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The efficacy of schema therapy for personality disorders: a systematic review and meta-analysis

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ABSTRACT

Objective: Personality disorders (PDs) are prevalent and associated with functional impairment and psychological disability. Studies suggest that schema therapy (ST) may be an effective treatment for PDs. This review aimed to evaluate the efficacy of ST in treating PDs.

Method: We conducted a comprehensive literature search using PubMed, Embase, Web of Science, CENTRAL, PsycInfo, and Ovid Medline. We identified eight randomized controlled trials (587 participants) and seven single-group trials (163 participants).

Results: Meta-analyses revealed that ST had a moderate effect size ($g=0.359$) compared to control conditions in reducing symptoms of PDs. Subgroup analysis indicated that the effect of ST on different types of PDs varied slightly, and that group ST ($g=0.859$) was more effective than individual ST ($g=0.163$) in treating PDs. Secondary outcome analysis revealed a moderate effect size ($g=0.256$) for ST compared to control conditions in improving quality of life, and ST was found to reduce early maladaptive schema ($g=0.590$). Single-group trials analysis showed that ST had a positive effect on PDs (OR = 0.241).

Conclusion: ST appears to be an effective treatment for PDs, as it reduces symptoms and improves quality of life. This review provides support for the use of ST in the treatment of PDs.

1. Introduction

Personality disorders (PDs) are a group of enduring mental disorders characterized by maladaptive patterns of behavior, cognition, and internal experiences. The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) categorizes PDs into three clusters: A, B, and C. Examples of PDs include borderline personality disorder, avoidant personality disorder, dependent personality disorder, obsessive-compulsive personality disorder, paranoid personality disorder, histrionic personality disorder, schizotypal personality disorder, narcissistic personality disorder, and passive-aggressive personality disorder. PDs are relatively common, affecting up to 10% of the population [1]. PDs are more prevalent in clinical populations who tend to require more healthcare services than the general population [2]. There is substantial evidence of impaired functioning associated with PDs. For instance, borderline personality disorder (BPD) is the most common PD in clinical populations, and patients with BPD often exhibit poor thinking, impaired social cognition, impulsivity, and emotional instability [3]. More than 75% of BPD patients have been reported to deliberately self-injure, and suicide rates are estimated to be as high as 10%, which is nearly 50 times higher than in the general population [4,5]. Overall, PDs impose a significant burden on society and individual lives.

Drug therapy is currently not recommended for the treatment of personality disorders (PDs) [6]. Therefore, psychotherapy is considered the first-line treatment for individuals with PDs [7]. There are several psychological interventions available for the amelioration of PDs and related symptoms [8]. Cognitive-behavioral therapy (CBT) is the most commonly used psychotherapy, initially developed as a short-term, problem-centered treatment for various DSM axis I disorders, but now increasingly used for PDs, offering effective tools for solving the enduring problems of PDs. Dialectical behavior therapy (DBT) is the most studied psychosocial therapy for the treatment of borderline personality disorder (BPD) [9]. DBT has been found to be more effective than treatment as usual (TAU) for BPD and its associated problems, such as suicidal behavior [10]. Other psychotherapeutic approaches, such as mentalization-based treatment (MBT) [11], transference-focused psychotherapy (TFP) [12], intensive

short-term dynamic psychotherapy (ISTDP) [13], and short- and long-term dynamic group psychotherapy [14], have also been recognized as valid. However, while a larger number of approaches have been developed for PDs, most of them have been applied to BPD, and psychotherapy research on PDs other than BPD is still limited.

One thing worth noting is that schema therapy (ST) has shown potential for treating different types of PDs [15]. ST was originally developed by Jeffrey Young [16] for individuals with PDs who did not respond to standard CBT. ST is an integrative therapy that combines behavioral, cognitive, experiential, and psychodynamic strategies [17]. For most PDs, only ST has explicit schema mode models, which describe an individual's current emotional, cognitive, and behavioral states [18]. Since the first specific ST model was developed for BPD [16], specific models for other PDs have been developed and elaborated for almost all PDs [19]. In a multicenter trial, ST was found to be more effective than TFP in terms of treatment efficacy and varied measures [20].

Interest in ST has grown over the last few decades, and several systematic reviews have been published [7,21–24]. Some reviews examined symptom reduction evidence based on a decrease in the Borderline Personality Disorder Severity Index (BPDSI-IV) [22,23], while others examined the results of reducing early maladaptive schemas (EMS) [24]. However, these reviews mainly reported overall effect sizes of BPD without other PDs due to the lack of related literature. Moreover, some new studies [25–27] were not included in the above reviews. To date, no study has used meta-analysis techniques to gather available evidence to evaluate the effectiveness of ST in treating PDs.

On the other hand, group format ST is a promising option, which is potentially more effective and cost-effective than individual treatment. Farrell and Shaw developed a group ST treatment for BPD [28], and some randomized controlled trials (RCTs) have investigated the efficacy of group ST [28,29]. However, there is no specific literature that has assessed the efficacy of group ST in the treatment of PD symptoms.

Nowadays, there are an increasing number of single-group trials of ST for treating PDs [30–32], but no one has conducted a quantitative analysis of the combined effect. However, it is meaningful to analyze them, as it can increase the sample size, extend the results, and make our findings more applicable.

Given these limitations, we conducted a systematic review and meta-analysis that gathered RCTs and single-group trials to investigate the effectiveness of ST (including individual and group ST) in treating individuals with PDs.

2. Method

2.1. Search strategy

This article was based on the Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA) guidelines [33]. The PROSPERO ID is CRD42020198134.

