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Implication of Social Rejection in Cognitive Bias Modification Interpretation Training in Adolescents With Eating Disorders

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Objectives: Difficulties in interpersonal relationships intensify negative emotions and act as risk and maintenance factors for eating pathology in eating disorders. Rejection sensitivity refers to the tendency to react sensitively to a rejection. Patients with eating disorders experience difficulties in interpersonal relationships because of their high sensitivity to rejection. Cognitive bias modification interpretation (CBM-I) is a treatment developed to correct interpretation bias for social and emotional stimuli. In this review, we searched for research characteristics and trends through a systematic literature analysis of CBM-I for eating disorders.
Methods: Five papers that met the selection and exclusion criteria were included in the final literature review and analyzed according to detailed topics (participant characteristics, design, and results).
Results: The literature supports the efficacy of the CBM-I in reducing negative interpretation bias and eating disorder psychopathology in patients with eating disorders. CBM-I targets emotional dysregulation in adolescent patients with eating disorders and serves as an additional strengthening psychotherapy to alleviate eating disorder symptoms.
Conclusion: The current findings highlight the potential of CBM-I as an individualized adjunctive treatment for adolescents with eating disorders and social functioning problems.

Keywords: Eating disorders; Rejection sensitivity; Interpretation bias; Cognitive bias modification for interpretation (CBM-I); Adolescent.

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INTRODUCTION

Eating disorders

Eating disorders are psychiatric conditions that cause serious impairments in physical health and psychosocial functioning due to psychopathologies related to eating, weight, and body shape [1]. Anorexia nervosa and bulimia nervosa, are eating disorders that usually begin in adolescence and early adulthood. In Korea, the proportion of adolescents who try to lose weight using inappropriate methods is high (17.6%–26.3%) [2]. Social admiration for a thin body and distorted body image are known risk and maintenance factors for eating disorders. The pathology underlying these eating disorders is closely associated with negative responses to emotions and nonadaptive responses to avoid negative emotions. In particular, a growing body of research suggests that emotional dysregulation in adolescents is associated with maladaptive eating behaviors [3]. Maladaptive eating behaviors can occur in adolescence due to various psychosocial factors; excessive dietary restriction or binge eating has negative physical and mental effects and appears to impede healthy development during adolescence.

According to a theoretical model of the etiology of eating disorders, interpersonal difficulties intensify negative emotions, which act as risk [4,5] and maintenance factors for eating pathology [6,7]. In other words, people who chronically experience difficulties in interpersonal relationships are more susceptible to developing eating disorders, and social relationships and social-emotional difficulties appear to play a role in persisting eating disorders after they have been affected by the eating disorder.

Rejection sensitivity and negative interpretation bias

Rejection sensitivity refers to the tendency to react sensitively to rejection; the stronger the rejection sensitivity, the

more anxious the person is about being rejected by others, and the more neutral reactions of others are perceived as rejection [8]. Patients with eating disorders not only have difficulties in interpersonal relationships owing to their high rejection sensitivity [9,10] but may also exhibit rejection sensitivity in ambiguous social situations [11,12]. The three-phase model of socioemotional functioning in eating disorders describes difficulties in emotional regulation and high rejection sensitivity as factors in the development and maintenance of the disorder [7]. Dysregulation of emotions and interpersonal vulnerability contribute to the development of dysfunctional eating behaviors; alter individuals' cognitive and emotional processes, such as emotional recognition and increased arousal of social cues; and intensify feelings of distress. This distress can lead to uncontrolled behaviors and affect the anxiety levels and behaviors of intimate others, which may lead to conflict with peers or guardians in youth groups. This pattern leads to a decline in social-emotional functioning, showing repeated vicious cycles.

