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Effectiveness of Cognitive Behavioral Therapy-Based Multimodal Interventions for Psychogenic Dizziness: A Systematic Review

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Objectives: Psychogenic dizziness is a chronic condition characterized by subjective imbalance and emotional distress, often in the absence of identifiable vestibular abnormalities. Cognitive behavioral therapy (CBT) has emerged as a promising intervention, with multimodal strategies integrating CBT with pharmacotherapy or vestibular rehabilitation (VR) being increasingly utilized. However, the overall clinical effectiveness of these interventions has not yet been clearly established. Therefore, this study aims to evaluate the clinical effectiveness of CBT-based multimodal interventions for psychogenic dizziness.

Methods: This systematic review evaluated randomized controlled trials (RCTs) involving patients with psychogenic or chronic subjective dizziness, where CBT was applied either as a monotherapy or as part of a multimodal intervention. Searches were conducted in international and domestic databases to identify RCTs published from 2010 to April 2025. Data were synthesized narratively and, when possible, through meta-analysis. Risk of bias was assessed using the Cochrane criteria.

Results: Eight RCTs comprising 690 participants were included. Multimodal interventions incorporating CBT demonstrated superior outcomes in dizziness severity, anxiety, and depression to monotherapies. Add-on effects of CBT were particularly evident in studies comparing CBT+VR+Drug to VR or Drug alone and in studies comparing CBT+Drug to Drug alone. Additionally, VR enhanced effects of CBT when combined. These findings suggest a synergistic effect across modalities. However, most studies exhibited limitations in methodological rigor, including inadequate reporting of randomization and blinding procedures.

Conclusions: CBT-based multimodal interventions appear to be more effective than single-modality treatments in addressing both physical and psychological symptoms of psychogenic dizziness. These results support the use of individualized, integrative treatment approaches. Further high-quality, multicenter RCTs are required to validate these findings and inform clinical practice.

Key Words: Psychogenic dizziness, Cognitive behavioral therapy, Systematic review.

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I. INTRODUCTION

Dizziness refers to symptoms such as feeling lightheaded, faint, or spinning, which make it difficult to maintain balance and interfere with daily life. In Korean medicine, the term "Hyeonhun" (眩暈) is commonly used[1]. Dizziness is reported by more than 50% of elderly individuals and is one of the main reasons for hospital visits among those aged 75 and above[2].

According to the Korean Medicine Clinical Practice Guideline for Dizziness, dizziness is classified based on its cause into vestibular and non-vestibular types. Vestibular dizziness can further be categorized into peripheral and central origins, while non-vestibular dizziness includes cervical, cardiovascular, psychogenic, gynecological, and other cause[2]. Psychogenic dizziness refers to cases in which psychological factors such as anxiety, depression, and somatic symptom act as the main cause without finding any structural abnormalities[3].

Patients with psychogenic dizziness often report a sense of fogginess, fullness in the head, subjective imbalance, and symptoms of anxiety or panic, but neurological and physical examinations often do not find any abnormalities[4].

Psychogenic dizziness is also known by similar terms such as psychiatric dizziness, functional dizziness, and psychophysiological dizziness. Recently, it has been grouped under broader diagnostic categories like Persistent Postural-Perceptual Dizziness (PPPD) or Chronic Subjective Dizziness (CSD)[5].

In overseas studies, psychogenic dizziness is generally managed as part of psychiatric disorders such as anxiety, depression, or panic disorder. Pharmacological treatments typically include selective serotonin reuptake inhibitors (SSRIs), serotonin-norepinephrine reuptake inhibitors (SNRIs), and benzodiazepines. In particular SSRIs have been reported to be effective in controlling persistent dizziness and anxiety (with vestibular symptoms)[6].

Vestibular rehabilitation (VR) has established itself as a representative non-pharmacological intervention for psychogenic dizziness[7]. VR consists of individualized exercise programs aimed at reducing dizziness symptoms through habituation by repeated exposure to visual-vestibular stimuli, adaptation and substitution mechanisms to compensate for impaired vestibular function, and improving balance ability through balance exercises[8]. In fact, in randomized controlled trials (RCTs) utilizing VR for patients with psychogenic dizziness, it has been shown to significantly improve the frequency and intensity of dizziness[7].

Among psychotherapeutic approaches, Cognitive Behavioral Therapy (CBT) is most commonly utilized. CBT is a structured psychotherapy that combines cognitive and behavioral techniques. Its core components typically include "cognitive restructuring," "behavioral activation," "gradual exposure," "relaxation training," and "psychoeducation." CBT helps patients recognize and correct distorted thoughts and irrational beliefs, reduces avoidance behaviors while strengthening adaptive behaviors, and systematically trains various skills to effectively cope with stress and anxiety[9]. Patients with psychogenic dizziness often have excessive fear that something bigger will happen than it actually is (catastrophizing), and subjective discomfort about stress stimulation is maximized when the stimulation is unpredictable and uncontrollable[10]. Psychological education, one of the key factors of CBT, can reduce symptoms or psychological discomfort caused by symptoms by reducing such unpredictability and uncontrollability[11].

In Korean medicine, dizziness is understood as a disorder arising from an imbalance in the mind-body interaction. In treating dizziness, "mental and physical therapy" is specified as main of Korean medicine intervention, which can include various psychother-

apeutic approaches such as meditation, relaxation, psychological counseling, and CBT[1].

Herbal medicine treatment has also shown positive effects on dizziness, anxiety, and quality of life improvement in patients with chronic dizziness[12]. Accordingly, a multi-modal intervention model combining herbal medicine treatment and CBT may also have potential for application in the treatment of psychogenic dizziness in the future.

However, treatment approaches for psychogenic dizziness have largely centered on pharmacotherapy or vestibular rehabilitation, and the clinical effectiveness of CBT when used as part of multimodal interventions remains unclear. With increasing recognition of the value of mind-body-based and integrative treatments, CBT-based multimodal strategies are gaining attention as practical and effective options[13]. Therefore, this review aims to systematically evaluate the clinical effectiveness of CBT-based multimodal interventions for psychogenic dizziness and explore their potential role in future non-pharmacological and integrative treatment paradigms.

II. METHODS

A review protocol outlining the objectives, inclusion and exclusion criteria, and analysis plan was developed prior to conducting this systematic review. However, the protocol was not registered on PROSPERO or any other public registry.

1. Database selection and literature search

Clinical studies published between January 2010 and April 2025 were searched using the following databases: PubMed (pubmed.ncbi.nlm.nih.gov) and ScienceDirect (www.sciencedirect.com) for English-language sources; CNKI (China National Knowledge Infrastructure, www.cnki.net) for Chinese-language sources; and OASIS (oasis.kiom.re.kr), DBPia (www.dbpia.co.kr), RISS (www.riss.kr), and the Korean Traditional Knowledge Portal (www.koreantk.com) for Korean-language sources. The search was conducted in April 2025.

The keywords used were as follows: for English databases: "psychogenic dizziness," "psychogenic vertigo," and "chronic subjective dizziness"; for CNKI: "精神性头晕," "精神性眩晕," "心因性头晕," "心因性眩晕," "慢性主观性头晕," "慢性主观性眩晕," and "认知行为治疗"; for Korean databases: "심인성 어지럼증," "심인성 현훈," "만성 주관적 어지럼증," and "인지행동치료."

