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Acupuncture as adjunctive treatment for schizophrenia: a systematic review and meta-analysis

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ABSTRACT

Background: Schizophrenia spectrum disorders significantly impair functioning and quality of life. While antipsychotic medications are the cornerstone of treatment, many patients experience persistent symptoms and adverse effects. The potential benefits of acupuncture as adjunctive treatment remain uncertain.
Methods: Nine databases including MEDLINE, EMBASE, and CENTRAL were searched through 15 January 2025. Randomised controlled trials comparing acupuncture plus antipsychotics versus antipsychotics alone in patients with schizophrenia spectrum disorders were included. The primary outcome was overall symptom scores (PANSS/BPRS). Secondary outcomes included adverse events, negative and positive symptom scores, response rates, social function, and quality of life. Risk of bias was assessed using the Cochrane Risk of Bias 2 tool, a random-effects model was applied for meta-analysis, and evidence certainty was evaluated using GRADE.
Results: Fifty-five studies with 4256 participants were included. Acupuncture plus standard-dose antipsychotics improved overall symptoms compared to antipsychotics alone (SMD −1.11, 95 % CI −1.52 to −0.70; 34 studies, 2819 participants; low certainty), but not versus sham acupuncture (MD −0.89, 95 % CI −2.72–0.95; 2 studies, 91 participants; low certainty). Adverse events were reduced versus antipsychotics alone (RR 0.44, 95 % CI 0.33–0.59; 7 studies, 862 participants; moderate certainty). Acupuncture plus low-dose antipsychotics showed little to no difference versus standard-dose antipsychotics alone (SMD −0.47, 95 % CI −1.56–0.61; 8 studies, 532 participants; very low certainty).
Conclusions: Acupuncture combined with standard-dose antipsychotics may provide pragmatic benefits, though lack of superiority over sham acupuncture indicates uncertainty about specific effects. High-quality trials are needed to establish definitive clinical recommendations.

1. Introduction

Schizophrenia spectrum disorders, as defined by the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), encompass a group of severe mental health conditions, including schizophrenia, brief psychotic disorder, and delusional disorder. These disorders are characterised by core features including delusions, hallucinations, disorganised thinking, disorganised or abnormal motor behaviour, and negative symptoms (American Psychiatric Association, 2013; Tandon et al., 2013). Schizophrenia typically begins in

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adolescence or early adulthood, progressing through prodromal, acute, and maintenance phases, with variable clinical courses ranging from early recovery to chronic deterioration (Jobe and Harrow, 2010; Molstrom et al., 2022). Brief psychotic disorder involves schizophrenia-like symptoms lasting less than one month (Fusar-Poli et al., 2022). Delusional disorder is characterised by prominent delusions with relatively preserved functioning.

According to the Global Burden of Disease (GBD) estimates, the number of individuals living with schizophrenia increased from approximately 13–14 million in 1990 to over 23 million in 2021 (Luo et al., 2025; Solmi et al., 2023; Zhan et al., 2025). Antipsychotic medications represent the cornerstone of treatment for schizophrenia spectrum disorders, with strong recommendations for their use in acute episodes and as maintenance treatment to prevent relapse and hospitalisation (Keepers et al., 2020; Buchanan et al., 2025). However, despite their proven efficacy, many patients continue to experience persistent symptoms (Samara et al., 2019), and antipsychotics are associated with various adverse effects, including weight gain and extrapyramidal symptoms that occur at high rates among patients receiving treatment (Hasan et al., 2013; Huhn et al., 2019). Therefore, adjunctive therapeutic approaches warrant investigation.

Acupuncture is a representative intervention in traditional East Asian medicine and one of the most commonly evaluated traditional Chinese medicine treatments for schizophrenia (Deng and Adams, 2017), while being increasingly recognized as a global adjunctive therapy (Ngubane et al., 2024). Regarding its mechanisms of action, a systematic review examining the working mechanisms behind acupuncture (Bosch et al., 2015) identified two underlying mechanisms when treating patients with schizophrenia: first, improvement of sleep quality (Reshef et al., 2013), and second, regulation of emotions and mood (Bloch et al., 2010). Additionally, acupuncture has been reported to have modulating effects on the limbic system (Hui et al., 2000), which plays a key role in emotional processing. Furthermore, acupuncture may modulate glutamate neurotransmission (Tu et al., 2019), which is implicated in schizophrenia pathophysiology.

This review was undertaken as part of the development of a Clinical Practice Guideline of Korean Medicine for treating schizophrenia spectrum disorders. Although several systematic reviews examining acupuncture for schizophrenia have been published, most were published over 10 years ago or had different research focuses, highlighting the need for an updated comprehensive review. Earlier systematic reviews by Lee et al. (2009) and Shen et al. (2014a) were published more than 10 years ago, making an update necessary to incorporate current evidence. More recent reviews have examined specific aspects of the topic: Van den Noort et al. (2018) conducted a literature review without quantitative synthesis, Wang et al. (2020) focused on identifying frequently used acupoints through data mining analysis, and Huang et al. (2023c) specifically examined electroacupuncture interventions. Huang et al. (2023b) conducted a network meta-analysis to identify optimal acupuncture therapies, and Huang et al. (2023a) performed a recent meta-analysis on acupuncture as adjunctive therapy, but the latter primarily focused on the total effective rate with heterogeneous definitions.

Therefore, we conducted this systematic review and meta-analysis to evaluate the benefits and harms of acupuncture combined with antipsychotics for schizophrenia spectrum disorders. Specifically, two clinical questions were assessed: (1) acupuncture combined with standard-dose antipsychotics versus standard-dose antipsychotics alone, and (2) acupuncture combined with low-dose antipsychotics versus standard-dose antipsychotics alone.

2. Material and methods

This systematic review was reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Supplementary material 1) (Page et al., 2021). The protocol was prospectively registered with PROSPERO (registration number: CRD42025634446; https://www.crd.york.ac.uk/PROSPERO/view/CRD42025634446) on 24 January 2025.

2.1. Eligibility criteria

2.1.1. Types of studies

Randomised controlled trials (RCTs) with parallel-group designs comparing acupuncture combined with antipsychotic medication versus antipsychotic medication alone in patients with schizophrenia spectrum disorders were included. Quasi-randomised trials, crossover trials, and cluster-randomised trials were excluded. Conference abstracts that only reported preliminary results without sufficient methodological details or outcome data were excluded.

2.1.2. Types of participants

Studies involving participants of any age diagnosed with schizophrenia spectrum disorders according to established diagnostic criteria, including the DSM-5, DSM-IV, International Classification of Diseases, 11th Revision (ICD-11), ICD-10, Chinese Classification of Mental Disorders, Third Edition (CCMD-3), CCMD-2, were included. The schizophrenia spectrum disorders included schizophrenia, delusional disorder, brief psychotic disorder, schizophreniform disorder, and schizoaffective disorder. Studies conducted in any setting, including inpatient psychiatric units and outpatient clinics, were included.

Studies involving participants with substance- or medication-induced psychotic disorders were excluded. In addition, studies where the primary focus was on antipsychotic medication-induced adverse effects in patients with schizophrenia spectrum disorders, such as weight gain, metabolic abnormalities, or hyperprolactinemia, were excluded. Additionally, studies targeting comorbid symptoms other than positive and negative symptoms in schizophrenia spectrum disorder patients, such as agitation, excitement, depression, or insomnia, were excluded.

2.1.3. Types of interventions

The experimental interventions consisted of acupuncture combined with standard-dose antipsychotic medication or acupuncture combined with low-dose antipsychotic medication. Various forms of acupuncture intervention were included, encompassing manual acupuncture (needle insertion at acupuncture points with manual stimulation), electroacupuncture (electrical stimulation at acupuncture points, including non-invasive electrical stimulation applied to acupuncture points), laser acupuncture (laser therapy applied to acupuncture points), and auricular acupuncture (acupuncture applied to ear acupuncture points using needles or seeds). Low-dose antipsychotic medication was defined as the planned dose of antipsychotic medication that was lower than the dose used in the control group. The comparator interventions were standard-dose antipsychotic medication alone or sham acupuncture combined with standard-dose antipsychotic medication.