A systematic review was conducted to retrieve publications from various databases including PubMed, PsycInfo, Ovid Medline, Cochrane Central Register of Controlled Trials, Embase, and Web of Science. The search was performed from the inception of these databases to 10 August 2022. The full search strings are provided in the supplemental material. Additionally, reference lists of early reviews were examined for potentially related studies. Furthermore, researchers in this field were consulted to identify any unpublished trials or literature.

2.2. Eligibility criteria

Prospective clinical studies, including RCTs and single-group studies, were included in this systematic review and meta-analysis. Only articles published in English were included.

Studies that included participants over the age of 18 with a diagnosis of PDs were eligible for inclusion. The samples were not limited by diagnosis or clinical characteristics, and could include individuals diagnosed with Borderline Personality Disorder, Avoidant Personality Disorder, Dependent Personality Disorder, Obsessive-compulsive Personality Disorder, Paranoid Personality Disorder, Histrionic Personality Disorder, Schizotypal Personality Disorder, and Narcissist Personality Disorder. Studies that utilized individual ST, group ST, or a combination of both were considered for inclusion.

2.3. Outcomes measures

The primary outcome for this systematic review and meta-analysis is the scores on the scales assessing PDs, including the BPDSI-IV, Borderline Syndrome Index (BSI), Millon Clinical Multiaxial Inventory (MCMI), and Structured Clinical Interview for DSM-IV Disorders II (SCID-II). The secondary outcome measures include quality of life assessments using tools such as the World Health Organization Quality of Life (WHOQO-L), the EuroQol-thermometer (EuroQol), Symptom Checklist-90 Revised (SCL-90), or Inventory of Interpersonal Problems (IIP), and changes in early maladaptive schemas using the Young Schema Questionnaire (YSQ).

To select eligible studies, we followed two steps. First, two independent reviewers (X.H. and Q.X.) screened the titles and abstracts of potential studies. Then, the full text of relevant articles was retrieved and evaluated. Disagreements were resolved through discussion with another reviewer (Z.W.). Only studies that met the inclusion criteria were included in the final analysis.

2.4. Quality assessment

In this article, we used the Cochrane risk of bias assessment tool [34] to evaluate the quality of included RCTs, which comprised six aspects: selection bias, detection bias, performance bias, attrition bias, reporting bias, and other biases. We rated each aspect as having a low risk, high risk, or an unknown risk of bias. Two independent assessors (X.H. and Z.W.) performed the risk of bias assessment. Then, we categorized the studies into an overall bias risk category. For the included single-group studies, we used the Methodological

Index for Non-Randomized Studies (MINORS) [35] to assess the methodological quality.

2.5. Data extraction

Two authors (Z.W. and R.H.) independently used standard extraction forms to collect data. The extracted data included: 1) patient characteristics (such as sample size, mean age, and diagnostic information); 2) intervention details (such as session of treatment, duration of treatment, and treatment pattern); 3) outcome measures (including the effects on symptoms of PDs and any increase in quality of life score using any validated scale). Any disagreements were resolved through discussion with a third author (Q.X.).

2.6. Statistical analysis

We used Comprehensive Meta Analysis 3.3 [36] to conduct all analyses. First, we conducted an intergroup analysis of RCTs to summarize the overall difference in the changes in symptoms of PDs between the ST group and the control group. We used Hedges's g (95% confidence interval) to calculate the overall effect size, as Hedges's g offers a relatively fair standardization effect estimate based on small samples [37] compared to Cohen's d. We also conducted heterogeneity tests, and if $I^2 > 50\%$ and $p \le 0.05$, indicating significant heterogeneity, we used a random effects model. Otherwise, we used a fixed effect model. Additionally, we performed subgroup analyses based on the type of PDs and ST. Secondly, we explored the impact of quality of life, which is often used as a secondary outcome indicator for the study of PDs. We conducted subgroup analysis of ST type. Thirdly, we also explored the effect size of ST on the EMS. Finally, for single-group trials, we conducted a rate meta-analysis. We defined 'effective' as a decline in the resulting indicator compared to the baseline, indicating that symptoms are relieved or no longer meet diagnostic criteria. Then, the effective rate was defined as the ratio of the quantity of activities to the total number of participants.

3. Results

3.1. Study selection

The literature search yielded a total of 425 citations, and an additional 3 records were identified through other sources. After removing 258 duplicate articles, 114 studies were screened based on their titles and abstracts, and 53 were excluded. The full texts of the remaining articles were then assessed for eligibility, resulting in the inclusion of 16 studies that met the criteria. These comprised 9 RCTs [20,25–31,38–40] and 7 single-group trials [32,41-–44]. Figure 1 illustrates the screening process of articles.

3.2. Characteristics of included studies

Table 1 presents details of each study, involving 750 participants with mean ages ranging from 25 to 38 years and a

median of 31 years. Ten studies included patients with BPD as the main inclusion criteria, requiring participants to be adults (18 years or older) with a primary diagnosis of BPD based on DSM-IV or other measures and a BPDSI-IV score above 20 [20,25–30,40,41,43]. Five studies included participants with at least one personality disorder diagnosis based on SCID II and other measures [31,32,39,42,44]. Another study [38] included participants with different PDs diagnosed using the Personality Diagnostic Questionnaire-Version 4 Revised (PDQ-4R). Eight studies used individual schema therapy [20,26,30,38–40,42,43]. The other seven studies used group schema therapy [25–29,31,32,44]. Most studies measured symptoms of PD as the primary outcome, with quality of life and changes in EMS measured as secondary outcomes.