The detailed search strategies for each database are presented in Supplementary Table 1.

2. Inclusion and exclusion criteria

In this systematic review, we included randomized controlled trials (RCTs) that targeted patients with psychogenic dizziness. There were no restrictions on participants' age, sex, or other demographic factors. However, since there is no consensus on the definition and classification of psychogenic dizziness and various similar terms are used interchangeably, the Korean Standard Clinical Practice Guideline for Vertigo[1] presents separate recommendations for "chronic subjective dizziness" and "psychogenic dizziness" within the subcategory of "psychogenic vertigo." Taking this into consideration, this study included research targeting patients diagnosed with psychogenic dizziness, psychogenic vertigo, or chronic subjective dizziness.

The intervention was specified as psychological therapy identified as CBT, whether administered alone or as part of a combination intervention with pharmacotherapy, VR, or other treatments. All studies included in this review either incorporated at least two of the core standard elements of CBT (e.g., cognitive restructuring, behavioral techniques, relaxation training, etc.) or employed a structured psychological therapy program that met the definition of

CBT.

The comparison group was not restricted to specific conditions; instead, a variety of treatment combinations that could assess the clinical effectiveness of CBT-based multimodal interventions—including antidepressant monotherapy, VR monotherapy, and multimodal interventions excluding CBT—were all included. This approach was intended to broadly analyze the relative effectiveness of CBT-based multimodal interventions and the additive effects of each component, reflecting the potential for practical application in diverse clinical situations.

3. Study selection and data analysis

1) Literature screening and selection

All retrieved studies were initially screened based on titles and abstracts. Full-text articles of potentially eligible studies were then thoroughly reviewed to determine final inclusion. In the case of Chinese-language studies, full texts were examined when it was difficult to assess eligibility through titles and abstracts alone.

2) Data extraction and analysis

Full texts of the selected studies were reviewed to extract the following information: study design, number of participants in the intervention and control groups, type of intervention and control treatments, outcome measures, and treatment effects. Based on the extracted information, the characteristics and findings of each study were analyzed. For risk of bias assessment, the Cochrane Risk of Bias (RoB) tool[14] was applied according to the Cochrane Handbook for Systematic Reviews of Interventions.

4. Data extraction and synthesis

Meta-analysis was conducted for studies that shared comparable interventions and primary outcome measures. For studies not suitable for meta-analysis, narrative synthesis was performed. For dichotomous variable, relative risk (RR) with a 95% confidence interval (CI) was calculated. For continuous variable, standardized mean difference (SMD) with 95% CI was used. Calculations were performed using Review Manager (RevMan) version 5.4 software.

To assess heterogeneity among studies, the chi-square test ($p<0.10$) and Higgins I^2 statistic ($I^2>50\%$) were used. When heterogeneity was detected, a random-effects model was applied for data synthesis. Otherwise, a fixed-effects model was used.

III. RESULTS

1. Literature selection

A total of 1,236 articles were retrieved from seven domestic and international databases up to April 2025, without any time restrictions. After removing duplicates and excluding articles that did not meet the research objectives, a total of eight articles were finally selected (Fig. 1). All eight articles were randomized controlled trials.



Fig. 1. Flow chart of literature selection.

2. Literature analysis

1) Overview of literature

A total of eight RCTs were included in this study, all of which were conducted in China. The intervention groups mostly involved combined interventions including CBT, drug therapy (Escitalopram, Duloxetine), and VR. Depending on the study, all three treatments were used together, two treatments were combined, or each was applied alone. The control groups included CBT alone, drug alone, or combined VR and CBT. The data analysis results are as follows (Table 1).

2) Risk of bias assessment

The risk of bias for the eight selected studies was assessed using the Cochrane Risk of Bias Criteria[14].

Table 1. Key Data of Studies

First author (year)	Intervention/control (A/B)	Duration	Evaluation index	Result
Zhang (2025)[16]	A: Escitalopram+VR+CBT (n=46) B: Escitalopram (n=46)	12 weeks	1. DHI 2. SAS 3. SDS 4. Attack duration 5. Attack frequency 6. Time to symptom resolution 7. Length of hospitalization 8. Efficacy rate	1~8. A>B ($p<0.05$)
Qi (2018)[17]	A: Escitalopram+VR+CBT (n=60) B: Escitalopram (n=60)	12 weeks	1. HADS 2. SF-36 3. Efficacy rate	1. A>B ($p<0.001$) 2. A>B ($p<0.001$) 3. A>B ($p<0.05$)
Yang (2018)[19]	A: Escitalopram+VR+CBT (n=48) B: VR+CBT (n=48) C: VR (n=48)	8 weeks	1. DHI 1) Total score 2) Physical subscale 3) Emotional subscale 4) Functional subscale 2. HAMA 3. HAMD	1~3. A>B>C ($p<0.05$)
Liu (2017)[18]	A: Duloxetine+Biofeedback-CBT+VR (n=20) B: Duloxetine (n=20)	6 weeks	1. DHI 2. HADS 3. SF-36	1~3. A>B ($p<0.05$)
Wang (2017)[21]	A: Biofeedback-CBT+VR (n=39) B: Biofeedback-CBT (n=39)	6 weeks	1. Efficacy rate 2. Attack duration 3. Attack frequency 4. Time to symptom resolution	1. A>B ($p=0067$) 2~4. A>B ($p<0.05$)
Sun (2018)[20]	A: Biofeedback-CBT+VR (n=31) B: Biofeedback-CBT (n=31)	6 weeks	1. Efficacy rate 2. Attack duration 3. Attack frequency 4. Time to symptom resolution	1. A>B ($p=0067$) 2~4. A>B ($p<0.05$)
Zhou (2019)[22]	A: Escitalopram+Biofeedback-CBT (n=32) B: Escitalopram (n=32)	8 weeks	1. DHI 2. Efficacy rate	1~2. A>B ($p<0.05$)
Yuan (2016)[15]	A: Escitalopram (n=32) B: VR (n=27) C: CBT (n=31)	6 weeks	1. DHI 1) Total score 2) Physical subscale 3) Emotional subscale 4) Functional subscale 2. HAMA 3. HAMD	1) A>B ($p<0.01$), A>C ($p<0.01$), B>C ($p<0.05$) 2) A>B ($p<0.01$), C>B ($p<0.05$), A≈C 3) A≈B, A>C ($p<0.01$), B>C ($p<0.01$) 4) A>B ($p<0.01$), C>B ($p<0.05$), A≈C 2~3. A>B ($p<0.01$), C>B ($p<0.05$), A≈C

VR: vestibular rehabilitation, DHI: Dizziness Handicap Inventory, HADS: Hospital Anxiety and Depression Scale, SAS: Self-Rating Anxiety Scale, SDS: Self-Rating Depression Scale, SF-36: Short Form-36 Health Survey, HAMA: Hamilton Anxiety Rating Scale, HAMD: Hamilton Depression Rating Scale.

In the domain of random sequence generation, two out of the eight studies explicitly stated the use of a "random number table" or "randomization method" and were thus rated as low risk. The remaining six studies lacked sufficient information and were assessed as unclear risk (Fig. 2, 3).

