LATAM Revista Latinoamericana de Ciencias Sociales y Humanidades, Asunción, Paraguay.
ISSN en línea: 2789-3855, marzo, 2025, Volumen VI

Cognitive remediation therapy in eating disorders: a systematic review

Terapia de remediación cognitiva en trastornos alimentarios: una revisión sistemática

Jesús Adrián Figueroa Hernández*
Adrian.figueroa@iztacala@unam.mx
https://orcid.org/0000-0003-1791-5533
Estancia Posdoctoral DGAPA. Universidad Nacional Autónoma de México
Ciudad de México – México

Rosalía Vázquez Arévalo
rvamap@unam.mx
https://orcid.org/0000-0001-6491-9639
Universidad Nacional Autónoma de México
Ciudad de México – México

Karina Franco Paredes
karina.franco@cusur.udg.mx
https://orcid.org/0000-0002-5899-3071
Universidad de Guadalajara
Guadalajara – México

Rebeca María Elena Guzmán-Saldaña
rguzman@uaeh.edu.mx
https://orcid.org/0000-0003-0877-4871
Universidad Autónoma del Estado de Hidalgo
Hidalgo – México

Juan Manuel Mancilla Díaz
jmm@unam.mx
https://orcid.org/0000-0001-7259-3667
Universidad Nacional Autónoma de México
Ciudad de México – México

Felipe Santoyo Telles
santf22@yahoo.com.mx
https://orcid.org/0000-0003-3854-9405
Universidad de Guadalajara
Guadalajara – México

AGRADECIMIENTOS
*Beca otorgada por la Dirección General de Asuntos del Personal Académico febrero 2024-enero 2025.

DOI: https://doi.org/10.56712/latam.v6i2.3796

Artículo recibido: 07 de abril de 2025.
Aceptado para publicación: 21 de abril de 2025.
Conflictos de Interés: Ninguno que declarar.

Redilat
Red de Investigadores Latinoamericanos

NÚMERO

DOI: https://doi.org/10.56712/latam.v6i2.3766

Cognitive remediation therapy in eating disorders: a systematic review

Terapia de remediación cognitiva en trastornos alimentarios: una revisión sistemática

Jesús Adrián Figueroa Hernández[1]
Adrian.figueroa@iztacala@unam.mx
https://orcid.org/0000-0003-1791-5533
Estancia Posdoctoral DGAPA. Universidad Nacional Autónoma de México
Ciudad de México – México

Rosalía Vázquez Arévalo
rvamap@unam.mx
https://orcid.org/0000-0001-6491-9639
Universidad Nacional Autónoma de México
Ciudad de México – México

Karina Franco Paredes
karina.franco@cusur.udg.mx
https://orcid.org/0000-0002-5899-3071
Universidad de Guadalajara
Guadalajara – México

Rebeca María Elena Guzmán-Saldaña
rguzman@uaeh.edu.mx
https://orcid.org/0000-0003-0877-4871
Universidad Autónoma del Estado de Hidalgo
Hidalgo – México

Juan Manuel Mancilla Díaz
jmm@unam.mx
https://orcid.org/0000-0001-7259-3667
Universidad Nacional Autónoma de México
Ciudad de México – México

Felipe Santoyo Telles
santf22@yahoo.com.mx
https://orcid.org/0000-0003-3854-9405
Universidad de Guadalajara
Guadalajara – México

Artículo recibido: 30 de marzo de 2025. Aceptado para publicación: 13 de abril de 2025.
Conflictos de Interés: Ninguno que declarar.

Abstract

This study constitutes a systematic review analyzing the evidence on the effectiveness of Cognitive Remediation Therapy (CRT) in the treatment of eating disorders in adults, with a particular focus on anorexia nervosa (AN). Studies published between 2005 and 2025 were examined using various databases, applying inclusion criteria that ensured relevance and methodological quality based on PRISMA. A total of 24 articles were collected, and data related to sample characteristics, assessment instruments (self-reports and performance-based tests), and outcomes were reported. Findings indicate that CRT significantly improves executive functions and central coherence, which are critical

[1] Beca otorgada por la Dirección General de Asuntos del Personal Académico febrero 2024-enero 2025.

elements in counteracting the cognitive rigidity inherent to eating disorders. It was observed that CRT, in both inpatient and outpatient settings, enhances therapeutic engagement and reduces treatment dropout rates. Additionally, factors such as age, body mass index, illness duration, and comorbidities influence the intervention's effectiveness, highlighting the need for personalized treatment protocols. The implications of these results suggest that CRT stands as a promising complementary intervention. Further research is recommended with larger samples and standardized methodologies integrating both objective and subjective assessments to optimize the therapy's application.

Keywords: cognitive remediation therapy, eating disorder, systematic review

Resumen

Este trabajo constituye una revisión sistemática que analiza la evidencia sobre la efectividad de la Terapia de Remediación Cognitiva (TRC) en el tratamiento de los trastornos alimentarios en adultos, con especial énfasis en la anorexia nervosa (AN). Se investigaron estudios publicados entre 2005 y 2025 a partir de diversas bases de datos, utilizando criterios de inclusión que aseguraron la relevancia y calidad metodológica basado en PRISMA. El estudio recopiló un total de 24 artículos y se reportaron datos relacionados con las características de la muestra, los instrumentos de evaluación empleados (autoinformes y pruebas de desempeño) y los resultados obtenidos. Los hallazgos muestran que la TRC mejora significativamente las funciones ejecutivas y la coherencia central, elementos críticos para contrarrestar la rigidez cognitiva inherente a los trastornos alimentarios. Se detectó que, tanto en entornos hospitalarios como ambulatorios, la TRC fomenta el compromiso terapéutico y reduce el abandono del tratamiento. Además, se evidencia que la diversidad en la edad, el índice de masa corporal, la duración de la enfermedad y la presencia de comorbilidades modulan la efectividad de la intervención, lo que evidencia la necesidad de personalizar los protocolos terapéuticos. Las implicancias de estos resultados sugieren que la TRC se posiciona como una intervención complementaria prometedora, a la vez que se recomienda continuar la investigación con muestras más amplias y metodologías estandarizadas que integren evaluaciones objetivas y subjetivas para optimizar la aplicación de la terapia

Palabras clave: terapia de remediación cognitiva, trastornos alimentarios, revisión sistemática

Cómo citar: Figueroa Hernández, J. A., Vázquez Arévalo, R., Franco Paredes, K., Guzmán-Saldaña, R. M. E., Mancilla Díaz, J. M., & Santoyo Telles, F. (2025). Cognitive remediation therapy in eating disorders: a systematic review. *LATAM Revista Latinoamericana de Ciencias Sociales y Humanidades 6 (2), 2250 – 2273. https://doi.org/10.56712/latam.v6i2.3766*

INTRODUCTION

Eating and Feeding Disorders (EFD) represent a group of psychiatric conditions characterized by persistent disturbances in eating behavior, significantly impacting the physical and psychosocial health of those affected. In 2013, the American Psychiatric Association (APA) eliminated the classification of childhood and adolescent eating disorders, acknowledging that pica, rumination disorder, avoidant/restrictive food intake disorder, Anorexia Nervosa (AN), Bulimia Nervosa (BN), and Binge eating disorder (BED) can manifest at any stage of life, integrating them into a unified framework (Vázquez et al., 2015).

Among these disorders, AN, BN, and BED have gained particular relevance due to their prevalence in both adolescents and adults, with global estimates indicating symptomatology in approximately 5.5% of women and 2.4% of men in Western settings, who experience an EFD during adolescence or early adulthood (Silén & Keski, 2022). In Latin America, studies such as that by Kolar et al. (2007) have reported a prevalence of 0.1% for AN, 1.16% for BN, and 3.53% for BED, with the latter being the most common (Udo & Grilo, 2019).

Due to their complex symptomatology, EFDs have been widely linked to impairments in various cognitive functions, particularly those related to executive processing (Tchanturia et al., 2016). Difficulties have been identified in cognitive flexibility, inhibitory control, decision-making, and working memory, which hinder the regulation of eating behavior and the adaptation to new coping strategies (Alvarado & Silva., 2014).

These deficits may contribute to the maintenance of symptoms by perpetuating rigid thought patterns and maladaptive automatic responses (Tchanturia et al., 2012). Scientific evidence has indicated that these cognitive impairments not only impact clinical symptomatology but may also hinder adherence to and effectiveness of conventional treatments (Álvarez et al., 2021; Jáuregui-Lobera, 2013; Knight et al., 2020). In this regard, cognitive functioning plays a key role in how individuals with EFDs process information and regulate their eating behavior, as it encompasses a set of mental activities necessary for completing tasks that require thought monitoring, planning, and decision-making. These functions involve processes such as sensory activation, attention, learning, and working memory, as well as problem-solving, reasoning, introspection, and metacognition, all of which are framed within executive functions (Álvarez et al., 2021; Muñoz-Céspedes & Tirapu-Ustárroz, 2004).

Executive functions (EF) encompass a set of cognitive tasks and strategies mediated by the brain's prefrontal areas, including problem-solving, concept formation, impulse control, planning, and working memory (Ardila & Surloff, 2007). These abilities enable individuals to filter out irrelevant information, engage in goal-directed behaviors, anticipate consequences, and adjust coping strategies through cognitive flexibility. Impairments in these functions result in cognitive deficits that can significantly impact the prognosis and treatment of various psychiatric disorders, including EFDs (Arbel et al., 2013; Hirst et al., 2017; Konstantakopoulos et al., 2011).

Specifically, deficits in EF can affect an individual's ability to self-regulate and organize themselves to achieve their goals, manifesting as difficulties in controlling emotions or impulses, initiating or completing tasks, maintaining attention, retaining short-term information, and adapting to new circumstances. These deficits can lead to academic and occupational difficulties, interpersonal relationship problems, mood disturbances, low self-esteem, and avoidance of complex tasks, reinforcing the cycle of symptoms characteristic of EFDs (Álvarez et al., 2021; Jáuregui-Lobera, 2013; Knight et al., 2020).