3.3. Risk of bias assessment

Figure 2 displays the results of the Cochrane Risk of Bias assessments. As shown in Figure 2(A), insufficient blinding of participants and inadequate concealment of allocation were common risk factors for bias. Only 3 out of 8 studies used blind methods, meaning participants were not aware of their treatment control status or the hypothetical outcomes of the trial. In Figure 2(B), allocation concealment also contributed to the risk of bias. Seven single-group studies scored from 12 to 15 points, which were considered acceptable for the present meta-analysis, as assessed using the MINORS index (Table 2).

3.4. Primary outcome

Figure 3 displays the overall effect of ST on PD symptoms in comparison to the control group. The results reveal that ST had a moderately positive effect on relieving symptoms of PDs compared to the control condition (8 studies, $n = 558$, $g = 0.359$, 95% CI: 0.006–0.711). A random-effects model was chosen due to significant heterogeneity ($I^2 = 58.92\%$).

There are differences in the efficacy of ST across different PDs (see Figure 4 for the forest plot). The effects of ST on BPD ($g = 0.665$) are considerably larger than for other types of PDs ($g = 0.297$–0.610). This subgroup analysis included avoidant personality disorder, borderline personality disorder, and paranoid personality disorder. Subgroup analysis was not performed for other PDs because there was only one study.

Also, we found that the effect size of group ST is greater than individual ST on symptoms of PDs when compared to control groups (The forest plot is shown in Figure 5). Group ST (3 studies, $n = 78$, $g = 0.859$, 95%CI: −0.425–2.142) had a moderately positive effect on symptoms of PDs compared to control groups. When comparing individual ST groups to control groups, there is a weaker effect (4 studies, $n = 375$, $g = 0.163$, 95%CI: −0.035–0.361). Heterogeneity was not significant. Moreover, it is worth noting that the result showed a significant between-subgroup effect size.

3.5. Secondary outcome

We used a random-effects model to compare the overall effects of ST on quality of life with control conditions, as
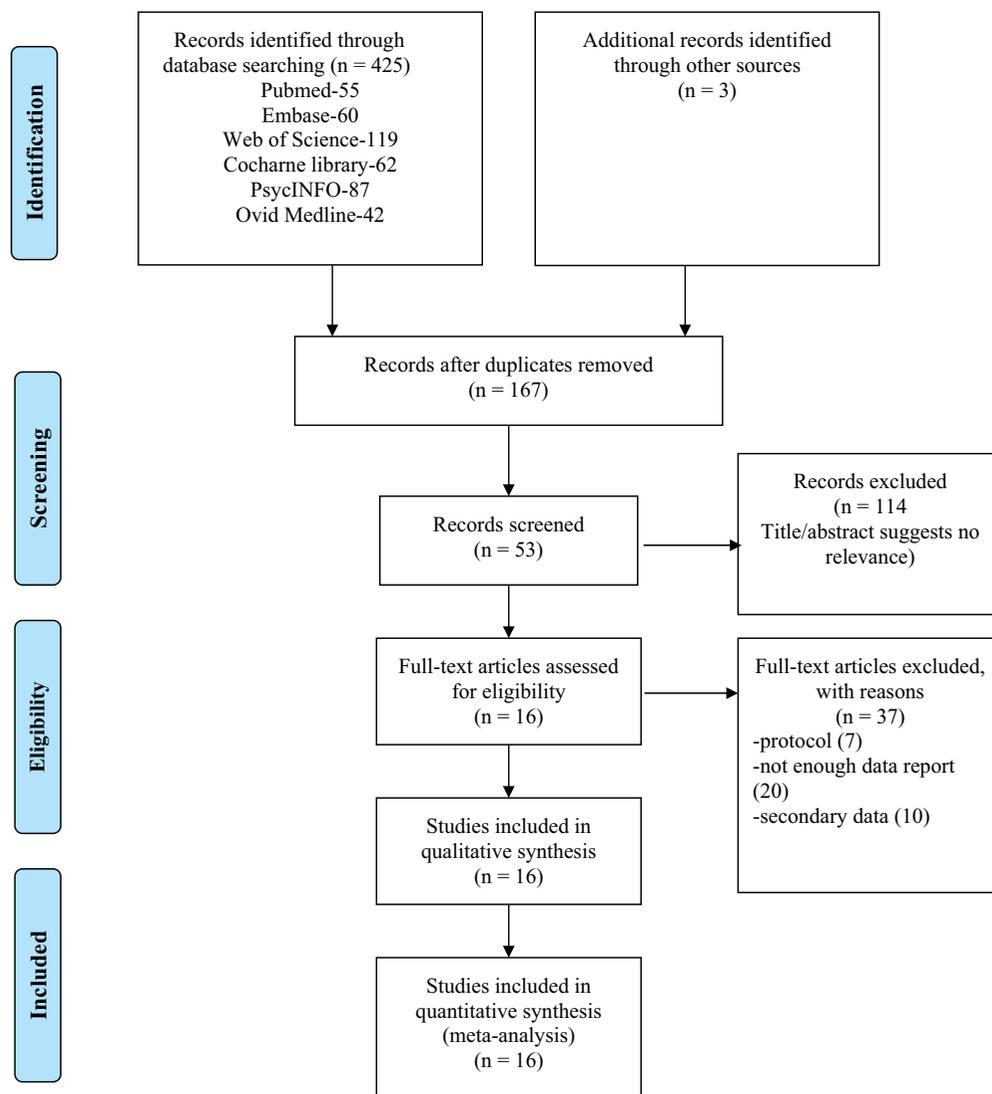
Figure 1. PRISMA Flow chart of study selection.

shown in Figure 6(A). The results showed a moderate pooled effect (6 studies, $n = 484$, $g = 0.256$, 95% CI: 0.066–0.446), indicating that ST significantly improved patients' quality of life. There was moderate heterogeneity ($I^2 = 39\%$).

