

Motivation to change, therapeutic alliance, and treatment adherence in the inpatient treatment of patients with anorexia nervosa

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Tübingen, 10. März 2021

Katrin Ziser

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Abbreviations

AN	anorexia nervosa
ANSOCQ	Anorexia Nervosa Stages of Change Questionnaire
BMI	body mass index (kg/m ²)
DSM-5	Diagnostic and Statistical Manual of Mental Disorders, 5th edition
ED	eating disorder
MANNA	motivation-enhancing psychotherapy for inpatients with anorexia nervosa
MI	motivational interviewing
TTM	transtheoretical model by Prochaska and DiClemente
SDT	self-determination theory according to Ryan and Deci
SoC	stages of change according to the TTM
URICA(-S)	University of Rhode Island Change Assessment (Short)

Zusammenfassung

PatientInnen mit Anorexia nervosa (AN) zeigen häufig eine ausgeprägte Behandlungsam-bivalenz, weshalb internationale Leitlinien bei schweren Krankheitsverläufen multidiszi-plinäre stationäre Behandlungsintervalle empfehlen. Trotz starker Bemühungen die Pati-entInnen bei der Gewichtszunahme und Verbesserung psychopathologischer Merkmale zu unterstützen, ist die Effektivität der stationären Behandlung nach wie vor unzureichend und die Abbruchquoten sind hoch. Motivationsfördernde Methoden sind daher im Fokus neuerer Ansätze, auch wenn noch ein großer Mangel an Wissen über ihre Effekte herrscht.

Das vorliegende Dissertationsprojekt leistet in drei Teilprojekten einen Beitrag zur Verbesserung multimodaler stationärer Behandlungskonzepte, indem Aspekte externaler und internaler Veränderungsmotivation bei PatientInnen mit AN untersucht und in eine im Rahmen des Dissertationsprojektes neu entwickelte, innovative Intervention integriert werden. Studie A analysiert die Effektivität von behavioristisch geprägtem Kontingenzmanagement zur Gewichtszunahme in einem systematischen Review. Studie B erhebt aktuelle Merkmale, Anwendung und Bewertung von Kontingenzverträgen zur Gewichtszunahme aus BehandlerInnensicht. In Studie C wird eine neue innovative Intervention zur Förderung der Behandlungsmotivation durch Techniken des Motivational Interviewing entwickelt und in einer randomisiert kontrollierten Phase II Pilotstudie auf Akzeptanz, Machbarkeit und Effektivität untersucht.

Die Ergebnisse der Studien A und B weisen dabei auf kurzzeitig positive Effekte von Kontingenzverträgen zur Gewichtszunahme hin, allerdings zeigt sich die Evidenzlage als unzureichend und der Einbezug kollaborativer Prozesse zur Förderung internaler Veränderungsmotivation wird gefordert. Dies wird durch die Ergebnisse von Studie C gestützt, in der eine sehr gute Akzeptanz und Machbarkeit der neu entwickelten Intervention zur Förderung von (internaler) Veränderungsmotivation in der stationären Behandlung von Patientinnen mit AN nachgewiesen werden konnte. Die Intervention wurde nicht nur sowohl von Patientinnen als auch TherapeutInnen durchweg positiv evaluiert, sondern zeigte mit einer höheren Behandlungsadhärenz von über 82 % auch eine klare Überlegenheit der neuen Intervention gegenüber der Kontrollbedingung.

Das vorliegende Dissertationsprojekt trägt daher zum einen zur besseren Differen-zierung und Integration behavioral geprägter Methoden zur Förderung von externaler Veränderungsmotivation Motivation bei. Darüber hinaus legt es mit der neu entwickelten Intervention zur Förderung internaler Veränderungsmotivation – bei Bestätigung der Ergebnisse in kommenden Phase III und Phase IV randomisiert kontrollierten klinis-chen Studien – einen wichtigen Grundstein für eine wegweisende Weiterentwicklung bestehender Behandlungsansätze für die unter motivationalen Aspekten herausfordernde stationäre Behandlung von PatientInnen mit AN.

Abstract

Patients with anorexia nervosa (AN) frequently experience pronounced ambivalence and reduced motivation to change. Despite great efforts of supporting weight gain and improvement of psychopathological characteristics in multidisciplinary inpatient treatment settings, few treatments show adequate effectiveness and treatment dropouts are frequent. Measures for enhancing motivation to change are proposed to address insufficient treatment effectiveness although there is still a substantial lack of knowledge about their effects.

The present dissertation project contributes to the improvement of multimodal inpatient treatment concepts with three sub-projects that investigate aspects of external and internal motivation to change in patients with AN and integrates them in a newly developed innovative intervention. Study A analyzes the development, utilization and effectiveness of contingency management for weight gain in the treatment of patients with AN in a systematic review. Study B assesses characteristics, utilization and appraisal of contingency management in form of contingency contracts for weight gain from healthcare professionals' point of view. In study C, a novel innovative intervention for enhancing motivation for treatment through motivational interviewing techniques is developed and its acceptance, feasibility and efficacy is evaluated in a randomized controlled phase II pilot study.

The results of study A and B indicate positive short-term effects of contingency contracts for weight gain. However, the evidence base is scarce and the integration of collaborative processes to stipulate internal motivation to change is recommended. This is further supported by the results of study C in which there is strong evidence for the acceptance and feasibility of the newly developed intervention for enhancing (internal) motivation to change in the inpatient treatment of patients with AN. Not only did patients and therapists consistently rate the intervention positively, a treatment adherence of over 82 % in the intervention condition was clearly superior compared to the control condition.

The present dissertation project therefore adds to the differentiation and integration of behavioristic methods for enhancing external motivation to change. Given confirmation of these findings in upcoming phase III and phase IV randomized controlled clinical trials, the newly developed intervention for enhancing internal motivation to change marks the foundation of a major advancement in the challenging inpatient treatment of patients with AN.

List of publications

- (1) Ziser K, Resmark G, Giel, KE, Becker S, Stuber F, Zipfel S, & Junne F (2018). The effectiveness of contingency management in the treatment of patients with anorexia nervosa: A systematic review. *European Eating Disorders Review*, 26, 379-393. <https://doi.org/10.1002/erv.2590>
- (2) Ziser K, Giel, KE, Resmark G, Nikendei C, Friederich H-C, Herpertz S, Rose M, de Zwaan M, von Wietersheim J, Zeeck A, Dinkel A, Burgmer M, Löwe B, Sprute C, Zipfel S, & Junne F (2018). Contingency contracts for weight gain of patients with anorexia nervosa in inpatient therapy: Practice styles of specialized centers. *Journal of Clinical Medicine*, 7, 215. <https://doi.org/10.1371/journal.pone.0166826>
- (3) Ziser K, Rheindorf N, Keifenheim K, Becker S, Resmark G, Giel KE, Skoda E-M, Teufel M, Zipfel S, & Junne F (2021). Motivation-enhancing psychotherapy for inpatients with anorexia nervosa (MANNA): A randomized controlled pilot study. *Frontiers in Psychiatry*, 12, 632660. <https://doi.org/10.3389/fpsy.2021.632660>

Theoretical background

Many patients with anorexia nervosa (AN) do not benefit from treatment. High ambivalence towards treatment frequently is an essential part in the treatment of eating disorders (ED), especially AN, and dissolving ambivalence an important goal for promoting motivation to change before or during treatment. To date, several efforts have been made to address this, such as the implementation of contingency contracts for weight gain, rewarding patients for pre-determined weekly amounts of weight gain through positive consequences and applying negative consequences such as restriction to the ward for not achieving weight goals. There is however still a substantial lack of knowledge about the effects of taken measures as well as concrete advancements of treatment approaches which are addressed in the present dissertation project. By conducting this project, we can not only add to the specialized treatment of patients with AN by examining established treatment techniques in the inpatient setting but also add to the evidence base by developing and investigating a novel intervention aimed at motivation to change in order to improve treatment adherence and treatment outcomes of inpatients with AN.

Anorexia nervosa and inpatient treatment

AN is a severe psychiatric disorder. According to the Diagnostic and Statistical Manual of Mental Disorders the disorder is characterized by restriction of energy intake leading to a significantly low body weight, intense fear of weight gain as well as body image disturbances (DSM-5; American Psychiatric Association, 2013). AN is known as the psychiatric disorder with the highest mortality rates among young females (Arcelus et al., 2011) due to the numerous somatic complications that can occur such as cardiovascular complications, impairment of the gastrointestinal tract or osteoporosis (Zipfel et al., 2015) as well as psychological sequelae such as depressed mood, social isolation and low quality of life (Oldershaw et al., 2015; Stuhldreher et al., 2012; Zipfel et al., 2015). A primarily psychotherapeutic approach under consideration of somatic and nutrition related problems is the treatment of choice (German Society for Psychosomatic Medicine and Medical Psychotherapy (DGPM), 2018). Due to the severity of the illness, a substantial proportion of patients with AN is treated in an inpatient treatment setting.

The German eating disorder guidelines indicate inpatient treatment for patients with AN if their body mass index (BMI) is below 15 kg/m² which constitutes an extreme severity of the disorder according to DSM-5 (American Psychiatric Association, 2013). Other indications are rapid weight decrease in six months (> 20%), severe bulimic symptoms (e.g., abuse of laxatives or excessive binge eating and purging) as well as psychological, familial or social factors that make success in other treatment settings unlikely (German

Society for Psychosomatic Medicine and Medical Psychotherapy (DGPM), 2018). Somatic endangerment as well as low problem awareness are also indicators for inpatient treatment.

State of the art inpatient treatment for patients with AN is characterized by a multidisciplinary treatment setting. Patients receive somatic monitoring and treatment in combination with individual and group psychotherapy, nutritional counseling, body-oriented therapy, and art or music therapy. Another common therapeutic addition for patients with AN is the utilization of contingency management plans in form of contingency contracts for promoting regular eating and controlled weight gain during the inpatient treatment (Hartmann et al., 2010; Herzog et al., 2006; Legenbauer & Vocks, 2014). They define (weekly) weight goals for patients with AN and install positive (e.g., participation in music therapy) and negative (e.g., restriction to the ward) consequences for meeting or not meeting these goals in order to build up patients' motivation to gain weight.

