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Validation of the Social Effort and Conscientious Scale (SEACS) in Schizophrenia

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Abstract
People with schizophrenia often experience impaired social functioning and low satisfaction with relationships. Existing measures of social impairment in schizophrenia primarily assess pleasure derived from social interactions, rather than examining impairments in social motivation, including effortful behavior. We conducted a validation study of a recently developed self-report measure of social effort in 31 participants with schizophrenia spectrum disorders, including tests of association with standard assessments of social functioning and behavior in daily life using ecological momentary assessment (EMA). We also assessed predictive validity of the scale, measuring the extent to which social effort at baseline predicted changes in social functioning over a 60-day smartphone-based social intervention. Higher social effort was associated with greater social functioning and lower negative symptom severity at baseline. Baseline social effort did not predict changes in social functioning over the intervention period, nor was it related to EMA-reported social experiences. Thus, tendencies toward social effort exertion may capture meaningful variance in gold-standard assessments of social functioning and negative symptoms, but may not track with social experiences in daily life. Further research should examine whether social effort is sensitive to change, and evaluate the utility of targeting social effort in evidence-based interventions for improving the social functioning in schizophrenia.

Keywords Schizophrenia · Social effort · Social functioning · Negative symptoms · Experience sampling · Mobile interventions

People with schizophrenia often have reduced social functioning (Oorschot et al., 2013) and a small social network size, including number of friends and people they feel they can reach out to for support (Horan et al., 2006; Lipton et al., 1981; Macdonald et al., 2000; Mote & Fulford, 2020). In daily life, people with schizophrenia report more social stress, spend less time with others, and have a greater preference to be alone when with others compared to healthy controls (Mote & Fulford, 2020).These challenges are often chronic (Velthorst et al., 2017) and lead to high rates of loneliness and desire for more friends (Stain et al., 2012), but do not improve with pharmacological treatments (Aleman et al., 2017).

Several factors contribute to these social impairments, including difficulties with social skills (Bellack et al., 1990; Couture et al., 2006) and social cognition (Couture et al., 2006; Penn et al., 2001). More severe negative symptoms, including motivation and pleasure deficits, are also associated with less frequent social interactions in people across the psychosis spectrum (Fulford et al., 2013; Robertson et al., 2014; Siegrist et al., 2015). Characteristic social perception difficulties—as in the identification and discrimination of facial affect from social partners, or reduced knowledge of the rules of appropriate social behavior (Couture et al., 2006; Penn et al., 2001)—make social interactions even more challenging for people with schizophrenia.

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Furthermore, high rates of unemployment and other financial barriers reduce opportunities for social connection Fulford, Mote, et al., 2021).

Taken together, these difficulties may contribute to reduced effort to form and maintain social bonds among people with psychosis (Fulford, Treadway, et al., 2018). Features of fulfilling social interactions, such as provision of social support and the ability to express empathy towards a friend, require mental and emotional effort (Cameron et al., 2019; Francis et al., 2020). Despite reported desire for improved social connection, people with schizophrenia set fewer social goals and choose goals that require less effort (e.g., "eating a ready-made meal" or "passing time," compared to "learning a new skill" or "making friends"), resulting in fewer positive long-term outcomes (Gard et al., 2014).

We conceptualize the actions required to form and maintain social relationships (i.e., social effort) as the behavioral output of negative symptoms, such as reduced pleasure and asociality. Gold standard assessments of negative symptoms, such as the Scale for the Assessment of Negative Symptoms (SANS; Andreasen, 1989) or the Clinical Assessment Interview for Negative Symptoms (CAINS; Kring et al., 2013), conflate reduced social interest and pleasure with the behavioral outputs of such impairment (Marder & Galderisi, 2017). No existing assessments isolate the measurement of social effort exertion specifically, which should more directly reflect social impairments than anticipated or consummated social pleasure (Catalano et al., 2022; Fulford, Campellone, et al., 2018; Fulford, Treadway,et al., 2018). Moreover, gold standard assessments of negative symptoms involve lengthy clinical interviews with trained raters, limiting their utility in clinical settings. Despite the potential importance of effortful behavior for forming and maintaining social bonds, there are currently no self-report measures of social effort validated in people with schizophrenia.