In this regard, EF impairments manifest differently in each of the main EFDs, directly influencing their clinical characteristics. In AN, deficits in cognitive flexibility and inhibitory control have been reported,

which may contribute to rigid thought patterns and the persistence of extreme restrictive behaviors (Zipfel et al., 2015; Wykes & Reeder, 2005). In BN, difficulties in inhibitory control and impulsivity affect the ability to regulate episodes of excessive food intake and compensatory behaviors, creating a cycle of eating dysregulation (Lavagnino et al., 2016). Meanwhile, BED has been associated with deficits in decision-making and emotional regulation, which increase the tendency toward compulsive eating in response to negative emotional states (Kittel et al., 2017). Additionally, it has been proposed to incorporate neuropsychological variables, such as cognitive flexibility, to assess the severity of EFDs, highlighting the importance of considering these deficits in the planning of therapeutic interventions (Seidel et al., 2022; Wykes, 2002).

Given the impact of these cognitive deficits on EDs with impaired executive functions (ED-IEF), various intervention strategies have aimed to improve the affected executive functions in these disorders. One of the most promising complementary interventions is Cognitive Remediation Therapy (CRT), an approach based on structured exercises designed to encourage reflection on cognitive processes, develop new strategies and thinking skills, and facilitate "thinking about thinking" to promote behavioral change (Cella et al., 2015). CRT was first introduced in the treatment of eating disorders in 2005 as a novel approach for adults with chronic and long-standing AN. Since then, it has been established as a brief and effective intervention for different ED-IEF, showing favorable results in improving cognitive flexibility and inhibitory control (Alserihi et al., 2024; Hagan et al., 2020; Marchesi et al., 2024).

The purpose of Cognitive Remediation Therapy (CRT) is to rehabilitate neuropsychological impairments by stimulating neuronal connections involved in cognitive processes (Gordon & Hibbard, 1992). This therapy has been shown to strengthen cognitive flexibility, global thinking, and, in general, the skills necessary for solving complex problems (Tchanturia & Lock, 2010).

To date, there are a total of seven publications, including systematic reviews and meta-analyses, that address the application of CRT in eating disorders. The first was conducted by Lindvall and Rø (2014), who carried out a systematic review on the development, current state, and clinical implications of CRT. Their work highlights that case studies provide strong evidence of feasibility and acceptability, while randomized clinical trials indicate its potential to reduce treatment dropout, improve cognitive shifting abilities, enhance quality of life, and decrease eating disorder psychopathology. In the same year, Tchanturia et al. (2014) conducted a systematic review on CRT in Anorexia Nervosa (AN) and related conditions. They found that the therapy was effective in improving task-switching abilities and central coherence, as well as promoting a strong therapeutic alliance and maintaining a low dropout rate (between 10% and 15%).

Following this, Tchanturia et al. (2017) conducted a systematic review and meta-analysis on young individuals with AN. Their study revealed significant methodological differences among the reviewed studies, making it difficult to compare findings. However, the meta-analysis showed small effect sizes for improvements in central coherence, although no significant improvements were found in task-switching abilities. The authors concluded that CRT is a suitable complementary therapy for young individuals with AN.

Similarly, Hagan et al. (2020) conducted a systematic review and meta-analysis based on randomized clinical trials of CRT in individuals with AN. They found that CRT was not associated with significant improvements in central coherence compared to control groups at the end of treatment, and the results regarding task-switching abilities were mixed. They suggested that CRT might be useful in preventing treatment dropout, although in this study, it did not show clear advantages over conventional treatments.

Subsequently, Marchesi et al. (2024) conducted a systematic review of systematic reviews. Their study emphasized that CRT can help individuals become aware of their cognitive style and information processing, in addition to having positive effects on treatment response.

More recently, Alserihi et al. (2024) conducted a systematic review and meta-analysis on CRT in randomized clinical trials. This study concluded that CRT did not show statistically significant differences compared to control groups in improving abstract thinking or quality of life in individuals with AN, indicating that the effectiveness of CRT remains inconclusive.

The available evidence on CRT in eating disorders, particularly in AN, presents mixed results. While some reviews highlight its feasibility, acceptability, and potential for improving cognitive aspects and reducing dropout rates, others have not found significant differences compared to conventional treatments. This suggests that, although CRT has promising elements, its clinical efficacy is not yet clearly established. Furthermore, the reviews do not include the still scarce studies conducted in Latin America, making it difficult to assess its global effectiveness.

The objective of the present study is to analyze the effectiveness of Cognitive Remediation Therapy (CRT) in improving cognitive deficits associated with eating disorders in adults with eating disorders. The study aims to identify key findings regarding sample characteristics (country of study, type of patient, number of participants, age, BMI, duration of illness, and comorbidities), as well as the assessment instruments used (both self-report and performance-based measures).

METHODOLOGY

Literature Search

The article search was conducted in the following databases: PubMed, ProQuest, Scopus, SpringerLink, Web of Science, and EBSCO. The following keywords in English were used: “Neuropsychology OR Neuropsychology evaluation OR Neuropsychology intervention OR Neuropsychology instruments” AND “Anorexia OR Anorexia nervosa OR Eating disorders” AND “Cognitive remediation therapy”, which had to appear in the title, abstract, and keywords of the articles.

The evaluation period for the studies covered the years 2005 to 2025, with the initial date criterion based on the identification of the first article addressing the main variables in that year. Article selection was conducted in pairs following the PRISMA methodology (Hutton et al., 2016) and considering the following inclusion and exclusion criteria.

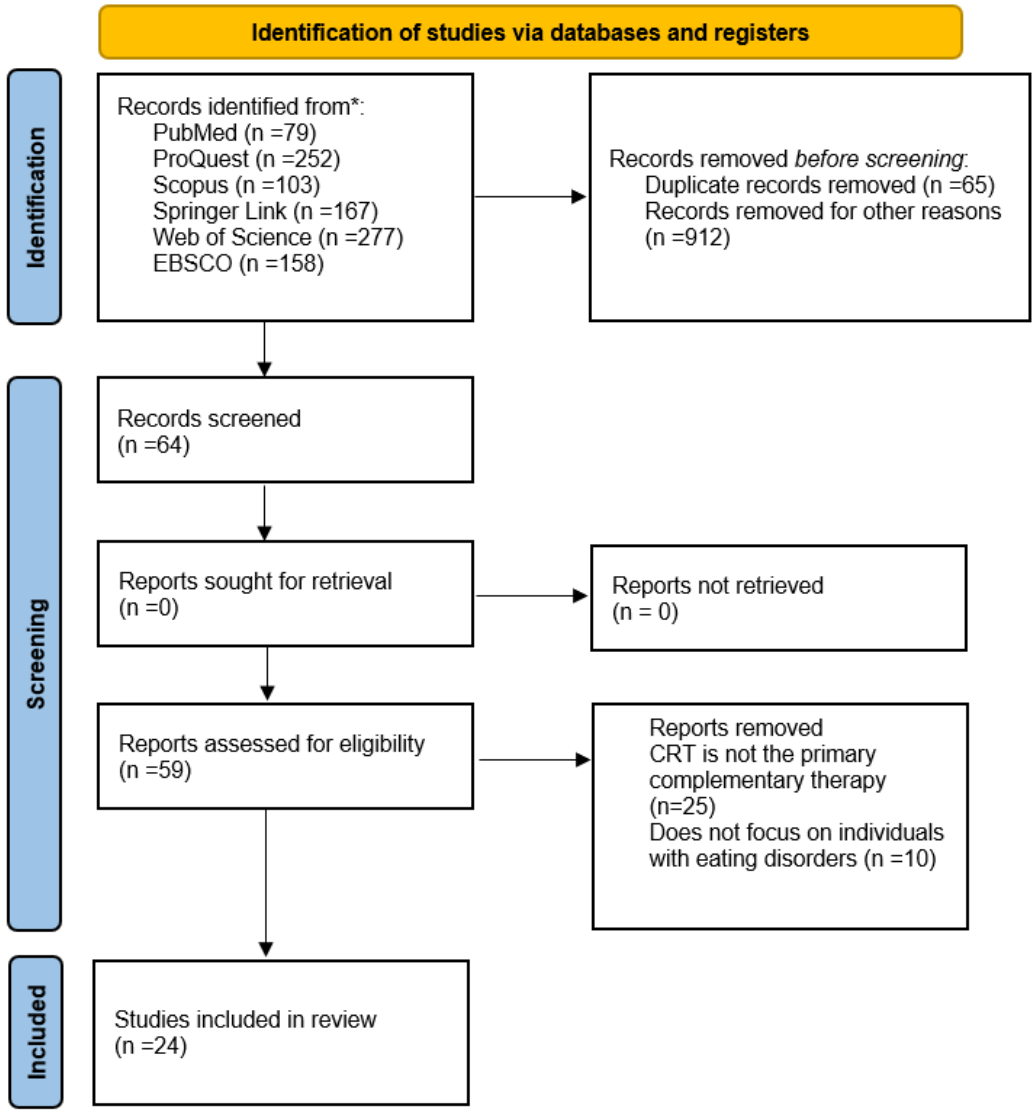
Inclusion and Exclusion Criteria

The studies included in this review were selected following the inclusion criteria: a) Studies that present, in the title and abstract, the defined keywords, b) Studies that focus exclusively on adult populations, considering at least the age of 17 years, c) Publications made between 2005 and 2025, and d) Studies published in English or Spanish.

On the other hand, the studies were excluded if: a) They were systematic reviews or meta-analyses, and b) They were theoretical or opinion articles. This selection allows the review to focus on empirical and relevant research for evaluating the effectiveness of CRT in eating disorders, a total of 24 articles were selected (see Table 1).