We also used a random-effects model to compare the pooled effect size of ST on change of EMS with control conditions, as shown in Figure 6(B). The results showed a moderate pooled effect size (3 studies, $n = 193$, $g = 0.590$, 95% CI: 0.238–0.942), indicating that ST substantially reduced EMS compared to control groups. However, there was very high heterogeneity ($I^2 = 97$, $p = 0.00$). A sensitivity analysis was performed and found that the study by Leppänen et al. [2019] was the source of heterogeneity. After its removal, the heterogeneity decreased. However, due to the lack of literature, further research is needed for more in-depth analysis.

3.6. Overall effects of single-group trials

Sixty patients were involved in seven single-group trials that adopted ST. As is shown in Figure 7, the pooled log (OR) values is 0.241 (95% CI: −0.079–0.559) and it has a negligible

heterogeneity. These results revealed that the ST intervention has moderate effect on PDs.

4. Discussion

The primary aim of this study was to examine the efficacy of ST in the treatment of PDs. Fifteen studies met the eligibility criteria. In comparison with a meta-analysis of ST on the treatment of depressive disorders or a review of ST intervention in the treatment of clinical patients [15,45], this meta-analysis identified more appropriate interventions and participants. With the development of ST, more and more clinicians have used this therapy to treat patients. Five out of the eight RCTs involved in the study were published in the past decade, which might suggest that ST has become increasingly popular in recent years [46].

The primary analysis of 8 RCTs revealed that ST has a moderate positive impact ($g = 0.359$) on the symptoms of PDs, with relatively small heterogeneity. Previous reviews of other psychological therapies for people with PDs have shown similar results [7,21], which found that both

Table 1. Characteristics of included trials.

Study	Study design	Clinical group	N (each group)	Mean age (SD)	Type of Schema Intervention	duration	control group type	Measurement of schema change	Outcome measures
Giesen-Bloo et al. (2006)	RCT	BPD	44,42	31.70 (8.9)	IST	50-minute sessions twice a week for 3 years	TFP	YSQ; DSQ–48	BPDSI-IV, EuroQol, BPD-Checklist, WHOQOL; SCL-90
Farrell et al. (2009) [28]	RCT	BPD	16,16	35.3 (9.30)	GST + TAU	30 weekly sessions, each lasting 90 min, over an eight-month period	TAU	N/A	BSI, SCL-90, DIB-R, GAFS
Nadort et al. (2009) [40]	RCT	BPD	32,30	31.81 (9.24)	IST + phone	50 sessions in first year (twice weekly), then once a week in Year two	TFP	YSQ	BPDSI-IV, EuroQol; WHOQOL, BPD-47, SCL90
Ball et al. (2011) [38]	RCT	PPD; BPD; Antisocial PD; Avoidant PD	54,5	25.60 (9.31)	IST	13.4 individual sessions	IDC	N/A	BSI, IIP, MAACL
Bamelis et al. (2014) [39]	RCT	different PDs	145,41,134	37.57 (9.69)	IST	40 sessions in the first year and 10 booster sessions	COP, TAU	N/A	SCID II, ADPDQ, SCL-90, WSAS, MSGODS
Leppänen et al. (2015) [29]	RCT	BPD	18,27	30.8 (6.9)	IST + DBT	40 sessions	TAU	YSQ	N/A
Leppanen et al. (2016)	RCT	BPD	19,32	31.9 (8.3)	IST + DBT	40 individual therapy sessions + 40 ninety minutes psycho-educational group sessions	TAU	N/A	BPDSI-IV; HRQoL
Mohamadizadea et al. (2017) [27]	RCT	BPD	12,12,12	N/A	GST	8 sessions	DBT, placebo	N/A	MCMI; BDI; SSI
Hilden et al. (2021) [25]	RCT	BPD	23,12	N/A	GST	20 weekly sessions of 90 min	TAU	N/A	BSL-23, PHQ-9, OASIS, AUDIT, SDS
Nordahl et al. (2005) [43]	case series	BPD	6	25.7 (8.3)	IST	65-120 sessions	N/A	YSQ	BAI; BDI; GSI; IIP
Gude et al. (2008) [42]	CT	Cluster C personality disorders	24	40.8 (7.7)	IST	52 sessions	TAU	N/A	IIP; SCL-90; MI
Dickhaut et al. (2014) [41]	single group trials	BPD	18	28.5 (8.7)	GST	96 sessions	N/A	YSQ; SMI	BPDSI-IV; EuroQol; WHOQOL; BPD-checklist; SCL90
van Vreeswijk et al. (2014) [44]	single group trials	different PDs	63	39.3 (8.5)	GST	20 sessions	N/A	YSQ	GSI
Videler et al. (2014) [32]	Single group trials	different PDs	31	68 (4.6)	GST	20 sessions	N/A	YSQ	BSI; SCL-90
Skewes et al. (2015) [31]	single group trials	APD; BPD	8	33.8 (7.8)	GST	8-20 sessions	N/A	YSQ; SMI	GSI
Jacob et al. (2018) [30]	single group trials	BPD	13	28.4 (8.3)	IST	48 sessions	N/A	N/A	BPDSI-IV