We recently developed the Social Effort and Conscientious Scale (Abplanalp et al., 2021), a brief measure of tendencies to exert social effort. We demonstrated evidence of reliability and validity of the SEACS in two geographically distinct college samples and in a community-based online sample of adults. The SEACS includes two factor-analytically derived subscales: one set of items focuses on tendencies toward general effort for social connection (Social Effort), and another represents effort to adhere to social norms (Social Conscientiousness). In our initial validation study, low scores on both SEACS subscales were associated with greater depression and social anxiety, and high scores were associated with greater degree of social connection.

To our knowledge, this is the first study examining the associations among social effort, negative symptoms, and social functioning in people with schizophrenia. We examined convergent validity of the SEACS with gold standard measures of negative symptoms and social functioning, and discriminant validity by measuring associations with positive symptoms of psychosis (which theoretically should not be strongly tied to social effort). We predicted that higher social effort would be associated with less severe negative symptoms and greater social functioning. We also aimed to explore whether social effort predicted changes in social functioning over time, and if it was associated with greater real-world social behavior as assessed using ecological momentary assessment.

Method

Data for this study were derived from an open pilot trial of a mobile intervention to address social functioning impairment in schizophrenia (Fulford et al., 2020). The intervention was designed to improve relationships with family, friends, or romantic partners through social goal support. Participants were prompted twice daily over a period of 60 days to report on social motivation (e.g., interest in social interaction), occurrence of recent interactions, and appraisals of those interactions (e.g., perceived social competence). Participants were recruited from outpatient treatment centers using fliers and word-of-mouth. Inclusion criteria were a diagnosis or schizophrenia or schizoaffective disorder, ages between 18 and 65, and fluency in English. Participants also had to be receiving pharmacological or psychotherapy treatment. Exclusion criteria were current substance use disorder or suicidal ideation, or self-reported neurological disorder. Seven of our participants discontinued the study due to technical difficulties with the mobile application, were lost to follow up, or were no longer being interested in the study after enrollment. Our final sample ($N = 31$, 52% men) included participants ages 22 to 65. Approximately half (45%) of participants had schizoaffective disorder, with 58% of participants were unemployed. Sample characteristics are presented in Table 1. This study was approved by the Institutional Review Boards and all participants provided written informed consent prior to their participation.

Measures

Social Effort

Social effort was assessed at baseline using the Social Effort and Conscientious Scale (Abplanalp et al., 2021), a self-report measure of general tendencies to exert social effort. Items from the Social Effort (SEACS-SE) subscale measure behavioral effort to form and maintain social bonds (e.g., "I often arrange events with other people", "I am often the one to call friends and/or family when I haven't spoken to them

Table 1 Demographic Characteristics *(N = 31)*

Characteristic	*n/Mean*	*%/SD*
Age	46.10	11.07
Gender		
Female	14	45.16
Male	16	51.61
Non-binary	1	3.23
Diagnosis		
Schizophrenia	17	54.84
Schizoaffective Disorder	14	45.16
Ethnicity/Race		
Asian	9	29.03
African American	5	16.13
White	14	45.16
Mixed Race	3	9.68
Employment Status		
Employed	13	41.93
Unemployed	18	58.06
Marital Status		
Married/Cohabitating/Divorced	4	12.91
Never Married	27	87.09
Highest Level of Education		
Less than high school	1	3.22
Graduated High School or Equivalent	6	19.35
Anything more than high school	24	77.42

in a while"), while items from the Social Conscientiousness (SEACS-SC) subscale assess effort in the service of adhering to social norms (e.g., "I present myself in a way that makes a good impression on others", "I compliment others when they have done something well"). Higher scores reflect greater tendencies toward exerting effort. In the initial validation study, higher scores on both subscales were associated with lower social anhedonia, social anxiety, and depression, and higher agreeableness and extraversion, in both college and community adult samples.