Studies in which either the intervention or control group received additional treatments beyond acupuncture and antipsychotic medication, such as herbal medicine, moxibustion, or cupping, were excluded. However, studies in which both groups received identical co-interventions that were considered part of standard care for schizophrenia spectrum disorders, such as general nursing care or rehabilitation training, were included.

2.2. Outcome measures

2.2.1. Primary outcome

Overall symptom scores served as the primary outcome for this review. This outcome was measured using the Positive and Negative Syndrome Scale (PANSS) (Kay et al., 1987) or the Brief Psychiatric Rating Scale (BPRS) (Leucht et al., 2005a) total score, with the PANSS total score prioritised when both measures were available. The time point of interest was treatment completion.

Overall symptom scores were identified as a critical outcome through expert consensus evaluation involving 13 Korean medicine doctors who assessed the importance of outcomes for evaluating Korean medicine effectiveness in schizophrenia spectrum disorders using a 1–9 Likert scale. This outcome received a mean rating of 8.15 with a standard deviation of 1.21, confirming its classification as a critical outcome essential for clinical decision-making. For interpretation of effect sizes, pre-defined thresholds for trivial effects were set as SMD −0.2–0.2 for continuous outcomes and RR 0.75–1.25 for dichotomous outcomes.

2.2.2. Secondary outcomes

Secondary outcomes included the overall adverse event incidence rate, negative symptom scores, positive symptom scores, response rates, social function scores, quality of life scores, relapse rates, and adherence to antipsychotic medication. The overall adverse event incidence rate was measured as the proportion of participants experiencing any adverse events during the treatment period. Negative symptom scores were measured using PANSS negative symptom scores or the Scale for the Assessment of Negative Symptoms (SANS) total score, with PANSS prioritised. Positive symptom scores were measured using PANSS positive symptom scores or the Scale for the Assessment of Positive Symptoms (SAPS) total score, with PANSS prioritised. Response rates were defined as the proportion of participants showing $\geq$ 50 % reduction from baseline in PANSS or BPRS total scores (Leucht et al., 2005a, 2005b).

Social function scores were measured using the Personal and Social Performance Scale (PSP), Social and Occupational Functioning Assessment Scale (SOFAS), or Global Assessment of Functioning (GAF) scale, with PSP prioritised. Quality of life scores were measured using the Quality of Life Scale (QLS), EuroQol Five Dimensions Questionnaire (EQ-5D), or 36-item Short Form Health Survey (SF-36), with QLS prioritised.

Most outcomes were assessed at treatment completion, while relapse rates were assessed at the end of the observation period. Studies that did not report at least one outcome from either primary or secondary outcomes were excluded.

2.3. Search methods for the identification of studies

2.3.1. Electronic searches

Comprehensive electronic searches across nine databases were conducted to identify relevant randomised controlled trials. The databases searched included MEDLINE via PubMed, EMBASE via Ovid, Cochrane Central Register of Controlled Trials (CENTRAL), China National Knowledge Infrastructure (CNKI), Citation Information by NII (CiNii), Korean Studies Information Service System (KISS), ScienceON, Oriental Medicine Advanced Searching Integrated System (OASIS), and WHO International Clinical Trials Registry Platform (ICTRP). All database searches were conducted on 15 January 2025. No restrictions were applied regarding language or publication date. The search strategy was developed by combining search terms related to schizophrenia spectrum disorders, acupuncture interventions, and study design (randomised controlled trials). The final search strategy was determined after consultation with systematic review experts. Full search strategies for all databases are provided in Supplementary material 2.

2.3.2. Searching other resources

The reference lists of all included studies and relevant systematic reviews identified during the search process were systematically examined to identify additional potentially eligible trials. It was also verified whether full-text publications were available for clinical trials identified through the ICTRP and conference abstracts identified during the search.

2.4. Data collection and analysis

All screening, data extraction, risk of bias assessment, reporting bias assessment, and certainty of the evidence assessment procedures were conducted independently by multiple reviewers. Two reviewers (Y.C. and P.W.K.) performed initial screening, extraction, and assessments with a third reviewer (B.L.) consulted when consensus could not be reached. Disagreements at all stages were resolved through discussion. Data extraction was conducted between 19 February and 14 April 2025.

2.4.1. Selection of studies

Two reviewers independently screened the titles and abstracts of all retrieved records against the inclusion criteria using EndNote software. Full-text articles were then independently assessed by the same two reviewers for eligibility using Zotero software. The reasons for excluding studies at the full-text stage were documented and presented in a PRISMA flow diagram. Exclusion reasons were categorised hierarchically according to the following criteria: study design (e.g. not a randomised controlled trial), participant characteristics (e.g. diagnostic criteria, comorbid conditions), intervention and comparison appropriateness (e.g. antipsychotic use, acupuncture use, combined treatment), outcome reporting, and publication type (e.g. duplicates, conference abstracts without results). None of the review authors was involved in any of the studies included in this review.

2.4.2. Data extraction and management

Two reviewers independently extracted data from the included studies using a standardised data collection form developed in Excel. The data extraction form was piloted on five studies and refined accordingly. For the included studies, the following information was extracted: study design (randomised controlled trial) and participant details including diagnostic criteria, major inclusion criteria of symptom scores and duration of illness, pattern identification, sex, age, duration of illness, setting, and country. Acupuncture intervention details were documented according to STRICTA guidelines (MacPherson, Altman, Hammerschlag, Youping, Taixiang, White, and Moher, 2010), including style of acupuncture, number of needle insertions, points used, depth of insertion, response sought, needle stimulation, needle retention time, needle type, and treatment sessions (number, frequency, and duration). Antipsychotic medication details included the name of antipsychotics, doses, and duration of treatment. All outcome measures, as defined in the outcome measures section, were extracted. For the meta-analysis, the mean and standard deviation for continuous outcomes and the number of events and sample size for dichotomous outcomes were extracted. Information regarding funding and potential conflicts of interest was also recorded. Data were extracted as reported in the original studies, without contacting the study authors for additional information.

2.4.3. Risk of bias assessment in the included studies

Two reviewers independently assessed risk of bias in included randomised controlled trials using the revised Cochrane Risk of Bias tool (RoB 2) (Higgins et al., 2019). Risk of bias was evaluated across five domains: randomisation process, deviations from intended interventions, missing outcome data, measurement of the outcome, and selection of the reported result. The risk of bias was assessed for all outcome measures, focusing on the effect of assignment to intervention (intention-to-treat effect). Each study was rated as ‘low risk of bias’, ‘some concerns’, or ‘high risk of bias’ for each domain and overall, following standard RoB 2 criteria.

2.4.4. Reporting bias assessment

Reporting bias was assessed using funnel plots and Egger’s test when at least 10 studies were available for an outcome. Funnel plots were created to visually inspect the small-study effects and potential publication bias. Egger’s test was performed to statistically assess funnel plot asymmetry, with a p-value < 0.05 considered indicative of potential reporting bias.

2.4.5. Synthesis methods

Separate random-effects meta-analyses were conducted for four main comparisons: (1a) acupuncture combined with standard-dose antipsychotic medication versus standard-dose antipsychotics alone, (1b) acupuncture combined with standard-dose antipsychotic medication versus sham acupuncture plus standard-dose antipsychotics, (2a) acupuncture combined with low-dose antipsychotic medication versus standard-dose antipsychotics alone, and (2b) acupuncture combined with low-dose antipsychotic medication versus sham acupuncture plus standard-dose antipsychotics.

