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Think and Cope Positively: A Feasibility and Acceptability Study to Improve the Subjective Well-Being of People Affected by a Severe Mental Disorder

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Objective: This study evaluated the feasibility and acceptability of Think and Cope Positively, a structured 15-session program designed to enhance well-being in adults diagnosed with severe mental health conditions such as schizophrenia and bipolar disorder. ***Methods:*** Twenty-six participants were recruited through mental health services, and sociodemographic and clinical characteristics, protocol compliance, session attendance, and satisfaction were assessed. Intervention outcomes, including hedonic and eudaimonic well-being, optimism, therapeutic alliance, and psychological symptoms, were measured both before and after the intervention. ***Results:*** Of the 26 participants, 20 completed the program (77%), attending an average of 14 out of 15 sessions. Both participants and facilitators reported high levels of satisfaction with the intervention. Statistically significant improvements in well-being, optimism, and therapeutic engagement were observed following the program. ***Conclusions and Implications for Practice:*** These findings indicate that Think and Cope Positively is a feasible and acceptable intervention to enhance well-being in individuals with severe mental health conditions. It provides a promising addition to existing psychosocial rehabilitation strategies.

Impact and Implications

The Think and Cope Positively program offers a novel, structured intervention grounded in positive psychology, acceptance and commitment therapy, and cognitive behavioral therapy, specifically designed to enhance subjective well-being in individuals with severe mental disorders. This feasibility study demonstrated high acceptability among service users and therapists, strong protocol adherence, and significant improvements in life satisfaction, global well-being, and key components of eudaimonic well-being, such as self-acceptance and life purpose. Additionally, participants reported increased optimism and a stronger therapeutic alliance. The inclusion of support people and the flexibility to recover missed sessions reflect a user-centered and inclusive approach. As a cost-free intervention, the program is highly replicable, and its structured format allows for easy transfer and implementation across other psychosocial rehabilitation centers. These findings support a shift in psychosocial care, emphasizing well-being and life purpose, not only symptom reduction, as essential therapeutic goals. Further research is needed to validate its efficacy in larger, controlled trials.

Keywords: psychological well-being, severe mental disorder, positive psychology, cognitive behavioral therapy, acceptance and commitment therapy

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This study was approved by the Internal University Ethics Committee of Universidad Pontificia Comillas (Faculty of Human and Social Sciences; Registration Code: 7-22/23; approval date: November 28, 2022) and by the External Hospital Ethics Committee of Hospital Clínico San Carlos (Registration Code: 23/518-EC_X; approval date: August 10, 2023). All procedures follow the ethical standards of the 1964 Helsinki Declaration and its later amendments. Informed consent was obtained from all individual adult participants included in the study.

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Rocio Caballero: project administration, funding acquisition, conceptualization, resources, investigation, data curation, writing–original draft, and

continued

Severe mental disorders (SMD) refer to a group of psychiatric disorders defined by three key dimensions: diagnosis (e.g., schizophrenia spectrum disorders, major bipolar disorder, and major depression with psychotic features), disability (impaired functioning in day-to-day life), and duration (over 2 years; Espinosa-López & Valiente-Ots, 2017; Ruggeri et al., 2000). These disorders have a profound impact on individuals' social, occupational, and personal functioning.

Psychosocial interventions for people affected by a SMD have tended to focus on improving functioning and balancing deficits (Varga et al., 2018). However, emerging evidence suggests that subjective well-being (SWB) is a crucial complement to psychosocial rehabilitation, enhancing both clinical and personal recovery. Including SWB in the usual psychosocial rehabilitation treatments of SMD can generate benefits by (a) reducing emotional distress, isolation, and feelings of loneliness, (b) increasing social support, and (c) improving the prognosis and the therapeutic/pharmacological response (Emsley et al., 2011).

Evidence suggests that improvements in clinical symptoms or functional outcomes do not automatically translate into enhanced SWB, highlighting the need for interventions that directly target well-being itself (Valiente et al., 2019). SWB is a complex multidimensional construct that includes hedonic aspects, such as pleasure and happiness (Ryan & Deci, 2001), and eudaimonic aspects centered on realizing human potential (Waterman, 1993).

In this context, besides the empirically validated cognitive behavioral therapy (CBT) model for the recovery and improvement of well-being of individuals with SMD, several multicomponent programs based on positive psychology interventions (PPIs) and acceptance and commitment therapy (ACT) have been developed (Meyer et al., 2012; Valiente et al., 2022). These interventions have demonstrated their feasibility and effectiveness in promoting SWB components among people affected by SMD (Valiente et al., 2022). For example, PPIs have been shown to increase positive emotions, hope, personal resilience, and self-esteem while reducing symptoms and negative thoughts (Meyer et al., 2012). Likewise, ACT is effective in fostering self-compassion and working on life purpose, both of which are critical for enhancing SWB in individuals with SMD (Morris et al., 2013).

Among the factors related to the promotion of SWB, several studies highlighted positive emotions, optimism, self-compassion, purpose of life, and gratitude (e.g., Halverson et al., 2021). Additionally, therapeutic alliance emerges as a key factor, as it ensures that individuals with SMD feel fully heard and engaged in their personalized rehabilitation plans (Fiorillo et al., 2020). Coping skills are also critical for achieving life purpose in SMD, where avoidance strategies are common. Training in coping skills has been shown to improve SWB, enhance psychosocial functioning, and reduce negative emotions and stress in individuals with schizophrenia (Halverson et al., 2021).

Finally, quality, person-centered social support emerges as one of the most critical aspects of recovery for people with SMD (Slade et al., 2017). Social support is strongly related to SWB in SMD when they provide practical help, moral support, and motivation to recover (Latipun et al., 2019).

The current pilot study describes the Think and Cope Positively (TC+) program and evaluates its feasibility and acceptability among both users and therapists. In addition, we assessed changes in SWB, optimism, and therapeutic alliance after the intervention as well as the potential impact of the TC+ on various indicators of psychopathology.

Method

Study Design

We implemented pre- and post-quasi-experimental design. Participants were evaluated immediately before and after the 15-week intervention. In addition, brief follow-up assessments were collected from participants and group therapists at the end of each session. This study was approved by the Internal University Ethics Committee of Universidad Pontificia Comillas (Faculty of Human and Social Sciences; Registration Code: 7-22/23; approval date: November 28, 2022) and by the External Hospital Ethics Committee of Hospital Clínico San Carlos (Registration Code: 23/518-EC_X; approval date: August 10, 2023). All procedures follow the ethical standards of the 1964 Helsinki Declaration and its later amendments.