Despite these efforts for supporting weight gain in inpatient therapy and providing a multidisciplinary treatment setting with a variety of complementary treatments, treatment success for inpatients with AN is insufficient. Schlegl and colleagues (2014) reported from their study with a sample of over 400 patients with AN that about one third of patients did not show a significant therapy response to inpatient treatment. Bodell and Keel (2010) reported in their review about the efficacy of current treatments in AN that results from randomized controlled trials up to date suggest that few treatments (including inpatient settings) are adequately effective in the treatment of AN. Additionally, consistently across studies, high rates of dropout were found in inpatient as well as outpatient treatments of patients with AN (DeJong et al., 2012; Schlegl et al., 2014). Continuing efforts in further developing treatment approaches seem therefore inevitable.

Ambivalence and lack of motivation to change in patients with anorexia nervosa

One prominent reason for the insufficient treatment outcomes in the treatment of patients with AN is the pronounced ambivalence these patients often experience. On one hand, patients with AN commonly experience positive aspects of their condition (Williams & Reid, 2010): it might be helpful in dealing with personal or interpersonal challenges, and gives them a sense of control over difficult situations or even a sense of achievement (Cockell et al., 2003; Nordbø et al., 2012). On the other hand, patients can acknowledge negative aspects of the disorder such as the dangerous effects of a very low body weight as well as accompanying health risks, resulting in strong feelings of ambivalence towards recovery (Abbate-Daga et al., 2013). This ambivalence hinders participation in treatment and treatment compliance and therefore strongly affects effective treatment.

Foremost, experienced ambivalence is likely associated with decreased motivation to change. According to Blake, Turnbull and Treasure (1997) 50% of patients with AN presenting for inpatient treatment were not ready for change. Insufficient internal motivation for change – as one form of motivation to change – is described as a known common problem in the treatment of AN (Bewell & Carter, 2008; Casasnovas et al., 2007). Roux and colleagues (2016) furthermore identified a poor awareness of the eating disorder with few weight concerns and a refusal to put on much weight during inpatient treatment as predictors for dropout in adult inpatients with AN, thus also hinting at a low motivation to change and emphasizing this as a risk for treatment success. To this end, it seems essential to find ways to strengthen motivation to change in patients with AN, especially in inpatient settings.

In order to derive the most promising ways of enhancing motivation to change in inpatient treatment of AN, an understanding of the supposed underlying processes is needed. On a theoretical basis, there are two important complementary conceptualizations of motivation or readiness to change in the field of ED, namely self-determination theory (SDT; Iyar et al., 2019; Vansteenkiste et al., 2005) and the transtheoretical model (TTM) with its stages of change (Prochaska & DiClemente, 1983). Both models as well as the evidence supporting their application in the field of ED are presented in the following.

Self-determination theory

In SDT, motivation is conceptualized as a continuum ranging between externally motivated behaviors and internally motivated behaviors (Ryan & Deci, 2008). Motivation can thereby be distinguished according to type of motivation, locus of causality (external versus internal) as well as motivational force (i.e., relevant regulatory processes) (Ryan & Deci, 2000; Vansteenkiste et al., 2005). An overview of the continuum of motivation according to SDT can be found in table 1.

Notably, SDT distinguishes between extrinsic and external motivation as well as intrinsic and internal motivation that are equalized in some other conceptualizations. In SDT, the term intrinsic motivation refers solely to states of motivation in which the behavior itself elicits enjoyment, pleasure and/or satisfaction (e.g., playing a game) and is therefore shown. Internal motivation on the other hand refers to the locus of causality (i.e., whom an individual perceives as initiating the behavior). Intrinsic motivation therefore always leads to internally motivated behavior, but there are also some forms of extrinsic motivation that can lead to internally motivated behavior.

Forms of extrinsic motivation leading to internally motivated behavior are identified motivation and integrated motivation. Identified motivation refers to motivation reflecting personal importance and valuing the behaviors outcome (e.g., gaining weight to increase

Theoretical background

Table 1

Overview of the continuum of motivation according to self-determination theory

	Amotivation	Extrinsic motivation				Intrinsic motivation
Type of motivation	none	external motivation	introjected motivation	identified motivation	integrated motivation	
Locus of causality	impersonal	external	somewhat external	somewhat internal	internal	internal
Relevant regulatory processes	nonintentional, discouragement, helplessness	compliance, external rewards and punishments	self-control, guilt, shame, anxiety, internal rewards and punishments	personal importance, conscious valuing, commitment	congruence, awareness, synthesis with self	enjoyment, pleasure, interest
		<i>controlled motivations</i>		<i>autonomous motivations</i>		

Notes. Table in accordance with Ryan & Deci (2000) and Vansteenkiste et al. (2005)

fertility). Integrated motivation refers to engagement in behaviors because they are congruent with central personal goals and values (e.g., gaining weight due to personal health goals). Identified motivation thereby frequently develops to integrated motivation over time (Ryan & Deci, 2008). Although the behavior itself might not be enjoyable or pleasant, they are internally motivated and can therefore – together with intrinsic motivation – be called autonomous forms of motivation.

In opposition to autonomous forms of motivation are controlled forms of motivation that refer to externally motivated behaviors according to SDT. These forms of motivation are external motivation and introjected motivation. External motivation refers to behavior motivated by external rewards and/or punishments (e.g., gaining weight due to being rewarded for it by relatives and/or therapists). Introjected motivation refers to behavior resulting from motivation due to internal rewards and punishments, feelings of guilt, shame and/or anxiety (e.g., entering treatment due to feeling of guilt towards worried relatives). Controlled forms of motivation are thereby known to produce only short-term positive effects.

To elicit internalization and enable optimal functioning, personal growth and well-being, SDT identifies three empirically derived psychological needs: The needs for autonomy, competence and relatedness (Ryan & Deci, 2000). The need for autonomy refers to the feeling of being the origin of one's own behavior. The need for competence refers to feeling effective. The need for relatedness refers to feeling understood and cared for by others. Supporting these needs helps facilitating internalization and integration of goals and behaviors.

In the field of health care greater internalization has been associated with a variety of positive behaviors. Patients with chronic illnesses' greater adherence to medication was associated with greater internalization, morbidly obese patients' better long-term

maintenance of weight loss and greater involvement and attendance in a treatment program for addictions (Ryan & Deci, 2000). Therefore, this is also an important aspect to be considered for the treatment of patients with AN.

There is a variety of evidence supporting the application and usefulness of SDT in the healthcare domain. Studies usually train healthcare practitioners in supporting the psychological needs according to SDT in their treatment/interventions and have found significant effects on behavioral changes, motivation as well as well-being: A meta-analysis by Ng and colleagues (2012) indicates that autonomy and autonomy support (e.g., in health care climates) are essential predictors of healthy behavior and psychological well-being. In the field of ED, van der Kaap-Deeder and colleagues (2014) showed in their path analyses in a sample of patients with AN and bulimia nervosa that relative increases in self-endorsed motivation were associated with increases of BMI over treatment. According to the authors, the results confirm the importance of creating an autonomy-supportive climate in inpatient therapy settings. Therefore, SDT presents an essential framework for the differentiation of the multidimensional construct of motivation that seems well applicable to AN but needs an extension on how change processes can be conducted.

Transtheoretical model of behavior change

The TTM was introduced by Prochaska and DiClemente (DiClemente & Prochaska, 1982; Prochaska, 1979; Prochaska & DiClemente, 1983) as a model of how (behavioral) change occurs. It is characterized by five stages of change (SoC) people pass through in order to achieve change of problematic behavior: (1) precontemplation, (2) contemplation, (3) preparation, (4) action, and (5) maintenance. Their defining characteristics are the presence of problem awareness as well as whether actual behaviors have been changed or not.

In the precontemplation stage, people have no problem awareness and therefore no desire to change. In the contemplation stage, people are aware of the problem or problematic behavior and contemplate if behavior should be changed. They frequently experience ambivalence in this stage, weighing pros and cons for change and might therefore benefit from motivation-enhancing techniques. In the preparation stage, the decision for changing behavior is made, change is prepared and small steps towards change might have been already taken, albeit no big enough steps to elicit effective change. In the action stage, action is taken towards changing problematic behavior. In the maintenance stage, change has been (successfully) made and people are working on maintaining this change as well as preventing relapse. Current operationalizations of the TTM frequently represent only four stages, thereby omitting the preparation stage and conceptualizing it as an early part of the action stage (Prochaska et al., 1992) which was the representation of choice in the

current project as well.

Although the TTM is one of the best-evaluated models of change, its conceptualization as a stage model is criticized in parts. West (2005) for example critically reflects on its conceptualization as a linear process in which people are progressing from stage to stage (Prochaska et al., 1992). However, the authors of the TTM acknowledge linear change as a possible but rather rare phenomenon, especially in the field of addictive behaviors they first tested their model in. Therefore, the process of change in the TTM today is rather seen as a spiral or circular pattern in which there are changes of heart and relapses leading to regressions to earlier stages that are possible at any stage of the process (Prochaska et al., 1992). These adjustments of the TTM concept account for the difficulties patients often have when trying to initiate successful and lasting change. Additionally, more recent models describing behavioral change such as the Health Action Process Approach (Schwarzer & Luszczynska, 2008) represent very similar constructs in comparison to the TTM such as intention, planning and maintenance and might therefore not differ strongly.

Empirical evidence on the TTM and tailored interventions according to the postulated SoC can be seen as inconclusive to some extent. Wilson and Schlam (2004) report on several shortcomings of the model such as discreteness of SoC and the originally proposed linearity of stages in a narrative review. They furthermore question the association between SoC and therapy outcomes although admitting that there is some evidence linking SoC to therapy outcome or even predicting it (Wilson & Schlam, 2004). The question remains however, if the inconclusive results are across all fields or if differences can be distinguished.

In the present project, a field of special interest for the evidence of tailored interventions according to the TTM is that of psychotherapy and ED. A recent review and meta-analysis by Krebs and colleagues (2018) reported 76 studies with a total sample of 25.917 patients and indicated a medium effect size and robust association of SoC and psychotherapy outcomes. SoC were also predictive of psychotherapy outcomes: interventions aiming at precontemplaters and contemplaters had the biggest effects in these two groups and weaker effects for patients being in the action or maintenance stage. Additionally, all psychotherapy studies included in the review reported results in favor of stage-matched treatment approaches (Krebs et al., 2018). The evidence therefore supports the usefulness of the TTM and stage-matched treatment approaches in psychotherapy.

