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Individual and group format adjunct therapy on social emotional skills for adolescent inpatients with severe and complex eating disorders (CREST-A)

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Summary
Background Relatively little is known about which psychological treatment adjuncts might be helpful for supporting people with the most severe and complex forms of anorexia nervosa (AN) with very low weight and malnutrition requiring inpatient admissions, but targeting key perpetuating factors such as social emotional difficulties may be one way to advance knowledge. This pilot feasibility project reports on the development of an adolescent adaptation of Cognitive Remediation and Emotion Skills Training (CREST-A) and explores its acceptability, feasibility and possible benefits.
Methods An uncontrolled, repeated measures design was employed with data collected at the start and end of treatment. CREST-A was investigated in two formats: a 10-session individual format delivered to a case series of 12 patients and a 5-session group format delivered to 3 groups of 9 patients.
Results Acceptability, measured using a Patient Satisfaction Scale was 7/10 for the individual and 6/10 for the group format. Individual take-up was 100% and group take-up was 34.62%. Drop-out was 8.33% and 29.63% in the individual and group formats respectively. Homework was completed 66.67% and 75% of the time in the individual and group formats respectively. Patients reported medium-sized improvements in components of social emotional functioning measured using the Work and Social Adjustment Scale, the Toronto Alexithymia Scale and the Revised Social Anhedonia Scale in the individual and group formats.
Conclusion Future studies employing randomized controlled designs may now be warranted to advance this evidence base of this low intensity treatment adjunct.

Keywords Eating disorders · Anorexia nervosa · Bulimia nervosa · Adolescents · Treatment

Ergänzende Einzel- und Gruppentherapie zu sozialen emotionalen Fähigkeiten für stationäre jugendliche Patienten mit schweren und komplexen Essstörungen (CREST-A)

Zusammenfassung
Grundlagen Es ist relativ wenig darüber bekannt, welche psychologischen Zusatzbehandlungen dabei helfen könnten, Menschen mit den schwersten und komplexesten Formen der Anorexia nervosa (AN) mit sehr geringem Gewicht und Unterernährung, die eine stationäre Aufnahme erfordern, zu unterstützen. Der Fokus auf die wichtigsten fortbestehenden Faktoren, wie z. B. soziale emotionale Schwierigkeiten, könnte jedoch ein Weg sein, die Kenntnisse diesbezüglich zu erweitern. Dieses Pilotprojekt berichtet über die Entwicklung einer Anpassung des CREST-A (Cognitive Remediation and Emotion Skills Training) an Jugendliche und untersucht dessen Akzeptanz, die Durchführbarkeit sowie den möglichen Nutzen.
Methoden Ein unkontrolliertes, wiederholtes Messdesign mit zu Beginn und am Ende der Behandlung

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erhobenen Daten, wurde angewandt. CREST-A wurde in zwei Formaten untersucht: ein Einzelformat mit 10 Sitzungen für eine Fallserie von 12 Patienten und ein Gruppenformat mit 5 Sitzungen für 3 Gruppen von 9 Patienten.
Ergebnisse Die Akzeptanz, gemessen anhand einer Patientenzufriedenheitsskala, betrug 7/10 für das Einzel- und 6/10 für das Gruppenformat. Die individuelle Akzeptanz lag bei 100% und die Gruppenakzeptanz bei 34,62%. Die Abbrecherquote lag bei 8,33% im Einzel- und 29,63% im Gruppenformat. Die Hausaufgaben wurden in 66,67% bzw. 75% der Fälle im Einzel- bzw. Gruppenformat erledigt. Die Patienten berichteten über mittelgroße Verbesserungen bei den Komponenten der sozialen emotionalen Funktionsfähigkeit, die mit Hilfe der Arbeits- und Sozialanpassungsskala, der Toronto-Alexithymie-Skala und der revidierten sozialen Anhedonie-Skala in den Einzel- und Gruppenformaten gemessen wurden.
Schlussfolgerung Zukünftige Studien, die randomisierte kontrollierte Designs verwenden, sind jetzt notwendig, um die Evidenzbasis für diese wenig intensive Zusatzbehandlung zu erweitern.

Schlüsselwörter Essstörungen · Anorexia nervosa · Bulimia nervosa · Jugendliche · Behandlung

Background

Eating disorders (EDs), including anorexia nervosa (AN), bulimia nervosa (BN) and binge eating disorder (BED) can be severe and enduring forms of mental illness associated with high disability [1], poor quality of life [2] and high mortality [3]. Typical onset occurs during adolescence and if treated promptly (i.e. in the first 3 years), long-term recovery is possible [4]. However, some patients are unable to recover in the community with evidence-based family interventions and may require more intensive forms of life-saving treatment in inpatient settings [5]. Evidence does not support the superiority of inpatient treatment over other settings [6], but for some, due to physical complications, the complexity, severity and enduring nature of their ED, intensive hospitalisation may be needed [7]. Medically compromised adolescents requiring inpatient treatment might represent a group who may have struggled to engage in community-based treatment due to a range of factors, like difficulties around the family coming into treatment together to fight the illness [8] and the highly valued nature of the illness [9]. There is a relative paucity of evidence for high-quality ED focused treatments for both adolescents and adults with these more severe and complex forms of illness [10], but a number of research groups have developed innovative treatment enhancers [11–13]. Alongside re-feeding and intensive psychological support for the individual and their family, these treatment adjuncts aim to support this patient subgroup to develop skills, knowledge, resilience and motivation to be able to better manage their illness and lead a fulfilled life.