For allocation concealment, none of the studies provided detailed descriptions, so all were classified as unclear risk.

Blinding of participants and personnel was generally not feasible due to the nature of the interventions, and most studies did not report on blinding of outcome assessors, resulting in a rating of high risk for performance bias and unclear risk for detection bias.

In the domain of incomplete outcome data, the study by Yuan (2016)[15] clearly reported dropout information and had consistent numbers of participants analyzed, resulting in a low risk rating. The remaining seven studies either did not mention dropouts or lacked consistency in participant numbers, and thus were rated as unclear risk.

For selective reporting, all studies were assessed as unclear risk due to insufficient information to determine whether prespecified outcomes were selectively reported.

In terms of other biases, the evaluation was based on the same criteria used in the reference example. Although most studies were small-scale and conducted at a single center, no clear high-risk factors such as major group imbalances or significant dis-

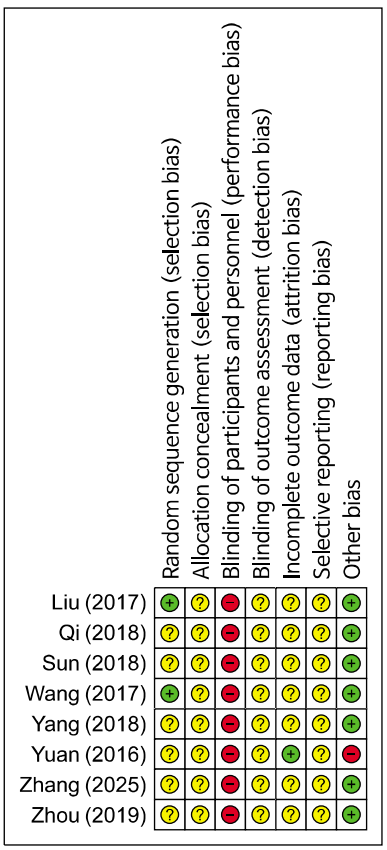


Fig. 3. Risk of bias summary.
(+): low risk of bias, (-): high risk of bias, (?): unclear of bias.

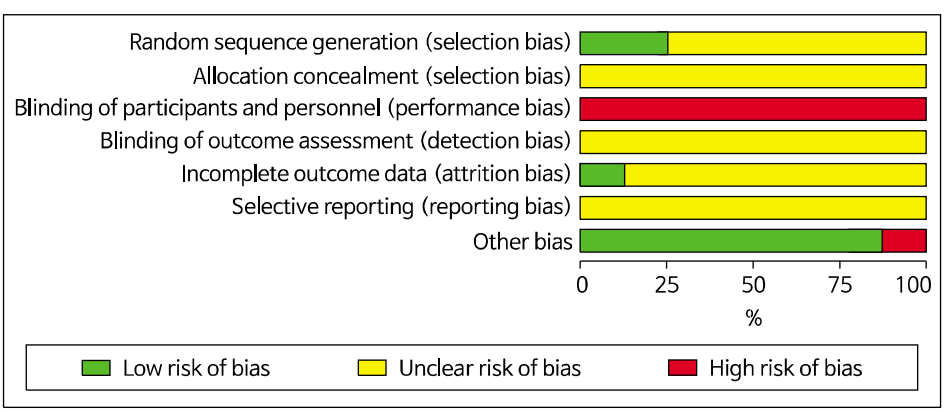


Fig. 2. Risk of bias graph.

crepancies in intervention duration were observed. Therefore, most were rated as low risk. However, the study by Yuan (2016)[15] was rated as high risk due to a clearly stated imbalance in dropout rates among groups and the exclusion of participants who withdrew mid-treatment.

3) Evaluation index

Among the 8 articles included in this study, a total of 690 participants were assessed using various outcome measures. The most frequently used outcome measures were efficacy rate and DHI, each used in five studies. HAMA and HAMD were used to assess anxiety and depressive symptoms in two studies each. The quality of life was measured using the SF-36 in two studies. HADS, attack duration, attack frequency, time to symptom resolution were used as outcome measures in two studies, while SAS, SDS and length of hospitalization were each used in one study.

4) Treatment effects

To analyze treatment effects, meta-analysis was conducted for studies in which the intervention methods and primary evaluation index of the intervention and control groups were consistent. For studies that could not be included in the meta-analysis, treatment effects were analyzed descriptively.

(1) CBT+drug+VR vs. drug

Zhang (2025)[16], Qi (2018)[17], and Liu (2017)[18] compared the treatment effects between combined therapy (CBT, drug, and VR) and drug monotherapy groups.

In Zhang (2025)[16], SDS·SAS scores are as follows (Table 2).

Before treatment, the DHI scores in the combined therapy and drug monotherapy groups were 62.18±9.33 and 62.05±9.47, respectively. After treatment, the DHI scores were 27.45±6.55 in the combined therapy group and 34.61±7.49 in the drug monotherapy group. The combined therapy group had significantly lower DHI scores than the drug monotherapy group ($t=4.881$, $p<0.05$).

The attack duration in the combined therapy and drug monotherapy groups was 12.29±1.44 minutes/episode and 21.28±3.59 minutes/episode, respectively. Attack frequency was 2.14±0.47 episodes/day and 3.52±0.23 episodes/day, respectively. Time to symptom resolution was 5.48±1.32 days and 8.31±2.14 days, respectively, and length of hospitalization was 6.50±2.08 days and 9.06±3.01 days, respectively. The combined therapy group showed superior outcomes in all dizziness recovery indicators (attack duration, attack frequency, time to symptom resolution, and length of hospitalization) compared to the drug monotherapy group, and all differences were statistically significant ($t=15.763$, 17.887, 7.634, 4.746, all $p<0.05$).

The efficacy rate in the combined therapy group was 97.83% (marked improvement: 24 cases, improved: 21 cases, no effect: 1 case), while in the drug monotherapy group it was 80.43% (marked improvement: 17 cases, improved: 20 cases, no effect: 9 cas-

Table 2. SDS·SAS Scores in Zhang (2025)[16]

Group	Sample size	Timepoint	SDS scores (mean±SD)	SAS scores (mean±SD)	Statistics (within-group pre–post comparison)
A	46	Pre-treatment	57.49±6.18	56.38±6.07	-
B	46	Post-treatment	32.15±7.24	33.41±7.59	$p<0.05$ or $p<0.01$
A	46	Pre-treatment	57.52±6.24	56.73±6.02	-
B	46	Post-treatment	41.06±8.93	41.22±8.06	$p<0.05$ or $p<0.01$

Prior to treatment, there were no statistically significant differences in SDS scores and SAS scores between the two groups, confirming baseline equivalence.
Between-group comparison before treatment: SDS scores: $t=0.023$, $p>0.05$, SAS scores: $t=0.278$, $p>0.05$.
Between-group comparison after treatment: SDS scores: $t=5.257$, $p<0.05$, SAS scores: $t=4.784$, $p<0.05$.

es). The combined therapy group had a significantly higher efficacy rate than the drug monotherapy group (χ^2=7.181, $p<0.05$).