Figure 1

PRISMA 2020 flow diagram for new systematic reviews that included only database and registry searches (Page et al., 2021)



Critical Assessment of Study Quality

To assess the methodological quality of each included study, predefined criteria and standardized tools were applied. First, two evaluators independently evaluated each article, considering key aspects such as research design, sample size, representativeness, and clarity in the description of procedures. Discrepancies between evaluators were resolved through consensus or, if necessary, with the intervention of a third reviewer. This process allowed for determining the internal quality of each study and its potential impact on the overall synthesis of the evidence.

Synthesis of Results

The integration of the evidence was carried out through a systematic two-stage process. Initially, relevant data from each study were extracted and organized, such as the country of study, sample characteristics (type of patient, number of participants, age, BMI, duration of illness, comorbidities), and

the assessment instruments used. An analysis of these categories was conducted, highlighting the findings related to the efficacy of Cognitive Remediation Therapy (CRT) in improving cognitive deficits associated with eating disorders. This analysis identified patterns and inconsistencies in the data, allowing for a deeper understanding of the impact of CRT on cognitive functioning, treatment adherence, and the reduction of eating disorder symptoms. The findings were then synthesized to provide an overall assessment of the effectiveness of CRT in addressing cognitive deficits in individuals with eating disorders, while considering the quality of the studies and potential biases.

LITERATURE REVIEW

Study Characteristics

The studies analyzed showed the inclusion of participants with BN in some works (Larsson et al., 2020; Mac-Neil et al., 2016; Roberts, 2018) and the participation of men in others (Mac-Neil et al., 2016; Van-Passel et al., 2020; Zuchova et al., 2013), in methodological terms, three designs were identified in the analyzed works:

Four case studies (Alvarado-Sánchez et al., 2019, 2023; Davies & Tchanturia, 2005; Tchanturia et al., 2006).

Sixteen between-subjects designs (Abbate-Daga et al., 2012; Brockmeyer et al., 2016; Dandil et al., 2020; Davies et al., 2012; Fonville et al., 2014; Leppanen et al., 2018; Mac-Neil et al., 2016; Pitt et al., 2010; Roberts, 2018; Tchanturia et al., 2007, 2008, 2015; Tchanturia, Larsson, & Brown, 2016; Zuchova et al., 2013).

Four case-control designs (Dingemans et al., 2013; Lock et al., 2013; Tchanturia, Doris, et al., 2014; Tchanturia, Larsson, & Adamson, 2016; van Passel et al., 2020). All studies were published between 2005 and 2024, and the information was organized systematically in the following order: country of study, type of patient, number of participants, age, body mass index (BMI), duration of the illness, comorbidities, and psychological and neuropsychological instruments used (see Tables 1 and 2).

Table 1

Characteristics of the analyzed studies

Author	Country	Type of patient	Number of participants	Age of participant	Body Mass Index	Duration of illness
1.- Davies & Tchanturia, 2005	London	IP	1	21	14.7	8
2.- Tchanturia et al., 2006	London	IP	1	42	13	18
3.- Tchanturia et al., 2007	London	IP	4	21-42	Range from 14.70 to 18.20	7 to 24 years
4.- Tchanturia et al., 2008	London	IP	23	x =28.8, D.E= 9.2	x=14.3, D.E=1.4	x=13.1, D.E=9.6
5.- Genders & Tchanturia, 2010	London	IP	30	x= 28.4, range from 14 to 60 years	16.4 range from 14.4 to 22.4	N/A
6 .- Pitt et al., 2010	London	OP	7	x=29.5	Range from 15 to 19.8	Range from 3 to 22 years
7.- Abbate-Daga et al., 2012	Italy	IP	20	x=22.5, D.E= 3.9	x=16.24, D.E=1.09	x=5.85, D.E=3.87
8.- Davies et al., 2012	London	IP	46	CREST (x_=26.1, D.E=7.6), TAU (x=26, D.E=7.9)	CREST (x =14.64, D.E= 2.12), TAU (x =13.91 D.E=1.40)	x=10.6, D.E=7.0
9.- Dingemans et al., 2013	Netherlands	IP	82	Range from 17 to 53 years	TAU+ CRT x=15.72, D.E=1.96, TAU x= 15.52, D.E= 1.87	All participants had more than 7 years with the illness
10.- Lock et al., 2013	United States	OP	46	x=22.7, D.E= 5.9	x=17.5, D.E= 1.2	x=6.4, D.E=5.8
11.- Zuchova et al., 2013	Czech Republic	IP	34	Group 1(x= 26.80, D.E=6.12, Group 2 (x= 25.47, D.E=5.11)	Group 1(x= 15.03, D.E=1.93, Group 2 (x= 15.56, D.E=2.01)	Group 1(x= 8.20, D.E=6.70, Group 2 (x=7.30, D.E=5.80)
12.- Fonville et al., 2014	United States	IP	18	AN (x=22), HC (x=24)	AN (x=15.9, D.E=2.2) HC (x=22, D.E=1.5)	3
13.- Tchanturia, et al., 2014	London	IP	36	x=27.9	x=14.9, D.E=2.05	x=11.7
14.- Tchanturia et al., 2015	London	IP	33	x= 24.5, D.E=8.2	x= 15.1 (1.95)	x=8, D.E=7.2
15.- Brockmeyer et al., 2016	Germany	OP	24	CRT (x=22.82, D.E=5.72), NNT (x=28.27, D.E=10.25)	CRT (x=15.13, D.E=1.63), NNT (x=14.72, D.E=1.78)	CRT (x= 8.05, D.E=6.63) NNT (x=6.32, D.E=6.10)
16.- Mac-Neil et al., 2016	Canada	OP	38	x=26.2, range from 18 to 55 years	Range from 61.7kg to 129.2kg	N/A
17.- Tchanturia et al., 2016	London	IP	14	x=26.2, D.E=7.7	x=15.8, D.E=1.8	x=8.6, D.E=6.5
18.- Tchanturia et al., 2016	London	IP	98	x=26.3, range from 17 to 59 years	x=15.6, range from 15 to 17.5	x=9.7, D.E=7.5
19.- Leppanen et al., 2018	London	IP	145	x=25, D.E=6.8	x=14.9, D.E=1.5	x=9.2, D.E=7.8
20.- Roberts, 2018	New Zeeland	IP	15	x=25.07, D.E=8.25	The lowest BMI AN/BN (x=14.38, D.E=0.78/x=17.10, D.E=2.88) the highest BMI AN/BN (x=21.33, D.E=4.32/ x=23.93, D.E=4.09)	x=8.6, D. E=8.21
21.- Alvarado-Sánchez et al., 2019	Mexico	IP	1	21 years	14.7	10
22.- Van-Passel *et al.*, 2020	Netherlands	IP	56	CRT (x=25.19, D.E=7.66), SAT (x=24.60, D.E=6.98)	CRT (x=15.87), D.E= 1.64), SAT (x=16.26, D.E=1.99)	CRT (x=5.10, D.E=7.50), SAT (x=4.66, D.E=4.35)
23.- Dandil et al., 2020	London	IP	59	x= 23.9, D.E=6.2	x=14.3, D.E=1.3	N/A
24.- Alvarado-Sánchez et al., 2023	Mexico	IP	1	20 years	22.41kg	6 Years

Notes: IP = Inpatient, AP = Outpatient, CRT = Cognitive Remediation Therapy, TAU = Treatment As Usual, CREST = Cognitive Remediation and Emotional Skills Training, NNT = Non-Specific Neurocognitive Therapy, SAT = Specialized Attention Therapy, AN = Anorexia Nervosa, BN = Bulimia Nervosa, BMI = Body Mass Index, X = Mean, S.D = Standard Deviation.

Table 2

Instruments used for symptomatology and neuropsychological assessment in the analyzed studies

Author	Comorbidities	Self-report questionnaires	Performance assessments	Results of the research
1.- Davies & Tchanturia, 2005	Depressive disorder and obsessive-compulsive disorder with 8 years of duration	Maudsley Obsessive-Compulsive Inventory, Hospital Anxiety and Depression Scale	Trail Making Test, Cat bat Test, The Uznadze Illusion Task	Improved in thinking change
2.- Tchanturia et al., 2006	It was not assessed	Maudsley Obsessive-Compulsive Inventory, Hospital Anxiety and Depression Scale	Trail Making Test, The Brixton Test, CatBat Test, The Uznadze Illusion Task	The patient shows improvement in the areas evaluated in the neuropsychological tests, the patient manages to complete the tasks in less time and with more controlled movements.
3.- Tchanturia et al., 2007	It was not assessed	The Maudsley Obsessive-Compulsive Inventory, The Self-Report Hospital Anxiety and Depression Scale	The CatBat Task, The Trail Making Test, The Brixton Test, The Haptic Illusion Task	CRT is described as useful as pretreatment, improvements with long effects on instrument results.
4.- Tchanturia et al., 2008	It was not assessed	The Maudsley Obsessive-Compulsive Inventory, The Self-Report Hospital Anxiety and Depression Scale	The CatBat Task, The Trail Making Test, The Brixton Test, The Haptic Illusion Task, The Rey-Osterrieth Complex Figure Test	Performance improved after 10 CRT sessions in a group of patients with severe AN in FE.
5.- Genders & Tchanturia, 2010	It was not assessed	Rosenberg Self Esteem Scale Motivational Ruler	Cognitive Flexibility Scale	Statistically significant gains were found in self-reported ability to change (p=0.03). Both patients and group facilitators found the group acceptable, useful and a positive experience.
6.- Pitt et al., 2010	Perfectionism	Frost´s Multi-Dimensional Perfectionism Scale	It was not assessed	The patients found the treatment effective in reducing altered eating patterns and perfectionism, the authors find it useful to include the perfectionism variable in the improvement of AN patients through CRT.
7.- Abbate-Daga et al., 2012	It was not assessed	Eating disorder Inventory-2, Beck Depression Inventory, Global Assessment of Functioning Scale	Wisconsin Card Sorting Test, Iowa Gambling Task, Trail Making Test, Hayling Sentence Completion Task	Changes in tests that assess cognitive functions, changes in BMI were found, decrease in the evaluation of eating disorders
8.- Davies et al., 2012	It was not assessed	It was not assessed	Brixton Test, Wisconsin Card Sort Test, Fragmented Picture Task, Group Embedded Figure Task, Reading. The Mind in the Eyes Task, Pictorial Emotional Stroop Task	Obtained changes in change tasks and central coherence tasks, in addition to acceptance by patients
9.- Dingemans et al., 2013	Anxiety, depression, and perfectionism	Eating Disorder-Specific Health Quality of Life, Depression Beck Inventory, Self-Esteem, Quality of Life, Strait-Trait Anxiety Inventory, Multidimensional Perfectionism Scale, Motivation to Change	Trail making Test, The Wisconsin Card Sorting, The Rey Osterrieth Complex Figure	CRT in addition to TAU produce significant improvements in specific eating disorders related to quality of life and a great reduction in eating psychopathology at follow-up.
10.- Lock et al., 2013	It was not assessed	Wechsler Adult Intelligence Scale, 3ª, Delis-Kaplan Executive Functioning System, Rosenberg Self-Esteem Scale, Therapy Suitability and Patient Expectancy, Helping Relationship Questionnaire	Wisconsin Card Sort Task	The group that received the CRT improved in the task change and in the central coherence, achieving a decrease in the score obtained in the test that evaluates eating disorders.
11.- Zuchova et al., 2013	It was not assessed	It was not assessed	It was not assessed	Feedback from patients with severe low weight perceived that CRT was a great help, the group format was very helpful to the clinic