Effect sizes were calculated as standardised mean differences (SMD) for outcomes measured by multiple instruments, mean differences (MD) for single instruments, and risk ratios (RR) for dichotomous outcomes, all with 95 % confidence intervals. The restricted maximum likelihood (REML) method with Hartung-Knapp-Sidik-Jonkman confidence intervals was used. Statistical heterogeneity was assessed using the I^2 statistic (25 %, 50 %, 75 % = low, moderate, high heterogeneity). All analyses used RevMan Web version 8.20.

2.4.6. Investigation of heterogeneity and subgroup analysis

Sources of heterogeneity were investigated through subgroup analyses when at least 10 studies were available for the outcome of interest. Three subgroup analyses were planned for the primary outcome. First, subgroups were planned to be defined based on risk of bias assessment (studies with low risk of bias or some concerns versus studies with high risk of bias). However, this analysis could not be performed, as all included studies for primary outcome were rated as having 'some concerns' for overall risk of bias. Second, subgroups were defined based on intervention type (manual acupuncture, electroacupuncture, laser acupuncture, or auricular acupuncture). It was expected that different acupuncture modalities might have varying therapeutic effects. Third, subgroups were defined based on participant type (refractory schizophrenia, chronic schizophrenia, and other subtypes). Additionally, a post-hoc sensitivity analysis excluding adolescent participants was conducted.

2.4.7. Certainty of evidence assessment

Two reviewers independently assessed the certainty of evidence using the GRADE approach for outcomes included in the summary of findings tables (Schünemann et al., 2013). The certainty of evidence was assessed across five domains. First, for risk of bias, the evidence was downgraded by one level when more than half of the studies were rated as having 'some concerns' or 'high risk' for overall risk of bias using RoB 2. Second, for inconsistency, the evidence was downgraded by one level when the confidence intervals of studies showed minimal overlap, and the direction of effects was opposite across multiple studies. Third, for indirectness, the evidence was planned to be downgraded by one level when evidence was not directly applicable; however, no such cases were identified. Fourth, for imprecision, the evidence was downgraded by one level when the confidence interval of the effect estimate crossed the threshold for trivial effect or when the predefined optimal information size was not met (at least 300 total events for dichotomous outcomes or 400 total participants for continuous outcomes). Finally, for publication bias, evidence was assessed using funnel plots and Egger's test when at least 10 studies were available for an outcome. A summary of the findings tables was created for four main comparisons, including seven outcomes where available.

3. Results

3.1. Results of the search

Our comprehensive search identified 867 records from nine databases. After removing 74 duplicates, 793 records were screened by title and abstract, of which 635 were excluded. An additional 2 records were identified through citation searching. A total of 159 full-text reports were assessed for eligibility, and 97 reports were excluded. The main reasons for exclusion were: not randomised controlled trials ($n = 15$), not schizophrenia spectrum disorders ($n = 3$), without or unclear diagnostic criteria ($n = 9$), comorbid substance use disorder ($n = 1$), focused on co-existing symptoms rather than core schizophrenia symptoms ($n = 26$), intervention and comparison criteria not met ($n = 13$), no relevant outcomes reported ($n = 13$), conference abstracts or achievement reports without results ($n = 11$), and duplicates ($n = 6$). A complete list of excluded studies with reasons is provided in Supplementary material 3. A total of 55 studies reported in 62 publications were included in this systematic review. The flow of study selection is presented in Fig. 1.

3.2. Characteristics of the included studies

A total of 55 randomised controlled trials with 4256 participants were included. The studies were conducted primarily in China (54 studies), with participants diagnosed with schizophrenia according to various criteria, including the DSM-5, DSM-IV, ICD-11, ICD-10, CCMD-3, and CCMD-2. Of the 55 included studies, 46 studies compared acupuncture combined with standard-dose antipsychotics: 43 versus standard-dose antipsychotics alone and 3 versus sham acupuncture plus standard-dose antipsychotics (Table 1), while 9 studies compared acupuncture combined with low-dose antipsychotics: 8 versus standard-dose antipsychotics alone and 1 versus sham acupuncture plus standard-dose antipsychotics (Table 2).

The acupuncture interventions included manual acupuncture (25 studies), electroacupuncture (25 studies), laser acupuncture (2 studies) (Ma et al., 1999; Zhang, 1991), auricular acupuncture (2 studies) (Meng et al., 2024; Yang et al., 2015), and 1 study(Xu et al., 2010) that used manual acupuncture and electroacupuncture sequentially in different phases. The most frequently used acupoints across all studies were GV20 (used in 37 studies), EX-HN3 (23 studies), PC6 (18 studies), SP6 (13 studies), GV24 (12 studies), HT7 (11 studies), and ST36 (11 studies). For electroacupuncture specifically, the most commonly used points were GV20 (15 studies), EX-HN3 (9 studies), EX-HN5 (5 studies), GV24 (4 studies), PC6 (4 studies), and LR3 (3 studies).

Treatment duration ranged from 2 to 16 weeks, with most studies providing treatment for 6–12 weeks. The antipsychotic medications used included risperidone, olanzapine, aripiprazole, clozapine, amisulpride, quetiapine, ziprasidone, and chlorpromazine. For the primary outcome of overall symptom scores, 30 studies reported PANSS total scores and 17 studies reported BPRS total scores, with 2 studies reporting both measures. Complete details of the characteristics of the included studies are provided in Supplementary material 4. Detailed acupuncture intervention characteristics according to STRICTA guidelines (MacPherson et al., 2010) are provided in Supplementary material 5.

3.3. Risk of bias in the included studies

Of the 55 included studies, 54 were assessed as having 'some concerns' and 1 study (Cui et al., 2022) was assessed as having 'high risk' for overall risk of bias according to the RoB 2 tool. The risk of bias assessments were consistent across all outcome measures. Detailed risk of bias assessments for all included studies are provided in Supplementary material 6.

The primary methodological concerns were related to reporting allocation concealment. Most studies (52 out of 55) were rated as having 'some concerns' for the randomisation process because allocation concealment was insufficiently reported, despite the appropriate randomisation sequence generation methods being described. Only 3 studies provided sufficient information about allocation concealment procedures (Cheng et al., 2009; Li et al., 2023b; Lu and Ma, 2020). For deviations from intended interventions, most studies had low risk of bias, though some studies using per-protocol analysis were rated as