One example of the use of a treatment enhancer for those with severe and complex EDs is cognitive remediation and emotion skills training (CREST, [14–16]). CREST was developed in collaboration with service users, parents and clinicians [17] and informed by research findings on cognitive styles and social emotional functioning to support adults with severe, complex and enduring EDs in inpatient settings. CREST has an emerging evidence base in adult inpatient cohorts in both individual and group formats [16]. The primary tenant of CREST is that people with EDs may show some inefficiencies in information processing in both the 'cold cognitive' (e.g. cognitive flexibility and bigger picture thinking [18–20] and 'hot cognitive' domains (e.g. emotional and social functioning [21]. CREST aims to first support patients to develop their 'cold cognitive' abilities and then to use these skills to further explore and develop their functioning in the social emotional domain, with an overall goal of enabling patients to increase their skills and confidence in this area of their recovery through teaching emotion regulation skills and emphasizing the importance of positive emotions and social communication. The social emotional domain is an important area to address as clinical experimental studies from adult populations highlight difficulties identifying [22], recognizing [23], regulating [24] and expressing emotions such as anger, disgust, fear, happiness, and sadness [25], alongside difficulties managing emotions in social contexts [26]. Smaller friendship groups, social isolation, difficulties understanding the concept of friendship [27], a reduced drive to seek out social contact and greater difficulties around social life [28] are also observed. In adults, the highest levels of social emotional functioning difficulties were observed in individuals with the most severe and enduring forms of EDs [29].

Alongside reports of cognitive inefficiencies in adolescents with EDs [30], mirroring adult populations, evidence suggests some degree of social emotional processing inefficiencies in adolescents with EDs [31, 32] although some contradictory evidence has also been reported [33]. Nonetheless, a qualitative study reported adolescent patients experience significant difficulties around their social lives, potentially compounded by the need for inpatient treatment itself and patients requested more support around this component of recovery [34]. These data suggest that, as observed in adults with the most severe and complex forms of ED, interventions targeting social emotional functioning may be a relevant and useful means of enhancing treatment outcomes for young people with severe and complex EDs. However, current reports on the feasibility, acceptability and possible efficacy of such interventions is sparse.

Therefore, the aim of this exploratory work was to describe how CREST can be adapted for use with

adolescents with severe and complex EDs and to explore the feasibility, acceptability and possible efficacy of CREST delivered through ten 45 min individual, face-to-face sessions and five 45 min group sessions in a child and adolescent ED inpatient setting.

It was hypothesized that it would be possible to adapt this treatment from its original adult implementation to an adolescent population, that CREST would show initial signs of efficacy (measured by reductions in alexithymia, social anhedonia and social functioning difficulties) and that it would be a feasible treatment to implement in an inpatient setting and experienced as acceptable by patients.

Methods

Design

This uncontrolled pilot feasibility study used a repeated-measures design.

Treatment context

The adolescent adaptation of CREST (henceforth referred to as CREST-A) was developed in consultation with service users, their families and multidisciplinary clinical colleagues and through expert supervision provided by a consultant clinical psychologist in a 27 bed child and adolescent inpatient unit treating patients of all genders with an ED diagnosis aged 8–18. Mean age on admission to the service from an internal audit was 14.6 (standard deviation [SD] = 3.9) years and average length of stay was 210 days (SD = 78 days). Sessions were offered as an adjunct to usual treatment (the ward package of individual psychotherapy, family therapy, psychology groups, occupational therapy, nursing key-working and weekly dietetic and medical review).

CREST-A: starting points and therapist stance

Like CREST (manual available at www.katetchanturia.com), CREST-A was planned to be delivered individually over 10 weekly sessions lasting around 45 min and in its group format over 5 weekly open group sessions lasting 45 min with 8–10 patients. The individual format was first implemented in the service followed by the group format.

Like CREST [16], the therapist delivering CREST-A takes a psychoeducational, interested, playful, collaborative and curious stance and works in a motivational way with the patient to explore social emotional functioning, taking into account the possible negative bias of the patient [16]. Exercises are used to provide a starting point to first reflect on cognitive skills and then social emotional skills. The therapist is entirely transparent and provides a clear rationale for the intervention and encourages the patient to provide feedback throughout. This is an important component of establishing a rapport with the patient at the start of the intervention.

CREST-A session overview: individual format

Like CREST, CREST-A commences with initial sessions focused on exploring thinking styles through cognitive exercises (examples available at www.katetchanturia.com/publications) like visual illusions requiring perspective taking, switching tasks and multitasking games. Rather than exploring patient performance, the aim is to explore how they approach the tasks and start a dialogue around 'thinking about thinking.' This metacognitive stance continues into the second session where the therapist and patient discuss the way the patient approaches social emotional stimuli, and the strategies they use to manage the social emotional context. Again, this topic is explored through simple exercises such as an emotion word sorting task where the patient switches between sorting emotion words of positive and negative valence.

In sessions 3 to 10, simple in session and homework exercises are used to explore the themes of recognizing emotions, managing emotions, expressing emotions and successful communication, and recognizing and interpreting others' emotions. Throughout, a positive, strengths-based stance is adopted utilizing positive psychology exercises, like noticing positives, counting blessings, random acts of kindness and focusing on activities which enhance positive emotions.

Table 1 provides a session overview for the individual format and explains where and how sessions were adapted through prior planning and stakeholder consultation and during this pilot feasibility project. Consultation took place through discussions with the multidisciplinary team in weekly ward rounds, at a weekly community meeting attended by all patients and staff members, at a staff training session on supporting patients' emotional skills and at a carers' workshop attended by 11 family members. The key adaptations required were (1) age appropriate language and examples, (2) greater consideration of social media as a key social communication tool, and (3) greater involvement of key workers to support engagement with tasks outside of the sessions.

CREST-A: group format

The group format adopted the same therapeutic stance as described for the individual modality and was run over five sessions, as per Tchanturia et al. [12]. Table 2 provides details of how the CREST-A group intervention was adapted from its adult predecessor.