Participants

Participants were recruited through convenience sampling and referred to the study by centers associated with public ambulatory services for people with SMD within the National Health System network from the Community of Madrid, Spain. Patients were eligible to participate if they were aged 18–65; had a primary clinical diagnosis of SMD, including schizophrenia, bipolar disorder, personality disorder, and obsessive–compulsive disorder; and were interested in attending a group therapy focused on well-being. Participants were excluded if they had (a) limited cognitive resources or a severe formal thinking disorder or (b) a current diagnosis of substance dependence or a severe personality disorder that could interfere with benefiting from a psychotherapy group.

Measures

Sociodemographic and Clinical Characteristics

Information about sex, age, civil status, highest level of educational attainment, employment situation, type of household coexistence,

writing–review and editing. Vanesa Peinado: investigation, data curation, writing–original draft, and writing–review and editing. Carmen Valiente: writing–review and editing. Ana Vucic: data curation and writing–original draft. Alvaro Alonso: data curation and writing–original draft. Jose Manuel Caperos: funding acquisition, investigation, methodology, formal analysis, writing–original draft, and writing–review and editing.

Rocio Caballero played a lead role in conceptualization, funding acquisition, project administration, and writing–original draft and an equal role in data curation, investigation, and writing–review and editing. Vanesa Peinado played a lead role in data curation and writing–original draft and an equal role in investigation and writing–review and editing. Carmen Valiente played an equal role in writing–review and editing. Ana Vucic played an equal role in writing–original draft. Alvaro Alonso played an equal role in data curation and writing–original draft. Jose Manuel Caperos played a lead role in formal analysis and methodology, a supporting role in writing–original draft, and an equal role in funding acquisition, investigation, and writing–review and editing.

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disability, principal diagnosis, and number of years since the first diagnosis was recorded.

Feasibility and Acceptability Measures

Attendance and Exercise Engagement Form. An inventory designed for the present study assessed (a) the participant's attendance (0 = absence; 1 = attendance), (b) their engagement with the exercises in the session (0 = not performed; 1 = exercise fully completed), and (c) their engagement with the exercises outside the session (0 = not performed; 1 = exercise fully completed). A total attendance score was obtained by summing the number of sessions in which all participants were present, where higher scores indicate higher attendance, ranging from 0 (no attendance) to 15 (complete attendance). Two total exercise engagement scores were obtained (i.e., in session and out of session) by summing the number of exercises completed by all participants, where higher scores mean higher exercise engagement, varying from 0 (no exercise engagement) to 15 (excellent exercise engagement).

Protocol Compliance Form. A 10-item inventory designed for the study assessed the completion of each session's objectives (e.g., explanation of the session's key concepts or completion of the session's target exercises). Therapists scored the achievement of the goals in each session on a 3-point Likert scale ranging from 0 (*not achieved*) to 2 (*fully achieved*). A total score was obtained by averaging all scores, where higher scores indicated greater compliance.

Participants' satisfaction was assessed with four items on a 10-point Likert scale regarding the usefulness of the intervention, the therapists' competence, and their readiness to recommend the protocol to future participants. Finally, two open-ended questions asked participants to suggest changes and indicate what they liked best.

The subjective experience of the participants and the therapists was assessed every 2 weeks by informal debriefing/monitoring sessions conducted with therapists to discuss the functioning of the intervention. Moreover, at the end of the group protocol, we met with all the service users of each center for 2 hr to obtain their subjective assessment of the efficacy and acceptability of the program. During these sessions, two researchers recorded ad libitum the information reported by the participants.

Primary Outcomes

Hedonic well-being was measured by the Satisfaction with Life Scale (SWLS). Well-being was measured by the SWLS (Diener et al., 1985). The SWLS is a five-item scale on a 7-point Likert scale ranging from 1 (*completely in disagreement*) to 7 (*completely in agreement*). A total score is obtained by adding the points for each item. Higher scores indicated higher satisfaction with one's life. The SWLS showed good internal reliability (Cronbach's $\alpha = .76$).

Eudaimonic well-being was assessed using the Scales of Psychological Well-being (Ryff & Keyes, 1995). The Scales of Psychological Well-being includes 29 items rated on a 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). A total of six subscales can be scored (i.e., self-acceptance, purpose in life, personal growth, positive relationships, autonomy, and environmental mastery). In our study, internal consistency was moderate for self-acceptance, purpose in life, personal growth development, positive relationships with others, and autonomy ($\alpha = .54$, $\alpha = .68$, $\alpha = .59$, $\alpha = .55$, $\alpha = .62$, respectively), and low for environmental mastery ($\alpha = .08$). Given the soft internal consistency of the environmental mastery subscale, we did not consider such dimension on subsequent analysis.

General well-being was also measured by the Warwick Edinburgh Mental Well-being Scale (WEMWBS; Castellví et al., 2014). The WEMWBS includes seven items on a 5-point scale ranging from 1 (*none of the time*) to 5 (*all of the time*), creating a scale ranging from 7 to 35, with higher scores indicating greater well-being. This instrument is feasible, reliable, and sensitive to well-being changes in people with various mental health problems. The WEMWBS showed high internal consistency ($\alpha = .91$).

Secondary Outcomes

Optimism was measured by the Openness to the Future Scale (OFS; Botella et al., 2018). This scale is a 10-item self-report questionnaire rated on a 5-point Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*). By adding up the scores, an overall OFS provides a score in which higher ratings indicate greater openness to the future. The OFS showed adequate internal consistency ($\alpha = .78$).

The therapeutic alliance was assessed through the Working Alliance Theory of Change Inventory (Corbella & Botella, 2004). The inventory consists of 17 items on a 7-Likert scale from 1 (*never*) to 7 (*always*). The higher the score, the greater the therapeutic alliance. Its internal consistency was high in our study ($\alpha = .93$).

Clinical Outcomes

Psychological symptoms were measured by the Symptom Checklist–45 (Sandín et al., 2008). This questionnaire consists of 45 items, a symptom inventory rated on a 5-point distress scale from 0 (*not at all*) to 4 (*a lot*). In our study, internal consistency was strong for depression ($\alpha = .82$), hostility ($\alpha = .86$), somatization ($\alpha = .84$), obsessions–compulsions ($\alpha = .86$), and phobic anxiety ($\alpha = .84$) and moderate for interpersonal sensitivity ($\alpha = .66$), anxiety ($\alpha = .77$), psychoticism ($\alpha = .78$), and paranoid ideation ($\alpha = .70$).

Procedure

All participants were informed about the study and the group intervention and signed a written informed consent before entering the study. Following consent, participants underwent baseline assessments, which included (a) primary outcomes, namely, hedonic, eudaimonic, and general well-being; (b) secondary outcomes, namely, optimism and therapeutic alliance; and finally (c) clinical outcomes described above. The questionnaires were self-reported and completed with the help of a trained research assistant, who was not involved in the delivery of the group therapy.