Social Functioning

We assessed social functioning at baseline and after the 60-day intervention (i.e., at treatment termination) using two well-validated clinical instruments frequently used in psychosis research studies. The Heinrichs Quality of Life Scale-Interpersonal Relations subscale (QLS-IR; Heinrichs et al., 1984) assesses the quality and quantity of social relationships over the past 30 days as part of a measure of functioning administered by a trained interviewer. Eight items on the QLS-IR assess the quality and quantity of relationships with family, close friends, acquaintances, and romantic partners, as well as experiences of social withdrawal and initiative, and instrumental social support. Self-reported social functioning was also assessed using the Social Functioning Scale (SFS; Birchwood et al., 1990). The SFS includes subscales that capture social withdrawal, interpersonal functioning, prosocial behavior, recreational activities, independence performance and competence, and role functioning. We examined the normed, total scale score in the current study. For both the SFS and the QLS-IR, higher scores reflect more adaptive social functioning.

Negative Symptoms

The Clinical Assessment Interview for Negative Symptoms (CAINS; Kring et al., 2013) is a 13-item interview designed to assess two primary facets of negative symptoms, including reduced expressiveness (i.e., affect and speech) and reduced motivation and pleasure (MAP). We focused specifically on the MAP subscale for this study, with higher scores reflect greater impairments in motivation and pleasure. Negative symptoms were assessed at baseline.

Positive Symptoms

The Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 1962) was administered at baseline by a trained interviewer. We specifically assessed positive symptoms, including somatic concern, grandiosity, suspiciousness, hallucinations, unusual thought content, bizarre behavior, disorientation, and conceptual disorganization. Higher scores are indicative of more severe positive symptoms.

Ecological Momentary Assessment (EMA) of Daily Social Experiences

As part of a larger mobile intervention study (see Fulford et al., 2020), participants received surveys via push notifications delivered through the Ethica application (www.ethicadata.com), installed on a smartphone device that participants were gifted as part of compensation for their participation. Surveys were administered two times per day over the 60-day intervention period. At the end of each survey, participants were also offered the opportunity to review the mobile intervention content designed to help support their progress toward their pre-selected social goal. EMA items measured desire to interact with others, number of recent interactions, and a composite of three items assessing positive appraisals of recent interactions (see Table 2). Higher scores indicate better social functioning, more social behavior, and more positive appraisals of interactions.

Data Analyses

We first examined descriptive statistics and frequency distributions of baseline measures to characterize the sample demographics and constructs of interest. We ran bivariate correlations between social effort (SEACS) and the other

Table 2 *EMA-reported social experiences*

EMA Variable	EMA Question	Answer Choices
Number of recent interactions	*How many conversations did you have in person, by phone/text, or online since the last time you filled out a survey?*	*None* *1* *2* *3 or more*
Positive social appraisals	*How well do you think you communicated in those conversations?* *Were the conversations you had worth the effort?* *What do you think other people thought of you in those conversations?*	*I did not communicate well at all* *I communicated OK* *I communicated well* *I communicated very well* *Not worth the effort at all* *Kind of worth the effort* *Worth the effort* *Definitely worth the effort* *Very unlikable* *Somewhat unlikable* *Neither likable or unlikable/unsure* *Somewhat likable* *Very likable*
Desire to have social interactions with others	*How much would you like to talk to or interact with someone right now?*	*Not at all* *A little* *A moderate amount* *Quite a bit* *Extremely*
Motivation to work on social goal	*Would you like to take any steps towards the following social goal today?*	*None for now* *Yes*

assessments completed at baseline, including negative symptoms (CAINS), social functioning (SFS and QLS-IR), and positive symptoms (BPRS). Because participant gender was an important moderator for social functioning outcomes in the digital intervention (Fulford et al., 2021), and previous studies have highlighted gender differences in social processes across the psychosis spectrum (Leung & Chue, 2000; Lindamer et al., 2003; Rietschel et al., 2017; Willhite et al., 2008), we included gender as a covariate in regression models of associations between social effort and other outcomes. To evaluate the extent to which social effort predicted change in social functioning over the intervention period, we ran two parallel multiple regression analyses with SEACS score as the predictor and social functioning measures (SFS and QLS-IR) at treatment termination as the outcome, controlling for social functioning at baseline. Finally, we examined the association between social effort at baseline (fixed effect predictor of the intercept) and daily social experiences via EMA (outcome) using multilevel modeling. Consistent with the regression models, we ran these multilevel models including gender as an additional covariate (Level 2 fixed effect). Multilevel models were run in Mplus version 8 (Muthén & Muthén 1998–2017) using maximum likelihood estimation.