Note. ADPDQ: assessment of dsm-iv personality disorders questionnaire dimensional subscales; BDI beck depression inventory; BPD-Checklist: BPD checklist on the burden of BPD-specific symptoms; BPDSI-IV: Borderline Personality disorder severity index, fourth version; BSI: borderline syndrome index; COP: clarification-oriented psychotherapy; DIB-R: diagnostic interview for borderline personality disorders-revised; DSQ-48: the defense style questionnaire; EuroQol: the euroqol thermometer; GAFS: global assessment of function scale; GSI:global symptom index; HRQoL: the quality of life with the 15D health-related quality of life; IDC: individual drug counseling; IIP: inventory of interpersonal problems-circumplex; MAACL:multiple-affect adjective checklist-revised; MCMI: Millon clinical multiaxial inventory; MSGODS: Miskimins self-goal-other discrepancy scale; SCID-II: structured clinical interview for DSM-IV axis II personality disorders; SCL-90 = the symptom checklist-90 for subjective experience of general symptoms; SSI: scale for suicide ideation; WHOQOL: The world health organization quality of life assessment; WSAS: The work and social adjustment scale; TAU treat as usual; TFP: transference-focused psychotherapy; YSQ: the young schema questionnaire.

comprehensive and non-comprehensive psychotherapeutic interventions for BPD have positive effects. Subgroup analysis showed that ST has positive effects on different kinds of PDs, with the effects of ST on BPD (g=0.665) being considerably larger than on other PDs. However, the number of articles included in the analysis for other PDs is small, and therefore, this result should be treated with caution.

Subgroup analysis showed that the effect size of group ST (g=0.859) was greater than that of individual ST (g=0.163) in reducing symptoms of PDs. This result is consistent with previous studies [45] that found both individual and group ST to be effective in reducing depressive symptoms in depressive disorders, but group ST may have additional advantages over individual ST, such as being more cost-effective and
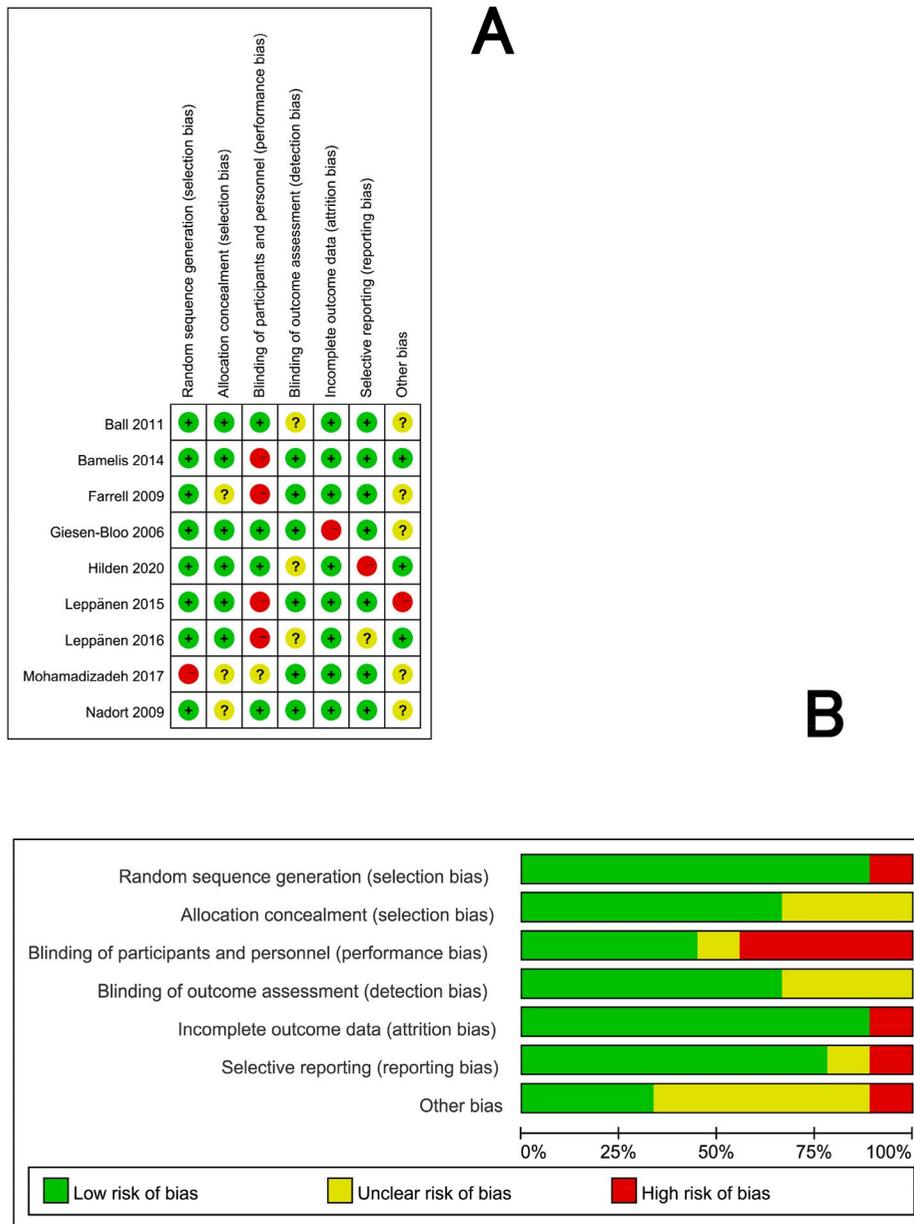
Figure 2. Quality assessment of RCTs. (A) Risk of bias summary: review authors' judgments about each risk of bias item for each included study. (B) Risk of bias graph: review authors' judgments about each risk of bias item presented as percentages across all included studies.