Negative interpretation biases in cognitive processing can act as a cognitive mechanism triggering rejection sensitivity [13]. Negative interpretation bias refers to the tendency to interpret ambiguous social situations negatively and anticipate negative outcomes. Adults with anorexia tend to interpret ambiguous social scenarios that include the risk of rejection more negatively. This interpretation bias is associated with fear of weight gain, body image distortion, anxiety, and depressive symptoms [14]. In adolescents diagnosed with mental illness, cognitive distortions in response to negative social stimuli were found to be a mechanism that can correct underlying interpersonal difficulties; this applies to adolescents with emotional difficulties, such as anxiety and depression [15]. A meta-analysis of adolescents examined a significant relationship between negative interpretation bias, which interprets ambiguous social information in a negative or threatening way, and anxiety level [16]. Taken together, these studies suggest that negative interpretation bias can increase anxiety about social situations, enhance rejection sensitivity, intensify secondary problems, such as interpersonal difficulties, and may function as a risk factor for the development of eating disorders.

Cognitive bias modification

Cognitive bias modification (CBM) is an intervention that aims to modify specific automatic cognitive processes that cause and maintain various psychopathological and dysfunctional psychological states. Recent studies on CBM have focused on attention and interpretation bias. Negative interpretation bias refers to emotionally vulnerable individuals' tendency to interpret ambiguous stimuli negatively. Attention bias modification (ABM) is a training method that helps individuals direct their attention toward neutral or positive stimuli, rather than threatening stimuli. The dot-probe task method induces probes to be associated with non-threatening stimuli, rather than threatening stimuli, to help correct attentional biases [17,18].

On the other hand, cognitive bias modification-interpretation (CBM-I) is a treatment designed to modify interpretation biases in response to social and emotional stimuli [19]. It uses sentences, short paragraphs, and pictures to reinforce the interpretation according to the valence that CBM aims for through feedback, thereby helping correct interpretation bias. Ambiguous scenarios that can be interpreted positively or negatively are often used; in these studies, participants are presented with a scenario in which the last word or letter is blank. They were then asked to choose words related to the end. When asked whether they understood the scenario, they answered yes or no. Under positive training conditions, participants were reinforced through feedback when they answered with a positive interpretation of the scenario, which helped them correct their interpretation biases [20,21].

The CBM-I is based on the hypothesis that psychopathology and symptoms are improved by modifying cognitive biases. The stimuli of CBM-I were mainly social and emotional. The interpretation of emotional values is reinforced through feedback to correct bias, and the instructions given at this time are implicit. This is distinct from cognitive behavioral therapy, which directly interferes with specific behaviors and ways of thinking related to the pathology of eating disorders.

Correcting adolescents' dysfunctional interpretation bias is expected to alleviate emotional distress and help them adjust to their daily lives. The effectiveness and efficacy of CBM-I have been examined in a wide range of populations, from healthy adolescents to adolescents with clinical symptoms, such as anxiety disorders, depressive disorders, and obsessive-compulsive disorder. Previous studies on participants with non-clinical symptoms have shown that CBM-I effectively reduces negative interpretations of ambiguous scenarios, increases positive interpretations, and significantly alters adolescents' cognitive biases. Lisk et al. [22] and Mao et al. [23] examined that CBM-I significantly reduced anxiety symptoms and interpretation bias among adolescents with social anxiety tendencies. Studies of adolescents with clinical symptoms have shown conflicting results regarding the effect of CBM-I on reducing anxiety levels in adolescents with anxiety disorders [24,25]. Similarly, a CBM-I study on adolescents with depressive and obsessive-compulsive disorders showed effectiveness in treating symptoms; however, there are also contradictory findings. Despite these contradictory results, many studies support the hypothesis that CBM-I effectively

modifies adolescent cognitive biases, which may be a protective factor against stressful situations.

Eating disorders in adolescence lead to several physical and psychological dysfunctions that require close examination for prevention and intervention for eating disorders. Rejection sensitivity is a risk and maintenance factor for eating disorders, and can cause interpersonal difficulties and emotional dysregulation. A negative interpretation bias can act as a cognitive mechanism that strengthens rejection sensitivity. According to the interaction model between emotion regulation and cognitive systems, attentional bias toward negative stimuli and negative interpretation bias influence the occurrence and maintenance of emotion regulation problems. Therefore, when the aforementioned considerations are comprehensively examined, CBM-I is expected to be more effective for adolescents.