Six therapists (66.7% women) aged between 26 and 55 (M_{age} = 33.3; SD = 11.2) delivered group interventions. The therapists were mainly psychologists (five out of six) with 7.3 average years of experience (SD = 11.1). All therapists received 5-hr training on the theoretical and practical aspects of the TC+ protocol. They were provided with a therapist's manual and a PowerPoint to use as a visual aid during sessions. Each participant was given a booklet containing worksheets and exercises aligned with the session topics. To support therapists, follow-up meetings were held every two sessions to discuss their progress and subjective experiences. Sessions were conducted weekly in groups of five to eight participants, each lasting 75 min. Four

treatment groups were conducted, each consisting of five to eight participants. At the end of each session, therapists completed protocol compliance, attendance, and exercise engagement forms, while participants completed the WEMWBS. At the conclusion of the 15-session program, participants completed a satisfaction questionnaire and repeated the baseline well-being and clinical assessments.

The TC+ Protocol

The TC+ protocol builds on previous treatments (Meyer et al., 2012; Valiente et al., 2022), integrating PPIs, CBT, and ACT principles (Beck, 2018; Morris et al., 2013; Seligman et al., 2005). The program includes 15 sessions organized into six modules, following Fredrickson's (2013) broaden-and-build theory, which suggests that positive emotions help build personal resources and foster goal achievement. The sessions progress systematically, with earlier sessions focusing on hedonic well-being (e.g., cultivating positive emotions and enjoyment) and later sessions transitioning to eudaimonic well-being (e.g., fostering a sense of purpose and personal growth). The ultimate goal is to increase positive emotions, optimism, and a clear sense of life purpose. Participants learn and apply coping strategies related to well-being, tailored to their personal goals. The protocol integrates exercises from previously validated research (see Table 1).

A novel aspect of TC+ is the inclusion of a support person for each participant, such as a family member, friend, peer, or professional. This individual supports the participant throughout the intervention and attends the final session. Their role is to help participants share their goals and projects while ensuring support from their community.

Session Structure

The sessions followed a consistent structure: They began with a review of the previous session's exercises or content, followed by the introduction of a new topic using the PowerPoint presentation. A thought-provoking video and an experiential group exercise were conducted, leading to a group discussion. Each session concluded with a song chosen by the group participants and the completion of weekly adherence and well-being questionnaires.

Homework varied across sessions: Mandatory assignments (Sessions 2, 3, 4, 9, 12, and 14) reinforced the session's main concepts, while optional tasks (Sessions 5, 6, 7, and 8) promoted overlearning. Sessions without homework emphasized group work or addressed content that was more beneficial to explore collectively. These sessions focused on themes such as social connection, emotional expression, and shared problem solving, which were better suited to the dynamics and support provided by the group. Session materials included relatable narratives reflecting the experiences of individuals with SMD. For instance, a story about a new user's fears in a rehabilitation group was used to address negative thinking traps.

All sessions were conducted in a group format, except for Session 9, which was individual. This session focused on life purpose, allowing the therapist to provide personalized attention, in line with collaborative care models (Woltmann et al., 2012), which emphasize proactive and coordinated care, self-management support, and individualized follow-up. The final session had a unique structure, incorporating the participants' support persons. Participants shared their progress, including increases in positive emotions, optimistic thinking, and adaptive coping, with a focus on personal goals.

Data Analysis

We assessed the intervention's feasibility by recording participants' adherence, dropout characteristics, and protocol compliance recorded by therapists. We have also analyzed quantitative answers to satisfaction questionnaires to evaluate participants' and therapists' intervention acceptability. Qualitative information from open-ended questions and monitoring/debriefing sessions was collected through informal observations during online meetings held with therapists after every two sessions, as well as in a final debriefing with all users involved at the end of the protocol. Participants' literal responses were compiled into a table and loosely grouped into categories (e.g., helpful elements, negative aspects, proposed changes to tasks or methodology such as session duration). These summaries are intended as informal insights rather than results of a formal thematic analysis.

To compare differences between completers and dropout participants in demographic and clinical variables, we employed the Pearson χ^2 test for categorical variables and the Mann–Whitney U test for ordinal or quantitative ones. We employed the Wilcoxon test to explore outcome changes and clinical scores after the intervention. We also report effect sizes as the post- and predifference standardized by the standard deviation of the prescores (Feingold, 2009). Finally, we used Kendall's τ_b correlation coefficient to analyze the relationship between quantitative variables.

Given that the variables analyzed showed significant deviations from the normal distribution, we used nonparametric tests in all the contrasts performed. Analyses were conducted in SPSS (28.0), all tests were two tailed, and we considered statistical results significant at $p < .05$.

Results

Feasibility

A total of 27 participants were referred and consented to take part in the study. However, one participant declined to participate just before the preevaluation, five dropped out, and one did not complete the posttreatment assessment. Figure 1 shows the participant flowchart detailing the number of participants at each stage of the study, from initial referral to final analysis.

The sample analyzed consisted of 20 individuals (50% women; $M_{age} = 43.3$; $SD = 7.2$). We found no differences in demographic or clinical variables between participants who completed the intervention and those who dropped out (Table 2).

Of the 15 sessions, participants attended between six and 15, with an average of 10.8 sessions ($SD = 2.6$). Participants could voluntarily make up missed sessions before the subsequent one, individually or in small groups, between sessions. The mean number of sessions recovered was 3.2 ($SD = 2.6$; range = 0–8), resulting in a comprehensive attendance rate of 14 sessions (93.3%; $SD = 1.7$; range = 10–15). Of the 20 participants, 13 completed the full set of 15 intervention sessions.