Table 2. MINORS Index for included non-randomized studies.

study	I	II	III	IV	V	VI	VII	VIII
Nordahl et al. (2005) [43]	2	2	2	2	0	2	1	2
Gude et al. (2008) [42]	2	2	2	2	0	2	2	2
Dickhaut et al. (2014) [41]	2	2	2	2	0	2	2	2
van Vreeswijk et al. (2014) [44]	2	2	2	2	0	2	2	2
Videler et al. (2014) [32]	2	2	2	2	1	2	2	2
Skewes et al. (2015) [31]	2	2	2	2	0	2	2	2
Jacob et al. (2018) [30]	2	2	1	2	0	2	1	2

Note. Numbers I-VIII in heading signified: I, a clearly stated aim; II, inclusion of consecutive patients; III, prospective collection of data; IV, endpoints appropriate to the aim of the study; V, unbiased assessment of the study endpoint; VI, follow-up period appropriate to the aim of the study; VII, loss of follow up less than 5%; VIII, prospective calculation of the study size.

providing a sense of universality and belongingness [28]. Overall, these findings suggest that ST is an effective treatment for PDs, particularly when delivered in a group format.

Most patients suffering from PDs have a low quality of life [47]. Therefore, we conducted an analysis to evaluate the effect of ST on improving quality of life compared to other interventions. The results from 6 RCTs indicated a moderate effect size ($g=0.256$), which suggests that ST effectively improved quality of life. By controlling symptomatic distress and helping patients overcome internal barriers and improve their coping and interpersonal skills, ST can improve their quality of life. These results are consistent with a previous meta-analysis [21], which found that psychotherapy has a positive effect on the quality of life of patients with BPD. However, the limited number of included studies in our analysis means that it is unclear whether psychotherapy has a lasting effect on the quality of life of patients with PDs.
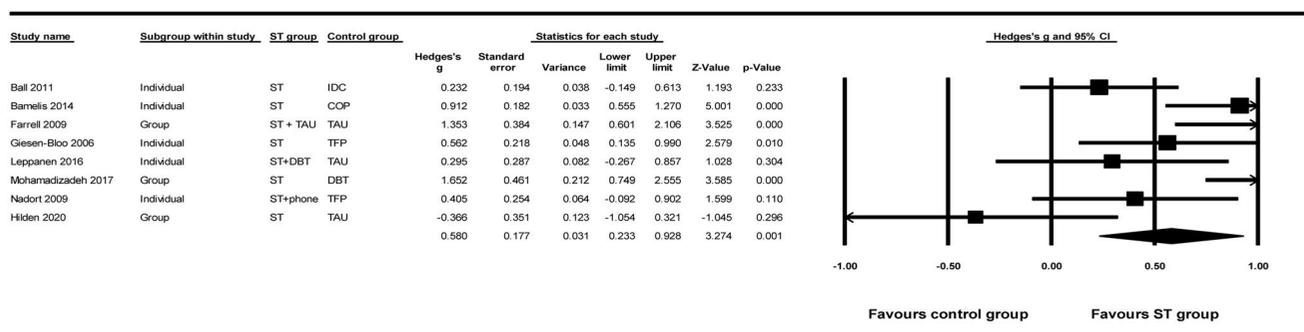
Figure 3. Between-group effect size of ST on symptoms of personality disorders. Meta-analysis of the effects of ST on symptoms of personality disorders. Box size represents study weighting. Diamond represents overall effect size and 95% CI.
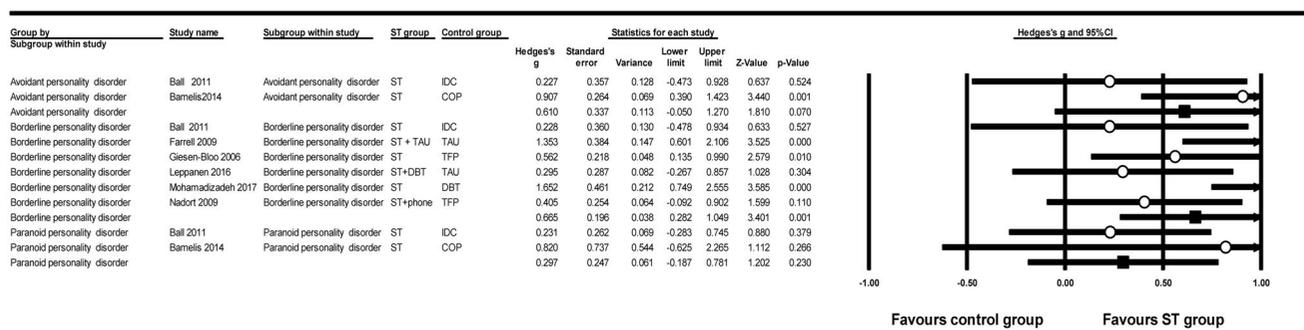

Figure 4. Subgroup analyses. Meta-analysis showing effects of ST on symptoms of different types of personality disorders.
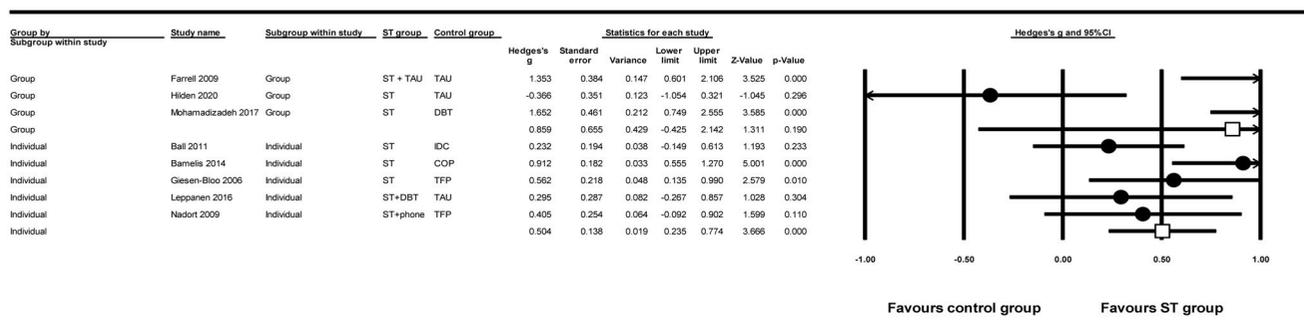

Figure 5. Subgroup analyses. Meta-analysis showing effects of individual and group ST on symptoms of personality disorders in comparison of control conditions. Box size represents study weighting. Diamond represents overall effect size and 95% CI.