In Qi (2018)[17], the efficacy rate in the drug monotherapy group (n=60) was 30 cases of marked improvement, 20 cases of improvement, and 10 cases of no effect, while in the combined therapy group (n=60) there were 40 cases of marked improvement, 17 cases of improvement, and 3 cases of no effect. The combined therapy group had a higher efficacy rate than the drug monotherapy group. Before treatment, there was no significant difference in anxiety scores between the two groups ($p>0.05$). After treatment, the combined therapy group had significantly lower anxiety scores than the drug monotherapy group ($p<0.05$), and both groups showed significant reductions in anxiety scores compared to before treatment ($p<0.05$). Before treatment, the HADS scores in the drug monotherapy and combined therapy groups were 7.93±1.11 and 7.88±1.73, respectively, with no significant difference between the groups (t=0.188, p=0.851). After treatment, the HADS scores in the drug monotherapy group were 3.78±0.67 and in the combined therapy group 2.11±0.56, both showing significant reductions (drug monotherapy: t=11.846, $p<0.001$; combined therapy: t=7.114, $p<0.001$), and the combined therapy group had significantly lower HADS scores than the drug monotherapy group (t=14.814, $p<0.001$). After treatment, the combined therapy group had SF-36 scores of 28.4±3.9 (physical), 24.1±3.1 (environmental), 13.4±1.9 (psychological), and 29.1±4.3 (social relationship), all significantly higher than the drug monotherapy group (24.8±4.1, 20.4±4.1, 10.7±1.4, 26.0±5.0; t=3.784, 5.576, 8.864, 3.009, all $p<0.001$).

In Liu (2017)[18], before treatment, the DHI scores in the combined therapy and drug monotherapy groups were 61.5±8.5 and 62.1±8.7, respectively, with no significant difference ($p>0.05$). At 2, 4, and 6 weeks after treatment, the combined therapy group had DHI scores of 49.3±7.1, 38.4±6.2, and 28.7±5.3, respectively, all significantly lower than the drug monotherapy group (54.6±7.8, 47.9±7.1, 37.8±6.8; $p<0.05$). Before treatment, the HADS scores in the combined therapy and drug monotherapy groups were 16.4±2.3 and 16.6±2.5, respectively, with no significant difference ($p>0.05$). At 4 and 6 weeks after treatment, the combined therapy group had HADS scores of 10.5±1.8 and 8.2±1.5, respectively, both significantly lower than the drug monotherapy group (12.9±2.0, 11.5±1.7; $p<0.05$).

Before treatment, the SF-36 scores in the combined therapy and drug monotherapy groups were 58.7±7.9 and 59.1±8.1, respectively, with no significant difference ($p>0.05$). At 4 weeks after treatment, the combined therapy group had SF-36 scores of 68.4±8.6, significantly higher than the drug monotherapy group (62.7±8.8; $p<0.05$), and at 6 weeks after treatment, the combined therapy group (75.3±9.1) had significantly higher scores than the drug monotherapy group (67.8±9.4; $p<0.05$). Although Qi (2018)[17] and Liu (2017)[18] used SF-36 as an indicator, differences in scoring and reporting methods (subscale scores vs. total scores) between studies prevented direct integration of results for meta-analysis. Standardized mean difference (SMD) analyses were attempted within each study, but a comprehensive meta-analysis across studies was not possible due to inconsistencies in data collection and reporting.

Meta-analysis was possible for efficacy rate between Zhang (2025)[16] and Qi (2018)[17] (Fig. 4). Meta-analysis was also possible for DHI between Zhang (2025)[16] and Liu (2017)[18], although the drugs used (Escitalopram vs. Duloxetine) differed, raising the possibility of clinical heterogeneity (Fig. 5). Meta-analysis for HADS was possible between Qi (2018)[17] and Liu (2017)[18], but the drugs used (Escitalopram vs. Duloxetine) and treatment durations (12 weeks vs. 6

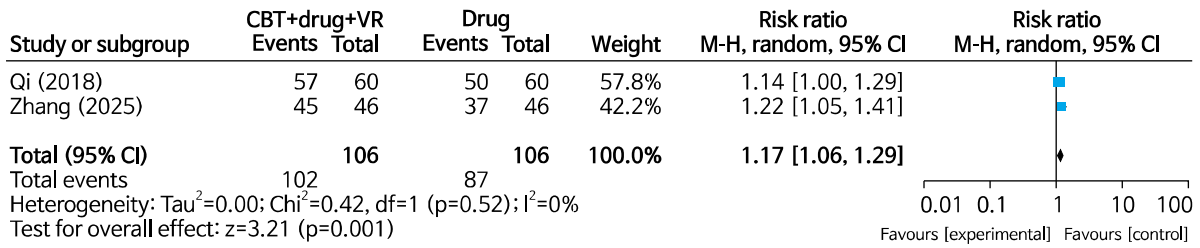


Fig. 4. CBT+drug+VR vs. drug in DHI.

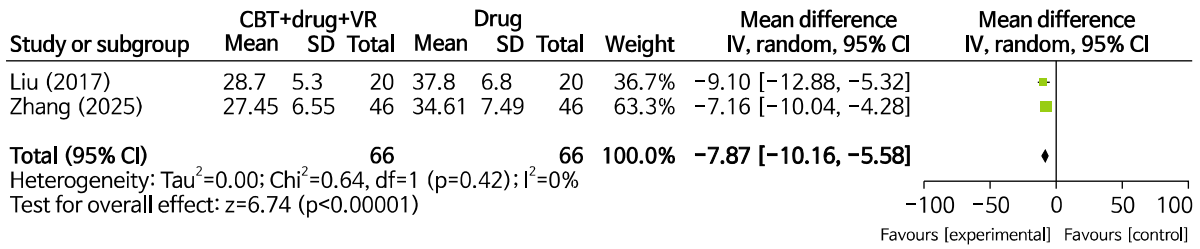


Fig. 5. CBT+drug+VR vs. drug in efficacy rate.

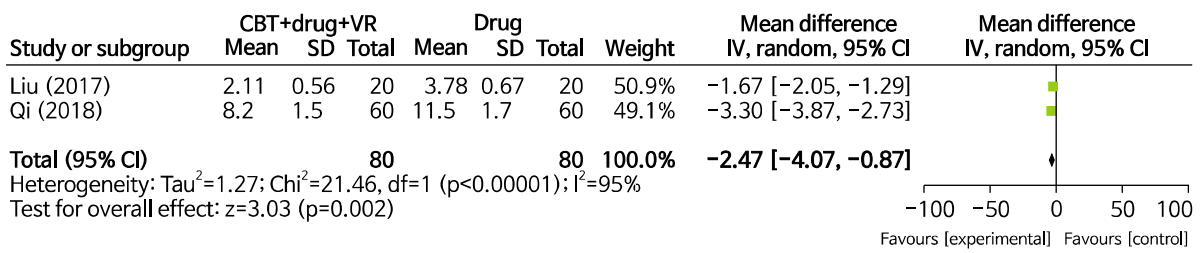


Fig. 6. CBT+drug+VR vs. drug in HADS.

weeks) differed, increasing the risk of clinical heterogeneity (Fig. 6).