12.- Fonville et al., 2014	It was not assessed	Eating Disorder Examination, Hospital Anxiety Depression Scale, Obsessive Compulsive Inventory Revised	Simple Embedded Figures, Complex Embedded Figures	Clinical evaluations did not differ from T1 to T2, while in EFs they generated changes intergroup
13.- Tchanturia, et al., 2014	It was not assessed	The Revised Social Anhedonia Scale, The Motivational Ruler	It was not assessed	The results show a significant decrease in the total of anhedonia, the perceived importance and the ability to change increased.
14.- Tchanturia et al., 2015	It was not assessed	Revised Social Anhedonia Scale, The Toronto Alexithymia Scale, Motivational Ruler	It was not assessed	Anhedonia and alexithymia in total score were found to decrease significantly across the intervention, the ability to change significantly increased after CREST.
15.- Brockmeyer et al., 2016	It was not assessed	The d2 Test of Attention, Wechsler Memory Scale III, The Cued Task-Switching	The Multiple-Choice Vocabulary Intelligence Test, Cued Task-Switching	Patients in the CRT group improved from pre to post-treatment, relationships between brain activation and behavioral performance: except for inhibition of response and activation in the temporal cortex.
16.- Mac-Neil et al., 2016	70% of the participants reported mood disorders and anxiety	Life Satisfaction, Beck Depression Inventory-II, Beck Anxiety Inventory, Patient Satisfaction with CRT	Difficulty in Flexibility in Everyday Life, Impact of Attention to Detail on Everyday Life	Significant changes were found in difficulties in flexibility, attention to detail, life satisfaction, no changes were found in depression or anxiety, participants found the intervention as acceptable
17.- Tchanturia et al., 2016	It was not assessed	Motivational Ruler, Patient Feedback Questionnaire, Autism-Spectrum Quotient	Detail and Flexibility Questionnaire	Differences in cognitive rigidity and ability to change were found in people with low autism scores.
18.- Tchanturia et al., 2016	It was not assessed	Motivational Ruler, Feedback Questionnaire	Detail and Flexibility Questionnaire, Cognitive Flexibility Scale	Differences were found in rigidity and attention to detail, in the motivational rule in the ability to change, patients found the intervention as adequate but very short
19.- Leppanen et al., 2018	Anxiety, mood disorders, alcohol or drug abuse, and self-harm.	Eating Disorder Examination-Questionnaire, Depression Anxiety and Stress Scale-21, Feedback Questionnaire	Detail and Flexibility Questionnaire,	There was improvement in central coherence and change in thinking, there were no changes in self-reported cognitive stiffness and attention to detail.
20.- Roberts, 2018	Anxiety and depression	Interview to Diagnostic Eating Disorders, Eating Attitude Test, Body Shape Questionnaire, Beck Depression Inventory	Weschler Adult Intelligence Scale, Wisconsin Card Sorting Test, Rey Complex Figure, Tower of London	Change in flexibility was found, both for focus and rigidity of thought, a decrease was found in mood disorders and eating disorders
21.- Alvarado-Sánchez et al., 2019	Obsessive-compulsive disorders	Yale Brown Obsessive-Compulsive Scale, Eating Disorder Examination, The Eating Disorders Quality of Life Questionnaire, Obsessive Compulsive Disorder, Quality of Life Self-Report Questionnaire,	Cognitive Rigidity and Attention to Detail	The average percentage of favorable changes in the different measurements was greater than 30%, except for the BMI, which increased only by 21%.
22.- Van-Passel *et al.*, 2020	Autism spectrum disorder	The Autism Spectrum Quotient (short version)	Detail and Flexibility Questionnaire, Rey-Osterrieth Complex Figure	No additional effect of CRT was found on cognitive inflexibility and attention to detail, CRT showed no improvement in the AN group
23.- Dandil et al., 2020	It was not assessed	The Eating Disorder Examination Questionnaire (EDE-Q)	Behavioral Rating Inventory of Executive Function – Adult Version (BRIEF-A)	The results show that obtaining high scores in autism spectrum disorder does not affect the scores in neurocognitive measurements, so the use of CRT in individual format is not affected by autism spectrum disorders.
24.- Alvarado-Sánchez et al., 2023	Anxiety and depression	Body Image Questionnaire Eating Attitudes Test Bulimia Test Beck Depression Inventory Beck Anxiety Inventory	Wechsler Adult Intelligence Scale (WAIS-III) Wisconsin Card Sorting Test (WCST) Rey Complex Figure (RCF) London–Drexel Tower Test (TOLDX)	The main neuropsychological effects were recorded in: cognitive flexibility, visuoconstructive processing, central coherence, and planning (CCO = 0.39-0.99). Relevant changes were also identified in psychiatric symptomatology and BN measures (CCO = 0.53-0.88), but not in BMI.

Country Where the Study Was Conducted

The analysis of the geographical distribution of the scientific production on CRT in AN and BN reveals a marked concentration of research in the United Kingdom, particularly in London, with 13 studies published (Davies & Tchanturia, 2005; Tchanturia et al., 2006, 2007, 2008; Genders & Tchanturia, 2010; Pitt et al., 2010; Davies et al., 2012; Tchanturia et al., 2014, 2015, 2016; Dandil et al., 2020). This predominance suggests not only leadership in the theoretical development and clinical application of CRT, but also a consolidation of the approach in contexts with a long tradition in neuropsychological and therapeutic research.

To a lesser extent, Germany (Brockmeyer et al., 2016) and the Netherlands have provided evidence through controlled studies (Dingemans et al., 2013; Van-Passel et al., 2020), while both Mexico and the United States present, respectively, two studies (Alvarado-Sánchez et al., 2019, 2023; Lock et al., 2013; Fonville et al., 2014). Finally, Italy (Abbate-Daga et al., 2012), the Czech Republic (Zuchova et al., 2013), Canada (Mac-Neil et al., 2016), and New Zealand (Roberts, 2018) are each represented by one publication.

Overall, as shown in table 1, these findings underscore the geographical disparities in the current literature, highlighting a dominant research presence in the United Kingdom alongside contributions from a diverse range of other countries.

Patient Type

Regarding the patient type, there are substantial differences in the care modality in which CRT is employed. The majority of studies have focused on inpatients, representing 84% of the total sample, while only 16% focus on outpatients (Brockmeyer et al., 2016; Mac-Neil et al., 2016; Lock et al., 2013; Pitt et al., 2010). This predominance of hospital care is partly related to the severity and chronicity of the pathology, as it has been shown that patients admitted to inpatient services tend to present with more severe clinical conditions or with a longer duration of illness.

The differentiation in patient type not only highlights the clinical characteristics and severity of eating disorders but also underscores the need to adapt therapeutic interventions to the specificities of the care setting. As detailed in table 1, these findings emphasize the importance of considering the treatment context when evaluating the efficacy of CRT.

Number of Participants and Sessions per Study

The analysis of the variable "number of participants per study" reveals considerable diversity. Some studies have focused on single-case designs (Alvarado-Sánchez et al., 2019; 2023; Davies & Tchanturia, 2005; Tchanturia et al., 2006) with the objective of implementing and preliminarily evaluating the feasibility and applicability of CRT in specific clinical contexts. Over time, and with the accumulation of evidence, an increase in sample sizes has been observed, with some studies including up to 145 participants (Dingemans et al., 2013). This growth in the number of participants has allowed not only the validation of the therapeutic effects of CRT but also the diversification of its application formats. Accordingly, both individual and group interventions have been developed, with variations in the number of sessions: some group-format studies have used as few as 4 sessions, while individual approaches have required up to 10 sessions (Tchanturia et al., 2010; Lang et al., 2015; Roberts, 2018; Tchanturia et al., 2016).

It is important to note that studies conducted in countries such as Mexico, representing Latin American contexts, typically employ single-case designs. Overall, the trend in the number of participants indicates that while early research often relied on single-case designs, more recent studies tend to include larger samples, which enhances the robustness and generalizability of the findings.

Age of Participants

The age of the participants indicates that most of the studies have been conducted with adults; however, it was noted that some studies included patients as young as 17 years old, who were administered the protocol established for the adult population, and no differentiated analyses were conducted (Dingemans et al., 2013; Lang et al., 2015; Lock et al., 2013; Tchanturia et al., 2016; Wu et al., 2016).