Results

There were no differences in measures at baseline (QLS-IR, CAINS-MAP, SEACS, and SFS) as a function of gender, employment status, race, or diagnosis. People who were married or cohabitating ($n = 4$) had significantly higher self-reported social functioning (SFS $M/SD = 117.22 \pm 5.91$) and lower severity of negative symptoms (CAINS-MAP $M/SD = 0.67 \pm 0.61$) compared to participants who were never married (SFS: M/SD 106.63 ± 6.30, $t(29) = 3.16$, $p = 0.004$, $d = 1.69$; CAINS-MAP: 1.79 ± 0.59, $t(29) = -3.75$ $p = 0.001$, $d = 1.89$). No univariate or multivariate outliers were identified from our visual analysis of distributions and scatter plots.

Associations Between Social Effort, Symptoms, and Functioning

When looking at the association between social effort and clinical measures at baseline, both higher social effort (SEACS-SE) and social conscientiousness (SEACS-SC) were associated with significantly lower severity of negative symptoms (CAINS-MAP; r values = -0.49 and -0.43, respectively; p values < 0.05; see Fig. 1A and B). Higher SEACS-SE and SC scores were also associated with significantly better social functioning on interviewer-rated (QLS-IR; $r = 0.44$ and 0.36, respectively; p's < 0.05; see Fig. 2A and B) and self-reported social functioning (SFS; $r = 0.54$ and 0.36, respectively; p's < 0.05) (see Fig. 2 C and 2D). When controlling for gender, associations between social effort (SEACS-SE) and social functioning remained positive and significant (SFS: $b = 3.58$, $SE = 1.10$, $p = 0.003$; QLS-IR: $b = 0.60$, $SE = 0.23$, $p = 0.013$); however, associations between social conscientiousness (SEACS-SC) and social functioning did not (SFS: $b = 2.21$, $SE = 1.15$, $p = 0.065$; QLS-IR: $b = 0.44$, $SE = 0.22$, $p = 0.059$). As expected, positive symptoms (BPRS) were not significantly associated with social effort (SEACS-SE; $r = 0.21$, $p = 0.26$) or social conscientiousness (SEACS-SC; $r = 0.09$, $p = 0.65$), providing evidence of discriminant validity of the scale.

We also assessed if social effort at baseline predicted changes in social functioning after the 60-day intervention. We found that social effort did not predict changes in social functioning measured by the QLS-IR (SEACS-SE: $b < 0.01$, $p = 0.99$; SEACS-SC: $b = 0.09$, $p = 0.62$) and the SFS (SEACS-SE: $b = 0.33$, $p = 0.76$; SEACS-SC: $b = 0.58$, $p = 0.53$) at treatment termination.