The individual format involved 10 sessions and covered 6 themes (thinking about thinking, thinking about emotions, recognising your emotions and focusing on positives, managing your emotions, ex-

Table 1 Individual session plan for Cognitive Remediation and Emotion Skills Training (CREST) and adaptations made for Cognitive Remediation and Emotion Skills Training for Adolescents with eating disorders (CREST-A)

Session theme	CREST	CREST-A	Key adaptations
Theme 1: Thinking about thinking			
1	**Cognitive remediation skills: Thinking about thinking**		
	1) Main idea—bigger picture thinking task in which the patient summarises a lengthy letter, story or news article headline or bullet points. Reflection on detail versus global information processing skills.	1) As CREST, but the gist/ summary is delivered in the form of a tweet, text message, Instagram, brief Facebook post, Snapchat or other form of social media.	1) Inclusion of social media context which is more familiar and relevant to young people.
	2) Professor's Jar story—therapist and patient explore life priorities through this philosophical story focused on identifying what is important and vital in life.	2) As CREST with some minor adaptation	2) Little adaptation needed for the Professor's jar task but younger patients often required more support around thinking about the future due to lifespan-related transitions and decisions around school/choosing a career path.
	3) Estimating task: patient is asked to bisect lines at different cut points with the aim of exploring perfectionist versus 'good enough' thinking styles.	3) As CREST	3) No adaptation required.
	Homework: Flexibility challenge related to changing routines	Homework: As CREST	Homework: No adaptation required
Theme 2: Thinking about emotions			
2	**Thinking about feeling**		
	1) Reflection on homework	1) Reflection on homework	1) No adaptation required
	2) Emotion word sorting task: flexibility task switching between sorting positive and negative emotion words. Discussion around patient's approach and experience of this.	2) As CREST with minor adaptation	2) It was important to ensure that patients were either able to read and understand the emotion words and have an opportunity to ask if they were unsure what a word meant.
	3) Emotions and our bodies: Psychoeducation related to how we experience emotions in a physiological sense.	3) As CREST with minor adaptation	3) The way the psychoeducation was delivered needed to be age appropriate, e.g. language appropriately tailored to the young person's level of comprehension.
	4) Emotions and thinking—exploring the role of the brain in emotional response and the emotion processing cycle: Psychoeducation	4) As CREST	4) No adaptation needed—patients were able to access this task in the same way as adults.
	Homework: Emotions questionnaire—exploring aspects of emotions the patients finds difficult	Homework: As CREST	Homework: The questionnaire was completed as homework with the patient's keyworker
Theme 3: Recognising your emotions and focusing on positives			
3	**Recognising emotions**		
	1) Discussion of homework	1) Discussion of homework	1) No adaptation required
	2) Emotion word list: developing an emotional vocabulary; discussion of whether the patient is drawn to positive or negative words or a mixture of the two.	2) As CREST with minor adaptation	2) Important to ensure that the patient was either able to read and understand the emotion words and have an opportunity to ask if they were unsure what a word meant.
	3) Describing emotions: mental imagery exercise	3) As CREST with minor adaptation	3) Some younger patients preferred to draw emotions rather than use mental imagery.
	4) Emotion words 'snap' game: discussion of the emotion that the 'snap' match ends on.	4) As CREST	4) No adaptation needed.
	Homework: Positive psychology exercise—three good things (looking out for three positive events, stimuli, interactions etc. daily)	Homework: As CREST	Useful to involve the patient's keyworker to help with the homework task
4	**Power of positive emotions**		
	1) Reflections around homework task	1) Reflection on homework	1) No adaptation required
	2) Psychoeducation around positive psychology interventions, particularly the useful effects of positive emotion on cognition, including being around others, being mindful of positive emotions, savouring, flow, smiling	2) As CREST with minor adaptation	2) Age appropriate language and examples required
	Homework: Putting into practice one or more positive psychology interventions	Homework: As CREST	Useful to involve the patient's keyworker to help with the homework task

Table 1 (Continued)

Session theme	CREST	CREST-A	Key adaptations
5	**Power of positive emotions**		
	1) Discussion of homework	1) Discussion of homework	1) No adaptation required
	2) Personal strengths task	2) As CREST	2) Useful to consider sources of information relevant to young people such as school reports and feedback they may have received from activities and hobbies such as sports and social clubs in the community to help patient approach the task.
	3) Emotion switching task	3) As CREST but with significant adaptation	3) This task was very challenging for younger patients—we used chair switching as an adaptation where the patient moved chairs when switching emotions. The images from the movie "Inside Out" of emotions were used instead of words.
	Homework: Developing emotional awareness	Homework: as CREST	Homework: no adaptation needed
Theme 4: Managing your emotions			
6	**Managing emotions**		
	1) Reflection on homework	1) Reflection on homework	1) No adaptation required
	2) Discussion around how the patient manages emotions	2) As CREST	2) No adaptation required
	3) Understanding avoidance: pink giraffe thought suppression exercise	3) As CREST	3) No adaptation required
	Homework: Self exercise—the patient creates two images; how they would like to appear to others and the second is to show how they actually feel on the inside	Homework: As CREST	Homework: no adaptation needed For younger children, consider using characters or watch scenes from the film "Inside Out" to explore how we might present ourselves differently to others from how we feel on the inside
7	**Expressing emotions**		
	1) Reflection on homework	1) Reflection on homework	1) No adaptation needed
	2) Emotion word map—a mind map style worksheet is used to explore different facets of emotions, with the aim of emphasising the idea that emotions exist on a continuum.	2) As CREST	2) No adaptation needed. For younger children, consider the use of an emotion thermometer and use this to provide more explanation around the different intensities of an emotion.
	3) Emotion thermometer or valence axis—the patient is asked to identify an emotion that they feel strongly and to then work down the thermometer identifying associated feelings and physiological sensations with lessening intensity.	3) As CREST but with moderate adaptation	3) It was necessary to provide an emotion word list due to developmental differences in emotional literacy to support younger patients in particular with the words needed to describe emotions across different levels of intensity. The word 'valence' was omitted and instead the term 'strength' of emotion was used to improve comprehension.
	Homework: The patient practices strategies to manage different emotions with ideas provided on a handout	Homework: As CREST with some adaptation	The patient's keyworker was involved to help support the patient to apply emotion regulation strategies and to keep a list of the strategies used
8	**Making emotions work for us**		
	1) Reflection on homework	1) Reflection on homework	1) No adaptation needed
	2) Making emotions work for us task—the patient and therapist explore what benefits the basic emotions provide us in terms of their functions. Further space is provided to develop the task using examples of emotions salient to the patient.	2) As CREST	2) No adaptation needed
	3) The therapist and the patient explore what is being communicated by different emotions	3) As CREST with minor adaptation	3) Patients required more examples to make the task more tangible. For example, the therapist provided an example of a situation in which anger might be expressed and the context made it more feasible for younger patients to explore what might be being communicated in the scenario.
	Homework: Exploring the benefits of communicating a range of emotions. The patient completes a worksheet exploring the positive intentions of a range of emotions in terms of the needs they help us to express	Homework: Major adaptation required	The homework was adapted for CREST-A because the CREST version was overly hypothetical for younger patients. Instead, photos of celebrities depicting a range of emotions were shared with the patient and they were asked to think about what emotion they were expressing and what response they might be hoping for