Among the studies presented, at least 18 included individuals aged between 20 and 40 years, four studies included participants ranging from 17 to 60 years, and at least three studies included women aged 20 and 21. The diversity in ages not only enriches the body of evidence but also underscores the importance of considering age as a moderating variable in the evaluation and monitoring of therapeutic outcomes.

Overall, while the diversity in participant age enriches the body of evidence, it also highlights a critical gap in the current literature: the necessity for a more nuanced understanding of how age influences both the process and outcomes of CRT in the treatment of eating disorders.

Body Mass Index (BMI)

The difference in BMI among participants can be attributed to several factors, notably the heterogeneity of the samples in terms of gender, type of eating disorder, and clinical severity. For example, while a marked decrease in BMI is observed in AN—as seen in a patient with a BMI of 14.3 (Roberts et al., 2018; Dandil et al., 2020), indicating a state of severe malnutrition—in patients with BN, values are recorded as high as 23.93 (Roberts et al., 2018), suggesting differences in clinical profile and eating behavior patterns. Likewise, the variability in BMI could directly impact cognitive performance and treatment adherence, as a compromised nutritional status may affect executive functions essential for the therapeutic process. Therefore, it is relevant that research organizes the results according to BMI and other clinical markers to broaden the application of CRT, taking this biological variable into account.

Duration of Illness

On average, patients have been living with the disorder for at least 7 years, although some studies have included patients with trajectories as short as less than 2 years, while others have grouped cases with over 10 years of illness duration within the same analysis (Brockmeyer et al., 2016; Leppanen et al., 2018; Roberts, 2018; Tchanturia et al., 2016; Tchanturia et al., 2016; Zuchova et al., 2013).

However, these data should be interpreted with caution, as the wide variability in illness duration complicates direct comparisons between subgroups. For example, positive results have been observed with CRT in both patients with severe AN (Davies & Tchanturia, 2005) and those with chronic eating disorders (Alvarado et al., 2019). This suggests that CRT may have beneficial effects across different stages of illness progression. Nevertheless, it remains inconclusive which type of therapy—psychological or complementary—proves most effective for patients with a long history of the disorder.

The variability in duration may influence treatment outcomes in several ways. Longer illness duration could be associated with more deeply entrenched maladaptive cognitive and behavioral patterns, potentially requiring more intensive or tailored interventions. On the other hand, patients with shorter illness durations might display a more rapid response to therapy due to less ingrained symptomatology. Future research should strive to disaggregate these subgroups to determine whether the length of illness serves as a moderating factor in the effectiveness of CRT and to identify optimal therapeutic strategies for different patient profiles.

Comorbidities

Of the studies examined, 15 (60%) did not report any information on participants' comorbidities. However, among those that did, the most commonly evaluated conditions were mood disorders, anxiety, depression, and obsessive-compulsive disorder (Davies & Tchanturia, 2005; Du et al., 2020); perfectionism (Dingemans et al., 2013; Pitt et al., 2010); alcohol or drug abuse; self-harm (Roberts, 2018); and autism spectrum disorder (Dandil et al., 2020). It should be noted, however, that the presence of these conditions was not an exclusion criterion in the analyzed studies.

The lack of information on comorbidities in a significant percentage of studies limits a comprehensive understanding of their impact on the response to CRT. It has been suggested that conditions such as anxiety and depression may affect performance on executive functions, which in turn could influence the efficacy of the therapy (Tchanturia et al., 2016). In this sense, some authors have proposed that these psychological characteristics should be an essential part of the analysis in studies, given that their role as moderating variables in the therapeutic response has been documented. Moreover, patient selection criteria often excluded those with learning disabilities, psychosis, or intellectual limitations (Davies et al., 2012).

Measurement Instruments

Two major categories of instruments were identified: self-report measures, which assess psychological characteristics as perceived by the patient, and performance-based tests, which objectively evaluate cognitive performance through structured tasks that measure response times and accuracy. This distinction is important because each type of test provides complementary information about the patient's neuropsychological profile and the effectiveness of CRT.

Self-report measures have been widely used to assess symptoms related to eating disorders and their comorbidities. Common instruments include those designed to evaluate eating disorder symptoms, such as the Eating Disorder Inventory-2 (Abbate-Daga et al., 2012), the eating disorder-Specific Health Quality of Life (Dingemans et al., 2013; Du et al., 2020), and the Eating Disorder Examination (Alvarado-Sánchez et al., 2019; Fonville et al., 2014). For the evaluation of obsessive-compulsive symptoms, instruments such as the Maudsley Obsessive-Compulsive Inventory, the Obsessive-Compulsive Inventory-Revised, and the Yale Brown Obsessive-Compulsive Scale have been employed (Davies & Tchanturia, 2005; Fonville et al., 2014; Tchanturia et al., 2006, 2007, 2008; van Passel et al., 2020). In assessing mood disorders, anxiety, and depression, the Hospital Anxiety and Depression Scale, Beck Depression Inventory, Beck Anxiety Inventory-II, and Depression, Anxiety and Stress Scale-21 have been utilized (Abbate-Daga et al., 2012; Alvarado-Sánchez et al., 2019; Davies & Tchanturia, 2005; Dingemans et al., 2013; Fonville et al., 2014; Leppanen et al., 2018; Mac-Neil et al., 2016; Roberts, 2018; Tchanturia et al., 2006, 2007, 2008). Specific scales for perfectionism, such as Frost's Multi-Dimensional Perfectionism Scale and the Multidimensional Perfectionism Scale, have also been applied (Dingemans et al., 2013; Pitt et al., 2010). Additional instruments have measured constructs such as self-esteem, autistic traits, motivation to change, and body image, including the Rosenberg Self-Esteem Scale, Autism-Spectrum Quotient, Motivational Ruler, and the Body Shape Questionnaire (Lock et al., 2013; Tchanturia et al., 2015; Leppanen et al., 2018; Roberts, 2018; Alvarado-Sánchez et al., 2019; 2023). It is noteworthy that three studies did not report the use of self-report measures (Davies et al., 2012; Zuchova et al., 2013), which might limit a full evaluation of the patients.

On the other hand, performance-based tests have been essential for objectively measuring cognitive functions. To evaluate executive functions, instruments such as the Trail Making Test, Wisconsin Card Sorting Test, Iowa Gambling Task, Hayling Sentence Completion Task, and Tower of London have been used (Brockmeyer et al., 2016). Cognitive flexibility and central coherence have been assessed through tests like the Brixton Test, Cued Task-Switching, Detail and Flexibility Questionnaire, Group Embedded Figures Task, and the Reading the Mind in the Eyes Task (Leppanen et al., 2018; Roberts, 2018). For attention and working memory, the D2 Test of Attention, Wechsler Adult Intelligence Scale-III, and the Delis-Kaplan Executive Functioning System have been utilized (Lock et al., 2013). Furthermore, specific evaluations of central coherence have been performed using the Rey-Osterrieth Complex Figure Test and the Simple/Complex Embedded Figures Task (Mac-Neil et al., 2016; Pitt et al., 2010; Roberts, 2018). However, nine studies did not incorporate performance-based tests, limiting the ability to establish correlations between cognitive performance and clinical progression (Mac-Neil et al., 2016; Pitt et al., 2010; Roberts, 2018; Tchanturia et al., 2016; Tchanturia et al., 2014, 2015, 2016A; 2016B; Zuchova et al., 2013).

The combination of self-report measures and performance-based tests allows for a more comprehensive assessment of the effects of CRT on patients with eating disorders. Yet, some interventions do not clearly distinguish between the two, using self-report measures to evaluate executive functions when these are better assessed through performance-based tests such as the Trail Making Test or the Iowa Gambling Task. The inclusion of a standardized battery that encompasses both perspectives could facilitate comparisons between studies and optimize CRT protocols. As detailed in Table 2, integrating both types of instruments is critical for developing a robust

understanding of the therapeutic impact of CRT, ultimately supporting more individualized treatment approaches.

Study Results

Studies consistently show that Cognitive Remediation Therapy (CRT) has a positive impact on cognitive flexibility, central coherence, and the ability to change in patients with eating disorders, particularly anorexia nervosa (AN). Various investigations have reported significant improvements in these areas, suggesting that CRT is an effective tool for addressing the cognitive difficulties associated with these disorders.

Several studies highlight improvements in cognitive flexibility and central coherence in patients who received CRT. Positive changes in cognitive adaptability and a reduction in mental rigidity have been observed, which are fundamental aspects in the treatment of eating disorders. Research by Davies & Tchanturia (2005), Tchanturia et al. (2013), and Lock et al. (2013) agree that CRT facilitates the ability to change and improves cognitive organization, contributing to the therapeutic process of these patients.

In addition to cognitive benefits, CRT has also shown positive effects on eating disorder psychopathology and other psychiatric symptoms. Improvements in eating patterns and a reduction in perfectionism—factors influencing the persistence of AN—have been reported (Pitt et al., 2010). Similarly, studies by Tchanturia et al. (2015) indicate significant reductions in anhedonia and alexithymia after CRT intervention. Other investigations, such as Roberts (2018), have found improvements in mood disorders and general psychiatric symptoms, reinforcing the therapeutic potential of this intervention.

CRT has also been well accepted by both patients and therapists. In various studies, participants have reported that the therapy is useful and positive, indicating a high rate of adherence and satisfaction (Genders & Tchanturia, 2010; Zuchova et al., 2013; Mac-Neil et al., 2016). This aspect is crucial in any therapeutic intervention, as greater patient acceptance often translates into better long-term outcomes.

Despite the positive findings, some studies have shown mixed results regarding CRT's effectiveness. While most studies highlight its benefits, others have found no significant differences between the intervention and control groups. For example, Fonville et al. (2014) and Van-Passel et al. (2020) reported that CRT did not produce additional improvements in certain cognitive variables. These findings suggest that CRT's effectiveness may depend on individual factors or the type of measures used to assess its impact.