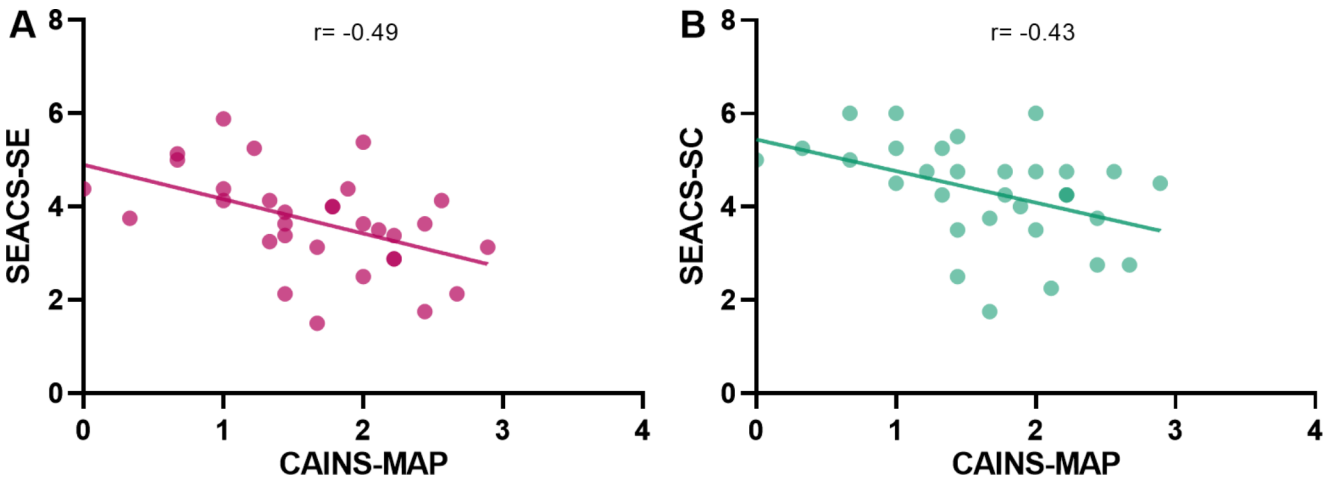

Fig. 1 Associations between Social Effort and Motivation and Pleasure Negative Symptoms. (Note. CAINS-MAP = Clinical Assessment Interview of Negative Symptoms, Motivation and Pleasure scale; SEACS-SE = The Social Effort and Conscientiousness Scale-Social Effort Subscale; SEACS-SC = The Social Effort and Conscientiousness Scale-Social Conscientiousness Subscale)