This study systematically analyzed experimental studies that tested the effectiveness of the CBM-I in adolescents and adults with eating disorders.

METHODS

Key questions

The participants in this study were adolescent and adult patients who had been diagnosed with eating disorders. In terms of intervention, we included studies that applied CBM-I. Regarding the intervention outcomes, we analyzed the effects of CBM-I on cognitive and emotional regulation. We included randomized controlled trials (RCTs) and non-randomized controlled clinical trials.

Data search, data collection, and screening procedures

In this study, a systematic review was conducted to comprehensively analyze the literature on CBM-I in adolescents with eating disorders. We searched the Web of Science database. The search terms were selected based on inclusion and exclusion criteria. The search terms were as follows: 1) eating disorder and 2) cognitive bias modification for interpretation. The inclusion criteria were as follows: 1) studies in which CBM-I was applied and 2) studies conducted in clinical groups diagnosed with eating disorders. The exclusion criteria were: 1) studies in which CBM-I was not applied, 2) gray literature, and 3) studies in which the study questions differed from those in this study.

Two researchers independently reviewed and screened the studies based on key questions and the inclusion and exclusion criteria. In case of disagreement, the literature was selected through sufficient discussion and input from a third-party researcher. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 flowchart was used to describe the literature selection process in a stepwise manner.

A total of 21 studies related to CBM-I for eating disorders were searched, of which 16 were excluded and five were finally selected (Fig. 1).

Evaluation of the quality of the literature

In this study, we used Cochrane Bias (RoB), a quality assessment tool for randomized controlled studies, to critically review the literature. Based on the quality evaluation items, we evaluated the literature as low-, moderate-, or high-risk. Two researchers independently evaluated the final selected literature, and if there were any disagreements, the opinions of a third researcher were listened to and agreed upon results were reached after sufficient discussion.

RESULTS

Evaluation of the quality of the literature

Two of the five studies that met the inclusion criteria were excluded from RoB assessment because they were not RCTs. As a result of the RoB quality evaluation of the three RCT using the ROBINS-I tool, no bias occurred in the randomization process, measurement of intervention outcomes, or selection of study results. Two studies were concerned about the risk of bias due to attrition from the intended intervention [26,27]. Two studies were concerned about the risk of bias owing to missing data on intervention outcomes [13,27].

Effects of CBM-I in adult patients with eating disorders

Recent studies have shown the modification effects of the CBM-I on negative interpretation bias in ambiguous social

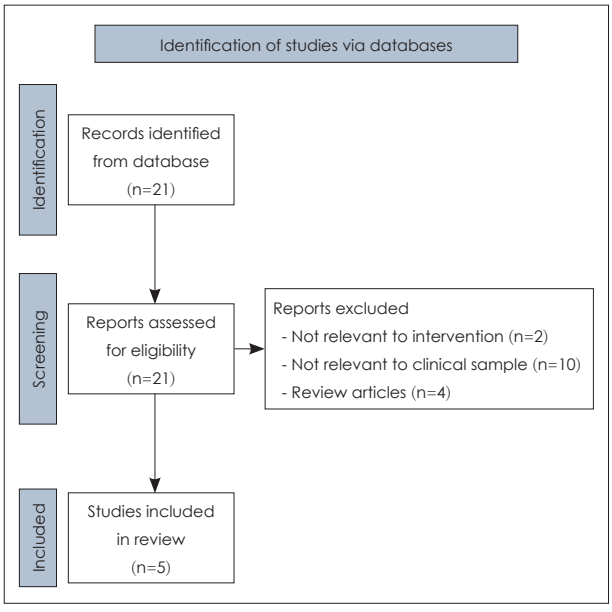

Fig. 1. Flowchart of the search strategy and selection of studies.