In terms of similarities, most studies agree that CRT improves cognitive flexibility and central coherence, reduces some psychiatric symptoms, and is well received by patients. However, there are differences in results concerning certain variables. For instance, some studies found no significant changes in body mass index (BMI) following the intervention (Alvarado-Sánchez et al., 2019, 2023), while others did not observe improvements in attention to detail (Leppanen et al., 2018). Additionally, differences have been identified based on the presence of autism spectrum traits, suggesting that CRT may not be equally effective across all patient subgroups (Tchanturia et al., 2016; Dandil et al., 2020).

DISCUSSION

The objective of the present study was to analyze the effectiveness of Cognitive Remediation Therapy (CRT) in improving cognitive deficits associated with eating disorders in adults with eating disorders. The study aims to identify key findings regarding sample characteristics (country of study, type of patient, number of participants, age, BMI, duration of illness, and comorbidities), as well as the assessment instruments used (both self-report and performance-based measures).

Regarding the geographic distribution, it indicates a diversity in the application and methodological approach of CRT, which has been explored in various cultural contexts and healthcare systems. This panorama suggests the need to continue expanding research in underrepresented regions, which will not only enrich the theoretical and empirical body of knowledge on CRT but also facilitate the adaptation of the intervention to diverse clinical and cultural realities (Davies & Tchanturia, 2005; Tchanturia et al., 2006, 2007, 2008; Genders & Tchanturia, 2010; Pitt et al., 2010; Davies et al., 2012; Tchanturia et al., 2014, 2015, 2016; Dandil et al., 2020).

The decision to group patients into inpatient and outpatient modalities is not merely a categorization; it also implies differences in therapeutic management. For example, inpatient care allows for more intensive monitoring and an integrated intervention that addresses both medical and psychosocial aspects, whereas outpatient care is aimed at patients in less acute phases who, despite exhibiting deficits in executive functions, may benefit from a less restrictive approach that focuses more on social and functional reintegration (Davies & Tchanturia, 2005; Tchanturia et al., 2006, 2007, 2008; Genders & Tchanturia, 2010; Pitt et al., 2010; Davies et al., 2012; Tchanturia et al., 2014, 2015, 2016; Dandil et al., 2020).

In hospitalized patients, where the severity and presence of comorbidities can be more pronounced, CRT emerges as a complementary tool that, by improving executive functions and central coherence, facilitates therapeutic engagement and helps reduce treatment dropout. On the other hand, in outpatient settings, the application of CRT can be oriented towards strengthening autonomy and the everyday management of the disorder, promoting adaptive strategies in a less controlled environment (Cella et al., 2015; González de Chávez, 1999)

The heterogeneity in the sample suggests that future research could benefit from a comparative analysis between care modalities, which would allow for the optimization of CRT protocols and the personalization of interventions according to the patient's clinical context. This variability in sample size and study design not only reflects the growing maturity of CRT research but also underscores the importance of adapting therapeutic protocols to the specific characteristics of each sample. The evolution in the number of participants per study shows a trend toward more robust and generalizable research, which is essential for consolidating the therapeutic impact of CRT.

In the analyzed studies, the age of participants ranges from 17 to 59 years, reflecting the heterogeneity of the clinical population to which CRT is applied and the possible influence of age-related variables, such as the duration of the disorder and adaptation to specific therapeutic interventions. It has been suggested that age might be linked to the chronicity of the disorder and, consequently, to the magnitude of deficits in executive functions—an aspect essential for managing and regulating eating behavior (Tchanturia et al., 2016; Alvarado et al., 2019). Likewise, the inclusion of such a wide age range suggests the need to adapt the CRT intervention, both in the selection of assessment instruments and in the application methodology, to the particularities of each age subgroup. Some studies have differentiated protocols for adolescents and adults, acknowledging that differences in cognitive maturity and psychosocial demands can influence the effectiveness of the therapy (Dingemans et al., 2013).

Regarding BMI, there is a wide variability in the reported values. For example, the lowest BMI was identified in a case study with a value of 13 (Tchanturia et al., 2006), while other studies have recorded higher values, reaching up to 25 (Roberts, 2018). This variability is consistent with the nature of eating disorders, where low body weight is characteristic, especially in AN. It is important to note that although CRT focuses on improving executive functions and central coherence, BMI is often used as a complementary variable to evaluate the evolution of nutritional status following the intervention. Some studies have attempted to explore the possible relationship between changes in cognitive functions and modifications in BMI, although to date no direct and consistent link has been established (Tchanturia et al., 2010; Lang et al., 2015; Roberts, 2018; Tchanturia et al., 2016).

The duration of the disorder is another crucial factor, as the time elapsed with the pathology may reflect the diversity of previous therapeutic processes (psychological, nutritional, and medical) to which patients have been subjected (Madruga et al., 2010) These antecedents can influence the degree of cognitive rigidity and the capacity for adaptation to change, aspects that CRT seeks to improve through structured interventions. The uncertainty regarding the influence of the disorder's duration suggests that a chronic course could be associated with a greater deterioration in executive functions, which in some cases would require more intensive or adapted therapeutic strategies (Mehler & Brown, 2015). Therefore, future studies should disaggregate the results according to the duration of the disorder, allowing for the identification of specific patient profiles and the optimization of CRT application based on the chronology of the disorder (Morris et al., 2015)

Regarding comorbidities, mood disorders, depression, anxiety, obsessive-compulsive disorder, substance abuse, and autism spectrum disorder are common conditions in eating disorders (Salbach-Andrae et al., 2008). However, many studies have not exhaustively evaluated whether these conditions affect CRT outcomes. Given that these comorbidities can influence cognitive functioning, it is essential to consider their impact when analyzing the efficacy of the intervention (Jagielska & Kacperska, 2017; Raney et al., 2008)

Regarding the instruments used, two main categories were identified: self-report instruments and performance-based tests. Self-report instruments, such as the Eating Disorder Inventory-2, the Eating Disorder Examination, or scales to assess anxiety and depression, allow for understanding the patient's perception of their own psychological state. On the other hand, performance-based tests (for example, the Trail Making Test, the Wisconsin Card Sorting Test, or the Iowa Gambling Task) provide an objective evaluation of executive functions and central coherence. The combination of both types of instruments is crucial for obtaining a comprehensive picture of the patients' neuropsychological profile and for more accurately assessing the impact of CRT. Nevertheless, it is observed that in some studies this distinction is not clearly defined, as self-reports have been used to evaluate functions that might be more appropriately measured through performance-based tests, which limits the ability to compare and contrast the results (Reville et al., 2016)

Regarding study results, the majority indicate that CRT has a positive impact on cognitive flexibility, central coherence, and, overall, on the adaptive capacity of patients with eating disorders, especially those with AN. Significant improvements have been reported in the ability to change and cognitively organize, as well as in the reduction of psychopathological symptoms related to eating disorders. Furthermore, some studies highlight that CRT helps reduce treatment dropout and improves patient engagement. However, there are studies that have reported mixed results, especially concerning variables such as attention to detail, BMI, or certain specific executive functions, suggesting that the efficacy of CRT may be modulated by individual factors or by the nature of the assessment instruments used (Easter & Tchanturia 2011; Fagundo et al., 2012)

CRT appears to be a promising complementary intervention for addressing cognitive difficulties in eating disorders. The diversity in the sample, the variability in the duration of the disorder, and the use of different assessment instruments underscore the need for future research that refines therapeutic protocols and personalizes interventions according to each patient's clinical profile. Moreover, the integration of self-report instruments and performance-based tests is fundamental for obtaining a more complete and precise evaluation of CRT's effects, which in turn will facilitate the identification of strategies tailored to the specific needs of patients, thereby optimizing therapeutic outcomes (Southgate et al., 2005).

CONCLUSIONS

This work constitutes a systematic review that has allowed us to analyze the available evidence on the effectiveness of CRT in the treatment of eating disorders in adults, with special emphasis on AN. The findings extracted from the included studies demonstrate that CRT is a promising complementary intervention, as it significantly contributes to improving executive functions and central coherence. These improvements are essential to counteract the cognitive rigidity characteristic of eating disorders and to facilitate the regulation of eating behavior, enabling patients to adopt more flexible and adaptive thought and behavior patterns.

The systematic review reveals that, both in inpatient and outpatient settings, the application of CRT promotes greater therapeutic engagement and significantly reduces treatment dropout. In the hospital context, where the severity and presence of comorbidities tend to be more pronounced, CRT stands out as a tool that, by enhancing cognitive capacities, helps patients comprehensively address both the medical and psychosocial aspects of the disorder. On the other hand, in outpatient settings, the intervention is oriented towards strengthening autonomy and the everyday management of the disorder, offering a less restrictive approach that facilitates social and functional reintegration.

The evidence gathered in this systematic review supports the effectiveness of CRT as a complementary intervention in the treatment of eating disorders, highlighting its potential to improve cognitive flexibility, central coherence, and, overall, the adaptive capacity of patients. However, to consolidate these findings and optimize the application of CRT, it is imperative to continue research through studies with larger samples, standardized methodologies, and an approach that combines both objective and subjective evaluations. Only in this way can the intervention be personalized, maximizing therapeutic benefits and providing a response tailored to the specific needs of each patient.