Regarding exercise engagement, participants completed 79.6% of the tasks during the sessions and 43.5% of the homework, with a

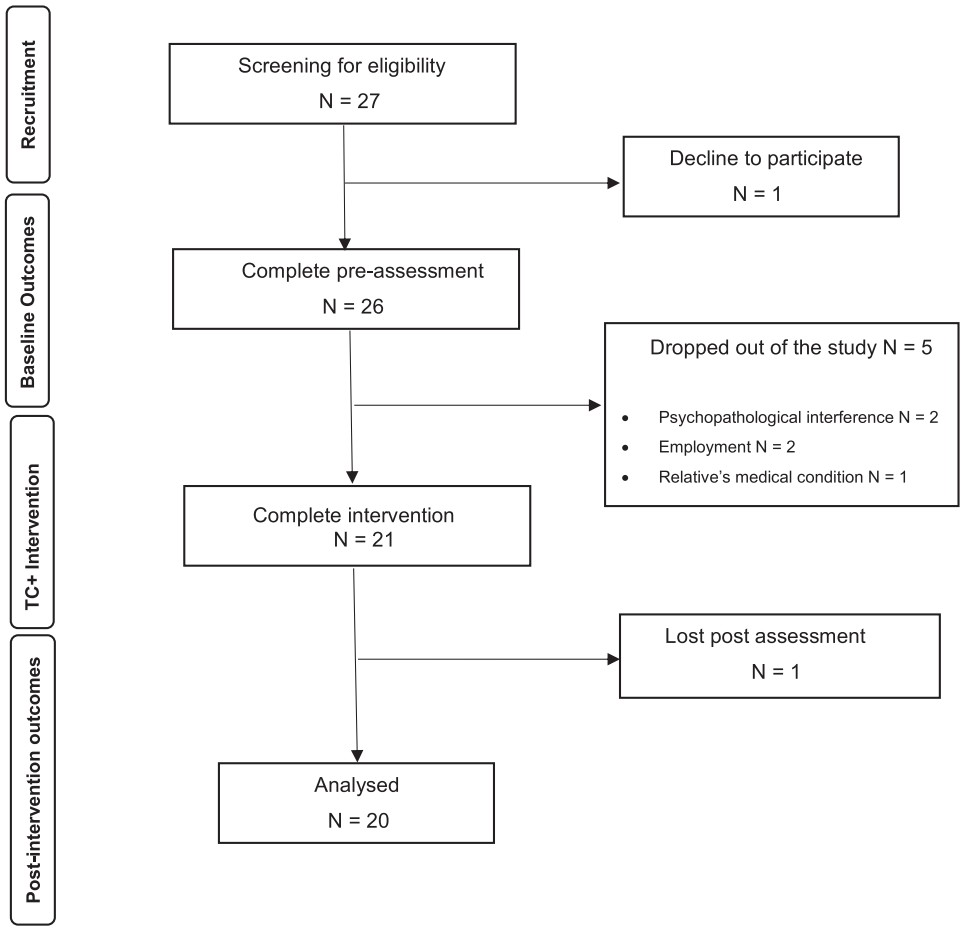
Table 1
Think and Cope Positively Description by Module, Sessions, and Targets

Module	Target	Session	Session's goal	Therapy used	Previous study
Emotions					
Welcome and introduction	Increasing positive feelings and experiences	1	• Get to know the program, participants, rules, and materials. • Define our individual goals.	PPI	
Identification and amplification of positive emotions		2	• Identify emotions and their function, connecting with the present moment. • Reflecting on the messages that pleasant emotions express to us.		Seligman et al. (2005)
Living positive emotions (savoring)		3	• Introduce the concept of savoring. • Amplify our positive experiences. • Generate pleasant experiences through the senses.		Bryant and Veroff (2017)
Thoughts					
Identifying my negative "trap" thoughts	Increasing optimism thoughts	4	• Identify negative "trap" thoughts. • Understand the influence they have.	CBT and PPI	Beck (2018)
Transforming my automatic thoughts into positive ones		5	• Discuss the advantages of a more optimistic way of thinking. • Implement the keys to modify automatic thinking for a more future-oriented one.		Seligman et al. (2005)
Living thoughts positive thoughts (Part I)		6	• Learn specific skills to promote optimism.		Seligman et al. (2005)
Living thoughts positive thoughts (Part II)		7	• Learn specific skills to promote optimism.		Seligman et al. (2005)
Self-compassion					
Learning to be kind to myself	Self-compassion	8	• Understand the concept of self-kindness. • Learn to generate a kind voice toward oneself to achieve their goals.	ACT	Gilbert (2019)
Purpose of life					
Identifying a life purpose (individual session)	Creating a life purpose	9	• Introduction to values and goals • Identify the most essential critical areas and values for us. • Working with the garden metaphor	ACT	Morris et al. (2013)
Cope					
Identifying coping strategies (Part I)	Amplifying focused coping in SWB	10	• Know the repertoire of coping strategies.	CBT	Lazarus and Folkman (1984)
Identifying coping strategies (Part II)		11	• Identify adaptive strategies associated with well-being and those that are maladaptive and linked to discomfort. •		Lazarus and Folkman (1984) Meyer et al. (2012)
Identifying adaptive coping strategies linked to well-being		12	• Learn to think about and implement a plan of action to improve my well-being.		Lazarus and Folkman (1984) Meyer et al. (2012)
Social support		10			
Creating my life purpose with my close environment	Building quality social support	13	• Know the influence of stigma and self-stigma on my relationship with others. • Know the effect of gratitude on myself and others.	PPI	Emmons and McCullough (2003) McGuire et al. (2020)
Can you help me create my life purpose?		14	• Design what and how I want to share my life purpose with my environment.		
Sharing my life purpose with my special guests, farewell, and festivity (group session with the environment)		15	• Sharing our life purpose and round of gratitude.		

Note. PPI = positive psychology interventions; CBT = cognitive behavioral therapy; ACT = acceptance and commitment therapy; SWB = subjective well-being.

Figure 1

Flowchart of Participants Through the Phases of the Pilot Study



Note. TC+ = Think and Cope Positively.

similar percentage completing both mandatory (42.9%) and voluntary (45%) tasks.

The final session of the intervention was designed as a closing event wherein participants could present their personal projects and share their experiences, ideally accompanied by a support person of their choice (e.g., a family member, friend, or trusted professional). This session aimed to foster recognition, connection, and emotional closure. Nine of the participants attended this session with a support person: Five were first-degree relatives, three were professionals with whom they had a good relationship, and one person invited a friend. Four people did not attend this session, while the remaining seven attended without accompaniment. The most common reasons for the absence of the support person were work-related reasons or that the participants did not ask to be accompanied to this session for fear of rejection. This difficulty caused sadness among some participants, who reported feeling lonely and unappreciated by those around them. All users shared their projects with the rest of the participants to alleviate this feeling.

Regarding protocol compliance, therapists across all three groups reported high adherence to the intervention protocol and generally agreed that session goals were met. However, during Sessions 6, 7, and 8, at least one therapist felt that more time was needed to accomplish the session goal. Therapists favored the group format because it did not require purchasing new resources previously unavailable in the centers where the pilot took place. Furthermore, in the interviews, therapists expressed satisfaction with both the group dynamics and the implementation of this program.

Acceptability

The acceptability of the intervention was notably high among participants. They perceived the therapists as highly competent (mean rating = 9.4; $SD = 0.9$) and attentive (mean rating = 9.3; $SD = 1.1$), and they reported overall positive group functioning (mean rating = 8.7; $SD = 1.0$). Additionally, participants expressed a strong willingness to repeat the experience (mean rating = 9.0; $SD = 1.4$) and to recommend the intervention to others (mean rating = 9.4; $SD = 0.9$). However, some participants felt that the group's contribution to problem solving could have been improved (mean rating = 6.6; $SD = 2.3$).