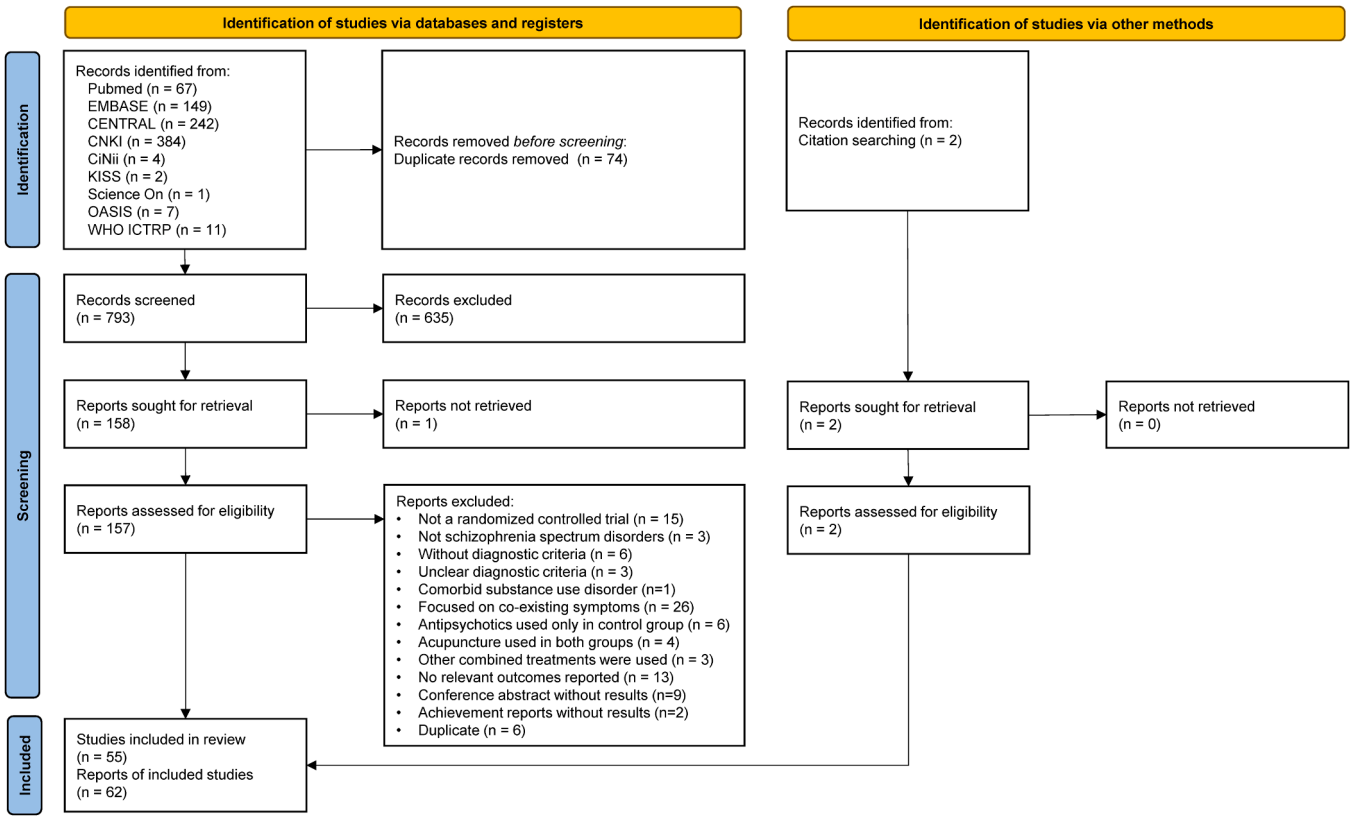

Fig. 1. PRISMA flow diagram.

having 'some concerns' or 'high risk'. One study was rated as having 'high risk' for this domain due to the use of per-protocol analysis combined with a high dropout rate (10.5 %), which could have substantially affected the study results (Cui et al., 2022). Regarding outcome measurement, only 7 studies implemented assessor blinding and were rated as low risk (Bouhlel et al., 2011; Cheng et al., 2009; Gao et al., 2014; Li et al., 2023a; Li et al., 2023b; Sun et al., 2016; Zhang, 1991). Studies without information about assessor blinding received 'some concerns' ratings, though the use of standardised assessment instruments such as PANSS and BPRS may provide some degree of protection against measurement bias. For selective reporting, only 1 study had adequate pre-registered trial information and was rated as low risk (Li et al., 2023a). One study had pre-registered trial information available but was insufficient, leading to a 'some concerns' rating (Li et al., 2023b). The remaining studies lacked pre-specified analysis plans, leading to 'some concerns' ratings, though the reported outcomes did not appear to have been selected based on results.

3.4. Synthesis of results

3.4.1. Comparison 1a: Acupuncture + standard-dose antipsychotics vs standard-dose antipsychotics only

3.4.1.1. Primary outcome. A summary of the findings is presented in Table 3. Meta-analysis showed that acupuncture combined with standard-dose antipsychotics resulted in improvement in overall symptom scores compared to standard-dose antipsychotics alone (SMD −1.11, 95 % CI −1.52 to −0.70; 34 studies, 2819 participants, low certainty). Statistical heterogeneity was high (I^2 = 95 %), but the direction of the effects consistently favoured the intervention across studies, so the evidence was not downgraded for inconsistency. The funnel plot showed asymmetry, and Egger's test indicated potential publication bias (p = 0.0194), which contributed to downgrading the certainty of evidence (Supplementary material 7).

In subgroup analysis, all acupuncture modalities showed similar effects: manual acupuncture (SMD −1.11, 95 % CI −1.70 to −0.53; 18 studies), electroacupuncture (SMD −1.10, 95 % CI −1.80 to −0.41; 15 studies), and auricular acupuncture (SMD −1.25, 95 % CI −1.71 to −0.79). The effects varied across patient types. High heterogeneity persisted across subgroups (Supplementary material 8).

3.4.1.2. Secondary outcomes. For secondary outcomes, acupuncture combined with standard-dose antipsychotics showed benefits across multiple domains. Overall adverse event incidence was reduced (RR 0.44, 95 % CI 0.33–0.59; 7 studies, 862 participants; moderate certainty), with low heterogeneity between studies (I^2 = 0 %). Both negative symptoms (SMD −1.17, 95 % CI −1.57 to −0.76; 20 studies, 1746 participants; moderate certainty) and positive symptoms (SMD −0.67, 95 % CI −1.02 to −0.32; 14 studies, 1345 participants; moderate certainty) improved. Response rates were higher (RR 1.32, 95 % CI 1.10–1.59; 10 studies, 979 participants; low certainty), and social function scores were better (SMD 1.14, 95 % CI 0.48–1.81; 5 studies, 404 participants; moderate certainty). Quality of life improvement was reported in 1 small study (MD −6.34, 95 % CI −9.70 to −2.98; 102 participants; low certainty). Publication bias assessment using funnel plots and Egger's test was conducted for negative symptoms, positive symptoms, and response rates, with no evidence of publication bias was detected. No studies have reported data on relapse rates or adherence to antipsychotic medication (Supplementary material 9).

3.4.2. Comparison 1b: Acupuncture + standard-dose antipsychotics vs sham acupuncture + standard-dose antipsychotics

3.4.2.1. Primary outcome. A summary of the findings is presented in Table 4. Meta-analysis showed that acupuncture combined with standard-dose antipsychotics showed no significant difference in overall

Table 1
Overview of included studies comparing acupuncture combined with standard-dose antipsychotics versus standard-dose antipsychotics alone.