Table 1 (Continued)

Session theme	CREST	CREST-A	Key adaptations
Theme 5: Expressing emotions and communicating positively			
9	**Expressing needs and getting needs met**		
	1) Reflection on homework	1) Reflection on homework	1) No adaptation needed
	2) Exercise focused on how the patient signals what they feel and need—a questionnaire is used to explore how the patient expresses their needs once they have noticed their emotional state.	2) Some adaptation needed	2) The language in the questionnaire required simplification
	3) Assertiveness vignettes—the patients were asked to explore how they would usually respond in a range of challenging social situations.	3) Some adaptation needed	3) The scenarios were rewritten to reflect typical teenage activities.
	4) The patient and therapist use the awareness gained from the above exercises to explore what might work better for patients in terms of communicating their needs in a more efficient and effective way.	4) As CREST	4) No adaptation needed
	Homework: Patients are asked to select a scenario in which they have not previously asserted themselves and actively communicated a need. They are asked to design an experiment to respond differently next time	As CREST	No adaptation needed
Theme 6: Recognising and interpreting others' emotions			
10	**Understanding emotions in a social context**		
	1) Reflection on homework	1) Reflection on homework	1) No adaptation needed
	2) Facial expressions exercise—the patient and therapist explore what people in a range of pictures might be feeling by looking at their facial expressions.	2) As CREST	2) No adaptation needed
	3) Ending CREST and feedback—the therapist offers patients a reflective space to explore what they have learnt during CREST, the changes they have made and what they might like to work on around their cognitive skills and social emotional functioning in future	3) As CREST	3) No adaptation needed. Consider greater scaffolding of this task through prompt questions like 'one change I made was . . . ' or, 'one new skill I learnt was . . . ' for younger children

CREST Cognitive Remediation and Emotion Skills Training, *CREST-A* Cognitive Remediation and Emotion Skills Training for adolescents with eating disorders

pressing emotions and communicating positively and recognising and interpreting others' emotions) and the group format covers largely the same themes although begins with a strong focus on positive emotions due to the social context in which it is delivered (this also provides a milieu in which recognising and interpreting others' emotions are explored) and because the group is run across 5 sessions, the content is delivered across 5 topics (the power of positive emotions, the nature and function of emotions, identifying emotions, emotion expression and communicating emotions and needs).

Measures

Self-report outcomes

The outcome measure battery was informed by the approach to data collection in the adult CREST literature [16]. The Eating Disorders Examination Questionnaire (EDE-Q [35]) is a self-report tool measuring eating behaviours and attitudes over the past 28 days on a 7-point scale, with higher scores indicating greater symptoms. Cronbach's α is 0.93 [36] and was 0.92 for this study. The main outcome measure for this study was the global EDE-Q score.

The Revised Social Anhedonia Scale (RSAS [37]) measures participants' desire to seek out and experience pleasure from social interactions and has previously been used in adolescent populations [38]. A true/false response format is used; higher scores indicate higher social anhedonia and scores ≥12 indicate functionally significant social anhedonia [39]. Cronbach's α is 0.95 [40] and was 0.91 for this study. The total score was used as the outcome variable in this study.

The Toronto Alexithymia Scale (TAS-20 [41]) is a 20-item, self-report questionnaire measuring alexithymia across 3 subscales: difficulty identifying feelings, difficulty describing feelings, and externally oriented thinking. The total score was used as the outcome variable in this study; higher scores indicate greater alexithymia. Scores range from 0 to 100, with a score ≤50 indicating the absence of alexithymia, scores ≥61 indicate alexithymia and scores between 51 and 60 indicate possible alexithymia. This measure has previously been used in adolescent populations [42].

Table 2 Group session plan for Cognitive Remediation and Emotion Skills Training (CREST) and adaptations made for Cognitive Remediation and Emotion Skills Training for Adolescents with eating disorders (CREST-A) group modality