With respect to the information obtained from the open-ended questions and the interviews conducted with participants and therapists, they discussed the positive and negative aspects of their

Table 2
Demographic and Clinical Characteristics of the Sample

Characteristic	Initial sample (n = 26)	TC+ (n = 20)	Dropout (n = 6)	p[b]
Age, *M* (*SD*)	43.3 (6.8)	43.3 (7.2)	43.7 (6.1)	1.00
Years from diagnosis, *n* (%)	16.8 (9.3)	17.2 (9.9)	15.5 (8.0)	.692
Sex: women, *n* (%)	15 (57.7)	10 (50.0)	5 (83.3)	.147
Single status, *n* (%)	19 (73.1)	17 (85.0)	2 (33.3)	.012
Disability, *n* (%)	22 (84.6)	16 (80.0)	6 (100.0)	.234
Education, *n* (%)				.366
Primary	4 (15.4)	4 (20.0)		
Secondary	17 (65.4)	13 (65.0)	4 (66.7)	
College	5 (19.2)	3 (15.0)	2 (33.3)	
Diagnosis, *n* (%)				.759
Schizophrenia	14 (53.8)	10 (50.0)	4 (66.7)	
Bipolar disorder	4 (15.4)	3 (15.0)	1 (16.7)	
Personality disorder	5 (19.2)	4 (20.0)	1 (16.7)	
Obsessive–compulsive disorder	3 (11.5)	3 (15.0)		
Therapy frequency, *n* (%)				.545
Once a week	11 (42.3)	9 (45.0)	2 (33.3)	
Every 15 days	10 (38.5)	8 (40.0)	2 (33.3)	
Once a month	1 (3.8)	1 (5.0)		
More than once a month	4 (15.4)	2 (10.0)	2 (33.3)	
Medication, *n* (%)[a]				
Antipsychotics	20 (76.9)	15 (75.0)	5 (83.3)	.518
Antidepressants	17 (65.4)	14 (70.0)	3 (50.0)	.366
Benzodiazepines	10 (38.5)	6 (30.0)	4 (66.7)	.105
Hypnotics (no benzo)	3 (11.5)	2 (10.0)	1 (16.7)	.654
Mood stabilizers	4 (15.4)	4 (20.0)		.585

Note. TC+ = Think and Cope Positively.
[a] Each participant can take more than one medication, so the percentages do not add up to 100%. [b] Comparison between dropouts and completers in demographic and clinical variables. The Mann–Whitney *U* test was used for ordinal and quantitative variables and the χ^2 test for categorical ones.

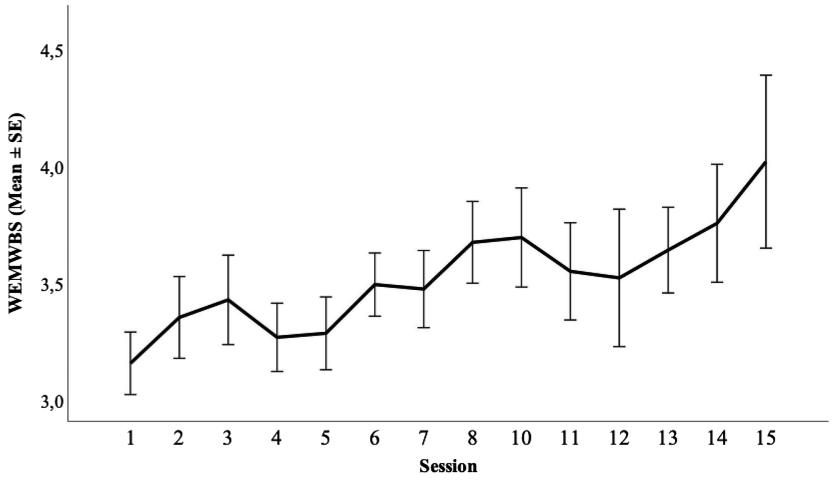
personal experience of the group in the meetings. The researchers not only listened to them and thanked them for their participation but also gave them specific feedback on the pre- and postresults of the program. Regarding the positive aspects of this experience, service users noted that they enjoyed the song at the end and the sessions' videos. They appreciated the horizontal relationship with the therapist and the individual space in Session 9, which allowed them to reflect on their life purpose and be listened to by the therapist. They particularly valued the emotionality of the last session, where they could share their personal goals, show more aspects of themselves, and be seen as part of the general population, not just as "sick patients." They emphasized how much this group helped them feel happier, combat perceived negative symptoms, modify some beliefs, and generate a life purpose. However, they needed help doing homework at home, completing the research questionnaires, and automating and generalizing what they learned in the group to their lives. They expressed distress when they realized the main objective was to create and carry out a life project. Ultimately, all of them

Table 3
Differences in the Outcomes Between Pre- and Postintervention Scores

	Preintervention		Postintervention		Comparison		
Primary and secondary outcome	*M*	*SD*	*M*	*SD*	*W*	*p*	*d*
Primary outcomes							
Hedonic SWB—Satisfaction with Life	2.4	1.1	3.3	0.9	179.5	<.05	0.84
Global well-being	3.2	0.6	3.7	0.6	202.5	<.05	0.87
Eudaimonic SWB							
Self-acceptance	2.8	0.9	3.6	1.0	161.5	<.05	0.93
Positive relationships with others	3.6	1.0	3.7	0.6	113.0	*ns*	0.07
Autonomy	3.6	0.9	3.9	0.7	111.5	*ns*	0.33
Personal growth	3.6	1.0	4.1	1.1	120.5	*ns*	0.50
Purpose in life	2.8	1.1	3.5	1.1	163.0	<.05	0.65
Secondary outcomes							
Optimism	2.9	0.6	3.3	0.6	152.0	<.05	0.69
Therapeutic alliance	5.0	1.3	5.5	1.0	182.0	<.05	0.44

Note. n = 20. *W* = Mann–Whitney *U* test rank sum; *ns* = no significant; *d* = effect size; SWB = subjective well-being.

Figure 2
Change in Well-Being Scores (WEMWBS) Across Sessions



Note. WEMWBS = Warwick Edinburgh Mental Well-being Scale; *SE* = standard error.

pointed out the need to complement their rehabilitation objectives with a focus on well-being and the importance of giving continuity to all the work done with their therapists. Nevertheless, despite these challenges, both users and professionals rated this session very positively, highlighting its warmth and high emotional engagement.