In Fig. 4, the pooled meta-analysis showed that the combined therapy group had a significantly higher efficacy rate than the control group (risk ratio [RR]= 1.17, 95% confidence interval [CI]: 1.06~1.29, p= 0.001). Heterogeneity between the two included studies was very low (χ^2=0.42, df=1, p=0.52; I^2=0%), supporting the consistency and reliability of the results. Both studies showed consistent direction and magnitude of effect, with low clinical and statistical heterogeneity.

In Fig. 5, the meta-analysis of two studies showed that the combined therapy group had significantly lower DHI scores than the control group (mean difference=-7.87, 95% CI: -10.16 to -5.58, p<0.00001). Heterogeneity between studies was very low (χ^2=0.84, df=1, p=0.36; I^2=0%), and both studies showed consistent direction and magnitude of effect, supporting the reliability of the results.

In Fig. 6, in Liu (2017)[18], at 6 weeks after treatment, the combined intervention group (2.11±0.56) had HADS scores that were an average of 1.67 points lower than the drug monotherapy group (3.78±0.67), which was statistically significant (95% CI: -2.05 to -1.29). In Qi (2018)[17], at 12 weeks after treatment, the combined intervention group (8.2±1.5) had HADS scores that were an average of 3.30 points lower than the drug monotherapy group (11.5±1.7), also showing a significant difference (95% CI: -3.87 to -2.73). The

pooled meta-analysis showed that the combined intervention group reduced HADS scores by an average of 2.47 points more than the control group (Mean Difference=-2.47, 95% CI: -4.07 to -0.87, p=0.002). However, heterogeneity was very high (I^2=95%), likely due to differences in treatment duration (6 weeks vs. 12 weeks), drug type (Duloxetine vs. Escitalopram), and study design. Therefore, caution is needed in interpreting the quantitative results of the meta-analysis, and it is necessary to consider the characteristics and differences of individual studies. Overall, the combined therapy showed a positive effect on HADS score reduction, but the interpretation should reflect the specific context of each study.

(2) CBT+drug+VR vs. CBT+VR vs. VR

In Yang (2018)[19], participants were divided into three groups: the intervetion group (Group A) received a combination of drug, VR and CBT. The comparison group (Group B) received VR and CBT. And the control group (Group C) received VR only. The effects were compared among these groups. Outcome measures included: ① DHI, ② HAMA, ③ HAMD. The results are as follows (Table 3, 4).

Group A showed significantly lower scores than Groups B and C in all subscales (physical, emotional, functional) and the DHI total score ($p<0.05$). Group A showed significantly lower scores than Groups B and C in all subscales (physical, emotional, functional) and the DHI total score ($p<0.05$).

The HAMA (anxiety) and HAMD (depression) scores in Group A were significantly lower than those in Groups B and C ($p<0.05$).

Table 3. DHI Score in Yang (2018)[19]

Group	Sample size	Timepoint	Physical subscale	Emotional subscale	Functional subscale	Total score
A	48	Baseline	18.47±3.74	20.37±4.00	24.16±4.66	63.52±10.97
		2 weeks	15.77±3.91	15.29±3.97	20.40±5.13	50.73±12.58
		4 weeks	12.89±4.11	13.08±4.26	15.02±5.19	40.37±15.01
		8 weeks	8.56±3.92	8.77±4.01	10.28±4.98	28.46±12.03
B	48	Baseline	18.53±3.69	20.12±4.19	23.98±4.85	64.02±11.14
		2 weeks	16.39±3.51	18.53±3.77	22.67±4.87	57.49±12.32
		4 weeks	15.22±4.17	16.41±3.99	19.85±4.79	50.64±12.59
		8 weeks	12.96±4.01	13.04±4.22	14.01±4.51	37.59±11.99
C	48	Baseline	18.69±3.27	20.09±4.01	24.23±4.77	63.85±10.79
		2 weeks	16.59±3.66	19.17±4.03	23.54±4.76	60.12±11.01
		4 weeks	15.98±3.97	17.95±4.00	20.59±4.68	55.53±12.47
		8 weeks	14.03±4.21	15.03±3.99	17.11±4.82	42.19±12.06

Table 4. HAMA, HAMD Score in Yang (2018)[19]

Group	Sample size	Timepoint	HAMA	HAMD
A	48	Baseline	19.87±4.01	20.87±4.22
		2 weeks	14.82±4.20	17.15±3.86
		4 weeks	11.35±4.66	13.58±3.64
		8 weeks	7.98±3.99	8.77±2.41
B	48	Baseline	19.56±3.89	21.04±4.19
		2 weeks	17.29±4.03	19.95±4.06
		4 weeks	14.98±4.11	16.39±3.58
		8 weeks	11.47±3.95	13.87±3.47
C	48	Baseline	19.77±3.78	20.95±3.99
		2 weeks	18.36±4.11	19.87±4.07
		4 weeks	16.17±4.23	17.15±3.96
		8 weeks	13.21±4.07	15.21±3.63

As treatment progressed, Group A showed significant reductions in both HAMA and HAMD scores compared to baseline ($p<0.05$). At the 2, 4, and 8-week time points, Group B's HAMA and HAMD scores were significantly higher than those of Group A ($p<0.05$). Furthermore, the decrease in both HAMA and HAMD scores was greater in Group B than in Group C, and this difference was also statistically significant ($p<0.05$). Therefore, the treatment in Group A was more effective in improving anxiety and depressive symptoms compared to Groups B and C.

(3) CBT+VR vs. CBT

In Sun (2018)[20], before treatment, the attack duration in the combined therapy group and the CBT monotherapy group was 41.34±10.25 minutes and 41.25±10.21 minutes, respectively, with no statistically significant difference between the two groups ($p>0.05$). Attack frequency was also similar, with the combined therapy group at 5.54±0.53 episodes/day and the CBT monotherapy group at 5.35±0.71 episodes/day ($p>0.05$). After treatment, the attack duration in the combined therapy group (12.78±0.32 minutes) was significantly shorter than in the CBT monotherapy group (23.29±4.69 minutes; $p<0.05$), and the attack frequency was significantly lower in the combined therapy group (2.21±0.51 episodes/day) compared to the CBT monotherapy group (3.58±0.25 episodes/day; $p<0.05$). Additionally, the time to symptom resolution was significantly shorter in the combined therapy group (5.52±1.41 days) than in the CBT monotherapy group (8.39±2.71 days; $p<0.05$).

Regarding efficacy rate, in the CBT monotherapy group, 16 patients showed marked improvement, 14 showed improvement, and 9 showed no effect, resulting in a total efficacy rate of 76.92% (30/39). In the combined therapy group, 23 patients showed marked improvement, 15 showed improvement, and 1 showed no effect, resulting in a total efficacy rate of 97.44% (38/39). However, the difference in total efficacy rate between the combined therapy and CBT monotherapy groups was not statistically significant (χ^2= 7.341, p=0.067).