Study ID	Population	Intervention (n)	Comparisons (n)	Duration of intervention	Outcomes domain (measure)
Bouhlel 2011	Schizophrenia or schizoaffective disorder (DSM-IV)	Usual antipsychotics (unspecified) + Manual acupuncture (15)	Usual antipsychotics (unspecified) + Sham acupuncture (16)	23 days	Overall symptom score (PANSS) Negative symptom score (SANS) Positive symptom score (SAPS)
Chen 2008	Schizophrenia (CCMD-3), predominant negative symptoms	Aripiprazole 10–30 mg/day (initial dose: 5 mg/day) + Electroacupuncture (32)	Aripiprazole 10–30 mg/day (initial dose: 5 mg/day) (30)	12 weeks	Overall symptom score (PANSS) Negative symptom score (PANSS-N) Positive symptom score (PANSS-P) Response rate (PANSS $\geq$ 50 % reduction)
Cheng 2009	Schizophrenia (DSM-IV), with refractory auditory hallucinations	Risperidone + Electroacupuncture (30)	Risperidone +Sham acupuncture (30)	6 weeks	Overall symptom score (PANSS) Negative symptom score (SANS) Positive symptom score (SAPS)
Cui 2022	Schizophrenia (DSM-5) with refractory auditory hallucinations	Antipsychotics (unspecified) + Manual acupuncture (76)	Antipsychotics (unspecified) (38)	12 weeks	Social function score (PSP) Quality of life score (SQLS)
Dang 2017	Schizophrenia (DSM-IV) with refractory auditory hallucinations	Usual medications (unspecified) + Manual acupuncture (43)	Usual medications (unspecified) (26)	12 weeks	Overall symptom score (BPRS) Negative symptom score (SANS) Positive symptom score (SAPS)
Ding 2005	Schizophrenia (CCMD-3), chronic, male	Usual antipsychotics (unspecified) + Electroacupuncture (25)	Usual antipsychotics (unspecified) (25)	8 weeks	Overall symptom score (PANSS, BPRS)
Fan 2015	Schizophrenia (ICD-10)	Risperidone 3–6 mg/day (initial dose: 1 mg/day) + Electroacupuncture (43)	Risperidone 3–6 mg/day (initial dose: 1 mg/day) (43)	6 weeks	Overall symptom score (PANSS) Negative symptom score (PANSS-N) Positive symptom score (PANSS-P)
Gao 2014	Schizophrenia (CCMD-3), with auditory hallucination	Risperidone 2–6 mg/day + psychoeducation + Electroacupuncture (31)	Risperidone 2–6 mg/day + psychoeducation (31)	4 weeks	Overall symptom score (BPRS)
Gong 2013	Schizophrenia (CCMD-3), predominant negative symptoms	Aripiprazole + Electroacupuncture (54)	Aripiprazole (54)	12 weeks	Negative symptom score (SANS)
Guo 2023	Schizophrenia (ICD-10)	Usual antipsychotics (unspecified) + psychoeducation + Manual acupuncture (55)	Usual antipsychotics (unspecified) + psychoeducation + rehabilitation (55)	12 weeks	Overall symptom score (PANSS) Negative symptom score (PANSS-N) Positive symptom score (PANSS-P)
Huang 2024	Schizophrenia (DSM-5)	Clozapine 300 mg/day (initial dose: 25 mg/day) + occupational therapy + Manual acupuncture (40)	Clozapine 300 mg/day (initial dose: 25 mg/day) + occupational therapy (40)	6 weeks	Overall symptom score (PANSS) Social function score (PSP)
Ji 2022	Sschizophrenia (ICD-10), refractory	Clozapine 200–400 mg/day (initial dose: 50–75 mg) + Electroacupuncture (30)	Clozapine 200–400 mg/day (initial dose: 50–75 mg) (30)	6 weeks	Overall symptom score (PANSS) Overall adverse event incidence rate
Le 2020	Schizophrenia (ICD-10), acute	Ziprasidone 10–40 mg/day + Electroacupuncture (30)	Ziprasidone 10–40 mg/day (30)	2 weeks	Social function score (PSP)
Li 2012	Schizophrenia (CCMD-3), with refractory auditory hallucination	Risperidone (initial dose: 1 mg/day) + Electroacupuncture (60)	Risperidone (initial dose: 1 mg/day) (60)	8 weeks	Overall adverse event incidence rate
Li 2013	Schizophrenia (CCMD-3)	Aripiprazole 10–30 mg/day (initial dose: 5 mg/day) + Manual acupuncture (30)	Aripiprazole 10–30 mg/day (initial dose: 5 mg/day) (30)	12 weeks	Overall symptom score (BPRS) Negative symptom score (SANS) Positive symptom score (SAPS)

(*continued on next page*)

Table 1 (*continued*)

Study ID	Population	Intervention (n)	Comparisons (n)	Duration of intervention	Outcomes domain (measure)
Li 2020a	Schizophrenia (CCMD-3)	Risperidone 2–6 mg/day + Manual acupuncture (40)	Risperidone 2–6 mg/day (40)	12 weeks	Overall symptom score (BPRS) Negative symptom score (PANSS-N, SANS)
Li 2020b	Schizophrenia (ICD-10), paranoid, chronic	Risperidone 1–6 mg/day + Electroacupuncture (30)	Risperidone 1–6 mg/day (30)	12 weeks	Overall symptom score (PANSS)
Li 2023a	Schizophrenia (ICD-10), first episode	Aripiprazole 20 mg/day (initial dose: 5 mg) + Transcutaneous electrical acupoint stimulation (TEAS) (30)	Aripiprazole 20 mg/day (initial dose: 5 mg) + sham TEAS (30)	8 weeks	Response rate (PANSS $\geq$ 50 % reduction)
Li 2023b	Schizophrenia (ICD-10), predominant negative symptoms	Amisulpride 50–1200 mg/day + Manual acupuncture (50)	Amisulpride 50–1200 mg/day (50)	12 weeks	Overall symptom score (PANSS) Negative symptom score (PANSS-N, SANS) Positive symptom score (PANSS-P)
Lin 2018	Schizophrenia (CCMD-3), predominant negative symptoms, male	Olanzapine 10 mg/day + Electroacupuncture (30)	Olanzapine 10 mg/day (30)	6 weeks	Overall symptom score (PANSS) Negative symptom score (PANSS-N) Response rate (PANSS $\geq$ 50 % reduction)
Liu 2010	Schizophrenia (CCMD-3) with refractory auditory hallucinations	Risperidone 2–6 mg/day (initial dose: 1 mg/day) + Manual acupuncture (50)	Risperidone 2–6 mg/day (initial dose: 1 mg/day) (50)	12 weeks	Overall symptom score (BPRS) Overall adverse event incidence rate
Liu 2011	Schizophrenia (CCMD-3)	Clozapine + Electroacupuncture (30)	Clozapine (32)	4 weeks	Overall symptom score (BPRS) Negative symptom score (SANS) Positive symptom score (SAPS)
Liu 2023	Schizophrenia (DSM-5)	Risperidone 3–6 mg/day + cognitive rehabilitation + Manual acupuncture (154)	Risperidone 3–6 mg/day + cognitive rehabilitation (154)	6 weeks	Overall symptom score (PANSS) Overall adverse event incidence rate Negative symptom score (PANSS-N) Positive symptom score (PANSS-P) Good response
Lu 2020	Schizophrenia (ICD-10), chronic	Usual antipsychotics + Electroacupuncture (30)	Usual antipsychotics (30)	6 weeks	Negative symptom score (PANSS-N) Social function score (SSSI)
Luo 2006	Schizophrenia (CCMD-3), predominant negative symptoms	Risperidone 4–6 mg/day (initial dose: 1 mg/day) + Manual acupuncture (30)	Risperidone 4–6 mg/day (initial dose: 1 mg/day) (30)	12 weeks	Overall symptom score (BPRS) Negative symptom score (SANS)
Meng 2024	Schizophrenia (ICD-11), stable, male	Usual medications (unspecified) + Auricular acupressure (51)	Usual medications (unspecified) (51)	4 weeks	Negative symptom score (PANSS-N) Positive symptom score (PANSS-P) Social function score (SSPI)
Ni 2021	Schizophrenia (CCMD-3), first episode	Risperidone (initial dose: 1 mg/day, maximal dose: 6 mg/day) + Manual acupuncture (50)	Risperidone (initial dose: 1 mg/day, maximal dose: 6 mg/day) (50)	16 weeks	Overall symptom score (BPRS)
Pan 2020	Schizophrenia (ICD-10), remission state	Usual medications (unspecified) + Electroacupuncture (55)	Usual medications (unspecified) (55)	12 weeks	Overall symptom score (PANSS) Overall adverse event incidence rate Negative symptom score (PANSS-N) Positive symptom score (PANSS-P) Good response

(*continued on next page*)

Table 1 (*continued*)