This has been shown for the field of ED as well. Pretreatment readiness to change was associated with treatment outcomes on eating disorder associated measures such as restricted eating behavior and bingeing behaviors (Clausen et al., 2013). Additionally, Dray and Wade (2012) conducted a review about the TTM and ED concluding that initial SoC predicts treatment outcome for a variety of variables, thus supporting its applicability in the field of ED. In summary, although evidence on the association of the TTM and

different outcomes is partially inconclusive, there is strong evidence for its usefulness in the field of psychotherapy and especially in the field of ED.

For clinical utilization however, it seems advisable to keep in mind that the categorial and discrete approach of the TTM might not picture the complex daily routine of inpatient therapy of patients with AN in full. This is supported by a qualitative study by Woerner, King and Costa (2016) investigating the SoC in a sample of patients with AN. They found readiness to change varying between different eating disorder associated pathology such as amount of food, types of food or body evaluation standards. Although up to date there are no better solutions for this conceptual problem than the TTM (Hoetzel et al., 2013), it seems advisable to try to strengthen readiness to change through techniques that are highly adaptive to the respective patient and their current SoC. An established technique that considers a dynamic process of change and varying readiness to change according to the topic is motivational interviewing (MI).

Motivational Interviewing

MI as developed by Miller and Rollnick (Miller & Rollnick, 2012) is an approach for eliciting change in problematic thinking and behavior. It was originally developed in the field of addiction but has since been successfully implemented and/or shown promise for a variety of other problems in the medical care sector such as dangerous drinking, dental caries, quality of life, self-monitoring as well as psychotherapy (Lundahl et al., 2013; Marker & Norton, 2018). In summary, MI is a person-centered conversation/counseling style aimed at reducing ambivalence and strengthening internal motivation and commitment to change.

Essential to the style of MI is the underlying spirit of partnership, acceptance, compassion, and evocation. Lying squarely with the approach of client-centered counseling by Rogers (1946), it puts the clients' or patients' perspective and needs in the center of attention. Every person is thought of having a natural process of change in themselves, are experts on themselves and motivation for change can therefore not be installed but evoked by MI. In light of the need for collaborative approaches serving needs of autonomy, competence and relatedness, MI seems especially promising for the field of AN.

Reviews about the implementation of MI in treatment settings have shown promise in a variety of health behaviors as well as in the field of ED. Equivalent effects to other active treatments and superiority in comparison to no-treatment or placebo controls in the fields of substance use/dependence or exercise and diet could be shown in a meta-analysis by Burke and colleagues (2003). In the field of ED, results from Cassin and colleagues (2008) support the efficacy of adapted MI in the treatment of binge eating disorder and associated symptoms. Sjörgen and colleagues (2017) however point at a lack of convincing results

Aim of the present work

of efficacy trials of MI in ED. Dray and colleagues (2012) also conclude in their review about the efficacy of MI in the treatment of ED that there is an insufficient number of high quality studies investigating this matter, encouraging future research to evaluate the efficacy of manual-based MI interventions.

For the treatment of AN, recent studies show promise for the utilization of MI. Positive effects of MI have been shown for establishing a strong therapeutic alliance and enhancing treatment adherence (Schmidt et al., 2015; Waterman-Collins et al., 2014). Moreover, a recent review by Denison-Day and colleagues (2018) found clear evidence supporting a variety of treatments aiming at motivation to change in ED, of which the majority consisted of or incorporated MI. The benefit of MI for patients with AN seems therefore apparent, potentially affecting essential variables such as treatment adherence and therapeutic alliance, that in turn can predict/influence therapy outcomes in terms of weight gain and eating disorder associated pathology (Bourion-Bedes et al., 2013; Stiles-Shields et al., 2013). MI can therefore be seen as a promising addition and potentially crucial factor for success in the inpatient treatment of severely ill patients exhibiting high ambivalence and high dropout rates of treatment.

Despite this promising evidence, MI is currently not routinely incorporated into (inpatient) treatment of patients with AN. One reason might be that the utilization of contingency contracts for weight gain in the inpatient treatment of patients with AN might be seen as a sufficient tool to enhance motivation to change in patients. An obstacle for incorporating MI as a motivation enhancing technique could be a lack of consistent or sufficient teaching during psychotherapists training. The current project should be able to provide further support for the utilization of MI as an established tool for enhancing motivation in the treatment of patients with AN.

Aim of the present work

The overall aim of the present work is to analyze the current practice and evidence on the effectiveness of behavioral interventions for patients with AN and to develop and evaluate a novel intervention based on innovative principals of stipulating motivation to change in patients with AN. The overarching research question is how we can improve motivation to change of patients with AN undergoing multidisciplinary inpatient therapy. In order to pursue this goal, this dissertation project addresses contingency contracts for weight gain as an established way to enhance external (or controlled) motivation in patients albeit not a very well empirically supported one. The evidence base as well as current practice styles in Germany, influences on therapy outcome and starting points for advancing these processes are identified. The dissertation project continues on to the development and evaluation of a treatment module containing techniques for furthering internal (or

autonomous) motivation since this is currently missing in the routine inpatient care of patients with AN. To achieve this goal, considerations from the theoretical background in terms of relevant factors such as patients' need for autonomy, competence and relatedness as well as the need for a dynamic counseling style to accompany processes of change are taken into account. The target is thereby not only supporting inpatients with AN weight gain but foremost the enhancement of therapeutic alliance and treatment adherence, thus decreasing dropouts from treatment. Figure 1 provides a graphical overview of the present project with its three sub-projects as well as their association to the presented theoretical conceptualizations.

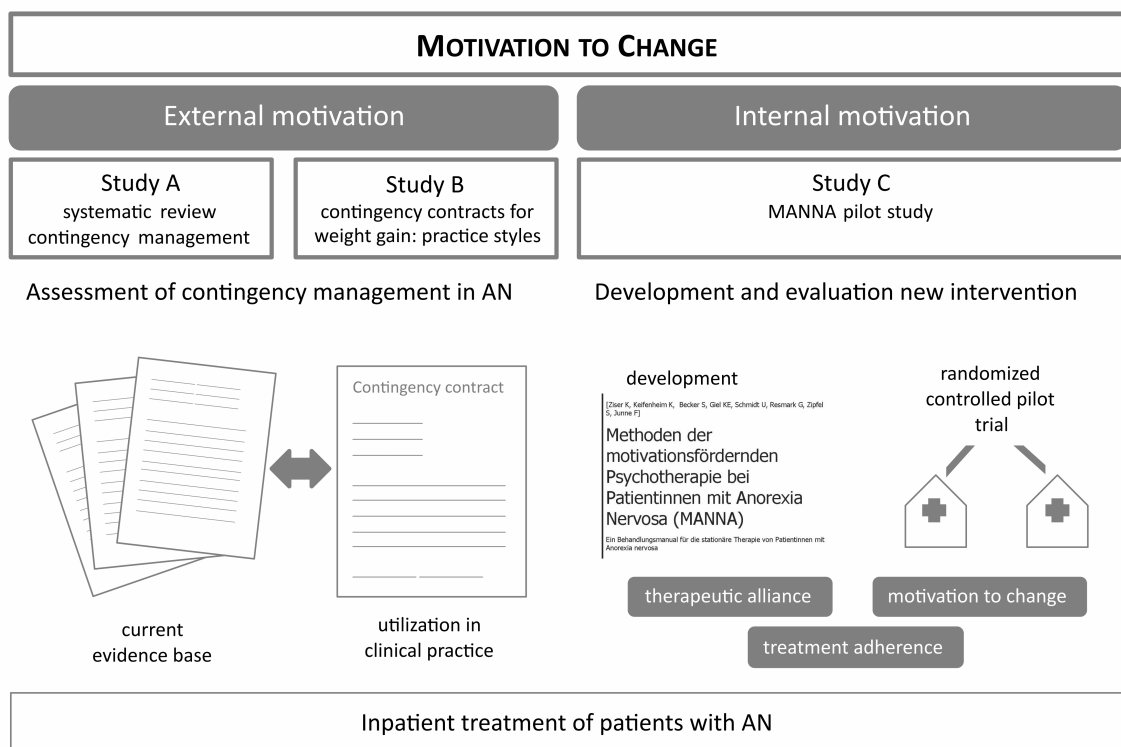


Figure 1. Illustration of the projects' concept

Project overview and summary of results

This dissertation project consists of three sub-projects all investigating aspects of external and internal motivation to change in patients with AN. Study C additionally develops and evaluates advancements in this field in inpatient settings. An overview of the design and results of each study can be found in table 2 whereas a more detailed description of the rationale for these approaches as well as their addition to the existing literature is provided in the following paragraphs.

Study A: Systematic review contingency management (Ziser, Resmark, et al., 2018)

Study A is a systematic review analyzing the development, utilization and effectiveness of contingency management for weight gain in the inpatient treatment of patients with AN. The concept of this widely established tool to enhance external motivation originates in social learning theory (Bandura, 1977) and operant conditioning techniques (Skinner, 1968). According to SDT and TTM, contingency management for weight gain might elicit short-term positive effects, i.e. weight gain. The question however remains whether the existing evidence really support its utilization.

Since it is an external form of motivation, it can be hypothesized that patients with AN might not perceive this as helpful. They often value autonomy and self-determination and are likely to experience lack or violation of perceived autonomy and competence by the externally controlled contingency management for weight gain. This review therefore determined if the expected effectiveness justifies its wide application by examining 42 articles with a total of 800 patients with AN and control patients.

As outlined in study A, contingency management for weight gain developed from now critically discussed historical bed rest programs in which patients were literally put to bed and deprived of social interactions and leisure items. They only gained more freedom with increasing weight. More current approaches commonly use contingency management for weight gain in form of explicitly verbalized contingency contracts. In these contracts, patients and healthcare professionals define weight goals that have to be met in a certain timeframe. Positive consequences for achieving weight goals as well as negative consequences for missing weight goals are defined and meant to strengthen motivation in terms of an operant conditioning plan. Active patient involvement and shared responsibility for the contingency management plan is emphasized as an essential part in the majority of included articles, although operationalizations to achieve this remain unspecific.