Table 1. Sample and methodological characteristics for studies using CBM-I in eating disorders

Study	Study design	Results
An et al. (2023) [26]	128 participants aged 18–40 33 (ED and PD) 22 (ED-only) 22 (PD-only) 51 (healthy controls) Eating disorder, personality disorder	The CBM-I task increased benign and decreased negative interpretations Participants' anxiety levels were reduced after the task
Rowlands et al. (2022) [27]	67 adolescents aged 12–18 37 (TAU+CBMT) 30 (TAU only) Eating disorder	The CBMT task decreased negative interpretations Participants' eating disorder psychopathology were reduced after the task No significant between-group differences on emotional response to criticism and anxiety and depression
Cardi et al. (2019) [28]	24 adolescents aged 14–18 Within subjects design Anorexia nervosa	After experimental training, participants produced fewer negative and more positive interpretations In the experimental condition, a trend for higher levels of self-esteem following virtual ostracism was founded
Turton et al. (2018) [13]	55 women aged 18–65 Positive training Control Anorexia nervosa	The CBM-I task reduced negative interpretation bias in both conditions No significant effect on eating behaviour or stress
Cardi et al. (2015) [29]	28 women aged 18–55 Anorexia nervosa	The CBM task increased attention to positive faces and decreased negative interpretations There were lower levels of anxiety and higher levers of self-compassion in response to a judgemental video clip

CBM, cognitive bias modification; CBM-I, cognitive bias modification-interpretation; CBMT, cognitive bias modification training; ED, eating disorder; PD, personality disorder; TAU, treatment as usual

situations in patients with eating disorders (Table 1). Recent studies have shown that study participants tend to interpret ambiguous situations more positively or less negatively after CBM-I, confirming the effectiveness of correcting interpretation bias. In addition, it reduces the level of anxiety experienced by individuals [13]. An et al. [26] reported that CBM-I was effective in improving symptoms in groups with both eating disorders and difficulties in emotional regulation.

Effect of CBM-I for patients with adolescents with eating disorders

A study of adolescents with eating disorders found that CBM-I reduced negative interpretation bias in situations where social rejection was expected and may help reduce eating disorder symptoms and maintain self-esteem in situations where others are ostracized [27,28].

DISCUSSION

This study selected five studies that met the inclusion and exclusion criteria regarding the effectiveness of CBM-I for adolescents and adults with eating disorders. The selected studies were analyzed according to detailed categories (participant characteristics, design, and results), and the main results are discussed below.

Studies on patients with eating disorders have suggested that improvements in cognitive and emotional regulation due to CBM-I have a secondary effect of alleviating the characteristic symptoms and common psychopathology of eating disorders. In adolescent populations with eating disorders, it is expected to function as a therapeutic variable by strengthening resilience to rejection. Assuming an interaction between emotion regulation and cognitive processing systems, modifying automatic and dysfunctional interpretation biases through CBM in adolescents with eating disorders may affect emotion regulation.

This study is significant in that it systematically analyzed studies that applied the CBM-I to adolescent and adult patients with eating disorders. The limitation of this study is that only a few studies have examined its effectiveness in eating disorders, so it is limited in interpreting its effectiveness. Additionally, most studies were conducted in patients with anorexia nervosa, failing not comprehensively consider the results of other types of eating disorders. In the future, it is expected that the effectiveness of CBM-I can be maximized through specific exploration of variables related to CBM-I,

such as the number of sessions and the evaluation method.

CONCLUSION

The results of this study demonstrate that CBM-I targets symptom reduction through the successful correction of interpretation bias, especially in adolescent populations, and can serve as an adjunct psychological treatment to alleviate the difficulties experienced by individuals. In particular, CBM-I reduced eating disorder symptoms by strengthening resilience in rejection situations and has the potential to be an individualized adjunct treatment for patients experiencing difficulties with social functioning.

Availability of Data and Material

The datasets generated or analyzed during the study are available from the corresponding author on reasonable request.

Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

Author Contributions

Conceptualization: Youl-Ri Kim. Formal analysis: Yeon-Sun Cho. Funding acquisition: Youl-Ri Kim. Investigation: Sohee Lee, Yeon-Sun Cho. Methodology: Sohee Lee, Yeon-Sun Cho. Writing—original draft: Youl-Ri Kim. Writing— review & editing: Sohee Lee, Yeon-Sun Cho.

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