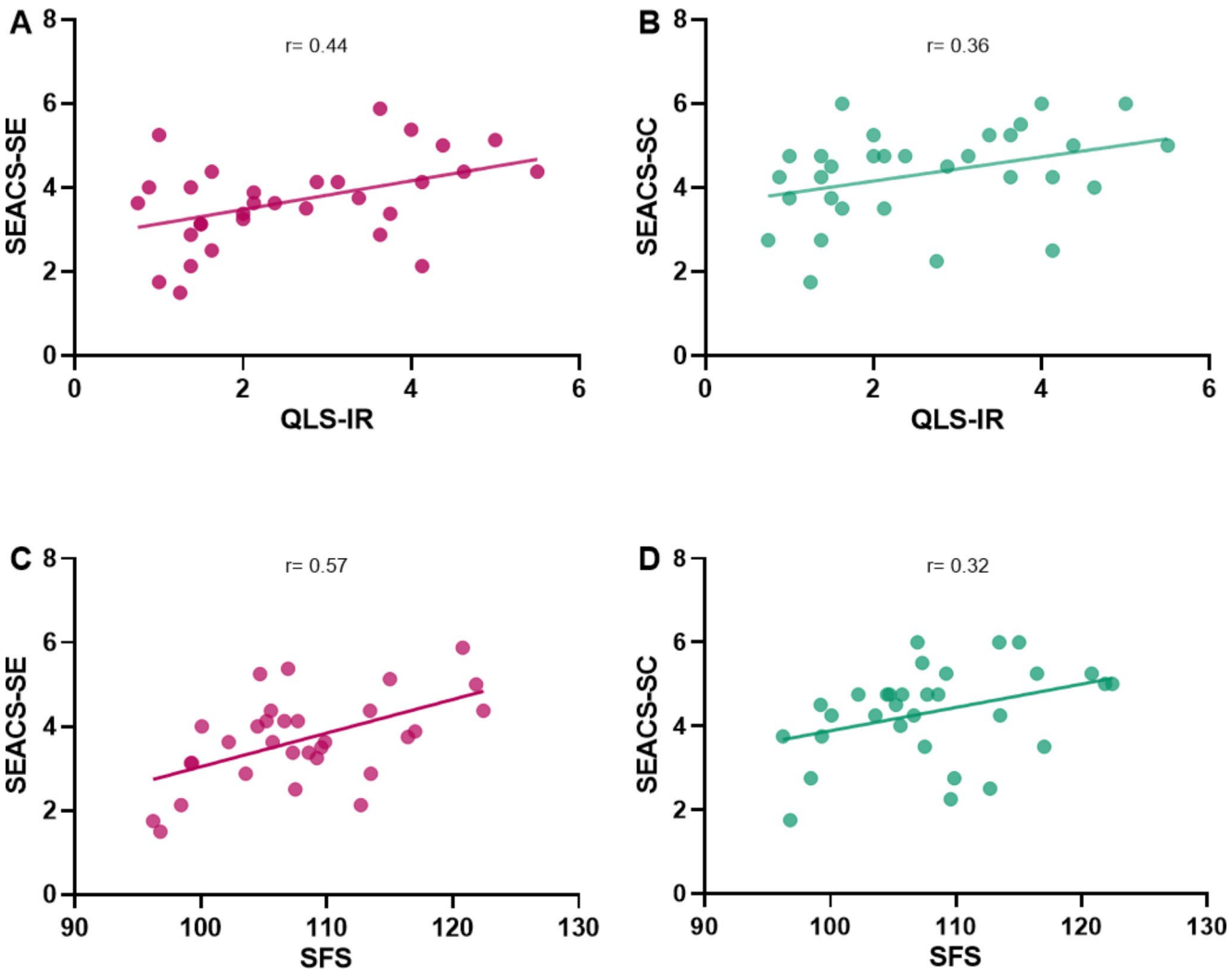

Fig. 2 Associations between Social Effort and Social Functioning (Note. QLS-IR = Quality of Life Scale: Interpersonal Relations Subscale; SEACS-SE = The Social Effort and Conscientiousness Scale-Social Effort Subscale; SEACS-SC = The Social Effort and Conscientiousness Scale-Social Conscientiousness Subscale; SFS = Social Functioning Scale)

Table 3 *Associations between social effort and social functioning*

Social Function Outcome	*b*	*SE*	*p*	*95% CI*
SFS				
Gender	0.23	2.32	0.92	-4.53–5.00
SEACS-SE	3.58	1.10	< 0.01	1.31–5.84
Gender	-1.05	2.51	0.68	-6.20–4.09
SEACS-SC	2.21	1.15	0.07	-0.15–4.58
QLS-IR				
Gender	0.41	0.48	0.40	-0.57–1.38
SEACS-SE	0.60	0.23	0.01	0.14–1.06
Gender	0.20	0.49	0.68	-0.80–1.20
SEACS-SC	0.44	0.22	0.06	-0.02–0.90

Note. SEACS-SE = The Social Effort and Conscientiousness Scale-Social Effort subscale; SEACS-SC = The Social Effort and Conscientiousness Scale-Social Conscientiousness subscale; QLS-IR = Quality of Life Scale-Interpersonal Relations subscale; SFS = Social Functioning Scale; Gender included male and female (one non-binary participant was excluded from analysis)

Associations Between Social Effort and Daily Social Experiences

We then examined associations between social effort at baseline and EMA-reported social experiences during the intervention using multilevel modeling. Self-reported social effort—measured by both the SEACS-SE and SEACS-SC—was not associated with EMA-reported social experiences (see Table 3). We also ran multilevel models that included gender as an additional fixed effect covariate, given associations between gender and daily social experiences (e.g., number of interactions). In these models, social effort remained unrelated to daily social experiences.

Discussion

In this study, we measured the degree to which a brief measure of social effort was associated with negative symptoms and social functioning in people with schizophrenia. We provided initial evidence of criterion-related validity of the scale in a clinical population, given moderate associations with gold-standard measures of social functioning and negative symptoms among people with schizophrenia. We also demonstrated that the SEACS was not significantly associated with positive symptoms, suggesting evidence of discriminant validity. Despite these findings, we did not find that the SEACS was associated with change in social functioning over time, nor with daily social experiences reported via EMA.