Outcome Analysis

Our results showed significant increases in most outcomes, specifically life satisfaction and well-being. We also found, after the intervention, an increase in optimism and therapeutic alliance (Table 3). Those significant changes presented associated effect sizes between moderately large and large (.65–.93).

We found that an increase in life satisfaction was strongly related to an increase in well-being ($n = 20$; Kendall's $\tau_b = .567$; $p < .001$). Additionally, changes in optimism were associated with increases in both life satisfaction ($n = 20$; $\tau_b = .406$; $p = .017$) and well-being ($n = 20$; $\tau_b = .538$; $p = .001$). We did not find a relationship between the increase in the therapeutic alliance and the change in life satisfaction ($\tau_b = -.091$; $p = .580$) or well-being ($\tau_b = -.080$; $p = 626$).

Finally, descriptive session-by-session analysis of WEMWBS scores showed increased well-being throughout the sessions (Figure 2). Change across sessions shows a positive linear trend ($n = 14$; $\tau_b = .794$; $p < .001$).

Clinical Symptomatology

When comparing clinical symptomatology after the intervention, we found no aggravation of any of the symptoms evaluated. Instead, we see a significant reduction in the global symptom score, depression, and interpersonal sensitivity. Descriptively, we found small to medium reductions in all symptom indicators (Table 4).

Discussion

The present study describes implementing the TC+ program to improve SWB in people diagnosed with SMD. It evaluates its feasibility,

Table 4
Differences in the Outcomes Between Pre- and Postintervention Symptom Checklist–45 Scores

	Preintervention		Postintervention		Comparison		
Clinical outcome	*M*	*SD*	*M*	*SD*	*W*	*p*	*d*
Global score	1.6	0.8	1.3	0.9	191.5	<.05	−0.43
Depression	2.3	1.0	1.9	1.0	167.0	<.05	−0.42
Anxiety	1.8	1.0	1.3	1.0	105.0	*ns*	−0.53
Somatization	1.8	1.2	1.4	1.3	118.0	*ns*	−0.32
Psychoticism	0.9	1.0	0.6	1.0	90.0	*ns*	−0.26
Obsessions–compulsions	1.7	1.1	1.5	1.1	108.0	*ns*	−0.17
Phobic anxiety	1.3	1.2	1.0	1.1	121.5	*ns*	−0.28
Paranoid ideation	1.6	0.9	1.5	1.0	81.5	*ns*	−0.08
Hostility	1.1	1.1	0.6	1.1	97.0	*ns*	−0.42
Interpersonal sensitivity	2.1	0.9	1.7	1.0	175.0	<.05	−0.45

Note. *W* = Mann–Whitney *U* test rank sum; *ns* = no significant; *d* = effect size.

acceptability, and associated changes found in SWB, optimism, therapeutic alliance, and psychopathology after the intervention. Findings indicated a high feasibility of the TC+ intervention. First, only five users dropped out of the intervention. This dropout rate is similar to that found in psychosocial treatments (Villeneuve et al., 2010) and PPI interventions (Meyer et al., 2012). It is also noteworthy that the reasons for dropping out were unrelated to the intervention. Remarkably, adherence to the treatment was robust, with a high attendance rate of 93.3%. This level of compliance is particularly significant given the difficulties previously found in maintaining treatment engagement for this population (Dixon et al., 2016). Offering the service users the possibility of retrieving lost sessions is an advantage of the TC+ intervention. This underscores the utility of content retrieval in future interventions, as it could help the continuity of the treatments. Such insights may be relevant to any SMD treatment, but especially in interventions aimed at well-being, where previous research has demonstrated cumulative benefits throughout the treatment (Geerling et al., 2020).

Additionally, compliance with the exercises at home was moderate, which aligns with similar studies of this population (Dunn et al., 2002). Previous research has indicated that individuals with schizophrenia may have low compliance with therapy homework given their difficulties in planning and memory, especially those with negative symptoms (Glaser et al., 2000). Satisfaction questionnaires indicated high acceptability, which aligns with previous qualitative studies that showed high satisfaction with incorporating well-being into their usual treatments (Cohen et al., 2017). Furthermore, the TC + intervention is low cost and uses easy-to-implement procedures, as indicated by the therapists, who also reported that the goals were achievable on a session-by-session basis. Moreover, participants reported high scores on all items of the satisfaction questionnaire and would recommend the TC+ intervention to other users.

After the intervention, participants showed increases in several components of well-being, including life satisfaction, self-acceptance, and purpose in life, similar to previous studies (Meyer et al., 2012; Valiente et al., 2022). We found significantly large effect sizes in these outcomes, which could be related to different reasons. On the one hand, our protocol has 15 sessions, while similar protocols have 10 or 11 sessions. This may explain the larger effect sizes given the linear trend between general well-being and number of sessions (Figure 2). In addition, treatments that include different models of psychotherapy may have a combined effect and be of more significant benefit (Zhang et al., 2021). Finally, given the usual inconsistency of session attendance in these populations, including the possibility of making up missed sessions may lead to greater compliance and, thus, more significant change. However, these findings must be confirmed in future randomized trials with larger samples.

Our findings align with previous research showing that optimism is associated with increased SWB (Seligman et al., 2005). Although the interventions tested by Seligman et al. (2005) were developed for individuals from the general population, the authors propose that such positive psychology strategies could complement clinical interventions. In our study, optimism-related components embedded in TC+ may have contributed to psychological well-being even among individuals with severe mental illness, suggesting that these approaches may be adaptable and valuable in more complex clinical contexts. Furthermore, our results support Beck's (2018) cognitive model, in which activating the individual's adaptive mode through the pursuit of personal goals and the reduction of defeatist beliefs fosters motivation and reduces negative symptoms. In line with this, TC+ also increased self-acceptance, a known predictor of resilience and protection against psychological distress and relapse (Oltean & David, 2018). These mechanisms are consistent with the recovery-oriented framework described by Fiorillo et al. (2020), which highlights the need for a strong therapeutic alliance and for involving service users as active agents in their individualized rehabilitation plans. Strengthening these elements appears essential for sustaining engagement and promoting long-term improvements in well-being.

We found TC+ safe for participants, with no evidence of worsening in any associated symptoms. Indeed, there was an improvement in levels of interpersonal sensitivity and depression, as reported in previous studies (Valiente et al., 2022). Interpersonal sensitivity is a personality trait that has been linked to mistrust following victimization and is closely related to paranoia. Improving levels of interpersonal sensitivity has clear implications for reducing the risk of relapse and perceived distress, as these factors are related to the prodrome of people experiencing psychotic symptoms. Furthermore, this finding is consistent with a meta-analysis on the potential of positive psychological interventions, which found that they improve well-being and reduce distress in populations with clinical disorders (Chakhssi et al., 2018).