Session theme	CREST	CREST-A	Key adaptations
Theme 1: The power of positive emotions: Recognising positive emotions. This session focuses on encouraging participants to acknowledge positive emotions in themselves and others			
	Discussion around what emotions are and why we have them. Emotions and our bodies—using a diagram of a body, the group explores how we experience emotions in the body.	Use of mindmaps to discuss what emotions are and why we have them.	Mindmaps were used to support the discussion as young people were more familiar with this tool as a strategy often used in school.
	Exploring positive emotions—on a flipchart, the group generates a range of positive emotion words. Next, the group chooses one of these emotion words and recalls a memory associated with this. A discussion is held to explore how this felt in the body, how this emotion was communicated to the self and others, its related body language and facial expressions	Patients asked to note down/ draw 3 positive emotions each on 'post-it' notes.	Patients could draw emotions if they found this easier, or refer to celebrities, TV personalities or characters from familiar books or movies to support them with the task. Use of 'Inside Out' movie characters to depict how positive emotions might be experienced in the body and expressed to others through body language and facial expressions.
	Homework: 1. Patients asked to visit website http://www.positivityratio.com/single.php and complete a test to explore the ratio of positive to negative experiences in their daily life. 2. To begin to develop the concept of the portfolio of positive emotions participants are invited to try out a positive psychology intervention, such as looking out for 3 good things each day	Homework: 1. Patients asked to visit website http://www.positivityratio.com/single.php and complete a test to explore the ratio of positive to negative experiences in their daily life. 2. Patients given a folder to support the development of their portfolio and asked to complete one of 2 positive psychology interventions	Use of nursing keywork session to support patients to access the positivity ration website and engage with this task. Use of a folder which made the portfolio more similar to a project at school which was familiar to the young people. Choice of two positive psychology interventions offered (looking out for 3 good things or looking at a picture of your favourite person, pet, memory, or place) to narrow down options to support decision making in younger people
Theme 2: The nature and function of emotions. This is a psycho-educational session which explores ways of expressing emotions and components of communication			
	Review homework	As CREST	As CREST—no adaptation needed
	Introduce the list of personal strengths. Ask patients to compile a list of their strengths for homework	As CREST	In between sessions, the Assistant Psychologist met with each patient to support them to look at a list of personal strengths and identify 2 or 3 that might be relevant for them.
	Vignette task: (available in full in the CREST manual at www.katetchanturia.com) used to support a discussion on how humans experience both positive and negative emotions, and that life can bring different challenges but avoiding emotions about this may not be helpful	Vignette task: patients read a vignette and discuss what could be learnt from it.	The vignette was rewritten for a younger audience. It focused on a young person who was having difficulties with friendships at school. Rather than reaching out for help, they avoided their emotions and bottled them up.
	Group discussion around the following beliefs about emotions: Negative emotions are bad. It is not acceptable to have a negative feeling. Having some emotions are a sign of weakness. Emotions are not important. If I really think about and acknowledge how I feel I will lose control	As CREST	Use of specific examples to make the ideas more tangible for a younger audience. For example "emotions are not important" was explained through a story

Cronbach's alpha α is 0.88 [43] and was 0.80 for this study.

A version of the 5-item Work and Social Adjustment Scale (WSAS [44]) amended to be relevant to adolescents measured patients' ability to manage school (rather than work), home tasks/chores (amended from 'home management'), personal/social leisure activities and close friendships (amended from 'relationships') on a 0–8 Likert scale. Higher scores indicate greater difficulties and the total score was used as the outcome variable in this study. Cronbach's α is 0.95 [44] and was 0.90 for this study.

Age, illness duration, gender and previous hospital admissions were obtained from patient notes. Weight and height were recorded by nursing keyworkers and used to calculate weight for height percentages informed by Junior MARSIPAN [45] and World Health Organization growth standards charts [46].

Table 2 (Continued)

Session theme	CREST	CREST-A	Key adaptations
Theme 3: How do we identify emotions. This session explores a number of strategies to help label emotions			
	Review homework	As CREST	As CREST—no adaptation needed
	Emotion word map: Emotions discussed could include: anger, sadness, anxiety, guilt, happiness. Agree as a group which to consider. Brainstorm associated emotion words to increase vocabulary for describing emotions and highlight that emotions vary in strength and intensity.	As CREST	Use a thesaurus to explore associated emotions words. Use a thermometer to plot the intensity of these different words.
	Exploring experience of emotions: Explore the following questions How do people know they are feeling this emotion? E.g.: Anger • How does the body feel? E.g.: tense, racing heart. • What kinds of thoughts are you having? E.g.: Everyone's against me, no-one listens or understands. • What types of things are you doing? How do you behave? E.g.: Start shouting, pacing up and down, hurt myself. • What situations or events prompt this emotion? E.g.: being challenged, not feeling listened to. • How do people currently mange this emotion? What makes it difficult? E.g.: Self-harm, withdraw. Don't want to upset people; it will get out of control.	As CREST	Questions given on a worksheet and patients received greater support from healthcare assistants and the group facilitators to explore the questions in small groups.
	Homework: identifying emotions worksheet (found in the CREST manual) and keeping a feelings diary. Write a list of things that you are grateful for or generate a list of emotion words associated with being 'grateful.'	As CREST	As CREST but use of nursing keywork sessions to support task completion
Theme 4: Emotion expression versus emotion suppression. This session explores the advantages and disadvantages of emotion suppression and expression. The session then introduces alternative strategies for managing emotions			
	Review homework	As CREST	As CREST—no adaptation needed
	Ask the group which emotion they would like to think about first (e.g. anger, guilt, sadness, anxiety). On flipchart, list the advantages and disadvantages of both expressing and suppressing this emotion and discuss. Discuss as a group that sometimes in the short term people suppress or avoid emotion as it provides relief but often the long term consequences are emotion intensification or not getting what you need. Elicit people's thoughts and views about this.	As CREST	Explain what is meant by expression versus suppression with clear examples. Get patients to think about characters from movies/TV shows to support making the idea more tangible.
	The emotion continuum: using emotion word cards that describe varying levels of anxiety or anger, descriptions of physiological sensations associated with increasing emotion and descriptions of behaviour changes (all provided in CREST manual), ask the group to place the cards in order of intensity on the floor from least intense to most intense. Next, ask the group to place associated physiological sensations and behaviours next to the varying levels of emotion. Next ask each group participant to think about at what point on this continuum they feel that they could manage the emotion before it overwhelms them and they either feel out of control or they block or avoid the emotion—"is this the point that you need to do something with the emotion before it continues to escalate and you then feel unable to manage it?" Ask the group to come up with ideas as to what other group members could do at the emotion points that they have placed themselves to manage or express the emotion? What do different people do?—brainstorm this on flipchart paper.	As CREST	As CREST—no major adaptation needed
	Homework: 1. Handout: Emotion thermometer (from CREST manual)—ask people to complete this during the week for an emotion they struggle with. 2. Handout: Ways to manage difficult emotions (in CREST manual)—explain this has a number of simple and useful ideas to help manage difficult emotions. Ask people to choose and practice a technique over the week. 3. Ask patients to try the Getting into the Flow Exercise (in CREST manual) which involves engaging fully in small pleasures, preferably with someone else if possible	As CREST	As CREST but use of nursing keywork sessions to support task completion. Patients given the option of completing as many of the 3 tasks as they felt able to
Theme 5: Emotions and needs. This session highlights emotions as being important signals that communicate needs, and the importance of listening to and responding to these needs			
	Homework review and discussion	As CREST	As CREST
	Vignette task (provided in CREST manual) to encourage people to start thinking about the needs that emotions communicate; the impact ignoring them can have, alongside thinking about ways to communicate needs	As CREST	Vignette rewritten to be more age appropriate. Rather than meeting in a restaurant and going for drinks, the person in the vignette feels worried about being invited out to the cinema with friends.
	Making emotions work for you: patients work through examples for different emotions exploring the following: When I feel Sad I need ..... (e.g. comfort/reassurance) When I feel this emotion I will respond to it by ..... (e.g. ringing a friend/family member, do something that will cheer me up)	As CREST	As CREST—no adaptation needed