In Wang (2017)[21], before treatment, there was no significant difference in attack duration (combined therapy: 41.34±10.25 minutes, control: 41.25±10.21 minutes) or attack frequency (combined therapy: 5.54±0.53 episodes/day, control: 5.35±0.71 episodes/day) between the combined therapy and control groups ($p>0.05$). After treatment, the combined therapy group showed significantly better outcomes in attack duration (12.78±0.32 minutes vs. 23.29± 4.69 minutes), attack frequency (2.21±0.51 episodes/day vs. 3.58±0.25 episodes/day), and time to symptom resolution (5.52±1.41 days vs. 8.39±2.71 days) compared to the CBT monotherapy group ($p<0.05$). Both groups showed significant reductions in attack duration and frequency after treatment ($p<0.05$), and the combined therapy group was superior to the control group in all indicators ($p<0.05$).

Regarding efficacy rate, in the CBT monotherapy group, 16 patients showed marked improvement, 14 showed improvement, and 9 showed no effect, resulting in a total efficacy rate of 76.92% (30/39). In the combined therapy group, 23 patients showed marked improvement, 15 showed improvement, and 1 showed no effect, resulting in a total efficacy rate of 97.44% (38/39). However, the difference in total efficacy rate between the combined therapy and control groups was not statistically significant (χ^2=7.341, p=0.067).

In Fig. 7, meta-analysis of efficacy rates from both studies showed that the combined therapy group had a higher efficacy rate than the CBT monotherapy group in both studies. In Sun (2018)[20], the combined therapy group had a total efficacy rate of 96.8% compared to 77.4% in the CBT monotherapy group, with a risk ratio (RR) of 1.25 (95% CI: 1.02~1.53), which was statistically significant. In Wang (2017)[21], the combined therapy group had a total efficacy rate of

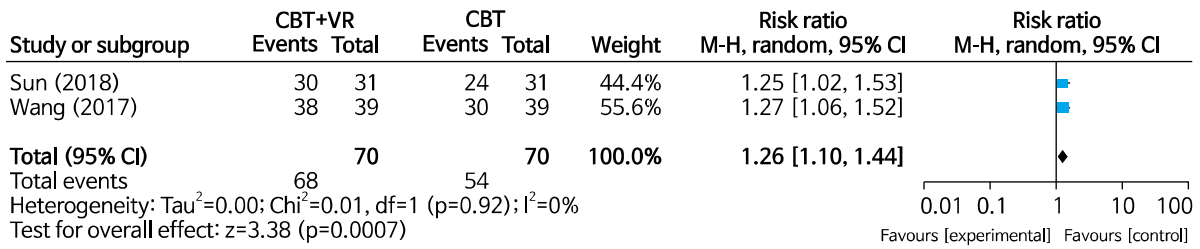


Fig. 7. CBT+VR vs. CBT in efficacy rate.

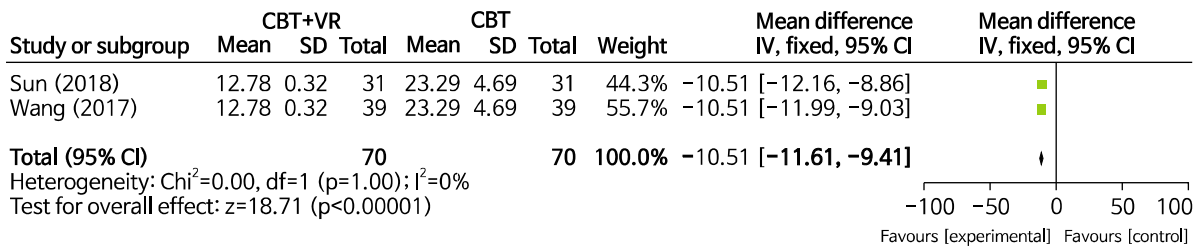


Fig. 8. CBT+VR vs. CBT in attack duration.

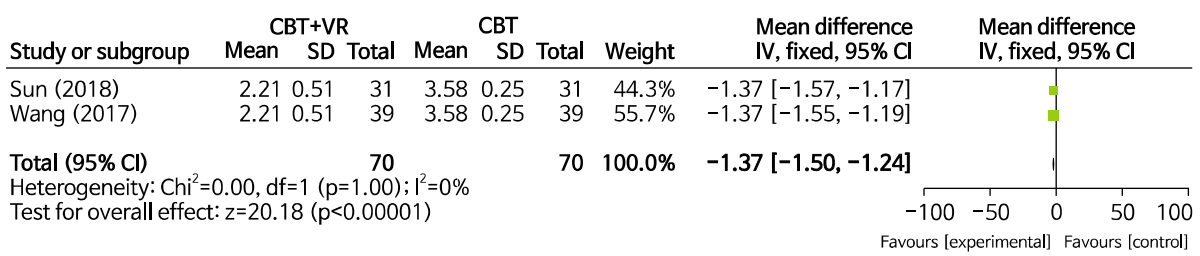


Fig. 9. CBT+VR vs. CBT in attack frequency.

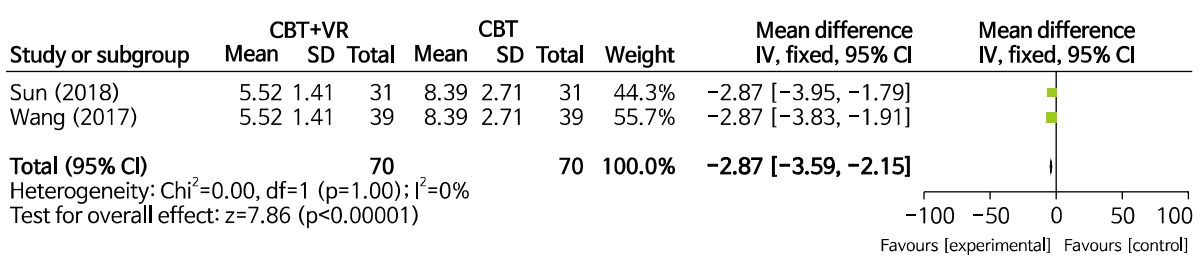


Fig. 10. CBT+VR vs. CBT in time to symptom resolution.

97.4% compared to 76.9% in the CBT monotherapy group, with a risk ratio of 1.27 (95% CI: 1.08~1.52), which was also statistically significant. The pooled meta-analysis result showed that the combined therapy group had a significantly higher efficacy rate than the CBT monotherapy group (RR=1.26, 95% CI: 1.10~1.44, p=0.0007), with very low heterogeneity between studies (I2=0%). This suggests that the combination of CBT and VR is clinically superior to CBT monotherapy.

In Fig. 8~10, meta-analysis results for attack duration, attack frequency, and time to symptom reso-

lution from both studies (Sun[20]; Wang[21]) showed that the combined therapy group (CBT+VR) was significantly superior to the CBT monotherapy group in all indicators. Specifically, for attack duration, the combined therapy group averaged 12.78±0.32 minutes while the CBT monotherapy group averaged 23.29±4.69 minutes; the combined therapy group reduced attack duration by an average of 10.51 minutes (95% CI: -11.61 to -9.41; z=18.71, $p<0.00001$, $I^2=0\%$). For attack frequency, the combined therapy group averaged 2.21±0.51 episodes/day while the CBT monotherapy group averaged 3.58±0.25 episodes/day; the combined therapy group reduced attack frequency by an average of 1.37 episodes/day (95% CI: -1.50 to -1.24; z=20.18, $p<0.00001$, $I^2=0\%$). For time to symptom resolution, the combined therapy group averaged 5.52±1.41 days while the CBT monotherapy group averaged 8.39±2.71 days; the combined therapy group reduced time to symptom resolution by an average of 2.87 days (95% CI: -3.50 to -2.15; z=7.86, $p<0.00001$, $I^2=0\%$). There was no heterogeneity between studies for any indicator ($I^2=0\%$), and the combined therapy group consistently demonstrated significant superiority over CBT monotherapy in improving vertigo symptoms. These results strongly suggest that the combination of CBT and VR is more effective than CBT monotherapy in managing symptoms in patients with vertigo.