In spite of its wide utilization in the inpatient treatment of patients with AN and being recommended by several treatment manuals, the evidence on effectiveness of contingency management for weight gain is scarce. As expected, results show positive short-term outcomes, evidence is however mainly based on historical case reports. There are no randomized controlled trials investigating these effects and a lot of the included studies are missing common characteristics of study quality. Additionally, there is a lack of descriptions of the contingency management process itself including common characteristics and best-practice recommendations.

This finding is discussed especially with respect to challenges in developing adequate study designs. It might originate in the complex nature of conducting this research: Since

inpatient treatment usually consists of multidisciplinary and multimodal treatments, the overall treatment effects can hardly be disentangled to single components of treatment such as a contingency contract. Another obstacle for research on contingency contracts for weight gain may lay in the choice of an adequate control group. Contingency contracts seem at least lead to positive short-term effects/weight gain. It might therefore be questioned ethically, if having a control group without a contract is justifiable for randomized controlled trials, especially in light of insufficient treatment success. Other approaches are therefore needed for further understanding how contingency contracts in the inpatient treatment of patients with AN are implemented nowadays and what the perceived effects as well as challenges are.

Study B: Contingency contracts for weight gain – current practice styles of specialized centers (Ziser, Giel, et al., 2018)

There was not only a scarce evidence base about the effectiveness of contingency contracts for weight gain in the inpatient treatment of patients with AN, but also a lack of descriptions, guidelines and common characteristics of them. Study B therefore assesses characteristics, utilization and appraisal of contingency management in form of contingency contracts for weight gain in German university hospitals specialized in the treatment of ED. Seventy-six medical doctors and clinical psychologists experienced in the inpatient treatment of patients with AN at twelve specialized university hospitals in Germany were questioned using an online survey. In line with the described theoretical background and the results of the systematic review, strategies to enhance patients' autonomy and collaboration within the contingency contract process were derived.

In accordance with our hypothesis, contingency contracts for weight gain were used for the vast majority of inpatients with AN. Most commonly, used weight goals ranged between 500 and 800 grams per week and where therefore well within the recommendations of the German as well as international guidelines for the treatment of ED (Herpertz et al., 2018; National Institute for Health and Care Excellence (NICE), 2017). From the results of this study, commonly shared characteristics of contingency contracts for weight gain in specialized German university centers were described for the first time. The most prevalent reported differences in the contingency contracting process referred to the definition of weight goals, when, how and if contingency contracts are revisited as well as the choice of consequences.

The study results show a good overall effectiveness of contingency contracts for weight gain from the experts' point of view and a high perceived significance of contingency contracts for the inpatient treatment of patients with AN. Greater clinical work experience was associated with a higher perceived relevance of contingency contracts for the inpatient treatment of patients with AN. In line with the theoretical concepts, therapeutic alliance

between patient and healthcare professional and empathy of the therapist (possibly satisfying the need of relatedness of patients) as well as motivation of the patient were confirmed as among the most important factors for success of a contingency contract by the experts. In order to enhance motivation and treatment adherence, collaborative approaches within the contingency contract process are reported by experts. It remains unclear however, if these approaches are able to sufficiently enhance internal motivation to change in inpatients with AN and if they can also work for patients with pronounced continued ambivalence, possibly still in the stage of contemplation.

Study C: Development of a novel treatment manual and the MANNA randomized controlled pilot study (Ziser et al., 2021)

In light of the underrepresentation of internal motivation enhancing aspects in the inpatient treatment of patients with AN, an innovative intervention was newly developed as part of this dissertation project. The intervention was conceptualized as a stage I psychotherapy manual suitable for pilot and feasibility testing (Carroll & Nuro, 2002) and called 'Motivation-enhancing psychotherapy for inpatients with ANorexia Nervosa' (MANNA). The MANNA intervention is based on the conversation techniques of MI and was trained in study C with an emphasis on the therapeutic stance of MI and the basic skills in MI. It addresses individual psychotherapy sessions of the first ten weeks of the multidisciplinary inpatient treatment and pursues the exploration of internal motivation to change in inpatients with AN.

Core of the intervention materials are worksheets that are worked on at a mean frequency of one worksheet per week. Worksheets contain elements of the Maudsley Model of Anorexia Nervosa Treatment for Adults (MANTRA; a MI-based outpatient treatment program in the UK; Schmidt et al., 2014) as well as interventions that have been successfully integrated into the treatment of ED before (e.g., letters to the eating disorder as a friend/foe, or explicit therapy goals for the time of inpatient treatment). With regards to content, topics patients with AN frequently struggle with are included: biographical aspects, ambivalence, goals in life and for the inpatient treatment, principles and values, self-esteem, relationships/social interactions, body image as well as emotions and needs (Cardi et al., 2018; Espindola & Blay, 2009; Junne et al., 2019; Kästner et al., 2018; Lavender et al., 2015). Own topics can also be added if handled by the therapist within the MI style.

In the randomized controlled multicenter phase II pilot study, acceptance and feasibility of the newly developed MANNA intervention was assessed. Furthermore, an intervention group receiving the MANNA intervention was compared to a treatment-as-usual inpatient group with regard to motivation to change, treatment adherence and therapeutic alliance. A total of 22 patients with full-syndrome AN recruited by two university hospitals were

assessed over three measurement timepoints. Changes in weight and eating disorder associated psychopathology were also assessed in the context of an exploratory analysis.

The MANNA intervention thereby proved to be very well accepted and feasible as evaluated by patients as well as therapists. Beyond its acceptance and feasibility, patients receiving the MANNA intervention completed treatment significantly more often on regular terms whereas patients in the control group terminated treatment more often irregularly. Reasons for irregular termination of treatment in the control group were due to dropouts, transfers to other clinics or departments or termination of treatment by the treatment team. In comparison to other studies which reported completion rates of inpatient eating disorder treatments ranging between 32% and 51% (Woodside et al., 2004; Zeeck et al., 2005) as well as 69% for a MI intervention (Weiss et al., 2013), study C found that 82% of patients in the MANNA intervention group completed treatment on regular terms. Treatment adherence in the MANNA intervention therefore proved to be excellent.

Contrary to our hypotheses, we did not find a stronger therapeutic alliance for patients in the MANNA intervention compared to the control group apart from a stronger baseline therapeutic alliance of patients in the MANNA intervention. This might be due to several reasons such as early effects of the intervention or therapists' bias. As for the exploratory part of this pilot study, only partial support could be found for group differences concerning BMI increase and improvement in eating disorder associated pathology. Patients receiving the MANNA treatment did show greater increase/improvement in these aspects compared to the control group but only in absolute numbers that did not reach significance. A small sample size was the main limitation in this study.

Table 2
Overview of sub-projects' design and results

	Study A: Systematic review contingency management	Study B: Contingency contracts for weight gain – current practice styles of specialized centers	Study C: Development of a novel treatment manual and the MANNA randomized controlled pilot study
Sample	800 patients with AN and control patients	76 mental health professionals	22 inpatients with full-syndrome AN
Design	systematic review of the development, utilization and effectiveness of contingency management for weight gain in the treatment of patients with AN	survey about the utilization and appraisal of contingency contracts for weight gains in the inpatient treatment of AN by experts currently or formerly treating inpatients with AN	randomized controlled pilot study evaluating the first ten weeks of inpatient therapy
Outcomes	<ul style="list-style-type: none"> • Evidence of effectiveness of contingency management for weight gain is scarce despite its frequent utilization. • Positive short-term outcomes, evidence however mainly based on historical case reports. • Active patient involvement and shared responsibility for the contingency management plan is essential. 	<ul style="list-style-type: none"> • perceived effectiveness of contingency contracts and significance for inpatient treatment • perceived factors of success of contingency contracts • utilization of and criteria for implementing contingency contracts • precise form of the contingency contract • weight days, control mechanisms and consequences • termination of contingency contracts 	<ul style="list-style-type: none"> • acceptance and feasibility of the treatment • stages of change • therapeutic alliance • treatment adherence • BMI and eating disorder associated pathology
Independent variables	<ul style="list-style-type: none"> • occupational group (medical doctor versus psychologist) • therapeutic orientation (behavior therapy versus psychodynamic therapy) 	<ul style="list-style-type: none"> • occupational group (medical doctor versus psychologist) • therapeutic orientation (behavior therapy versus psychodynamic therapy) 	<ul style="list-style-type: none"> • group (MANNA intervention versus treatment-as-usual) • time (baseline versus week 5 versus end of week 10)
Statistical Analyses	<ul style="list-style-type: none"> • Mann-Whitney-U tests • Spearman rho correlations 	<ul style="list-style-type: none"> • Mann-Whitney-U tests • Spearman rho correlations 	<ul style="list-style-type: none"> • t-tests and Mann-Whitney-U tests • Fishers exact test • odds ratio including confidence interval
Main results	<ul style="list-style-type: none"> • Good overall effectiveness and high significance for the treatment of inpatients with AN in the experts' point of view. • Greater clinical work experience is associated with higher perceived relevance of contingency contracts. • most important factors for success: therapeutic alliance, empathy of the therapist, motivation of the patient • no differences between occupational groups or therapeutic orientation 	<ul style="list-style-type: none"> • Good overall effectiveness and high significance for the treatment of inpatients with AN in the experts' point of view. • Greater clinical work experience is associated with higher perceived relevance of contingency contracts. • most important factors for success: therapeutic alliance, empathy of the therapist, motivation of the patient • no differences between occupational groups or therapeutic orientation 	<ul style="list-style-type: none"> • high acceptability and feasibility in view of patients and therapists • more frequently irregular treatment termination (e.g. drop out) in the control group than the MANNA group • stronger therapeutic alliance at baseline in the MANNA group than the control group, no difference at subsequent measurements • no group difference in stages of change • greater BMI increase and improvement in eating disorder associated pathology in the MANNA group than the control group in absolute number, albeit not significant

Discussion

The present dissertation project investigated external and internal motivation to change as well as the associated factors of therapeutic alliance and treatment adherence in the inpatient treatment of patients with AN. It provides a systematic overview of the evidence for the behavioristic concept of contingency contracts and analyzes current practice styles in the application of contingency contracts in specialized centers in Germany, thereby revealing the need for more collaborative approaches within these processes to foster internal motivation to change in patients with AN. Against this background, the dissertation project developed an innovative new intervention for the inpatient treatment of patients with AN. It provides first evidence from a randomized controlled phase II pilot study for the incorporation of motivation-enhancing techniques and shows its superiority concerning treatment adherence. Given confirmation of these findings in upcoming phase III and phase IV clinical trials, the present dissertation project marks the foundation of a major advancement in the challenging inpatient treatment of patients with AN.