Study ID	Population	Intervention (n)	Comparisons (n)	Duration of intervention	Outcomes domain (measure)
Ren 2013	Schizophrenia (CCMD-3), first episode	Aripiprazole (initial dose: 5 mg/day, maximal dose: 30 mg/day) + Manual acupuncture (32)	Aripiprazole (initial dose: 5 mg/day, maximal dose: 30 mg/day) (32)	6 weeks	Response rate (PANSS $\geq$ 50 % reduction)
Ren 2016	Schizophrenia (CCMD-3), first episode	Amisulpride (initial dose: 200 mg/day, maximal dose: 800 mg/day) + Manual acupuncture (30)	Amisulpride (initial dose: 200 mg/day, maximal dose: 800 mg/day) (30)	6 weeks	Overall symptom score (PANSS) Response rate (PANSS $\geq$ 50 % reduction)
Sun 2016	Schizophrenia (DSM-IV)	Usual antipsychotics (Clozapine or risperidone) + Electroacupuncture (31)	Usual antipsychotics (Clozapine or risperidone) (32)	4 weeks	Overall symptom score (PANSS) Negative symptom score (PANSS-N) Positive symptom score (PANSS-P)
Tang 2024	Schizophrenia (DSM-5)	Quetiapine 200 mg/day + Manual acupuncture (40)	Quetiapine 200 mg/day (40)	8 weeks	Overall symptom score (PANSS) Overall adverse event incidence rate
Wang 2005	Schizophrenia (CCMD-3), predominant negative symptoms	Risperidone 3–6 mg/day (initial dose: 1 mg/day) + Electroacupuncture (40)	Risperidone 3–6 mg/day (initial dose: 1 mg/day) (35)	8 weeks	Overall symptom score (PANSS) Negative symptom score (PANSS-N) Positive symptom score (PANSS-P) Response rate (PANSS $\geq$ 50 % reduction)
Wang 2011	Schizophrenia (CCMD-3), first episode	Antipsychotics (unspecified) + Electroacupuncture (50)	Antipsychotics (unspecified) (50)	8 weeks	Overall symptom score (BPRS) Response rate (BPRS $\geq$ 50 % reduction)
Yang 2014	Schizophrenia (CCMD-3)	Olanzapine 10 mg/day + Electroacupuncture (40)	Olanzapine 10 mg/day (40)	30 days	Overall symptom score (PANSS)
Yang 2015	Schizophrenia (CCMD-3)	Olanzapine + Auricular acupressure (43)	Olanzapine (43)	12 weeks	Overall symptom score (PANSS)
Yang 2016	Schizophrenia (CCMD-3), paranoid	Risperidone 4–6 mg/day (initial dose: 1 mg/day) + Manual acupuncture (50)	Risperidone 4–6 mg/day (initial dose: 1 mg/day) (50)	12 weeks	Overall symptom score (PANSS) Negative symptom score (PANSS-N) Positive symptom score (PANSS-P)
Yang 2022	Schizophrenia (CCMD-3)	Olanzapine 15–20 mg/day (initial dose: 5 mg/day) + Manual acupuncture (33)	Olanzapine 15–20 mg/day (initial dose: 5 mg/day) (33)	8 weeks	Overall symptom score (PANSS) Good response
Yao 2006	Schizophrenia (CCMD-3)	Clozapine 200–300 mg/day + Electroacupuncture (45)	Clozapine 200–300 mg/day (45)	8 weeks	Overall symptom score (PANSS)
Zhang 2021	Schizophrenia (ICD-10)	Risperidone 4–6 mg/day (initial dose: 1 mg/day) + Manual acupuncture (30)	Risperidone 4–6 mg/day (initial dose: 1 mg/day) (30)	12 weeks	Overall symptom score (PANSS, BPRS)
Zhang 2022	Schizophrenia (ICD-10), chronic	Aripiprazole (initial dose: 5 mg/day, maximal dose: 30 mg/day) or Olanzapine 10 mg/day + Electroacupuncture (50)	Aripiprazole (initial dose: 5 mg/day, maximal dose: 30 mg/day) or Olanzapine 10 mg/day (50)	4 weeks	Overall symptom score (PANSS) Overall adverse event incidence rate
Zhang 2024	Schizophrenia (CCMD-3)	Olanzapine 15–20 mg/day (initial dose: 5 mg/day) + Manual acupuncture (42)	Olanzapine 15–20 mg/day (initial dose: 5 mg/day) (42)	12 weeks	Overall symptom score (PANSS)
Zheng 2020	Schizophrenia (ICD-10), Chronic	Usual antipsychotics + Manual acupuncture (35)	Usual antipsychotics (35)	6 weeks	Overall symptom score (PANSS)
Zhong 2021	Schizophrenia (ICD-10), remission state	Aripiprazole (initial dose: 20 mg/day) + Electroacupuncture (44)	Aripiprazole (initial dose: 20 mg/day) (44)	8 weeks	Response rate (PANSS $\geq$ 50 % reduction)
Zhu 2000	Schizophrenia (CCMD-2-R), chronic, male	Chlorpromazine 100–450 mg/day + Manual acupuncture (17)	Chlorpromazine 100–450 mg/day (17)	12 weeks	Negative symptom score (SANS)
Zhu 2024	Schizophrenia (ICD-10)	Antipsychotics (unspecified) + Manual acupuncture (30)	Antipsychotics (unspecified) (30)	4 weeks	Overall symptom score (PANSS) Negative symptom score (PANSS-N) Positive symptom score (PANSS-P)

BPRS: brief psychiatric rating scale; PANSS: positive and negative syndrome scale; PANSS-N: PANSS Negative Symptom Score; PANSS-P: PANSS Positive Symptom Score; PSP: Personal and Social Performance Scale; SANS: Scale for the Assessment of Negative Symptoms; SAPS: Scale for the Assessment of Positive Symptoms; SQLS: Schizophrenia Quality of Life Scale; SSPI: Scale of Social Function in Psychosis Inpatients; SSSI: Scale of Social Skills of chronic schizophrenia Inpatients

Table 2
Overview of included studies comparing acupuncture combined with low-dose antipsychotics versus standard-dose antipsychotics alone.

Study ID	Population	Intervention (n)	Comparisons (n)	Duration of intervention	Outcomes domain (measure)
Cui 2000	Schizophrenia (CCMD-2-R)	Chlorpromazine 100–300 mg/day + Electroacupuncture (30)	Chlorpromazine 400–500 mg/day (30)	6 weeks	Overall symptom score (BPRS) Response rate (BPRS ≥ 50 % reduction)
Ma 1999	Schizophrenia (CCMD-2), with auditory hallucination	Chlorpromazine 300–550 mg/day + Laser acupuncture (60)	Chlorpromazine 300–600 mg/day (60)	Not reported	Overall symptom score (BPRS)
Ma 2008	Schizophrenia (CCMD-3)	Risperidone 2–4 mg/day (initial dose: 1 mg/day) + Manual acupuncture (30)	Risperidone 2–6 mg/day (initial dose: 1 mg/day) (30)	6 weeks	Overall symptom score (PANSS) Response rate (PANSS ≥ 50 % reduction)
Wang 2006	Hebephrenic schizophrenia (CCMD-2-R)	Chlorpromazine ≤ 200 mg/day + Manual acupuncture (16)	Chlorpromazine 400–600 mg/day	30 days	Overall symptom score (BPRS) Negative symptom score (SANS) Positive symptom score (SAPS)
Xiong 2010	Schizophrenia (CCMD-3), refractory	Clozapine 100–150 mg/day (initial dose: 50 mg/day) + Electroacupuncture (40)	Clozapine 200–500 mg/day (initial dose: 50–100 mg/day) (40)	8 weeks	Overall symptom score (PANSS) Negative symptom score (PANSS-N) Positive symptom score (PANSS-P) Response rate (PANSS ≥ 50 % reduction)
Xu 2004	Schizophrenia (CCMD-2-R), male	Chlorpromazine ≤ 200 mg/day + Manual acupuncture (40)	Chlorpromazine 400–700 mg/day (40)	80 days	Overall symptom score (BPRS) Negative symptom score (SANS) Positive symptom score (SAPS)
Xu 2010	Schizophrenia (CCMD-3), first episode, male	Risperidone 2 mg/day+ Manual acupuncture, electroacupuncture (30)	Risperidone 3–6 mg/day (30)	8 weeks	Overall symptom score (PANSS) Response rate (PANSS ≥ 50 % reduction)
Zhang 1991	Schizophrenia (DSM-III), paranoid	Chlorpromazine 150–300 mg/day + Laser acupuncture (10)	Chlorpromazine 350–600 mg/day + Sham laser acupuncture (10)	5 weeks	Overall symptom score (BPRS)
Zhou 1997	Schizophrenia (DSM-III)	Usual antipsychotics (approximately 60 % of original dose) + Electroacupuncture (25)	Usual antipsychotics (15)	6 weeks	Overall symptom score (BPRS) Response rate (BPRS ≥ 50 % reduction)

BPRS: brief psychiatric rating scale; PANSS: positive and negative syndrome scale; PANSS-N: PANSS Negative Symptom Score; PANSS-P: PANSS Positive Symptom Score; SANS: Scale for the Assessment of Negative Symptoms; SAPS: Scale for the Assessment of Positive Symptoms

symptom scores compared to sham acupuncture plus standard-dose antipsychotics (MD −0.89, 95 % CI −2.72–0.95; 2 studies, 91 participants, low certainty) (Supplementary material 7).