To our knowledge, this is the first measure that captures tendencies toward social effort exertion, without the confounding contributions of interest in or pleasure derived from social interactions. Our study provides evidence of the scale's relevance for capturing variation in social functioning and negative symptoms among people with schizophrenia. Social effort is an important construct to measure in psychopathology given its potential role in driving social impairment (Abplanalp et al., 2021; FeldmanHall & Shenhav, 2019; Fulford, Campellone, et al., 2018). For example, adequate effort directed toward forming and maintaining social bonds, including behaviors that conform to social norms, may be mechanisms through which social interest or desire leads to social goal attainment. When such efforts are limited, perhaps due to either fear of rejection or lack of perceived benefit, the likelihood of attaining desired social goals (e.g., staying in touch with a friend, meeting someone new) is reduced (de la Asuncion et al., 2015; Green & Phillips, 2004). In our previous work we demonstrated that social encouragement can serve to enhance social effort, in both those with and without schizophrenia (Fulford, Treadway, et al., 2018). Further research should explore whether other approaches, such as breaking down social interactions and goals into smaller, more achievable steps, might also result in higher social effort that, over time, would lead to improved social outcomes. Because we only measured social effort at one point in time in the current study, future work could address these questions more directly by measuring social effort longitudinally and examining the extent to which its change might explain variance in improved social functioning.

Furthermore, self-reported social effort could be evaluated as a target in evidence-based psychosocial interventions. The SEACS could be used in clinical and research settings aimed at improving social effort, given social functioning is often a treatment goal and important outcome for people with schizophrenia (Burns & Patrick, 2007). There is also a need to identify dimensional processes of psychopathology as mechanisms of change in intervention, as advocated for in the National Institute of Mental Health (NIMH)'s experimental therapeutics approach. For example, social effort could be integrated as positive valence systems and social processes in the NIMH Research Domain Criteria (RDoC) framework (e.g., in reward valuation/effort and affiliation, respectively; (Cuthbert, 2019; Saris et al., 2022)). It may be that evidence-based psychosocial interventions improve social functioning at least partly through their impact on willingness to expend social effort, which could be captured in a brief self-report measure like the SEACS.

Social effort at baseline was not associated with changes in social functioning or social experiences in daily life. It is important to note, however, that social functioning did not show robust changes over the course of the digital intervention (see Fulford et al., 2021); as such, there may not have been sufficient change in social functioning to be captured by individual differences in social effort. The lack of association between social effort and EMA-reported social experiences (e.g., number of interactions and social appraisals) may be due to the fact that participants in our study had limited opportunities for social connection. It could be that the degree to which one exhibits adequate social effort in daily life might depend on opportunities for social interaction. It may also be that social effort would be more reflected in the degree of involvement in social interactions, as opposed to their simple presence (or perceptions related to the interactions). Furthermore, although EMA may capture variation in certain types of social behavior, the low convergent validity between clinical assessments and EMA measures of social processes in daily life is consistent with previous studies (Abel & Minor, 2021; Culbreth et al., 2021; Mote & Fulford, 2020). This suggests there may be meaningful differences between daily social experiences reported and general tendencies toward social effort captured at a single timepoint in a lab setting.

Only measuring social effort at one point in time did not allow us to test potential sensitivity to change in the scale, which will be important to demonstrate. It will be important to examine the degree to which social effort is a stable, trait-like construct versus an intervention target that is more sensitive to change. Although a benefit of the SEACS is that it is brief and easy to administer, future studies could also examine associations between objective measures of social effort and social functioning, as well as constructs like defeatist attitudes and social cognition, given they have been shown in the literature to be associated with negative symptoms and social functioning (Campellone et al., 2016; García-López et al., 2022; Kalin et al., 2015). Another limitation is that we relied solely on self-reported measures of social behavior in daily life via EMA. Future research would benefit from the use of observable measures of everyday social behavior, such as through the use of smartphone sensing (e.g., GPS-based location patterns or interactions captured via microphone), to capture objective indices of social effort and engagement (Fulford et al., 2021; Narkhede et al., 2022).

In sum, we examined the validity of a recently developed measure of social effort in people with schizophrenia. Greater self-reported social effort was associated with less severe interviewer-rated negative symptoms and better self- and interviewer-rated social function, providing evidence of criterion-related validity in a clinical sample. These findings support the utility of measuring individual differences in social effort as a marker of negative symptoms and functioning in schizophrenia. In future work, inclusion of the SEACS as an outcome measure in intervention studies targeting social functioning and behavior in psychopathology could provide additional evidence of the measure's clinical utility.

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Declarations

Conflicts of Interest The authors have no conflicts of interest to disclose.

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