Synthesis and interpretation of results

Studies A and B investigated the utilization of contingency management for weight gain in the inpatient treatment setting of patients with AN. In line with our expectations, contingency contracts for weight gain are described in the literature although empirical evidence of their effectiveness is missing. Equally missing from the literature is the description of common characteristics of these contracts, which we could add with our study B. Due to the descriptive study design, no conclusions about the effectiveness of the reported characteristics and efficacy of utilization differences could be drawn. There are however a few conclusions noteworthy.

Although originating in classic behavioral theories such as operant conditioning and social learning theories (Bandura, 1977; Skinner, 1968), there has been a substantial claim for more collaborative processes within psychotherapy of eating disorders in the literature since around the 2000s (Geller et al., 2003). This claim clearly points at the perceived shortcomings of purely behavioral (directive) approaches and is in line with suggestions from SDT in which the need for autonomy, relatedness and competence are incorporated to foster internalization of goals and behaviors. All of those three needs might be better satisfied by collaborative approaches in which the patient has a more autonomous role and can co-determine important treatment steps.

Study B demonstrated that currently, co-determination in case of contingency contracts for weight gain is implemented by ‘negotiating the contract’ between therapists (representing the treatment teams) and patients. Not only is the weight to be gained

negotiable within a certain range, but patients are explicitly encouraged to choose their own positive and negative consequences. This might come across as an attempt to foster internalization, although from a theoretical standpoint, it is more likely to foster another form of external motivation – introjected motivation. The question therefore remains if more than short-term positive effects can be expected from the contingency contract for weight gain procedure.

From the experts' point of view questioned in study B, negotiating and potentially re-negotiating and adapting the contingency contract for weight gain during the course of treatment, although sometimes challenging and tiresome, is perceived as worth the effort. This may hint at other benefits of the contingency contract procedure, apart from the purpose of enhancing external motivation. In the context of inpatient treatment, the process of collaborative decision making might also promote the therapeutic alliance between patient and therapist, potentially satisfying the need for relatedness of patients, furthering internalization of weight goals at last.

Considering these potential positive side effects of contingency contracts for weight gain, our randomized controlled pilot study C kept the contingency contract procedure as-is in the two university hospitals specialized in eating disorders that recruited patients for the study. Since therapists with patients in the MANNA intervention group were instructed in the utilization of MI throughout their individual therapy sessions, this might have reinforced the positive aspects of contingency contracts for weight gain. By choosing this approach, we combined the potential positive short-term effects of contingency contracts for weight gain with the hopefully longer-lasting positive effects of MI as a tool to enhance internalization and motivation to change.

The results of the randomized controlled phase II pilot study C confirm acceptance and feasibility of the MANNA intervention group. Moreover, with an astounding treatment adherence of over 82%, the MANNA intervention showed a great advantage over the treatment-as-usual. The finding of better treatment adherence potentially hints at a higher perceived autonomy, competence and relatedness on the patients' side. This might enable them to stay in inpatient treatment longer although it is often experienced as constricted through the very structured nature of inpatient treatment settings. The effect for treatment adherence is thereby in line with other studies on MI showing better treatment adherence in chronically ill psychiatric patients (Britt et al., 2004) or better treatment attendance as indicators of patient engagement in a variety of mental health problems (Romano & Peters, 2015). While Romano and Peters did not find better treatment attendance for patients with ED, the present study C added to the literature by providing first evidence that the utilization of MI greatly improves treatment adherence in patients with AN.

Future studies could extend these findings by examining the associations between MI and further aspects of patient engagement in patients with AN. This might be of interest

because treatment engagement, especially homework compliance, seems to be associated with better subsequent outcome (Romano & Peters, 2015). The improvement of patient engagement within their usual treatment is furthermore described as the main goal of using MI in the treatment of ED (Westra et al., 2011). Operationalizations of motivation-enhancing techniques within the counseling styles of established interventions, such as in our study C, seem therefore most promising for improving inpatient treatments of patients with AN.

This primarily reflects in the acceptance and feasibility evaluation of the MANNA intervention by participating patients as well as therapists: Both groups indicated that they benefited from the MANNA intervention. They were highly satisfied with the provided worksheets and their comprehensibility, found the provided worksheets useful and indicated great personal (respectively patients) overall benefits from the MANNA intervention. Importantly, patients and therapists indicated a good balance between working within the structured nature of the manualized intervention and having enough space for emerging topics and incorporating own topics. According to the evaluations, no topics were missing in the intervention. Moreover, therapists indicated great usefulness of the instructions for therapists accompanying each worksheet. Despite the strongly positive evaluation by patients and therapists, not all of the reported benefits were supported by psychometric measures in study C.

No differences between intervention and control group were found concerning the SoC. This could originate in different reasons: First, our operationalization of SoC might not have been ideal for the group of patients with AN which we discuss further in the strengths and limitations section in this discussion. Second, patients in the control group might have experienced a similar motivation to change in the inpatient setting compared to patients in the intervention group due to the other characteristics of the inpatient setting. And third, the effect of the intervention on motivation to change or the SoC might not have been an explicit or proximal one (Wollburg et al., 2013), but might have rather shown itself in variables implicitly hinting at a continuing higher motivation such as treatment adherence. In order to determine the most probable explanation, a larger sample size enabling better comparisons over time between the two groups would be needed with a follow-up period.

The argument for replicating study C in a larger sample size applies to the exploratory examinations in study C as well. The exploratory examinations assessed the effects of the MANNA intervention on weight gain and eating disorder associated psychopathology in comparison to the treatment-as-usual control group. Absolute numbers thereby indicated a bigger difference in BMI gain from baseline to the end of week ten of treatment in the MANNA group. Since the groups were very small, a significant difference could not be reached. Higher weight gain and greater improvements in eating disorder associated

pathology under the MANNA intervention therefore remain to be proven in a fully powered sample. However, since the focus of study C was on acceptance and feasibility, this was not essential for the present dissertation project.

Another consideration is to study the effects of MI on outcomes different from self-reported motivation to change or SoC. Other interesting aspects are the effect of MI on compensatory and/or restrictive behavior (Sjögren, 2017) or according to subtype of AN (restrictive versus binge-purge) since the literature suggests greater dropout rates for patients with binge eating/purging subtype of AN (Woodside et al., 2004). We tried to address these ideas by assessing eating disorder associated psychopathology through a questionnaire. In-depth analysis of this data was however not possible due to the limited sample size. On a descriptive level, the control group reached higher absolute values across all eating disorder associated subscales, but it did not reach significance in the present sample and therefore remains face validity for now.

Conceptual implications for future research into motivational aspects

In terms of considerations and implications for motivational research the present results are in line with the existing concepts of TTM and SDT. There are however some considerations noteworthy in light of experienced challenges as well as further questions that can be answered by future studies. These considerations concern the operationalization of outcomes and motivation, definition of treatment success and integrating conceptual considerations of TTM and SDT.

The first consideration concerns the question of the most adequate measure of therapy outcome for evaluating interventions adapted to the motivational stage of patients. In study C, weight gain respectively BMI was used as measure of therapy outcome in the exploratory analysis. However, some authors suggest rather using an ‘impact’ measure such as a composition of weight/BMI outcome and treatment adherence (Prochaska & Norcross, 2018) instead of weight gain alone. Other studies with patients with AN have used a composition of BMI and the psychiatric status rating for AN (Zipfel et al., 2014). The psychiatric status rating is a third-party assessment indicating the psychopathological state and severity of the disorder usually evaluated by the therapist (Keller et al., 1987). Combination measures might therefore deliver a more differentiated view of the progress patients make in inpatient treatment.

Alongside therapy outcome, there is also an ongoing discussion about the term ‘recovery’ in the field of AN. Similar to therapy outcome, weight gain is frequently attributed as the main indicator for recovery within few other indicators. According to the literature, a refined concept of recovery is still missing that not only considers behavioral criteria such

as weight gain but also cognitive criteria such as body image distortion (Bachner-Melman et al., 2006). Recent studies suggest to redefine recovery as the experience of meaningful relationships, identity and the feeling of value and worth apart from AN (Stockford et al., 2019) and show patients supporting a multifaceted understanding of recovery (Kenny et al., 2020; Richmond et al., 2020). Recovered patients with AN were also shown to attribute their recovery to psychological components rather than the physical process of gaining weight (Stockford et al., 2019). Since working with principles and values is also part of MI, this might be an aspect to consider when defining relevant therapy outcomes or recovery in interventions adapted to the motivational stages of patients with AN.

By adapting the inpatient treatment to the motivational stages of patients with AN, the handling of contingency contracts for weight gain is of special interest since it might be perceived as external control as was discussed earlier. In the TTM, contingency or reinforcement management is conceptualized within the so-called ‘processes of change’ that describe how people change (Norcross et al., 2011). As a process of change, contingency or reinforcement management is thereby assigned to the action and maintenance SoC, emphasizing its benefits in situations when patients already initiated or underwent change (Prochaska et al., 1992). For these patients with AN, it is likely a useful tool producing the positive (short-term) effects reported by the literature.

However, for patients with AN who are in the precontemplation or contemplation stages, different approaches might be advisable. These patients are sometimes externally pressured to seek treatment by relatives, close friends, employers, or educators (Guarda, 2008). They present themselves in general practitioner practices or in outpatient care, transferring to inpatient care with minimal internal motivation. From a motivational standpoint, it might be contraindicated to install contingency contracts for weight gain for these patients. Likely, patients in precontemplation or contemplation stages would perceive the contingency contract procedure as missing autonomy and being controlled from the outside (i.e., the treatment team). It might therefore be advisable to omit the contract for inpatients with AN in the precontemplation or contemplations stages when implementing SoC-adapted treatment.