This study has some limitations. First, the lack of a control group does not allow inferences to be made about efficacy. Nevertheless, being a pilot study, we only sought to assess the feasibility and acceptability of the intervention, like previous studies (Meyer et al., 2012). Future studies should incorporate a control group to measure efficacy. Second, questionnaires were self-reported, and social desirability may have occurred. However, the use of self-reports has been found to have satisfactory concurrent, ecological, and predictive validity for people with these mental disorders (Bergsma et al., 2011). Future studies could incorporate other complementary assessment measures, such as direct observation. Third, the fact that some users came alone was a barrier that caused discomfort and increased participants' feelings of loneliness. Future randomized trials should provide this support.

The study has several strengths. First, the inclusion and analysis of new features in well-being intervention, such as the presence throughout the treatment of a support person, increasing quality social support for the service user, and making up missed sessions, allowed the participants to reach a high adherence. Both suggest that these are helpful features for future interventions. Second, they developed different modules using therapies with proven evidence in SMD. Third, it considers the participants' feedback after the intervention to include it in the final development of the TC+ intervention, which enriches the treatment with direct input from the target population, offering feedback to the service users regarding results.

The present study holds significant clinical implications. Findings underscore the crucial role of integrating elements that foster positive emotions, optimism, self-compassion, coping strategies, and a sense of purpose into therapeutic interventions for individuals with SMD. In this vein, a holistic approach, drawing techniques from various evidence-based therapeutic approaches, is highlighted. Additionally, it is necessary to emphasize the importance of including the social context of people with SMD in interventions, making their loved ones participate in their well-being and progress beyond the symptoms of the disease, as well as future interventions

considering the benefits derived from offering the possibility of voluntary makeup sessions.

In conclusion, well-being is a relevant target in SMD treatment, and TC+ is a feasible, acceptable, and easy-to-implement intervention to improve it. TC+ might be able to increase well-being, therapeutic alliance, and optimism and is proven to be an appropriate and safe intervention for SMD, highlighting the relevance of including a support person as part of the treatment and offering the possibility of makeup missed sessions.

References

Beck, A. (2018). Recovery-oriented cognitive therapy for schizophrenia: A personal perspective. In R. L. Leahy (Ed.), *Science and practice in cognitive therapy: Foundations, mechanisms, and applications* (pp. 3–12). Guilford Press.

Bergsma, A., Veenhoven, R., Ten Have, M., & De Graaf, R. (2011). Do they know how happy they are? On the value of self-rated happiness of people with a mental disorder. *Journal of Happiness Studies*, *12*, 793–806. https://doi.org/10.1007/s10902-010-9227-5

Botella, C., Molinari, G., Fernández-Álvarez, J., Guillén, V., García-Palacios, A., Baños, R. M., & Tomás, J. M. (2018). Development and validation of the openness to the future scale: A prospective protective factor. *Health and Quality of Life Outcomes*, *16*(1), Article 72. https://doi.org/10.1186/s12955-018-0889-8

Bryant, F. B., & Veroff, J. (2017). *Savoring: A new model of positive experience*. Psychology Press. https://doi.org/10.4324/9781315088426

Castellví, P., Forero, C. G., Codony, M., Vilagut, G., Brugulat, P., Medina, A., Gabilondo, A., Mompart, A., Colom, J., Tresserras, R., Ferrer, M., Stewart-Brown, S., & Alonso, J. (2014). The Spanish version of the Warwick-Edinburgh Mental Well-Being Scale (WEMWBS) is valid for use in the general population. *Quality of Life Research*, *23*(3), 857–868. https://doi.org/10.1007/s11136-013-0513-7

Chakhssi, F., Kraiss, J. T., Sommers-Spijkerman, M., & Bohlmeijer, E. T. (2018). The effect of positive psychology interventions on well-being and distress in clinical samples with psychiatric or somatic disorders: A systematic review and meta-analysis. *BMC Psychiatry*, *18*(1), Article 211. https://doi.org/10.1186/s12888-018-1739-2

Cohen, A. N., Hamilton, A. B., Saks, E. R., Glover, D. L., Glynn, S. M., Brekke, J. S., & Marder, S. R. (2017). How occupationally high-achieving individuals with a diagnosis of schizophrenia manage their symptoms. *Psychiatric Services*, *68*(4), 324–329. https://doi.org/10.1176/appi.ps.201600031

Corbella, S., & Botella, L. (2004). Psychometric properties of the Spanish version of the Working Alliance Theory of Change Inventory (WATOCI). *Psicothema*, *16*(4), 702–705. https://www.psicothema.com/pdf/3053.pdf

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction With Life Scale. *Journal of Personality Assessment*, *49*(1), 71–75. https://doi.org/10.1207/s15327752jpa4901_13

Dixon, L. B., Holoshitz, Y., & Nossel, I. (2016). Treatment engagement of individuals experiencing mental illness: Review and update. *World Psychiatry*, *15*(1), 13–20. https://doi.org/10.1002/wps.20306

Dunn, H., Morrison, A. P., & Bentall, R. P. (2002). Practitioner report patients' experiences of homework tasks in cognitive behavioural therapy for psychosis: A qualitative analysis. *Clinical Psychology & Psychotherapy*, *9*(5), 361–369. https://doi.org/10.1002/cpp.344

Emmons, R. A., & McCullough, M. E. (2003). Counting blessings versus burdens: An experimental investigation of gratitude and subjective well-being in daily life. *Journal of Personality and Social Psychology*, *84*(2), 377–389. https://doi.org/10.1037/0022-3514.84.2.377

Emsley, R., Chiliza, B., Asmal, L., & Lehloenya, K. (2011). The concepts of remission and recovery in schizophrenia. *Current Opinion in Psychiatry*, *24*(2), 114–121. https://doi.org/10.1097/YCO.0b013e3283436ea3

Espinosa-López, R., & Valiente-Ots, C. (2017). ¿Qué es el trastorno mental grave y duradero? [What is a serious and enduring mental disorder?] *Edupsykhé: Revista de Psicología Y Educación*, *16*(1), 4–14. https://doi.org/10.57087/edupsykhe.v16i1.4079

Feingold, A. (2009). Effect sizes for growth-modeling analysis for controlled clinical trials in the same metric as for classical analysis. *Psychological Methods*, *14*(1), 43–53. https://doi.org/10.1037/a0014699

Fiorillo, A., Barlati, S., Bellomo, A., Corrivetti, G., Nicolò, G., Sampogna, G., Stanga, V., Veltro, F., Maina, G., & Vita, A. (2020). The role of shared decision-making in improving adherence to pharmacological treatments in patients with schizophrenia: A clinical review. *Annals of General Psychiatry*, *19*(1), Article 43. https://doi.org/10.1186/s12991-020-00293-4