Indicators of acceptability and feasibility

Patient satisfaction scale

A 3-item questionnaire employing a 0–10 Likert scale was used to assess treatment acceptability was administered in the final session measuring the degree to which patients were satisfied with treatment (with 0 equal to 'not at all satisfied' and 10 indicating 'extremely satisfied, the treatment/group couldn't have been better'), whether they would recommend the treatment/group to a friend (0 = not at all; 10 = definitely), and whether they would be happy to receive the treatment/group again if offered (0 = never again; 10 = absolutely). The outcome measure used for this project was the mean score reported across the three items.

Attendance, drop-out and homework completion were recorded via registers. The number of staff hours per patient require to deliver CREST-A were calculated.

Procedure

The project was approved by the hospital's internal research and clinical governance committees and received ethical approval from the NHS (National Health Service) Research Ethics Committee. The research was conducted in keeping with World Medical Association Declaration of Helsinki ethical principles. CREST-A was delivered by an experienced and qualified (doctoral level) clinical psychologist (individual format) and an experienced and qualified clinical psychologist (doctoral level) and a masters level assistant psychologist (group format). Patients were given written information about the project and informed that taking part was voluntary and that the clinician would ask them to complete outcome measures at the start and end of sessions (both individual and group formats) to understand whether the intervention had impacted their symptoms in any measurable way. Parents/guardians/carers were informed about the project and consent was obtained for collection of their loved ones' data. Patients aged under 16/16 and over were asked to provide assent/consent for this. Patients were informed that data would be anonymised and that completing the measures was their own choice. They were encouraged to provide feedback to the clinician throughout and to discuss their experiences of CREST-A as a means of further informing the development of the intervention. Individual treatment was offered to a consecutive case series of patients. Three consecutive groups were run and were offered to all patients on the ward at the time. Outcome measures were administered before treatment commenced and immediately after the final session (thus, after 5 weeks in the group format and after 10 weeks in the individual format).

Data analysis

Data were analysed using SPSS Version 24 (IBM SPSS Statistics for Windows, Version 24.0., IBM Corp, Armonk, NY, USA). Repeated measures t-tests were used to compare scores on the ED and social emotional outcome measures, after, compared to before treatment. The Bonferroni correction was applied (0.05/= 0.01) to account for multiple testing. As this was a pilot and included a small sample, t-tests and effect size estimations should be interpreted with caution. Accordingly, reliable change scores (RC) were calculated for each patient for the four outcome measures administered before and after treatment where x_2 = the post group score, x_1 = the pre group score as follows [47]:

$$\mathrm{RC} = \frac{x_2 - x_1}{S_{\mathrm{diff}}}$$

$$\text{and } S_{\mathrm{diff}} = \sqrt{2(S_E)^2}.$$

To identify whether patients' scores reflected RC, their RC scores were compared to a cut-off calculated for each measure [47]. The cut-off was calculated by subtracting the standard deviation of scores from a well-functioning group on the sample outcome measure from their group mean and then dividing this score by 2. This meant that for the TAS, based on Amianto et al. [48], the RC cut-off was 15.99. Based on Harrison et al. [28] for the WSAS, the RC cut-off was 0.79 and it was 0.47 for the RSAS.

Cohen's D was used as an effect size estimation, with 0.2 indicating a small effect, 0.5 indicating a medium effect and 0.8 indicating a large effect [49]. The last observation carried forwards technique was applied to manage missing data [50].

Results

Individual format

CREST-A (individual format) was delivered to a consecutive case series of 12 adolescents (one male; 8.33%) with AN; 25% (n = 3) had AN binge–purge subtype and the remaining patients had a diagnosis of restricting AN. The mean age was 15.53 (SD = 2.74; range = 13.50–17.50) and mean illness duration was 6.49 years (SD = 3.77; range = 4–9). Participants had had an average of 3.5 (SD = 2.55) hospital admissions to a medical ward or specialist ED unit (range = 1–6) including the current admission. All participants had ≥2 comorbid psychiatric disorders, including anxiety disorders (social anxiety disorder; posttraumatic stress disorder), obsessive compulsive disorder, major depressive disorder and chronic fatigue; 66.67% (n = 8) were taking antidepressant medication and 30.33% were taking antipsychotic medication (n = 4). The decision to offer CREST-A was discussed in supervision and after discussion in the weekly multidisciplinary

team meeting. Patients who were able to verbally engage in conversation and whose admission had sufficient time remaining for treatment to be completed were eligible for inclusion. No patient declined CREST-A when offered.

Group format

Three CREST-A groups were delivered to 27 patients, with 9 patients attending each group. One male attended each group (11.11%). Across the groups, all patients had a diagnosis of AN; 29.63% ($n=8$) had AN binge–purge subtype and others had a diagnosis of restricting AN. The mean age was 14.97 (SD = 3.15; range = 13.10–17.40) and mean illness duration was 5.85 years (SD = 3.22; range = 3.5–9). Participants had had an average of 3.4 (SD = 2.11) hospital admissions for their ED to a medical ward or specialist ED inpatient unit (range = 1–6) including the current admission. Participants had ≥2 comorbid psychiatric disorders including anxiety disorders (social anxiety disorder; posttraumatic stress disorder), obsessive compulsive disorder, major depressive disorder and chronic fatigue. Regarding medication, 70.37% ($n=19$) were taking antidepressant medication and 11 (40.74%) were taking antipsychotic medication ($n=4$). Groups were an encouraged but not mandatory part of the ward timetable meaning that all patients on the ward at the time the groups were offered were invited to join. At the time the groups were delivered, there were 26 beds on the ward and the take-up rate was 34.62% (9 patients per group).