This is also supported by considerations from SDT. It suggests that rewards in themselves might undermine intrinsic motivation alongside directiveness, threats, deadlines, pressured evaluation and imposed goals (Ryan & Deci, 2000). Hindering intrinsic motivation is thereby supposedly caused by an external perceived locus of causality. If taken at face value, this presents a common problem of the inpatient treatment setting patients frequently face. Due to the structure of hospitals and treatments, there is always some sort of external control or at least co-determination about dates, therapy components and treatment goals. There are not only rules for being able to attend inpatient therapy, such as participation in offered therapy groups, household shifts to keep, e.g., the dining

hall in order, but also regulations from the health system, e.g., in order for them to pay for the treatment. In extreme cases, when underweight becomes life-threatening, compulsory measures might additionally be put into place, temporarily removing almost all autonomy patients may experience. Helping the frequently already highly ambivalent group of patients with AN to settle into inpatient treatment is therefore no insignificant task. Although findings from the literature as well as this project are encouraging for the utilization of MI face these challenges.

On the methodical side, in light of the non-significant effects of SoC in study C, a symptom-specific measure of motivation to change in patients with AN might have been the better choice. The University of Rhode Island Change Assessment (URICA; McConaughy et al., 1983) is the most widespread instrument to assess SoC in psychotherapy research (Krebs et al., 2018) and also widely used in assessing SoC in eating disorders (Hoetzel et al., 2013). Likewise, Treasure and colleagues (1999) e.g., who were using the URICA similar to our study, did not find differences in motivation to change between their motivation enhancing treatment and an active comparison treatment in patients with bulimia nervosa. There are also indications that the URICA is a poor predictor of weight gain in comparison with a symptom-specific measure of motivation to change such as the Anorexia Nervosa Stages of Change Questionnaire (ANSOCQ; Green et al., 2017; Rieger et al., 2002). However, the URICA and ANSOCQ scores were significantly correlated. Furthermore, the validated short form of the URICA, the URICA-S (Mander et al., 2012) used in study C, was validated among other disorders in a sample of patients with AN. In sum, this rather supports the small sample size as being the reason for the nonsignificant differences in study C.

Another theoretical aspect of motivational research not yet taken into consideration in the present investigation about the application of MI in the inpatient treatment of patients with AN is change talk. In MI, change talk refers to any self-expressed language that is an argument for change (Arkowitz et al., 2015). It can be distinguished in preparatory change talk referring to statements expressing the desire ('I want to...'), ability ('I would be able to...'), reasons or need to change, whereas mobilizing change talk expresses commitment ('I will...'), activation ('I am ready to...') or taking steps to change. Preparatory and mobilizing change talk do not entail all forms of change talk but are common examples (Miller & Rollnick, 2012). In summary, all statements signaling patients' movements towards change can be referred to as change talk.

Change talk is an essential indicator of how likely change is about to happen. It has been shown to predict behavioral change through assessing commitment language (Amrhein et al., 2003), changes in neural responses to alcohol cues following client language (Feldstein Ewing et al., 2011), as well as change talk predicting reduced drinking even when readiness to change was controlled for (Moyers et al., 2009). The importance of change talk for

psychosocial interventions was thereby highlighted (Feldstein Ewing et al., 2011). Change talk is an important indicator that could be taken into consideration in the next study.

Implications for clinical practice

For clinical practice and inpatient treatment of patients with AN, there are several considerations. Accounting for highly ambivalent patients that might present for admission in the precontemplation or contemplation stage, one approach might be to establish a motivational preparation for inpatient treatment. Some eating disorder centers are known to set up contingency contracts for weight gain before admission that patients need to sign (as shown in study B) in order to prepare them for inpatient treatment, to reduce ambivalence in advance, and to strengthen health motives compared to eating disorder pathologies.

Another approach is starting a brief motivational intervention before admission to the inpatient setting which has been done by a few examples. Weiss and colleagues (2013) used three to four sessions of MI as prelude for intensive inpatient treatment and compared this against a (waiting list) control group. At the end of inpatient treatment, they found significantly higher completion rates for the group receiving the MI intervention. Similar to our study C, there were no significant differences between the groups according to the self-reported motivation. However, another study (Allen et al., 2012) using a similar approach, found differences in readiness to change for the treatment group with the preceding motivational intervention in comparison to a waiting control group but no differences in treatment completion. Motivational interventions as a prelude to inpatient treatment seem therefore promising but in need of more empirical evidence.

While preparing patients with AN for inpatient treatment is an important focus, securing and extending treatment outcomes is essential as well. On one hand, this refers to the integration of inpatient treatment into the broader healthcare system by collaborations between clinics and healthcare professionals providing outpatient care as well as integrating 'step down' processes of treatment in which patients can, e.g., transition from inpatient settings to day-patient settings before discharge. On the other hand, offers for patients living in rural areas with insufficient access to suitable follow-up care should also be taken into account. One innovative concept providing aftercare via videoconference is the SUSTAIN program that is currently being evaluated in a large multicenter randomized trial. Results of the pilot study have shown promise for its application as a suitable follow-up care for patients with AN (Giel et al., 2015).

Another important consideration is the training of therapists performing MI. Although the therapeutic stance is similar to other common approaches such as client-centered care (Rogers, 1946), patient-centered medicine (Laine & Davidoff, 1996) and relationship-

centered care (Beach et al., 2006), our experiences in study C were mixed at times. Although therapists reported on knowing and routinely using client-centered conversation styles in their feedback on the intervention, there were also some statements suggesting confrontations in opposition to MI and its underlying spirit (e.g., ‘This was a really difficult one. I had to confront her with the seriousness of her condition, she was just denying reality.’) Therefore, hands-on application of MI in the inpatient treatment setting might be a little more challenging than some therapists initially expect.

To account for these challenges, adequate training taking into account that therapists are frequently knowledgeable of the theoretical aspects of the counseling style of MI but might need primarily practicing seems essential. In case of inpatient treatment of patients with AN, it also seems advisable to align practical training in MI and MI techniques alongside typical inpatient treatment situations, such as negotiating of a contingency contract for weight gain and talking about (mandatory) weight gain requirements, giving information on difficult topics that need to be discussed (e.g., poor blood levels), or discussing fear of social situations or weight gain.

Strengths and limitations of the thesis

Strengths of the current project lie in the applicability and relevance to clinical practice, linking conceptual frameworks to everyday inpatient treatment of patients with AN. Not only did the author of this thesis add to the literature base through synthesizing results on contingency management for weight gain and adding own data to this field about the current utilization and important characteristics. A newly developed intervention was added to the current clinical practice and positively evaluated, bringing together motivational considerations with established treatment approaches for patients with AN. The current project therefore has the potential to be useful for future studies as well as eating disorder treatment programs. If the results of the randomized controlled phase II study are confirmed in confirmatory phase III and IV studies, the MANNA intervention might be a groundbreaking advancement in the inpatient therapy of patients with AN.

The present project also has several limitations. First of all, studies A and B are of mostly descriptive nature and therefore cannot show evidence of causation or effectiveness. However, since the investigated contingency contracts for weight gain are already well established in inpatient clinical treatment, possibilities for evaluating their isolated effects were constricted. Second, study C contained a rather small sample size. This originated in the rationale for the study to investigate acceptance and feasibility. In this pilot character study, the author of this thesis wanted to assess if the newly developed intervention could be used in clinical inpatient settings at all and get feedback on the intervention from therapists as well as patients. It did, however, prevent more in-depth statistical analysis

such as investigating subgroups of patients (e.g., for restrictive and binge-purge subtypes of AN) or performing survival analyses.

Third, since only inpatients with AN were investigated, the author of this thesis looked at a special group of patients within the field of patients with AN. Although this patient group was deliberately chosen for frequently presenting chronic states of the disorder known for challenging treatment, the author of this thesis is aware that the results might not be representative for the whole group of patients with full-syndrome AN but might – in part – only apply to this group of severely ill patients. Last, again due to the nature of study C of being a clinical pilot trial, not all theoretical constructs could be assessed with their own measure, such as the fulfillment of needs of autonomy, competence and relatedness. The author of this thesis did stick to comprehensive constructs such as therapeutic alliance. It can therefore only be speculated about underlying mechanisms and directions for future research on this matter are derived.

Conclusions and further directions

The present dissertation project contributes to the field of motivation to change in eating disorders by systematically searching and analyzing the literature on contingency management for weight gain, providing more detailed analyses of the evidence and current practice styles of the state of the art behavioristic tool of contingency contracts for weight gain to enhance external motivation and adding to the field by the development and randomized controlled phase II evaluation of a new treatment manual for enhancing internal motivation to change in inpatient treatment of patients with AN. While contingency contracts for weight gain are commonly used in German university hospitals specialized in eating disorders, their evidence base is lacking. Evidence suggests positive short-term effects of these measures. In light of motivational processes however, it seems essential to incorporate collaborative approaches in these processes since external motivation produced by external rewards and punishments is not likely to elicit long-term effects. The combination of measures enhancing external motivation and internal motivation seems therefore inevitable. In particular, techniques for fostering internal motivation to change in patients with AN are needed across all treatment settings. For the inpatient treatment setting, this dissertation project delivers important starting points.

In order to implement and evaluate the goal of fostering internal motivation to change, we provided an intervention based on MI for the individual psychotherapy sessions of the first ten weeks of inpatient treatment. We thereby did not only demonstrate acceptance and feasibility of the intervention, but also superiority of the intervention compared to treatment-as-usual in terms of treatment adherence. This is in line with findings from interventions utilizing motivation-enhancing counseling styles, e.g., in outpatients or

Discussion

group settings, finding better treatment adherence or treatment continuation for their intervention groups (Dean et al., 2008; Schmidt et al., 2015; Wade et al., 2009), and extends them for the individual inpatient treatment setting. Implementing motivation-enhancing counseling styles seems therefore to have potential in substantially improving inpatient treatment adherence of patients with AN.

To determine other potential benefits of MI for inpatient treatment of patients with AN there are two important next steps. First, the intervention manual for therapists used in the acceptance and feasibility trial needs to be revised based on the results from this trial and feedback from patients as well as therapists. Second, a fully powered phase III randomized controlled trial will answer a lot of the remaining questions discussed in this dissertation project. It can determine potential positive effects of the intervention on self-reported motivation to change and more importantly eating disorder associated psychopathology and other measures of treatment outcomes. Ultimately, this potentially lays the foundation for great advancements towards reducing or resolving ambivalence, strengthen motivation to change and therefore improving the inpatient treatment of the often challenging treatment of patients with AN.