Fredrickson, B. L. (2013). Positive emotions broaden and build. *Advances in Experimental Social Psychology*, *47*, 1–53. https://doi.org/10.1016/B978-0-12-407236-7.00001-2

Geerling, B., Kraiss, J. T., Kelders, S. M., Stevens, A. W. M. M., Kupka, R. W., & Bohlmeijer, E. T. (2020). The effect of positive psychology interventions on well-being and psychopathology in patients with severe mental illness: A systematic review and meta-analysis. *The Journal of Positive Psychology*, *15*(5), 572–587. https://doi.org/10.1080/17439760.2020.1789695

Gilbert, P. (2019). Explorations into the nature and function of compassion. *Current Opinion in Psychology*, *28*, 108–114. https://doi.org/10.1016/j.copsyc.2018.12.002

Glaser, N., Kazantzis, N., Deane, F., & Oades, L. (2000). Critical issues in using homework assignments within cognitive-behavioral therapy for schizophrenia. *Journal of Rational-Emotive and Cognitive-Behavior Therapy*, *18*(4), 247–261. https://doi.org/10.1023/A:1007888615752

Halverson, T. F., Meyer-Kalos, P. S., Perkins, D. O., Gaylord, S. A., Palsson, O. S., Nye, L., Algoe, S. B., Grewen, K., & Penn, D. L. (2021). Enhancing stress reactivity and wellbeing in early schizophrenia: A randomized controlled trial of Integrated Coping Awareness Therapy (I-CAT). *Schizophrenia Research*, *235*, 91–101. https://doi.org/10.1016/j.schres.2021.07.022

Latipun, L., Amalia, D. R., & Hasanati, N. (2019). Relation social support and psychological well-being among schizophrenic patients: Self-care as mediation variable? *4th ASEAN Conference on Psychology, Counselling, and Humanities (ACPCH 2018)* (pp. 1–5). Atlantis Press.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer.

McGuire, N., Melville, C., Karadzhov, D., & Gumley, A. (2020). "She is more about my illness than me": A qualitative study exploring social support in individuals with experiences of psychosis. *Psychosis*, *12*(2), 128–138. https://doi.org/10.1080/17522439.2019.1699943

Meyer, P. S., Johnson, D. P., Parks, A., Iwanski, C., & Penn, D. L. (2012). Positive living: A pilot study of group positive psychotherapy for people with schizophrenia. *The Journal of Positive Psychology*, *7*(3), 239–248. https://doi.org/10.1080/17439760.2012.677467

Morris, E. M. J., Johns, L. C., & Oliver, J. E. (2013). *Acceptance and commitment therapy and mindfulness for psychosis*. Wiley. https://doi.org/10.1002/9781118499184

Oltean, H. R., & David, D. O. (2018). A meta-analysis of the relationship between rational beliefs and psychological distress. *Journal of Clinical Psychology*, *74*(6), 883–895. https://doi.org/10.1002/jclp.22562

Ruggeri, M., Leese, M., Thornicroft, G., Bisoffi, G., & Tansella, M. (2000). Definition and prevalence of severe and persistent mental illness. *The British Journal of Psychiatry*, *177*(2), 149–155. https://doi.org/10.1192/bjp.177.2.149

Ryan, R. M., & Deci, E. L. (2001). On happiness and human potentials: A review of research on hedonic and eudaimonic well-being. *Annual Review of Psychology*, *52*(1), 141–166. https://doi.org/10.1146/annurev.psych.52.1.141

Ryff, C. D., & Keyes, C. L. M. (1995). The structure of psychological well-being revisited. *Journal of Personality and Social Psychology*, *69*(4), 719–727. https://psycnet.apa.org/buy/1996-08070-001

Sandín, B., Valiente, R. M., & Chorot, P. (2008). SA-45: Forma abreviada del SCL-90. *Psicothema*, *20*(2), 290–296. https://www.psicothema.com/pdf/3463.pdf

Seligman, M. E. P., Steen, T. A., Park, N., & Peterson, C. (2005). Positive psychology progress: Empirical validation of interventions. *American Psychologist*, *60*(5), 410–421. https://doi.org/10.1037/0003-066X.60.5.410

Slade, M., Oades, L., & Jarden, A. (2017). *Wellbeing, recovery and mental health*. Cambridge University Press. https://doi.org/10.1017/9781316339275

Valiente, C., Espinosa, R., Contreras, A., Trucharte, A., Caballero, R., & Peinado, V. (2022). The feasibility and acceptability study of a positive psychology group intervention for people with severe psychiatric conditions. *The Journal of Positive Psychology*, *17*(4), 518–631. https://doi.org/10.1080/17439760.2021.1871940

Valiente, C., Espinosa, R., Trucharte, A., Nieto, J., & Martínez-Prado, L. (2019). The challenge of well-being and quality of life: A meta-analysis of psychological interventions in schizophrenia. *Schizophrenia Research*, *208*, 16–24. https://doi.org/10.1016/j.schres.2019.01.040

Varga, E., Endre, S., Bugya, T., Tényi, T., & Herold, R. (2018). Community-based psychosocial treatment has an impact on social processing and functional outcome in schizophrenia. *Frontiers in Psychiatry*, *9*, Article 247. https://doi.org/10.3389/fpsyt.2018.00247

Villeneuve, K., Potvin, S., Lesage, A., & Nicole, L. (2010). Meta-analysis of rates of drop-out from psychosocial treatment among persons with schizophrenia spectrum disorder. *Schizophrenia Research*, *121*(1–3), 266–270. https://doi.org/10.1016/j.schres.2010.04.003

Waterman, A. S. (1993). Two conceptions of happiness: Contrasts of personal expressiveness (eudaimonia) and hedonic enjoyment. *Journal of Personality and Social Psychology*, *64*(4), 678–691. https://doi.org/10.1037/0022-3514.64.4.678

Woltmann, E., Grogan-Kaylor, A., Perron, B., Georges, H., Kilbourne, A. M., & Bauer, M. S. (2012). Comparative effectiveness of collaborative chronic care models for mental health conditions across primary, specialty, and behavioral health care settings: Systematic review and meta-analysis. *The American Journal of Psychiatry*, *169*(8), 790–804. https://doi.org/10.1176/appi.ajp.2012.11111616

Zhang, Y., Yin, Z., & Shang, L. (2021). *Effects of comprehensive psychological and behavioral intervention on mental symptoms, quality of life, and social function of patients during the first episode of schizophrenia* [Preprint]. Research Square. https://doi.org/10.21203/rs.3.rs-157520/v1

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