3.4.2.2. Secondary outcomes. For secondary outcomes, negative symptom scores showed no significant difference (MD 0.78, 95 % CI −1.73–3.29; 2 studies, 91 participants; low certainty), and positive symptom scores also showed no significant difference (MD −1.54, 95 % CI −5.86–2.79; 2 studies, 91 participants; low certainty). One study reported response rates, showing higher rates in the acupuncture group (RR 4.40, 95 % CI 1.92–10.08; 60 participants; low certainty) (Supplementary material 9).

3.4.3. Comparison 2a: Acupuncture + low-dose antipsychotics vs standard-dose antipsychotics only

3.4.3.1. Primary outcome. A summary of the findings is presented in Table 5. Meta-analysis showed that acupuncture combined with low-dose antipsychotics showed little to no difference in overall symptom scores compared to standard-dose antipsychotics alone (SMD −0.47, 95 % CI −1.56–0.61; 8 studies, 532 participants; very low certainty evidence). Statistical heterogeneity was high (I^2 = 95 %), and the confidence interval included no effect and crossed the threshold for trivial effect, indicating considerable uncertainty about the intervention effect. Due to the small number of included studies, subgroup analyses and publication bias assessments were not performed. An additional sensitivity analysis excluding the study that enrolled adolescent participants (Wang L. & Xie, 2006) yielded a similar result (SMD −0.10, 95 % CI −0.66–0.47; 7 studies, 500 participants) and showed a reduction in heterogeneity (I^2 = 84 %) (Supplementary material 10).

3.4.3.2. Secondary outcomes. For secondary outcomes, acupuncture combined with low-dose antipsychotics showed no clear benefits compared to standard-dose antipsychotics alone. Negative symptom scores showed no significant difference (SMD −0.32, 95 % CI −2.53–1.89; 3 studies, 192 participants; very low certainty), and positive symptom scores also showed no significant difference (SMD −0.76, 95 % CI −4.34–2.82; 3 studies, 192 participants; very low certainty).

Table 3
Summary of findings (Comparison 1a: Acupuncture + standard-dose antipsychotics vs standard-dose antipsychotics only).

Outcomes	Anticipated absolute effect (95 % CI)		Relative effect (95 % CI)	No. of participants (studies)	Certainty of the evidence (GRADE)
	Standard-dose antipsychotics only	Acupuncture + standard-dose antipsychotics			
Overall symptom score (PANSS or BPRS)	-	SMD 1.11 lower (1.52 lower to 0.7 lower)	-	2819 (34 RCTs)	⨁⨁◯◯ Low[a,b,c]
Overall adverse event rate	336 per 1000	148 per 1000(111−198)	RR 0.44 (0.33–0.59)	862(7 RCTs)	⨁⨁⨁◯Moderate[a]
Negative symptom score (PANSS-N or SANS)	-	SMD 1.17 lower (1.57 lower to 0.76 lower)	-	1746 (20 RCTs)	⨁⨁⨁◯ Moderate[a,b]
Positive symptom score (PANSS-P or SAPS)	-	SMD 0.67 lower (1.02 lower to 0.32 lower)	-	1345 (14 RCTs)	⨁⨁⨁◯ Moderate[a,b]
Response rate (PANSS, BPRS ≥ 50 % reduction)	448 per 1000	591 per 1000 (492−712)	RR 1.32 (1.10–1.59)	979 (10 RCTs)	⨁⨁◯◯ Low[a,b,d]
Social function (PSP, SSSI, SSPI)	-	SMD 1.14 higher (0.48 higher to 1.81 higher)	-	404 (5 RCTs)	⨁⨁⨁◯ Moderate[a,b]
Quality of life (SQLS)	-	MD 6.34 lower (9.7 lower to 2.98 lower)	-	102 (1 RCT)	⨁⨁◯◯ Low[a,e]

BPRS: brief psychiatric rating scale; CI: confidence interval; MD: mean difference; PANSS: positive and negative syndrome scale; PANSS-N: PANSS Negative Symptom Score; PANSS-P: PANSS Positive Symptom Score; PSP: Personal and Social Performance Scale; RR: risk ratio; SANS: Scale for the Assessment of Negative Symptoms; SAPS: Scale for the Assessment of Positive Symptoms; SMD: standardized mean difference; SQLS: Schizophrenia Quality of Life Scale; SSPI: Scale of Social Function in Psychosis Inpatients; SSSI: Scale of Social Skills of chronic schizophrenia Inpatients
a. Most studies were assessed as having 'some concerns' for overall risk of bias
b. Heterogeneity exists between studies, but the direction of effect is the same in most studies
c. Publication bias is suspected due to funnel plot asymmetry and Egger's test
d. Confidence interval crosses the threshold for trivial effect (RR 0.75–1.25)
e. Optimal information size not met (< 400 participants)

Table 4
Summary of findings (Comparison 1b: Acupuncture + standard-dose antipsychotics vs sham acupuncture + standard-dose antipsychotics).

Outcomes	Anticipated absolute effect (95 % CI)		Relative effect (95 % CI)	No. of participants (studies)	Certainty of the evidence (GRADE)
	Sham acupuncture + standard-dose antipsychotics	Acupuncture + standard-dose antipsychotics			
Overall symptom score (PANSS)	-	MD 0.89 lower (2.72 lower to 0.95 higher)	-	91 (2 RCTs)	⨁⨁◯◯ Low[a,b]
Negative symptom score (SANS)	-	MD 0.78 higher (1.73 lower to 3.29 higher)	-	91 (2 RCTs)	⨁⨁◯◯ Low[a,b]
Positive symptom score (SAPS)	-	MD 1.54 lower (5.86 lower to 2.79 higher)	-	91 (2 RCTs)	⨁⨁◯◯ Low[a,b]
Response rate (PANSS ≥ 50 % reduction)	167 per 1000	773 per 1000 (320−1000)	RR 4.40 (1.92–10.08)	60 (1 RCT)	⨁⨁◯◯ Low[a,c]

CI: confidence interval; MD: mean difference; PANSS: positive and negative syndrome scale; RR: risk ratio; SANS: Scale for the Assessment of Negative Symptoms; SAPS: Scale for the Assessment of Positive Symptoms; SMD: standardized mean difference.
a. All studies were assessed as having 'some concerns' for overall risk of bias
b. Confidence interval crosses the threshold for trivial effect (SMD −0.2–0.2)
c. Optimal information size not met (< 300 events)

Table 5
Summary of findings (Comparison 2a: Acupuncture + low-dose antipsychotics vs standard-dose antipsychotics only).