The concept of early maladaptive schemas (EMS), described as negative beliefs about oneself, other people, and the world, is a central focus of ST [48]. Thus, we also evaluated the impact of ST on reducing EMS. The results showed a moderate effect size ($g = 0.601$), suggesting that ST was effective in reducing EMS. However, there was high heterogeneity, which may be attributed to the small number of studies and publication bias. Therefore, further studies are required to confirm these findings.

Additionally, the results of the single-group trials also support the effectiveness of ST in treating PDs, which adds to the collective evidence. Some studies suggest that high-quality single-group trials can provide estimates similar to RCTs [49], and the inclusion of both types of studies in the meta-analysis can increase the applicability of the findings. The quality of the included single-group trials was
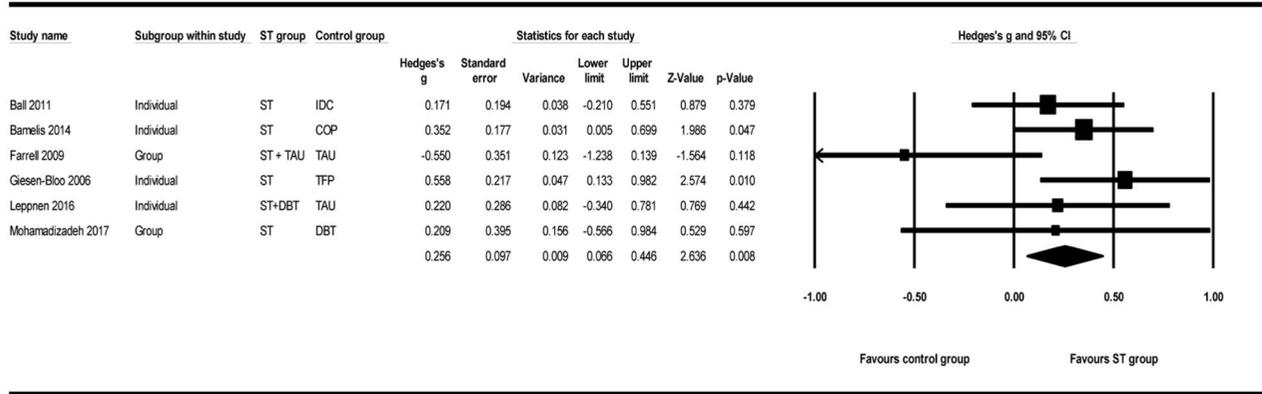
assessed using MINORS and found to be high (12 to 15 points), which increases the objectivity and comprehensiveness of the results.

Overall, ST shows significant reductions in symptoms of PDs and improvements in quality of life and EMS. Despite growing empirical support for ST [15], there is still room for improvement. High-quality RCTs for different PDs are rare, limiting generalizability, and few studies have investigated changes in EMS. Future studies should make EMS change an essential outcome measure to further investigate the efficacy of this treatment.

4.1. Study limitations

This meta-analysis has some limitations that should be considered when interpreting the results. Firstly, the majority of
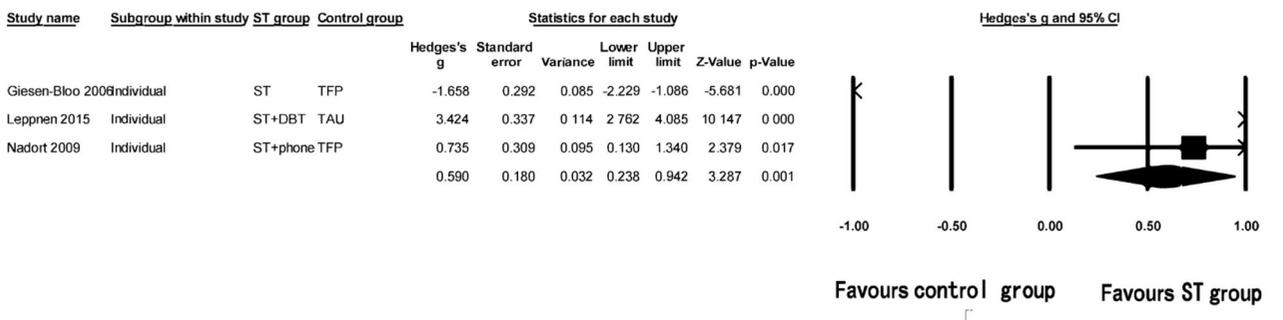
A

Study name	Subgroup within study	ST group	Control group	Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
Ball 2011	Individual	ST	IDC	0.171	0.194	0.038	-0.210	0.551	0.879	0.379
Bamelis 2014	Individual	ST	COP	0.352	0.177	0.031	0.005	0.699	1.986	0.047
Farrell 2009	Group	ST + TAU	TAU	-0.550	0.351	0.123	-1.238	0.139	-1.564	0.118
Giesen-Bloo 2006	Individual	ST	TFP	0.558	0.217	0.047	0.133	0.982	2.574	0.010
Leppnen 2016	Individual	ST+DBT	TAU	0.220	0.286	0.082	-0.340	0.781	0.769	0.442
Mohamadizadeh 2017	Group	ST	DBT	0.209	0.395	0.156	-0.566	0.984	0.529	0.597
				0.256	0.097	0.009	0.066	0.446	2.636	0.008

