% CI = 0.565, 1.613]; $p < .001$).

A significant direct association was also found between the P-Scale scores and the WHOQOL scores ($B = 0.310$; [95% CI = 0.281, 0.338]; $p < .001$) and all WHOQOL subscales.

Association between daily life activities and positive and negative emotions and P-Scale score in the DiAPAson subsample assessed by EMA

Table 6 shows the association between P-Scale scores and daily life activities and emotions as assessed with EMA in the subsample of 102 patients with SSD. There was a

Table 6. Association between daily life activities and positive and negative emotions and P-Scale score in the DiAPAson subsample assessed by EMA.

	B	95% CI	*p*-Value
Non-productive activities	−0.761	[−2.029, 0.507]	.237
Productive activities	0.354	[−0.365, 1.073]	.331
Leisure activities	−0.211	[−1.022, 0.601]	.608
Physical activities	0.721	[−2.232, 3.675]	.629
Self-Care	0.571	[−0.491, 1.633]	.289
Religious activities	1.360	[−1.731, 4.451]	.385
Positive emotions	0.167	[0.101, 0.233]	**<.001**
Negative emotions	−0.201	[−0.284, −0.118]	**<.001**
Alone	−0.135	[−0.995, 0.725]	.756

Note. Bold values denote statistical significance at the $p < .05$ level. Numbers in the same table are different between daily life activities and emotions because they have a different unit of measure: the numbers of 'click' done by the patients for each received notification on the smartphone app, and the selection of a point on a bar with a range from 0 to 100 for the emotions. Linear regression univariate models with P-Scale as dependent variable and daily life activities and positive and negative emotions as independent variables in the DiAPAson subsample assessed by EMA.

significant direct association between P-Scale scores and Positive Emotions (B=0.167; [95% CI=0.101, 0.233]; $p < .001$), while the opposite was true for P-Scale scores and Negative Emotions (B=−0.201; [95% CI=−0.284, −0.118]; $p < .001$). No significant associations were observed between the other independent variables and the P-Scale scores.

Discussion

This study aimed to compare POS levels in individuals with SSD to a matched normative sample from Italy and investigate how POS affects daily time use, functioning, and mood using EMA.

It is the first investigation of its kind to explore the relationship between POS and time use in individuals with SSD using EMA. Contrary to our hypothesis, our results indicate that individuals with SSD exhibit similar self-reported P-Scale scores compared to controls from the general population (Strauss et al., 2017). This finding suggests that the ability to perceive the world positively remains strong in individuals with severe mental disorders and varying levels of psychosocial disability. This resilience could be seen as a valuable resource to utilize and prioritize.

Our findings support the association between POS and psychiatric symptoms in individuals with SSDs (Gard et al., 2007; Kring & Caponigro, 2010; Strauss et al., 2017). Consistent with previous research (Najas-Garcia et al., 2018), individuals with SSD who reported higher levels of POS exhibited less severe symptoms, including negative symptoms such as anhedonia.

Furthermore, our data confirm that individuals with SSD reporting higher levels of POS also demonstrated higher quality of life and better functioning (Najas-Garcia et al., 2018). Over the past few decades, there has been a growing interest in studying the relationship between POS and individual functioning. Significant efforts have been made to identify the main determinants and appropriate indicators of optimal functioning (Caprara et al., 2012), with particular emphasis on the importance of positive emotions and cognition (Vazquez, 2017). Interestingly, we found that higher POS was associated only with specific aspects of functioning in individuals with SSDs. Specifically, POS showed no association with physical functioning, as assessed by SLOF.

The lack of association between POS and physical functioning can be understood by considering that it only focuses on diagnosed physical health conditions. POS was also not linked to personal care skills assessed by SLOF, which is unexpected since self-care is crucial for overall well-being. However, achieving self-care remains a common objective for individuals with SSDs due to potential negative symptoms affecting body perception and personal hygiene neglect (Rose & Glass, 2008; Vazquez, 2017).

On the other hand, individuals with SSDs reporting higher POS levels showed improved interaction skills, work abilities, and engagement in pleasant activities according to SLOF. Therefore, we expected that higher POS levels would lead to prioritizing leisure activities and productive pursuits, but the EMA survey results did not show a significant increase in such activities among individuals with SSDs reporting higher POS levels.

Interestingly, POS levels were associated with having a stronger support network, but they were not associated with other sociodemographic variables such as marital status, employment status, and living situation. These variables are typically recognized as important features of adulthood that relate to the roles individuals with psychosocial disabilities need to fulfill in order to achieve independence (Goldstone, 2020; Martinelli et al., 2023). This observation suggests the importance of understanding the real needs of patients (Rose & Glass, 2008) and evaluating whether patients develop a dependency on support networks provided by mental health services (World Health

Organization, 2010) and/or other caregivers (Bonavigo et al., 2016; Martinelli et al., 2022).

Strengths and limitations

A strength of this study is the use of EMA, collecting real-time longitudinal data and reducing biases. However, a limitation is that the DiAPAson and COMIT samples were assessed at different time points during the COVID-19 pandemic, potentially affecting the results. Our clinical sample included 620 individuals with SSD, excluding those with cognitive deficits assessed by MMSE, so our findings may not generalize to other psychiatric diagnoses, more severe symptoms, or cognitive impairments.

Conclusion

This study compared POS levels in individuals with SSD to an Italian normative sample using EMA. Higher POS was associated with better functioning, quality of life, and less severe symptoms in individuals with SSD. It also correlated with higher levels of positive emotions and lower levels of negative emotions. P-Scale scores in SSD patients were comparable to the Italian normative sample. No significant correlations were found between POS and daily activities. These findings highlight the need to integrate POS in rehabilitation programs for better outcomes. Further research is needed to explore the complex relationship between POS and time use in individuals with SSD using EMA.

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Availability of Data and Materials

Dataset referring to this manuscript is published with restricted access on Zenodo platform and accessible at this link: https://doi.org/10.5281/zenodo.8119376

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Ethical Standards

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 200. The study has been approved by the ethical committees (ECs) of the three main participating centers: EC of IRCCS Istituto Centro San Giovanni di Dio Fatebenefratelli (31/07/2019; no. 211/2019), EC of Area Vasta Emilia Nord (25/ 09/2019; no. 0025975/19), and EC of Pavia (02/09/2019, no. 20190075685) and by the ECs of all participating sites. All participants provided informed consent to the participation.

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Supplemental Material

Supplemental material for this article is available online.

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