(4) CBT+drug vs. drug

In the Zhou (2019)[22], the experimental group received a combined intervention of CBT and drug (Escitalopram), while the control group received drug (Escitalopram) monotherapy, and their effectiveness was compared. The primary outcome measures were ① DHI score and ② efficacy rate.

Before treatment, the DHI scores in the drug monotherapy group and the combined therapy group were 65.19±8.12 and 64.93±7.38, respectively, with no statistically significant difference between the two groups ($p>0.05$). As treatment progressed, both groups showed significant reductions in DHI scores at 2, 4, and 8 weeks ($p<0.05$), and the combined therapy group had significantly lower DHI scores than the drug monotherapy group at each time point ($p<0.05$).

At 2 weeks after treatment, the DHI scores were 54.30±6.10 in the drug monotherapy group and 48.31±4.95 in the combined therapy group, with a statistically significant difference between the groups ($p<0.05$). At 4 weeks, the scores were 47.05±5.04 in the drug monotherapy group and 39.45±4.73 in the combined therapy group, with the combined therapy group again showing significantly lower scores ($p<0.05$). At 8 weeks, the scores were 40.14±5.68 in the drug monotherapy group and 29.05±4.20 in the combined therapy group, with the combined therapy group demonstrating significantly lower scores than the drug monotherapy group ($p<0.05$).

Compared to baseline, DHI scores decreased significantly at all time points ($p<0.05$), and additional significant reductions were observed at 4 and 8 weeks compared to the 2-week time point ($p<0.05$).

These results suggest that the treatment in the experimental group was more effective in improving dizziness-related disability than that in the control group.

Regarding efficacy rate, in the drug monotherapy group, 12 patients showed marked improvement, 13 showed improvement, and 7 showed no effect, resulting in a total efficacy rate of 78.14% (25/32). In the combined therapy group, 21 patients showed marked improvement, 10 showed improvement, and 1 showed no effect, resulting in a total efficacy rate of 96.88% (31/32). Statistical analysis showed that the combined therapy group had a significantly higher efficacy rate than the drug monotherapy group ($\chi^2=5.148$, $p<0.05$).

(5) CBT vs. drug vs. VR

In Yuan (2016)[15], the treatment effects of three groups (Drug group (Escitalopram), VR group, and

CBT group) were compared in patients with chronic subjective dizziness. The evaluation indices used were ① DHI score (including total score, Physical Subscale, Functional Subscale, and Emotional Subscale), ② HAMA and ③ HAMD for depression. The evaluation results are as as follows (Table 5, 6).

After 6 weeks of treatment, all three groups showed a significant decrease in each outcome measure. For emotional symptoms (DHI Emotional Subscale), anxiety (HAMA), and depression (HAMD), drug therapy and CBT showed similar effectiveness, and both were superior to VR. In terms of DHI total score, drug therapy was the most effective, followed by VR, and then CBT. In summary, drug therapy was effective in improving physical, functional, and emotional symptoms overall. CBT was similar to drug therapy in improving emotional symptoms (anxiety and depression), but its effect on physical and functional symptoms was limited. VR was effective for physical and functional symptoms, but its effect on emotional symptoms was limited.

IV. DISCUSSION

Psychogenic dizziness presents a complex clinical profile in which physical symptoms interact with psychological factors such as anxiety, fear, and avoidance behaviors, leading to chronicity. Treating this condition with a single approach has limitations; recently, a multimodal treatment strategy integrating CBT, VR, and pharmacotherapy with SSRIs or SNRIs has been emphasized[23].

CBT helps patients recognize and correct irrational thoughts, health anxieties, fear of falling, and avoidance behaviors related to dizziness. This process reduces anxiety and anticipatory anxiety, breaks the vicious cycle, and prevents symptom exacerbation. VR promotes compensation and adaptation of the vestibular system through repetitive physical and balance training, facilitating physical functional re-

Table 5. DHI Score in Yuan (2016)[15]

Group	Sample size	Timepoint	Physical subscale	Emotional subscale	Functional subscale	Total score
Drug	31	Pre-treatment	15.94±4.40	18.06±5.05	20.77±5.48	54.77±13.59
		Post-treatment	10.06±4.49*	9.68±5.68*	10.71±5.95*	30.45±15.84*
VR	26	Pre-treatment	15.85±4.15	18.15±4.90	21.08±5.37	55.08±13.46
		Post-treatment	10.23±4.64*	14.69±4.76*†	11.23±5.03*	36.15±13.07*
CBT	28	Pre-treatment	15.87±4.18	17.86±4.52	20.86±4.66	54.57±12.46
		Post-treatment	14.43±4.37*†§	11.86±4.74*‡	17.57±4.37*†§	43.86±12.48

*Compared to pre-treatment within group, $p<0.01$.
†Compared to Medication Group, $p<0.01$.
‡Compared to Vestibular Rehabilitation Group, $p<0.05$.
§Compared to Vestibular Rehabilitation Group, $p<0.01$.

Table 6. HAMA, HAMD Score in Yuan (2016)[15]

Group	Sample size	Timepoint	HAMA	HAMD
Drug	31	Pre-treatment	16.81±4.26	18.39±4.29
		Post-treatment	9.97±4.72*	10.26±4.91*
VR	26	Pre-treatment	17.31±4.71	18.50±4.66
		Post-treatment	14.96±4.77*†	14.88±4.65*†
CBT	28	Pre-treatment	16.71±4.13	17.89±4.57
		Post-treatment	12.18±4.16*‡	12.32±4.53*‡

*Compared to pre-treatment within the same group, $p<0.01$.
†Compared to the CBT Group, $p<0.01$.
‡Compared to the VR Group, $p<0.05$.

covery. Pharmacotherapy, especially SSRIs and SNRIs, alleviates comorbid anxiety and depression symptoms and helps reduce neurophysiological hypersensitivity. These treatment components act complementarily to comprehensively improve both physical and psychological symptoms[13].

In practice, multimodal interventions integrating CBT, VR, and pharmacotherapy have been reported to produce clinically meaningful improvements in dizziness severity, emotional distress, and quality of life. Multimodal interventions can be tailored to each patient's predominant symptom profile (physical, psychological, or functional), making them particularly useful for heterogeneous patient populations with comorbidities such as psychogenic dizziness. Additionally, CBT can alleviate anxiety and fear of symptom exacerbation during VR, maximizing the effect of rehabilitation, while VR complements physical adaptation and functional recovery that CBT alone may not sufficiently address[24].