Individual format: indicators of acceptability and feasibility

Twelve inpatients commenced CREST-A. One patient (8.33%) dropped-out at session 4 and the remaining patients attended all 10 sessions. Homework was administered after sessions 1–9 and engagement with homework completion reported on a mean of 6 (66.67%) occasions (SD = 2, range = 4–8). The mean score on the Patient Satisfaction Questionnaire was 7 (SD = 2.6). Regarding staff hours, each session lasted 45 min, required around 30 min of preparation time and each patient was discussed in supervision at least once. Notes were written up after each session, taking around 15 min. Thus, CREST-A in individual format utilized approximately 16 h of staff time per patient across the 10 sessions.

Individual format: indicators of possible benefit

Table 3 provides data on the ED and social emotional outcome measures before and after individual CREST-A.

Group format: indicators of acceptability and feasibility

Twenty-seven inpatients attended one of three five-session CREST-A groups. There were nine patients in each group. Seven patients (25.93%) dropped-out of group treatment at session 2 and one (3.70%) dropped out at session 3, with a total drop-out rate of 29.63%. This means that overall, 19 patients attended all five group sessions. Homework was administered after sessions 1–4 and engagement with homework was reported on a mean of 3 (75%) occasions (SD = 2, range = 0–4). Participants across all 3 groups were considered together in the data analysis below. The mean score on the Patient Satisfaction Questionnaire was 6 (SD = 3.2). Regarding staff hours, including supervision, preparation, note-writing and the actual delivery of the group by the two facilitators, approximately 19 h were required to run each 5-session group. Dividing this by group take-up of 9 patients, this required around 2.11 h of staff time per patient. Support pro-

Table 3 Eating disorder and social emotional outcome measures before and after individual Cognitive Remediation and Emotion Skills Training for Adolescents ($n=12$)

Measure	Before treatment Mean (SD)	After treatment Mean (SD)	Test statistics	Reliable change index outcome
Weight for height percentage	77.82 (7.46) 95% CI: 76.19–82.09	88.71 (8.62) 95% CI: 85.44–92.66	t(11) = –8.72, $p \leq 0.001$* $d = 0.98$ ($d = 0.96$)	Not applicable
Eating Disorder Examination Questionnaire	4.22 (1.54) 95% CI: 3.17–4.35	3.05 (1.19) 95% CI: 2.72–3.66	t(11) = 1.19, $p = 0.06$, $d = 0.30$ ($d = 0.28$)	Not applicable
Work and Social Adjustment Scale total score	29.44 (11.29) 95% CI: 27.31–32.44	23.92 (8.56) 95% CI: 21.94–27.62	t(11) = 2.96, $p = 0.02$, $d = 0.55$ ($d = 0.51$)	31.29[a]
Toronto Alexithymia Scale total score	65.91 (7.82) 95% CI: 54.22–72.11	56.22 (9.48) 95% CI: 49.28–56.02	t(11)=3.01, $p = 0.01$*, $d = 0.62$ ($d = 0.57$)	21.68[a]
Revised Social Anhedonia Scale total score	16.75 (4.21) 95% CI: 13.98–21.22	11.64 (9.62) 95% CI: 12.56–16.78	t(11) = 2.88, $p = 0.001$*, $d = 0.59$ ($d = 0.57$)	11.67[a]

SD standard deviation, *CI* confidence interval
*indicates significant difference after applying the Bonferroni correction for multiple testing. The reliable change score is the mean score for each outcome variable
[a]indicates the change in scores, after compared to before treatment scores over the cut-off indicates reliable/clinically significant change. Effect size estimations are based on Cohen's *d*, with 0.2 indicating a small effect, 0.5 indicating a medium effect and 0.8 indicating a large effect. The effect size in brackets represents the estimated change for completers only (e.g. the $n = 11$ participants who completed the full course of treatment)

Table 4 Eating disorder and social emotional outcome measures before and after group Cognitive Remediation and Emotion Skills Training for Adolescents ($n = 27$)

Measure	Before treatment Mean (SD)	After treatment Mean (SD)	Test statistics	Reliable change index outcome
Weight for height percentage	76.43 (6.31) 95% CI: 74.11–81.79	85.63 (4.55) 95% CI: 82.95–89.54	t(26) = –7.49, $p \leq 0.001$* $d = 0.94$ ($d = 0.97$)	Not applicable
Eating Disorder Examination Questionnaire	4.29 (1.49) 95% CI: 3.11–4.51	3.13 (1.09) 95% CI: 2.55–3.21	t(26) = 1.19, $p = 0.04$, $d = 0.37$ ($d = 0.45$)	Not applicable
Work and Social Adjustment Scale total score	28.51 (9.24) 95% CI: 25.21–33.91	22.78 (7.26) 95% CI: 20.01–24.69	t(26) = 2.44, $p = 0.01$*, $d = 0.58$ ($d = 0.63$)	25.61[a]
Toronto Alexithymia Scale total score	66.49 (9.42) 95% CI: 58.47–76.67	55.99 (11.24) 95% CI: 54.79–58.62	t(26) = 2.97, p=0.01*, $d = 0.65$ ($d = 0.66$)	26.11[a]
Revised Social Anhedonia Scale total score	17.87 (6.63) 95% CI: 12.98–24.20	11.54 (7.29) 95% CI: 10.05–22.41	t(26) = 2.88, $p = 0.001$*, $d = 0.63$ ($d = 0.67$)	18.38[a]

SD standard deviation, *CI* confidence interval
*indicates significant difference after applying the Bonferroni correction for multiple testing. The reliable change score is the mean score for each outcome variable
[a]indicates the change in scores, after compared to before treatment scores over the cut-off indicates reliable/clinically significant change. Last observation carried forward is used to manage missing data. In total, $n = 27$ patients started group treatment and $n = 19$ patients completed all five sessions
Effect size estimations are based on Cohen's *d*, with 0.2 indicating a small effect, 0.5 indicating a medium effect and 0.8 indicating a large effect. The effect size in brackets represents the estimated change for completers only (e.g. the $n = 19$ participants who completed all five group sessions and provided data before and after treatment)

vided by nursing keywork sessions around homework is not accounted for here as this was a component of usual treatment.