REFERENCES

Abbate-Daga, G., Buzzichelli, S., Marzola, E., Amianto, F., & Fassino, S. (2012). Effectiveness of cognitive remediation therapy (CRT) in anorexia nervosa: A case series. Journal of Clinical and Experimental Neuropsychology, 34(10), 1009–1015. https://doi.org/10.1080/13803395.2012.704900

Alserihi, A. R., Hubayni, W. A., Alotaibi, S. H., Bahkali, S., Alqurashi, S., Abualola, M. S., & Alsaleh, A. M. (2024). Effect of cognitive remediation therapy in anorexia nervosa: A systematic review and meta-analysis. Frontiers in Psychiatry, 15, 1484457. https://doi.org/10.3389/fpsyt.2024.1484457

Alvarado, N., & Silva, C. (2014). Funciones ejecutivas y sintomatología asociada con los trastornos de la conducta alimentaria. Revista Latinoamericana de Psicología, 46(3), 189–197. doi:10.1016/S0120-0534(14)70022-6

Alvarado-Sánchez, N., Alvarez-Rayón, G., & Mancilla-Díaz, J. M. (2019). Cognitive remediation therapy in Mexico as a treatment for Anorexia Nervosa: A case study. Eating Disorders, 27(2), 230–252. https://doi.org/10.1080/10640266.2019.1591849

Alvarado-Sánchez, Nayelli, Alvarez-Rayón, Georgina, Aizpuru de la Portilla, Araceli, & Mancilla-Diaz, Juan Manuel. (2023). Terapia de remediación cognitiva en bulimia nerviosa: Un estudio de caso. Revista mexicana de trastornos alimentarios, 13(2), 199-208. Epub 15 de enero de 2024.https://doi.org/10.22201/fesi.20071523e.2023.2.698

Álvarez, V., Maldonado, R., Catalán-Camacho, M., & Jáuregui-Lobera, I. (2021). Quién influye en quién: el trío Flexibilidad Cognitiva-Emociones-Trastornos de la Conducta alimentaria. Journal of Negative & No Positive Results, 6(1), 47–67.

APA. (2013). American Psychiatric Association, 2013. Diagnostic and statistical manual of mental disorders (5th ed.). In American Journal of Psychiatry. https://doi.org/10.1176/appi.books.9780890425596.744053

Arbel, R., Koren, D., Klein, E., & Latzer, Y. (2013). The neurocognitive basis of insight into illness in anorexia nervosa: A pilot metacognitive study. Psychiatry Research. https://doi.org/10.1016/j.psychres.2013.01.009

Ardila, A., & Surloff, C. (2007). Dysexecutive syndromes. Medlink: Neurology.

Brockmeyer, T., Walther, S., Ingenerf, K., Wild, B., Hartmann, M., Weisbrod, M., Weber, M. A., Eckhardt-Henn, A., Herzog, W., & Friederich, H. C. (2016). Brain effects of computer-assisted cognitive remediation therapy in anorexia nervosa: A pilot fMRI study. Psychiatry Research - Neuroimaging, 249(30), 52–56. https://doi.org/https://doi.org/10.1016/j.pscychresns.2016.02.007

Cella, M., Reeder, C., & Wykes, T. (2015). Cognitive remediation in schizophrenia-now it is really getting personal. Current Opinion in Behavioral Sciences, 4, 147–151. https://doi.org/10.1016/j.cobeha.2015.05.005

Dandil, Y., Smith, K., Adamson, J., & Tchanturia, K. (2020). Individual cognitive remediation therapy benefits for patients with anorexia nervosa and high autistic features. European Eating Disorders Review, 28(1), 87–91. https://doi.org/10.1002/erv.2707

Davies, H., & Tchanturia, K. (2005). Cognitive remediation therapy as an intervention for acute anorexia nervosa: A case report. European Eating Disorders Review, 13, 311–316. https://doi.org/10.1002/erv.655

Davies, H., Fox, J., Naumann, U., Treasure, J., Schmidt, U., & Tchanturia, K. (2012). Cognitive remediation and emotion skills training for anorexia nervosa: An observational study using neuropsychological outcomes. European Eating Disorders Review, 20, 211–217. https://doi.org/10.1002/erv.2170

Dingemans, A. E., Danner, U. N., Donker, J. M., Aardoom, J. J., Van Meer, F., Tobias, K., Van Elburg, A. A., & Van Furth, E. F. (2013). The effectiveness of cognitive remediation therapy in patients with a severe or enduring eating disorder: A randomized controlled trial. Psychotherapy and Psychosomatics, 89, 29–36. https://doi.org/10.1159/000355240

Easter, A., & Tchanturia, K. (2011). Therapists' experiences of Cognitive Remediation Therapy for anorexia nervosa: Implications for working with adolescents. Clinical Child Psychology and Psychiatry, 16(2), 233–246. https://doi.org/10.1177/1359104511401185

Fagundo, A. B., de la Torre, R., Jiménez-Murcia, S., Agüera, Z., Granero, R., Tárrega, S., Botella, C., Baños, R., Fernández-Real, J. M., Rodríguez, R., Forcano, L., Frühbeck, G., Gómez-Ambrosi, J., Tinahones, F. J., Fernández-García, J. C., Casanueva, F. F., & Fernández-Aranda, F. (2012). Executive functions profile in extreme eating/weight conditions: From Anorexia Nervosa to Obesity. PLoS ONE, 7(8), e43382. https://doi.org/10.1371/journal.pone.0043382

Fonville, L., Giampietro, V., Davies, H., Lounes, N., Simmons, A., Williams, S., & Tchanturia, K. (2014). Cognitive remediation, brain function and central coherence: An anorexia nervosa pilot study. Annals of General Psychiatry, 13(25), 1–5. https://doi.org/10.1186/s12991-014-0025-z

Genders, R., & Tchanturia, K. (2010). Cognitive remediation therapy (CRT) for anorexia in group format: A pilot study. *Eating and Weight Disorders, 15*(4), e234–e239. https://doi.org/10.1007/BF03325304

González de Chávez, M. (1999). Dos grupos psicoterapéuticos de pacientes esquizofrénicos: hospitalizados y ambulatorios. Revista de La Asociación Española de Neuropsiquiatría.

Gordon, W. A., & Hibbard, M. R. (1992). Critical Issues in Cognitive Remediation. Neuropsychology. https://doi.org/10.1037/0894-4105.6.4.361

Hagan, K., Christensen, K., & Forbush, K. (2020). A preliminary systematic review and meta-analysis of randomizedcontrolled trials of cognitive remediation therapy for anorexia nervosa. Eating Behaviors, 37, 1–10.

Hirst, R. B., Beard, C. L., Colby, K. A., Quittner, Z., Mills, B. M., & Lavender, J. M. (2017). Anorexia nervosa and bulimia nervosa: A meta-analysis of executive functioning. Neuroscience and Biobehavioral Reviews, 83, 678–690. https://doi.org/10.1016/j.neubiorev.2017.08.011

Hutton, B., Catalá-López, F., & Moher, D. (2016). La extensión de la declaración PRISMA para revisiones sistemáticas que incorporan metaanálisis en red: PRISMA-NMA. Medicina Clinica, 146(6), 262–266. https://doi.org/10.1016/j.medcli.2016.02.025

Jagielska, G., & Kacperska, I. (2017). Outcome, comorbidity and prognosis in anorexia nervosa. Psychiatria Polska, 51(2), 205–218. https://doi.org/10.12740/pp/64580

Jáuregui-Lobera, I. (2013). Neuropsychology of eating disorders: 1995-2012. Neuropsychiatric Disease and Treatment, 9, 415–430. https://doi.org/10.2147/NDT.S42714

Kittel, R., Schmidt, R., & Hilbert, A. (2017). Executive functions in adolescents with binge-eating disorder and obesity. *International Journal of Eating Disorders, 50*(8), 933–941. https://doi.org/10.1002/eat.22714

Knight, M., Lyrtzis, E., & Baune, B. (2020). The association of cognitive deficits with mental and physical Quality of Life in Major Depressive Disorder. Comprehensive Psychiatry, 97, 1–7.

Kolar, D. R., Rodriguez, D. L., Chams, M. M., & Hoek, H. W. (2016, November). Epidemiology of eating disorders in Latin America: A systematic review and meta-analysis. Current Opinion in Psychiatry, 29(6), 363–371. https://doi.org/10.1097/YCO.0000000000000279

Konstantakopoulos, G., Tchanturia, K., Surguladze, S. A., & David, A. S. (2011). Insight in eating disorders: Clinical and cognitive correlates. Psychological Medicine. https://doi.org/10.1017/S0033291710002539

Lang, K., Treasure, J., & Tchanturia, K. (2015). Acceptability and feasibility of self-help Cognitive Remediation Therapy For Anorexia Nervosa delivered in collaboration with carers: A qualitative preliminary evaluation study. Psychiatry Research, 225(3), 387–394. https://doi.org/10.1016/j.psychres.2014.12.008

Lavagnino, L., Arnone, D., Cao, B., Soares, J. C., & Selvaraj, S. (2016). Inhibitory control in obesity and binge eating disorder: A systematic review and meta-analysis of neurocognitive and neuroimaging studies. *Neuroscience & Biobehavioral Reviews, 68*, 714–726. https://doi.org/10.1016/j.neubiorev.2016.06.041

Leppanen, J., Adamson, J., & Tchanturia, K. (2018). Impact of cognitive remediation therapy on neurocognitive processing in anorexia nervosa. Frontiers in Psychiatry, 9(96). https://doi.org/10.3389/fpsyt.2018.00096

Lindvall, C., & Rø, O. (2014). A systematic review of cognitive remediation therapy for anorexia nervosa - development, current state and implications for future research and clinical practice. Journal of Eating Disorders, 2(26), 1–11. https://doi.org/10.1186/s40337-014-0026-y

Lock, J., Agras, W. S., Fitzpatrick, K. K., Bryson, S. W., Jo, B., & Tchanturia, K. (2013). Is outpatient cognitive remediation therapy feasible to use in randomized clinical trials for anorexia nervosa? International Journal of Eating Disorders, 46(6), 567–575. https://doi.org/10.1002/eat.22134

Mac-Neil, B., Nadkarni, P., Leung, P., Stubbs, L., O´Brien, C., Singh, M., & Leduc, S. (2016). Cognitive Remediation Therapy, Eh! An Exploratory Study at a Canadian Adult Eating Disorders Clinic. Canadian Journal of Counselling and Psychotherapy / Revue Canadienne de Counseling et de Psychothérapie, 50(2), 180–191.