Thus, addressing the complex pathophysiology and diverse clinical manifestations of psychogenic dizziness requires a multidisciplinary approach that integrates CBT, VR, and pharmacotherapy. This study systematically analyzed the clinical effects of CBT-based multimodal interventions in patients with psychogenic dizziness.

This systematic review analyzed the clinical effects of CBT-based multimodal interventions in patients with psychogenic dizziness from multiple perspectives. The results showed that multimodal interventions including CBT generally demonstrated superior clinical improvements compared to monotherapy, and additive effects of each component were confirmed in comparisons among multimodal interventions.

In particular, this study included not only comparisons between multimodal and monotherapy but also direct comparisons among multimodal interventions (e.g., CBT+Drug+VR vs. CBT+VR), clearly presenting the relative effects and clinical significance of each treatment combination. Such multifaceted comparisons provide important evidence for establishing patient-tailored treatment strategies in clinical practice beyond evaluating the effect of a single treatment.

Meta-analysis of CBT+Drug+VR vs. Drug showed that the multimodal intervention group combining CBT and VR with pharmacotherapy had significantly greater improvements in dizziness (DHI), anxiety (HAMA), depression (HAMD), and efficacy rates than the drug monotherapy group. The 3-arm study by Yang (2018)[19] evaluated various add-on effects. The addition of drugs (A vs. B), CBT+Drug (A vs. C), and CBT (B vs. C) all contributed to clinically meaningful symptom improvements. Notably, the add-on effect of CBT (B vs. C) showed greater improvements in dizziness and psychological symptoms compared to VR monotherapy. The comparison between CBT+Drug+VR and CBT+VR (A vs. B) also confirmed the effect of drug addition.

Meta-analysis of CBT+VR vs. CBT showed that the multimodal intervention group had superior reductions in dizziness symptoms and faster recovery than the CBT monotherapy group. Zhou (2019)[22] reported that the CBT+Drug group had better improvements in DHI scores and efficacy rates than the drug monotherapy group, indicating that adding CBT to drug therapy can provide clinically meaningful additional effects.

Yuan (2016)[15] found that drug therapy was most effective in DHI, while CBT and drug therapy had similar effects on anxiety and depression symptoms (HAMA, HAMD). VR was effective in improving physical and functional symptoms but was relatively limited in emotional symptom improvement. These results suggest the relative strengths and limitations of each intervention and highlight the need for in-

dividualized treatment strategies based on patients' predominant symptoms.

Overall, CBT-based multimodal interventions showed clinically meaningful additional effects on both physical and psychological symptoms compared to monotherapy. Comparisons among multimodal interventions also allowed exploration of the relative contributions and optimal combinations of each component.

All included studies were RCTs with various designs, but many lacked sufficient information on randomization, allocation concealment, blinding of participants and personnel, and blinding of outcome assessors. Most studies provided insufficient details on these aspects, resulting in an overall high or unclear risk of bias. Yuan (2016)[15] had a high risk of bias due to differential dropout rates among groups, and Wang (2017)[21] and Zhang (2025)[16] lacked information on randomization and blinding. Future high-quality studies addressing these methodological issues are needed, and methodological improvements should be considered.

Most intervention groups in this study combined CBT with antidepressants (SSRIs/SNRIs), which limits direct substitution of pharmacotherapy in Korean traditional medicine clinical settings. In this context, combining herbal medicine with CBT in Korean neuropsychiatry may be a viable alternative. A case report using Yanshimtang-Gamibang showed overall improvements in DHI, anxiety (BAI), pain (NRS), sleep quality, and quality of life (EQ-5D). However, this is limited evidence from case reports, and further high-quality randomized controlled trials are needed.

This study has several limitations. First, all eight included studies were conducted in China, with a lack of randomized controlled trials from Korea or other countries. This raises concerns about language and publication bias and limits the applicability of the results to domestic clinical settings. Second, most studies lacked sufficient methodological details on randomization, allocation concealment, and blinding, resulting in a high or unclear risk of bias. Third, reporting on adverse events and side effects was insufficient, limiting safety assessments. Fourth, most studies were small, single-center trials, raising the possibility of overestimating effects. Fifth, ethical approvals (IRB) were often not reported. Future research should focus on standardized protocols, adequately powered multicenter RCTs, long-term follow-up, and improved reporting of adverse events and methodological quality.

Despite these limitations, this study is meaningful in that it systematically evaluated the clinical effectiveness of CBT-based multimodal interventions in patients with psychogenic dizziness through a systematic review and meta-analysis, comparing various intervention groups, including both monotherapies and combination therapies. I hope this review provide a foundation for the development of patient-tailored, multimodal treatment strategies and serve as a basis for future research design on the treatment of psychogenic dizziness in clinical practice in Korea.

V. CONCLUSION

This study systematically reviewed the clinical effects of CBT-based multimodal interventions in patients with psychogenic dizziness and evaluated their efficacy and safety compared to various control groups, yielding the following conclusions.

1. CBT-based multimodal interventions demonstrated superior effects on key clinical indicators such as dizziness (DHI), anxiety, and depression compared to monotherapies (including medication, vestibular rehabilitation, and CBT alone).

2. Comparisons among multimodal interventions confirmed the additive effects of each component (CBT, medication, vestibular rehabilitation), with parti-

cularly significant additional improvements observed when CBT was combined with medication or vestibular rehabilitation. This suggests that multimodal interventions are more effective than single interventions in symptom relief and provide a basis for personalized treatment strategies.

3. CBT-based multimodal interventions showed clinically meaningful improvements in both physical and psychological symptoms, with the flexibility to apply various combinations tailored to individual patients' predominant symptom profiles.

4. Although reports on adverse events and side effects were limited in most studies, the reported adverse effects were generally mild or transient, indicating that CBT-based multimodal interventions are overall safe treatment options.

5. The findings of this study provide clinical evidence for patient-tailored, multimodal treatment strategies and are expected to serve as foundational data for designing high-quality, large-scale clinical trials suited to domestic clinical settings in the future.

SUPPLEMENTARY MATERIALS

Supplementary materials can be found via https://doi.org/10.7231/jon.2025.36.2.055

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Supplementary Table 1. Search Strategy by Database

Database	Search Strategy
PubMed	#1 psychogenic dizziness[Title/Abstract] #2 psychogenic vertigo[Title/Abstract] #3 chronic subjective dizziness[Title/Abstract] #4 #1 OR #2 OR #3 #5 cognitive behavioral therapy[Title/Abstract] #6 #4 AND #5
ScienceDirect	#1 psychogenic dizziness #2 psychogenic vertigo #3 chronic subjective dizziness #4 #1 OR #2 OR #3 #5 cognitive behavioral therapy #6 #4 AND #5
CNKI	(‘精神性头晕’ AND ‘认知行为治疗’) OR (‘精神性眩晕’ AND ‘认知行为治疗’) OR (‘慢性主观性眩晕’ AND ‘认知行为治疗’)
Korean Databases	Title = 심인성 현훈 Title = 심인성 어지럼증 Title = 만성 주관적 어지럼증 Abstract = 심인성 현훈 Abstract = 심인성 어지럼증 Abstract = 만성 주관적 어지럼증 * Classified by type of intervention after retrieval.