Group format: indicators of possible benefit

Table 4 provides data on the ED and social emotional outcome measures before and after treatment for patients receiving the group version of CREST-A.

Conclusions for practice

This pilot feasibility project aimed to report on the development of an adolescent adaptation of CREST. It was hypothesised that this treatment could be adapted from its original adult implementation to an adolescent population, would show initial signs of efficacy and would be a feasible treatment to implement in an inpatient setting and experienced as acceptable by patients.

While adaptations were required to ensure materials and exercises were age appropriate, and accessible by younger patients, the clinical team reflected that these were not onerous and could be easily implemented by staff with reasonable experience of working with younger cohorts. Ideas from the young people themselves were very helpful, like customizable folders for the positive emotion portfolio and mindmaps. In future replications, colleagues are encouraged to utilize ideas like this from service users. Collaborating to make exercises and activities more accessible is strongly in keeping with the stance/approach of CREST/CREST-A [17].

The drop-out rates of 8.33% ($n = 1$) in the individual and 29.63% ($n = 8$) in the group format of CREST-A could be interpreted as indicating good to moderate acceptability and are lower than or similar to other studies [51]. Data suggest that patients found the individual format more acceptable than the group format, with a lower drop-out rate and slightly higher Patient Satisfaction Scale scores. Perhaps this cohort find group treatment more challenging that individual therapy because of the social context. This is also reflected in group take-up as only around a third of patients opted in. However, learning to be comfortable in groups is an important life skill and group treatment should be encouraged. In addition, fewer staff hours were required to reach a greater number of patients using a group format, adding to the feasibility of this form of the treatment. Engagement with homework was higher in the group format, perhaps because of the support offered by nursing keywork sessions, and perhaps because of the greater accountability afforded by the group context. This could be explored further by collecting qualitative feedback in future studies. Take-up could be improved through a buddy system in which patients join up with another group member to engage in homework and go to the group together to help patients feel more comfortable to attend. It may also help to share positive experiences of the group from previous attendees to address some concerns about attendance.

The hypothesis that CREST-A might be of possible benefit and result in reductions in social anhedonia, alexithymia and social functioning difficulties was supported by medium-sized, significant reductions in Toronto Alexithymia Scale and the Revised Social Anhedonia Scale scores and a medium-sized, nonsignificant improvement on the Work and Social Adjustment scale. The observed improvements also met criteria for reliable change, suggesting that in individual format, CREST-A may be of possible benefit to aspects of social emotional functioning.

This hypothesis was further support by data from the group format of CREST-A. There were significant, medium-sized improvements in scores on the Toronto

Alexithymia Scale and the Revised Social Anhedonia Scale and the Work and Social Adjustment scale and these improvements met criteria for reliable change, indicating the group format of CREST-A may have possible benefits for the measured components of social emotional functioning.

While small-sized, nonsignificant reductions in ED symptoms and a large-sized, significant increase in weight were observed after, compared to before CREST-A, as this was a treatment adjunct offered in addition to the intensive inpatient treatment provided to patients, it is likely that these changes were attributable to other interventions like dietetic input. It would be interesting in future work involving larger samples to explore predictors of change because improved social emotional functioning might help those with the most severe and complex forms of illness to access social support which qualitative studies have shown is a key mechanism in recovery [52].

These outcomes are similar to those reported in the adult literature [14–16, 53], suggesting that CREST can be a helpful tool to increase social emotional functioning in people with EDs across the lifespan. They also corroborate recent findings on group adaptation of CREST for adolescent inpatients with EDs [54, 55]. Given that the adjunct has now been successfully delivered in two adolescent inpatient units treating people with these severe and complex forms of ED, this further highlights the feasibility of the intervention in the settings for which it was designed to be implemented and multisite randomised control trials may now be warranted, with a new manual available at www.katetchanturia.com.

This work adds new knowledge because it is the first article to discuss the individual adaptation of CREST for younger patients. There are also a number of limitations inherent to the design of this pilot feasibility project. As this uncontrolled pilot study involved studying a treatment adjunct, it is not possible to know how much value CREST-A added beyond usual treatment, but data on the intervention's acceptability and possible benefits suggest that a randomized controlled trial is warranted which would allow this to be investigated. The outcome measure battery was informed by measures employed in adult literature; however, relying on self-report could affect the validity and reliability of data obtained and limit any conclusions that can be drawn from the findings. It would be useful in future studies to explore ways of measuring social emotional functioning outcomes drawing on a wider range of data sources, such as including other informants and more ecologically valid measures; for example, ecological momentary assessment might be a useful tool. As the individual and group formats differ in their intensity (e.g. 5 versus 10 sessions), this may hamper a direct comparison of feasibility/acceptance, dropout rates, homework completion between the formats. Furthermore, the difference in acceptability between the group and individual formats could be accounted for by social anxiety, with patients experiencing being in a group more anxiety provoking than individual treatment. Social anxiety might be an important variables to consider in future work. Although open-ended feedback was sought throughout, little written feedback was provided by patients and more qualitative evaluation should be sought in future work to further explore patient experiences of the treatment.

In conclusion, new knowledge on the feasibility, acceptability and possible benefits of CREST-A, an adolescent adaptation of CREST was generated by this project and future studies employing randomized controlled designs may now be warranted to advance the evidence base of this low intensity treatment adjunct designed to target key social emotional maintaining factors in those with severe and complex EDs.

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