Statistics for each study — Hedges's g and 95% CI

Favours control group Favours ST group

B

Study name	Subgroup within study	ST group	Control group	Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
Giesen-Bloo 2006	Individual	ST	TFP	-1.658	0.292	0.085	-2.229	-1.086	-5.681	0.000
Leppnen 2015	Individual	ST+DBT	TAU	3.424	0.337	0.114	2.762	4.085	10.147	0.000
Nadort 2009	Individual	ST+phone	TFP	0.735	0.309	0.095	0.130	1.340	2.379	0.017
				0.590	0.180	0.032	0.238	0.942	3.287	0.001

Statistics for each study — Hedges's g and 95% CI

Favours control group Favours ST group

Figure 6. Secondary analysis. (A) Meta-analysis of the effects of ST on quality of life. Box size represents study weighting. Diamond represents overall effect size and 95% CI. (B) Meta-analysis of the effects of ST on EMS. Box size represents study weighting. Diamond represents overall effect size and 95% CI.
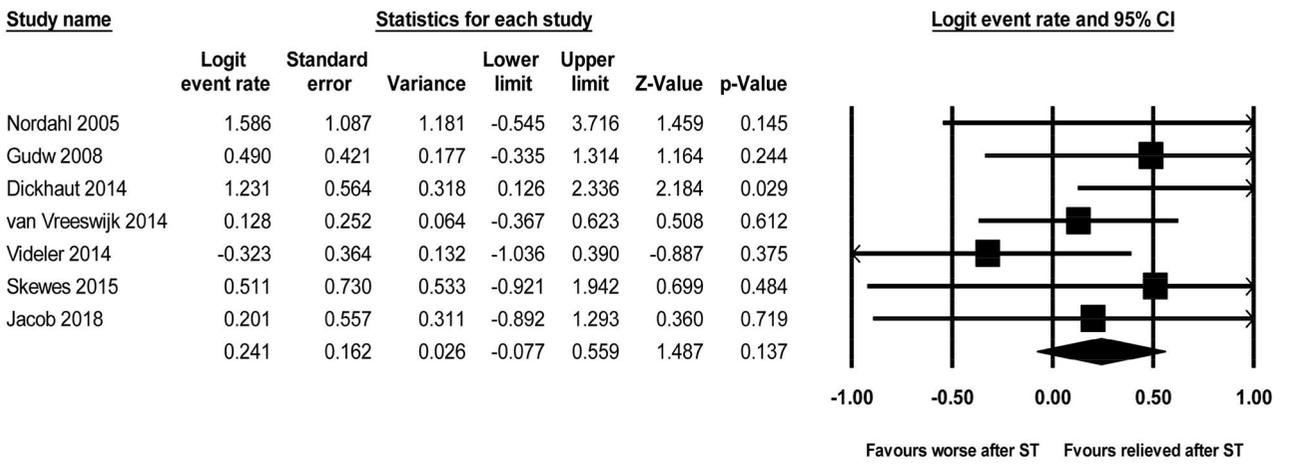
Study name	Logit event rate	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
Nordahl 2005	1.586	1.087	1.181	-0.545	3.716	1.459	0.145
Gudw 2008	0.490	0.421	0.177	-0.335	1.314	1.164	0.244
Dickhaut 2014	1.231	0.564	0.318	0.126	2.336	2.184	0.029
van Vreeswijk 2014	0.128	0.252	0.064	-0.367	0.623	0.508	0.612
Videler 2014	-0.323	0.364	0.132	-1.036	0.390	-0.887	0.375
Skewes 2015	0.511	0.730	0.533	-0.921	1.942	0.699	0.484
Jacob 2018	0.201	0.557	0.311	-0.892	1.293	0.360	0.719
	0.241	0.162	0.026	-0.077	0.559	1.487	0.137

Statistics for each study — Logit event rate and 95% CI

Favours worse after ST Fvours relieved after ST

Figure 7. Rate meta-analysis of seven single-group trials. Meta-analysis of the effects of ST on symptoms of personality disorders. Box size represents study weighting. Diamond represents overall effect size and 95% CI.

the included studies focused on patients with BPD, which limits the ability to conduct subgroup analyses for other types of PDs. This highlights the need for more research that includes a diverse range of PDs. Secondly, some of the studies had small sample sizes, which can reduce the statistical power of the study. Thirdly, while the importance of measuring the change in EMS as an outcome is recognized, only a small number of studies included this measurement. Future studies should aim to use standardized measures and report details consistently to improve the reliability and validity of meta-analyses. Lastly, in our meta-analysis, a notable limitation is the potential researcher allegiance bias [50] that

could affect study findings. Although we assessed methodological quality using the Cochrane tool, its limitations [51] might not fully mitigate this bias. Future research should prioritize enhancing methodological rigor, addressing biases, and promoting transparency to yield more accurate and generalizable insights that contribute meaningfully to scientific knowledge.

4.2. Conclusion

In the meta-analysis, eight randomized controlled trials and seven single-group trials indicated that the ST intervention had a positive effect on PDs. ST is also effective in improving quality of life and EMS, although more high-quality studies are needed to confirm its effect on EMS treatment. These results contribute to the literature on the treatment of PDs with ST, and there are still many aspects of ST that are worth exploring.

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