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Statement of Contributions

Study A: Systematic review contingency management

Ziser K, Resmark G, Giel, KE, Becker S, Stuber F, Zipfel S, & Junne F (2018). The effectiveness of contingency management in the treatment of patients with anorexia nervosa: A systematic review. *European Eating Disorders Review*, 26, 379-393.

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This study was designed by **Katrin Ziser** and Florian Junne with contributions by Gaby Resmark, Katrin E. Giel and Stephan Zipfel. **Katrin Ziser** searched for studies, screened and rated the search results, collected data from the studies, generated the tables and figures and drafted the manuscript. Felicitas Stuber was the second screener and rater and checked all extracted data for correctness. **Katrin Ziser**, Florian Junne, Gaby Resmark and Sandra Becker contributed to the interpretation of results. All authors edited and approved the drafts of the manuscript. **Katrin Ziser** drafted the revisions and **Katrin Ziser** and Florian Junne wrote the correspondence during the peer-reviewing process.

Study B: Contingency contracts for weight gain – current practice styles of specialized centers

Ziser K, Giel, KE, Resmark G, Nikendei C, Friederich H-C, Herpertz S, Rose M, de Zwaan M, von Wietersheim J, Zeeck A, Dinkel A, Burgmer M, Löwe B, Sprute C, Zipfel S, & Junne F (2018). Contingency contracts for weight gain of patients with anorexia nervosa in inpatient therapy: Practice styles of specialized centers. *Journal of Clinical Medicine*, 7, 215. <https://doi.org/10.1371/journal.pone.0166826>

Katrin Ziser, Florian Junne, Stephan Zipfel, Katrin E. Giel and Gaby Resmark conceptualized this study and its methodology. **Katrin Ziser** compiled the questionnaire, all authors distributed and administered the investigation at their respective trial site. Florian Junne, Katrin E. Giel and Stephan Zipfel provided the resources for this study. **Katrin Ziser** performed the data curation, generated tables and figures and drafted the manuscript. All authors edited and approved the drafts of the manuscript. **Katrin Ziser** drafted the revisions and wrote the correspondence during the peer-reviewing process.

Study C: Development of a novel treatment manual and the MANNA randomized controlled pilot study

Ziser K, Rheindorf N, Keifenheim K, Becker S, Resmark G, Giel KE, Skoda E-M, Teufel M, Zipfel S, & Junne F (2021). Motivation-enhancing psychotherapy for inpatients with anorexia nervosa (MANNA): A randomized controlled pilot study. *Frontiers in Psychiatry*, 12, 632660. <https://doi.org/10.3389/fpsy.2021.632660>

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Manuscripts

REVIEW

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The effectiveness of contingency management in the treatment of patients with anorexia nervosa: A systematic review

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Abstract

Contingency management in stipulating weight gain is routinely used in the treatment of anorexia nervosa, however, empirical investigations concerning its effectiveness have been scarce. This systematic review was conducted according to the PRISMA statement. Of $N = 973$ hits, 42 full-texts were included in the qualitative synthesis (11 theoretical texts, 19 case reports, 12 descriptive, cohort, and controlled trials). A central topic in the included publications concerns the enhancement of patients' autonomy through participation in the contingency management process. This heightened autonomy is achieved by using contingency contracts. Positive short-term effects on weight gain were shown, whereas follow-up results were heterogeneous. Although contingency contracts are widely used in clinical practice, our systematic review shows that empirical evidence on underlying mechanisms and efficacy is still scarce. Using an explicit treatment contract can enhance patients' motivation, compliance, and autonomy. Clinical practice should see further development including innovative motivation enhancing and conflict dissolving techniques in addressing the pronounced ambivalence often shown by patients with anorexia nervosa.

KEYWORDS

anorexia nervosa, contingency contracts, contingency management, systematic review, weight gain

1 | INTRODUCTION

The treatment of patients with anorexia nervosa (AN) is challenging due to the high degree of ambivalence that these patients often express towards recovery and weight gain (Abbate-Daga, Amianto, Delsedime, De-Bacco, & Fassino, 2013; Cockell, Geller, & Linden, 2003). Initial weight gain has been shown to be an important factor for treatment success (Sly, Morgan, Mountford, & Lacey, 2013). In the multimodal treatment of AN, weight gain is commonly supported by contingency management,

for example, in the form of a treatment contract for weight gain.

Contingency management in psychotherapy can be defined as “a systematic strategy of presenting and withdrawing contingent rewards and punishments” (Abel, Rouleau, & Coyne, 1987). Overall, Abel et al. (1987) define contingency management as a tool for inducing behavioural change. Within a clinical context, it is primarily used and investigated in the field of addiction (e.g., substance abuse and smoking) and eating behaviours (weight loss or weight gain; Bigelow & Silverman, 1999; Cooney et al.,

2017; Sayegh, Huey Jr, Zara, & Jhaveri, 2017; Stanger, Lansing, & Budney, 2016). The concept of contingency management originates in social learning theory (Bandura, 1977) and operant conditioning techniques (Skinner, 1968). It assumes that behaviour that is followed by positive consequences will be subsequently shown more often, whereas behaviour that is followed by negative consequences will subsequently be shown less often. The term “contingency” thereby refers to a noticeable connection between behaviour and consequence. In the case of eating behaviour, contingency management can be put in place to achieve a behavioural change that should intentionally lead to weight loss, weight gain, or weight maintenance after weight gain. The participant in a contingency management programme is positively reinforced (i.e., rewarded) if he or she shows the desired behaviour in a specified amount of time and is negatively reinforced if target behaviour is not shown in that time frame.

Alternative terms for contingency management programmes are behaviour modification, operant conditioning programmes/techniques, and contingency contracting. The term contingency contract refers to instances where the contingency management plan is explicitly verbalized in the form of a contract between the person wanting to increase a target behaviour (usually the patient) and the healthcare professionals. For reasons of consistency, we will use the term contingency management for programmes using this tool in general and contingency contracting for the operationalization of contingency management programmes in an explicit contract.

Concerning eating behaviour, there are a substantial number of studies that use contingency management to induce weight loss. These studies mainly use financial incentives and token systems: the participants can earn tokens/reward points for achieved goals (e.g., a certain amount of weight loss or an exercise goal) and exchange them for rewards or they are directly financially rewarded for achieving goals (Adams et al., 2017; De Melo Boff, Liboni, De Azevedo Batista, De Souza, & Da Silva Oliveira, 2017; Jeffery, 2012; Sykes-Muskett, Prestwich, Lawton, & Armitage, 2015).

When using contingency management for weight gain, however, there seems to be scarce evidence of effectiveness, although contingency management is routinely used within the multimodal treatment of AN (Hartmann, Zeeck, & Barrett, 2010) and recommended by treatment manuals (Borgart & Meermann, 2004; Legenbauer & Vocks, 2014). Especially in inpatient settings, contingency management is used as a controlled way to promote weight gain and motivate the patient through positive reinforcement to meet weekly weight goals. It is therefore a tool that achieves both behaviour modification and enhances compliance (Janz, Becker, & Hartman, 1984).

Despite its routine implementation, empirical investigations concerning its application and effectiveness are scarce (Janz et al., 1984; Peck, 2016). The previous version of the National Institute for Clinical Excellence (NICE) guidelines for eating disorders from 2004 seems to be the only guidelines that acknowledge this topic by stating that “rigid inpatient behaviour programmes should not be used” (National Institute for Clinical Excellence (NICE), 2004). Beyond that, clear recommendations in eating disorder guidelines are solely available concerning the weekly weight goal set during treatment (American Psychiatric Association, 2006; Herpertz, Herpertz-Dahlmann, Fichter, Tuschen-Caffier, & Zeeck, 2011; National Institute for Clinical Excellence (NICE), 2004). However, in light of the pronounced ambivalence patients with AN often show concerning weight gain (Cockell et al., 2003; Williams & Reid, 2010), frequent withdrawals from treatment (Wallier et al., 2009) and the high mortality and morbidity patients with AN face (Arcelus, Mitchell, Wales, & Nielsen, 2011), the evidence-based application of contingency management is essential to enhance motivation for weight gain.

In this context, the current systematic review aims to provide an overview of the available literature on the development, utilization, and effectiveness of contingency management for weight gain in patients with AN. To the best of our knowledge, this systematic review adds to existing literature by assessing the empirical evidence on the effectiveness of contingency management on weight gain in patients with AN for the first time. We strive to depict the evidence base and deduce implications and directions for further research in this area, as well as trends for its clinical application.

2 | METHODS

The current systematic review was conducted according to the PRISMA statement (Liberati et al., 2009). Methods of analysis and inclusion criteria were specified in advance and documented in a protocol.

2.1 | Eligibility criteria

In order to be eligible for inclusion, articles had to fulfil the modified PICOS criteria (Liberati et al., 2009; Moher, Liberati, Tetzlaff, & Altman, 2009) described in Table 1.

2.2 | Literature search and study selection

Articles were identified by searching the electronic databases PubMed, PsycINFO, and Web of Science until August 2016 with constant updates until February 2018,

TABLE 1 Applied inclusion and exclusion criteria according to the PICOS dimensions

PICOS dimensions	Inclusion	Exclusion
(P)articipants	Humans with primary diagnosis of anorexia nervosa, atypical anorexia nervosa, other specified feeding or eating disorder	Other primary diagnoses
(I)nterventions	Use of/discussion of - contingency management - operant conditioning techniques - behaviour modification	- blinded interventions - not professionally instructed interventions (e.g., self-contracting)
(C)omparator/control group	Possible but not required	
(O)utcomes	Interventions with the aim of modifying eating disorder associated behaviours (e.g., weight gain, weight control, exercising behaviour, vomiting)	- interventions for weight loss - chewing rates as sole outcomes - general lifestyle as sole outcome
(S)tudy design	Include all	

Note. PICOS criteria were applied according to the PRISMA statement (Liberati et al., 2009, Box 2).

as well as by hand searching reference lists of articles. The search term used referred to the use of contingency management for the purpose of weight gain or weight control after weight gain and was limited to the languages English, German, and French. Exemplarily, the PsycINFO search term was defined as following:

(AB("contingency contract*" OR "treatment contract*" OR "weight contract*" OR "contingency management" OR "therapeutic contract" OR "behavioral contract" OR "positive reinforcement" OR "operant condition*" OR "punish*")) AND (AB(anorexia OR anorexic OR "eating disorder" OR "weight gain" OR "weight control" OR "weight change" OR eating)) AND (LA(English OR German OR French)).