Outcomes	Anticipated absolute effect (95 % CI)		Relative effect (95 % CI)	No. of participants (studies)	Certainty of the evidence (GRADE)
	Standard-dose antipsychotics only	Acupuncture + low-dose antipsychotics			
Overall symptom score (PANSS or BPRS)	-	SMD 0.47 lower (1.56 lower to 0.61 higher)	-	532 (8 RCTs)	⨁◯◯◯ Very low[a,b,c]
Negative symptom score (PANSS-N or SANS)	-	SMD 0.32 lower (2.53 lower to 1.89 higher)	-	192 (3 RCTs)	⨁◯◯◯ Very low[a,b,c]
Positive symptom score (PANSS-P or SAPS)	-	SMD 0.76 lower (4.34 lower to 2.82 higher)	-	192 (3 RCTs)	⨁◯◯◯ Very low[a,b,c]
Response rate (PANSS, BPRS ≥ 50 % reduction)	586 per 1000	586 per 1000 (451−756)	RR 1.00 (0.77–1.29)	300 (5 RCTs)	⨁◯◯◯ Very low[a,b,d]

BPRS: brief psychiatric rating scale; CI: confidence interval; MD: mean difference; PANSS: positive and negative syndrome scale; PANSS-N: PANSS Negative Symptom Score; PANSS-P: PANSS Positive Symptom Score; RR: risk ratio; SANS: Scale for the Assessment of Negative Symptoms; SAPS: Scale for the Assessment of Positive Symptoms; SMD: standardized mean difference.
a: All studies were assessed as having 'some concerns' for overall risk of bias
b: Results inconsistent between studies
c: Confidence interval crosses the threshold for trivial effect (SMD −0.2–0.2)
d: Confidence interval crosses the threshold for trivial effect (RR 0.75–1.25)

Response rates were similar between groups (RR 1.00, 95 % CI 0.77–1.29; 5 studies, 300 participants; very low certainty). No studies reported data on adverse events, social function, quality of life, relapse rates, or adherence to antipsychotic medication (Supplementary material 11).

3.4.4. Comparison 2b: Acupuncture + low-dose antipsychotics vs sham acupuncture + standard-dose antipsychotics only

One study (Zhang, 1991) was included in the comparison, and overall symptom scores (BPRS) showed no significant difference between groups (MD −1.50, 95 % CI −12.40–9.40; 1 study, 20 participants; low certainty) (Supplementary material 10). The certainty of evidence was downgraded due to risk of bias and imprecision.

4. Discussion

4.1. Summary of main results

This systematic review and meta-analysis synthesised evidence from 55 randomised controlled trials involving 4256 participants to evaluate the effectiveness of acupuncture as an adjunctive treatment for schizophrenia spectrum disorders. Two clinical questions relevant to Korean medicine practice were examined. First, regarding acupuncture combined with standard-dose antipsychotics, studies comparing acupuncture versus antipsychotics alone showed improvements in overall symptoms, while studies comparing acupuncture versus sham acupuncture showed no significant difference. This discrepancy suggests that observed benefits may reflect non-specific effects of acupuncture, such as therapeutic context, practitioner-patient interaction, and treatment expectations rather than specific effects (Ho et al., 2021). Second, regarding acupuncture with low-dose antipsychotics as a dose-sparing strategy, studies showed little to no difference in overall symptoms compared to standard-dose antipsychotics alone or sham controls. These findings indicate that while acupuncture combined with standard-dose antipsychotics may provide pragmatic benefits in clinical practice, the mechanisms remain unclear given the lack of superiority over sham controls. Furthermore, current evidence does not support using acupuncture to reduce antipsychotic doses.

4.2. Agreements and disagreements with other studies or reviews

Our findings are generally consistent with previous systematic reviews showing the benefits of acupuncture as an adjunctive treatment for schizophrenia, though methodological differences limit direct comparisons. For overall symptom improvement, our results (SMD −1.11, 95 % CI −1.52 to −0.70) align with previous meta-analyses. Huang et al. (2023a) reported PANSS reductions (MD −5.75, 95 % CI −8.08 to −3.42) and BPRS reductions (MD −7.02, 95 % CI −10.59 to −3.46), while Shen et al. (2014b) found similar BPRS (MD −4.32, 95 % CI −5.28 to −3.36) and PANSS improvements (MD −3.79, 95 % CI −6.43 to −1.15). Our standardised mean differences allowed comprehensive synthesis across instruments with 34 studies and 2819 participants. Response rates showed consistency across reviews despite varying definitions. We found RR 1.32 (95 % CI 1.10–1.59) using $\geq$ 50 % PANSS/BPRS reduction, while Lee et al. (2009) reported RR 1.15 (95 % CI 1.04–1.28) and Huang et al. (2023a) found benefits (OR 3.43, 95 % CI 2.71–4.35) using heterogeneous effectiveness criteria. Adverse event reduction (RR 0.44, 95 % CI 0.33–0.59) was consistent with Huang et al.'s (2023a) findings (OR 0.45, 95 % CI 0.32–0.63), both showing moderate certainty evidence. Similarly, both our review and Shen et al. (2014b) found no clear benefits when combining acupuncture with low-dose versus standard-dose antipsychotics, although the evidence remains very limited.

Our review employed RoB 2.0 (Higgins et al., 2019) rather than the original RoB tool used in previous reviews and focused on two clinically relevant questions reflecting clinical practice. Unlike Shen et al. (2014b) who examined six comparisons including acupuncture monotherapy, we concentrated on adjunctive acupuncture use with antipsychotics. In addition, we conducted separate analyses comparing acupuncture plus antipsychotics with antipsychotics alone, and with sham acupuncture plus antipsychotics, an approach that differs from previous studies. Despite substantial increase in evidence (55 studies, 4256 participants vs. 13–38 studies in previous reviews), our certainty assessments (low to very low) align with previous reviews, highlighting the continued need for high-quality trials. Given the global use of acupuncture (Ngubane et al., 2024), rigorous evidence synthesis is essential to clarify its current clinical role.

4.3. Limitations

There are several limitations. First, most studies had methodological concerns, including inadequate allocation concealment reporting (only 3 of 55 studies) and lack of assessor blinding (only 7 studies), and funnel plot asymmetry suggesting potential publication bias. Second, the evidence base was geographically limited, with 54 of 55 studies conducted in China, restricting generalisability to other healthcare contexts. Third, only 4 studies included sham controls, making it difficult to examine the specific efficacy of acupuncture (Linde et al., 2010). Fourth, heterogeneity in participants and interventions included in the review requires caution in interpretation of the results.

4.4. Clinical and research implications

For acupuncture practitioners and traditional medicine doctors, acupuncture as an adjunctive treatment to standard-dose antipsychotics may provide pragmatic benefits, though the lack of superiority over sham acupuncture suggests uncertainty about specific acupuncture effects. The most commonly used acupoints (GV20, EX-HN3, PC6; GV20, EX-HN3 for electroacupuncture) (Wang et al., 2020) provide practical guidance. However, current evidence is insufficient to support the use of acupuncture to reduce antipsychotic doses, as low-dose combinations show no superiority over standard-dose antipsychotics alone.

For conventional psychiatrists, these findings may inform collaborative care, particularly given the moderate-certainty evidence for reduced adverse events. While recent clinical practice guidelines indicate insufficient evidence to recommend for or against acupuncture augmentation for schizophrenia symptoms (Buchanan et al., 2025), collaboration with qualified acupuncturists may benefit patients experiencing medication side effects.

Future research should prioritise high-quality randomised controlled trials with proper allocation concealment, assessor blinding, and sham controls. Long-term follow-up studies, standardised intervention protocols, and geographic diversification beyond China are essential to establish more definitive evidence and enhance generalisability.

5. Conclusion

This systematic review provides the most comprehensive synthesis to date of evidence regarding acupuncture as an adjunctive treatment for schizophrenia spectrum disorders. Low-certainty evidence suggests that acupuncture combined with standard-dose antipsychotics may provide benefits for overall symptoms and adverse event rates compared to standard-dose antipsychotics alone. However, the lack of superiority over sham acupuncture indicates uncertainty about whether these benefits reflect specific acupuncture mechanisms. Acupuncture combined with low-dose antipsychotics does not appear superior to standard-dose antipsychotics alone. The limited high-quality available evidence necessitates cautious interpretation of these findings.

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CRediT authorship contribution statement

Yujin Choi: Writing – original draft, Investigation, Formal analysis, Conceptualization. **Pyung-Wha Kim:** Writing – review & editing, Investigation, Conceptualization. **Boram Lee:** Writing – review & editing, Methodology, Investigation. **Seung-Hun Cho:** Writing – review & editing, Supervision, Conceptualization. **A-La Park:** Writing – review & editing, Investigation.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Yujin Choi reports financial support was provided by Korea Health Industry Development Institute. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.ajp.2026.104844.

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