Madruga, A., Leis, T., & Lambruschini, F. (2010). Trastornos del comportamiento alimentario: Anorexia nerviosa y bulimia nerviosa. Protocolos Diágnosticos y Terapéuticos En Peditría, 325–329. https://www.aeped.es/ sites/default/files/documentos/anorexia bulimia.pdf

Marchesi, G., Cammisuli, D. M., Semonella, M., Castelnuovo, G., & Pietrabissa, G. (2024). The efficacy of cognitive remediation therapy for anorexia nervosa: A systematic review of systematic reviews. *Brain Sciences, 14*(2), 118. https://doi.org/10.3390/brainsci14020118

Mehler, P. S., & Brown, C. (2015). Anorexia nervosa - Medical complications. Journal of Eating Disorders, 3(11), 1–8. https://doi.org/10.1186/s40337-015-0040-8

Morris, M. C., Evans, L. D., Rao, U., & Garber, J. (2015). Executive function moderates the relation between coping and depressive symptoms. Anxiety, Stress and Coping. https://doi.org/10.1080/10615806.2014.925545

Muñoz-Céspedes, J., & Tirapu-Ustárroz, J. (2004). Rehabilitación de las funciones ejecutivas. Rev Neurología, 38(7), 656–663.

Page MJ, et al. BMJ 2021;372:n71. doi: 10.1136/bmj.n71.

Pitt, S., Lewis, R., Morgan, S., & Woodward, D. (2010). Cognitive remediation therapy in an outpatient setting: A case series. Eating and Weight Disorders, 15, e281–e286. https://doi.org/10.1007/BF03325310

Raney, T. J., Thornton, L. M., Berrettini, W., Brandt, H., Crawford, S., Fichter, M. M., Halmi, K. A., Johnson, C., Kaplan, A. S., LaVia, M., Mitchell, J., Rotondo, A., Strober, M., Woodside, D. B., Kaye, W. H., & Bulik, C. M. (2008). Influence of overanxious disorder of childhood on the expression of anorexia nervosa. International Journal of Eating Disorders, 41, 326–332. https://doi.org/10.1002/eat.20508

Reville, M. C., O'Connor, L., & Frampton, I. (2016). Literature Review of Cognitive Neuroscience and Anorexia Nervosa. Current Psychiatry Reports, 18(18), 1–8. https://doi.org/10.1007/s11920-015-0651-4

Roberts, M. (2018). Feasibility of group Cognitive Remediation Therapy in an adult eating disorder day program in New Zealand. Eating Behaviors, 30, 1–4. https://doi.org/10.1016/j.eatbeh.2018.04.004

Roberts, M. E., Tchanturia, K., Stahl, D., Southgate, L., & Treasure, J. (2007). A systematic review and meta-analysis of set-shifting ability in eating disorders. Psychological Medicine, 37, 1075–1084. https://doi.org/10.1017/S0033291707009877

Roberts, M., Tchanturia, K., & Treasure, J. (2016). Overlapping neurocognitive inefficiencies in anorexia nervosa: a preliminary investigation of women with both poor set-shifting and weak central coherence. Eating and Weight Disorders, 21, 725–729. https://doi.org/10.1007/s40519-016-0302-8

Salbach-Andrae, H., Lenz, K., Simmendinger, N., Klinkowski, N., Lehmkuhl, U., & Pfeiffer, E. (2008). Psychiatric comorbidities among female adolescents with anorexia nervosa. Child Psychiatry and Human Development, 39, 261–272. https://doi.org/10.1007/s10578-007-0086-1

Seidel, M., King, J., & Ehrlich, S. (2022). Executive functions and eating behavior: Commentary on Steegers et al., 2021. International Journal of Eating Disorders, 55(3), 418-419

Silén, Y., & Keski-Rahkonen, A. (2022, November 1). Worldwide prevalence of DSM-5 eating disorders among young people. Current Opinion in Psychiatry, 35(6), 362–371. https://doi.org/10.1097/YCO.0000000000000818

Southgate, L., Tchanturia, K., & Treasure, J. (2005). Building a model of the aetiology of eating disorders by translating experimental neuroscience into clinical practice. Journal of Mental Health, 14(6), 553–566. https://doi.org/10.1080/09638230500347541

Tchanturia, K, Davies, H., & Campbell, I. (2007). Cognitive remediation therapy for patients with anorexia nervosa: Preliminary findings. Annals of General Psychiatry, 6(14), 1–6. https://doi.org/10.1186/1744-859X-6-14

Tchanturia, K, Davies, H., Reeder, C., & Wykes, T. (2010). Cognitive remediation therapy for anorexia nervosa (University of London (ed.)). King´s College London.

Tchanturia, K, Giombini, L., Leppanen, J., & Kinnaird. (2017). Evidence for Cognitive Remediation Therapy in Young People with Anorexia Nervosa: Systematic Review and Meta-analysis of the Literature. European Eating Disorders Review, 25(4), 227–236. https://doi.org/10.1002/erv.2522

Tchanturia, K, Larsson, E., & Brown, A. (2016). Benefits of group cognitive remediation therapy in anorexia nervosa: case series. Neuropsychiatrie : Klinik, Diagnostik, Therapie Und Rehabilitation : Organ Der Gesellschaft Osterreichischer Nervenarzte Und Psychiater, 30, 42–49. https://doi.org/10.1007/s40211-016-0177-y

Tchanturia, K, Lounes, N., & Holttum, S. (2014). Cognitive remediation in anorexia nervosa and related conditions: A systematic review. European Eating Disorders Review, 22, 454–462. https://doi.org/10.1002/erv.2326

Tchanturia, K, Whitney, J., & Treasure, J. (2006). Can cognitive exercises help treat anorexia nervosa? Eating and Weight Disorders, 11, e112–e116. https://doi.org/10.1007/BF03327574

Tchanturia, Kate, & Lock, J. (2010). Behavioral neurobiology of eating disorders. In R. Adan & W. Kaye (Eds.), Current Topics in Behavioral Neurosciences (pp. 269–287). Springer Publishing Company. https://doi.org/10.1007/7854_2010_90

Tchanturia, Kate, Davies, H., Lopez, C., Schmidt, U., Treasure, J., & Wykes, T. (2008). Letter to the Editor: Neuropsychological task performance before and after cognitive remediation in anorexia nervosa: A pilot case-series. Psychological Medicine, 38(9), 1371–1373. https://doi.org/10.1017/S0033291708003796

Tchanturia, Kate, Davies, H., Roberts, M., Harrison, A., Nakazato, M., Schmidt, U., Treasure, J., & Morris, R. (2012). Poor cognitive flexibility in eating disorders: Examining the evidence using the wisconsin card sorting task. PLoS ONE, 7(1), e28331. https://doi.org/10.1371/journal.pone.0028331

Tchanturia, Kate, Doris, E., & Fleming, C. (2014). Effectiveness of cognitive remediation and emotion skills training (CREST) for anorexia nervosa in group format: A naturalistic pilot study. European Eating Disorders Review, 22(3), 200–205. https://doi.org/10.1002/erv.2287

Tchanturia, Kate, Doris, E., Mountford, V., & Fleming, C. (2015). Cognitive Remediation and Emotion Skills Training (CREST) for anorexia nervosa in individual format: Self-reported outcomes. BMC Psychiatry, 15(53), 1–6. https://doi.org/10.1186/s12888-015-0434-9

Tchanturia, Kate, Larsson, E., & Adamson, J. (2016). How anorexia nervosa patients with high and low autistic traits respond to group Cognitive Remediation Therapy. BMC Psychiatry, 16(334), 1–7. https://doi.org/10.1186/s12888-016-1044-x

Tchanturia, Kate, Larsson, E., & Brown, A. (2016). Benefits of group cognitive remediation therapy in anorexia nervosa: case series. Neuropsychiatrie : Klinik, Diagnostik, Therapie Und Rehabilitation : Organ Der Gesellschaft Osterreichischer Nervenarzte Und Psychiater. https://doi.org/10.1007/s40211-016-0177-y

Udo, T., & Grilo, C. M. (2019). Psychiatric and medical correlates of DSM-5 eating disorders in a nationally representative sample of adults in the United States. International Journal of Eating Disorders. https://doi.org/10.1002/eat.23004

Van Passel, B., Danner, U. N., Dingemans, A. E., Aarts, E., Sternheim, L. C., Becker, E. S., van Elburg, A. A., van Furth, E. F., Hendriks, G.-J., & Cath, D. C. (2020). Cognitive Remediation Therapy Does Not Enhance Treatment Effect in Obsessive-Compulsive Disorder and Anorexia Nervosa: A Randomized Controlled Trial. Psychotherapy and Psychosomatics, 89, 228–241. https://doi.org/10.1159/000505733

Vázquez Arévalo, Rosalia, López Aguilar, Xochitl, Ocampo Tellez-Girón, María Trinidad, & Mancilla-Diaz, Juan Manuel. (2015). El diagnóstico de los trastornos alimentarios del DSM-IV-TR al DSM-5. Revista mexicana de trastornos alimentarios, 6(2), 108-120. https://doi.org/10.1016/j.rmta.2015.10.003

Wykes, T., & Reeder, C. (2005). Cognitive Remediation Therapy for Schizophrenia: Theory and Practice. In Routledge.

Zipfel, S., Giel, K. E., Bulik, C. M., Hay, P., & Schmidt, U. (2015). Anorexia nervosa: Aetiology, assessment, and treatment. The Lancet Psychiatry, 2(12), 1099–1111. https://doi.org/10.1016/S2215-0366(15)00356-9

Zuchova, S., Erler, T., & Papezova, H. (2013). Group cognitive remediation therapy for adult anorexia nervosa inpatients: First experiences. Eating and Weight Disorders, 18, 269–273. https://doi.org/10.1007/s40519-013-0041-z

AGRADECIMIENTOS

Proyecto PAPPIT IN307024.