Title and Abstract screenings were performed by two independent reviewers (KZ and FS) according to the eligibility criteria. The first author analysed identified articles in full-text and extracted relevant data for finally included articles. The data extracted consisted of demographic and clinical characteristics concerning the intervention group and, if applicable, the control group (e.g., age, diagnosis, and treatment setting), outcomes in form of target behaviour of contingency management and results as well as follow-up data about the effectiveness of contingency management.

3 | RESULTS

3.1 | Study selection

The initial database searches yielded a total of 961 hits, 12 articles were identified through hand search, resulting in 973 references in total. After removing duplicates, 676 articles remained for title and abstract screenings. Interrater reliability among the two independent screeners proved

to be good with $\kappa = .74$. Five hundred eighty-nine articles clearly did not fulfil eligibility criteria, leaving 87 articles for full-text screening. Finally, 42 full-texts were included for analyses, data extraction, and qualitative synthesis. Of these 42 articles, 11 were theoretical works describing the application of contingency management for weight gain in general while taking different key aspects into account. The largest group of 19 articles consisted of case reports and case series reporting on one patient or a (small) number of patients on an individual level. The remaining 12 articles were descriptive, cohort, and controlled studies. For additional information about the selection process including the reasons for exclusion of full-text articles, see the flow diagram (Figure 1).

3.2 | Study characteristics

The majority of included articles share basic characteristics: Most of the articles and studies refer to an inpatient treatment setting and were published before the year 2000, more recent articles are scarce. All articles refer to contingency management or contracting in the context of AN, often referring to patients that meet all of the respective diagnostic criteria. Smaller portions of samples consist of patients that meet all but one criteria for AN (e.g., lacking amenorrhea according to DSM-IV and, therefore, include patients with atypical AN). However, because articles were very heterogeneous and ranging over a time span of 52 years, consistent diagnostic criteria for AN were not applied.

3.3 | Theoretical articles and overviews

The included theoretical articles consisted of descriptions of contingency management programmes (Bemis, 1987;

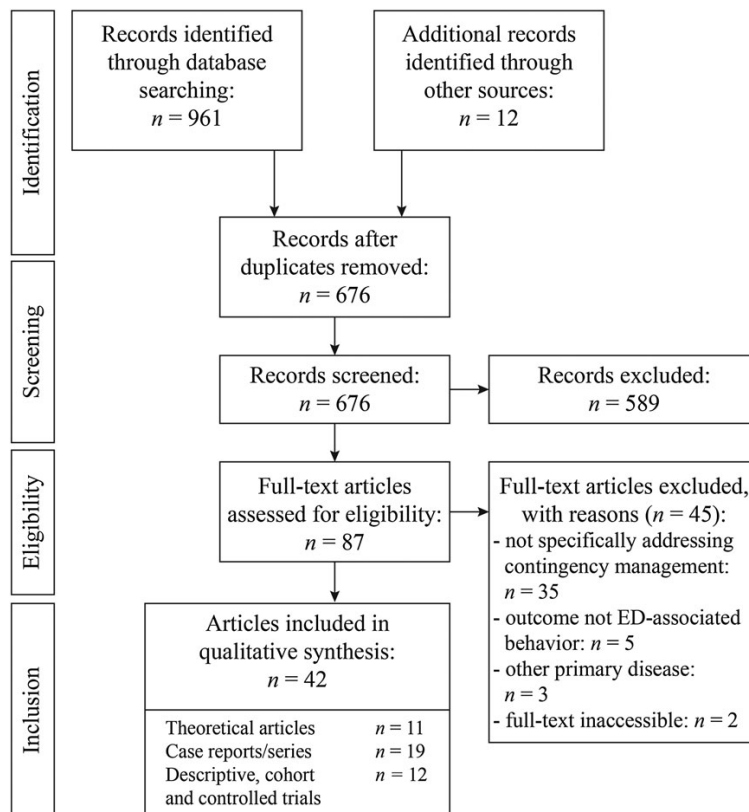


FIGURE 1 PRISMA flow chart for study selection. ED = eating disorder. Additional records were identified through hand searching reference lists of articles

Brubaker & Leddy, 2003; De Zwaan, Karwautz, & Strnad, 1996; Fisk, 1985; Godart et al., 2005; Levendusky & Dooley, 1985; Steinhausen, 2000; Touyz, 1998; Touyz & Beumont, 1997; Vandereycken, 1985; Wisniewski & Ben-Porath, 2015) with some also reporting nonsystematic literature overviews (Bemis, 1987; de Zwaan et al., 1996; Steinhausen, 2000; Touyz, 1998; Touyz & Beumont, 1997; Vandereycken, 1985). Two articles report the utilization of contingency contracts in specialized and/or new ways (Brubaker & Leddy, 2003; Wisniewski & Ben-Porath, 2015). A central theme in the included theoretical articles is the advancement of contingency management to support a more self-determined and autonomous patient.

3.3.1 | Historical contingency management: Bed rest programmes

Early works describing AN treatment are based mainly on the concept of deprivation: Patients are isolated from material and/or social reinforcers at the beginning of treatment (Bemis, 1987) and reinforcer return is contingent on specified amounts of meals eaten, caloric intake, and/or weight gain (Steinhausen, 2000; Touyz, 1998; Vandereycken, 1985). Bed rest is an especially critically discussed method: It describes the situation in which

patients are required to lay in their bed in a state of deprivation and isolation. Sometimes, this was applied very strictly, not even allowing patients to wash themselves but instead having a nurse come in once a day for bedside care.

In most of the articles, bed rest is discussed as a necessity and attempts are made at finding more lenient programmes than strict bed rest to induce weight gain in patients with AN. Touyz (1998), for example, states that most of the traditional (bed rest) programmes are too harsh. Steinhausen (2000) emphasizes the necessity of accommodating for the patients' need for increasing autonomy in regulating their eating behaviour in a structured contingency management programme. Although many of the included theoretical articles used deprivation and bed rest, they also report valid criticism of this method.

This criticism must be seen in light of the preliminary context bed rest was first implemented in: Early articles describe this method as an alternative to psychotherapy and a stand-alone treatment programme that promises rapid weight gain (Vandereycken, 1985). The majority of included articles, however, opposes this limited methodical view point and instead describe programmes with a multidisciplinary treatment approach combining contingency management, psychotherapy, and often various other types of treatment such as art therapy and group

therapy (Fisk, 1985; Godart et al., 2005; Levendusky & Dooley, 1985; Steinhausen, 2000; Vandereycken, 1985). Vandereycken (1985) was one of the first to report these multimodal approaches, and admitting that this new multimodal approach was not based on empirical findings but more on a trial and error approach. Furthermore, sufficient evidence in favour of the rather historical attempt of bed rest procedures for patients with AN in the context of contingency management could not be identified.

Compared with contingency management programmes, contingency contracting emphasizes a more formal collaborative relationship with the patient instead of a directive approach where the conditions of treatment are entirely dictated by the treatment team. The patients' view is considered and he or she has an opportunity to take part and codetermine the proceedings. This collaborative approach is used to increase compliance in patients and enhance the patients' autonomy (Brubaker & Leddy, 2003; de Zwaan et al., 1996; Fisk, 1985). Other treatment conditions that reportedly facilitate weight gain are techniques that include informational feedback: explicit feedback about the weight that was gained or lost progressively during treatment, such as the nurse simply telling the patient during weekly check ins. Included articles also commonly used visualizations such as weight graphs that patients were encouraged to update after each weighing.

3.3.2 | Current contributions to contingency management theory

Similar trends concerning patients' autonomy and collaboration in treatment are seen in the more current included articles. As an example, Brubaker and Leddy (2003) present their principles for contingency contracting concerning athletes with an eating disorder. They document the therapeutic relationship and an active patient involvement as primary principles, whereas the other principles are mainly dealing with the general framework (outcome, monitoring) and necessary consistency in enforcing the contingency contract. Similarly, Wisniewski and Ben-Porath (2015) emphasize the need of active patient involvement. They describe a combination of contingency contracting with dialectical behaviour therapy (DBT) elements for dilemmas addressing "apparent compliance" versus "active defiance" situations during treatment.

3.4 | Case reports and case series

This section comprises 19 case reports and case series reporting on a total of 35 patients. Notably, Bhanji and Thompson (1974) and Bhanji (1975) report about the same 11 cases and are therefore only counted once for the total

number of patients. All of the included case reports and case series outline a positive short-term effect of contingency management for weight gain (Abel et al., 1987; Agras, Barlow, Chapin, Abel, & Leitenberg, 1974; Azerrad & Stafford, 1969; Bachrach, Erwin, & Mohr, 1965; Bhanji, 1975; Bhanji & Thompson, 1974; Blue, 1979; Boey, 1985; Bruch, 1974; Cinciripini, Kornblith, Turner, & Hersen, 1983; Geller, Kelly, Traxler, & Marone Jr, 1978; Hauserman & Lavin, 1977; Martin & Mclaughlin, 1975; Matthews & Peterson, 2016; Monti, Mccrady, & Barlow, 1977; Munford, 1980; Munford, Tarlow, & Gerner, 1984; Perkin & Surtees, 1976; Stumphauzer, 1969).

When assessed, the long-term effects varied greatly. Some case reports indicated that patients had maintained (Blue, 1979; Munford, 1980) or further increased (Geller et al., 1978; Matthews & Peterson, 2016; Perkin & Surtees, 1976) their weight at follow-up. Whereas, some of the long-term follow-up assessments lack positive reports: Patients were lost to follow-up assessment, and for the remaining patients, information about weight maintenance was inconclusive (Bhanji, 1975; Bhanji & Thompson, 1974), weight maintenance after discharge remained in the underweight range (Boey, 1985), or one of two patients maintained weight at 2-year follow-up, but the other patient was rehospitalized (Cinciripini et al., 1983).

The characteristics of contingency management in these included case reports were similar to the presented theoretical articles: about a third of the articles report severe deprivation of material and social reinforcers resulting in patient isolation at the beginning of treatment (Abel et al., 1987; Bachrach et al., 1965; Bhanji, 1975; Bhanji & Thompson, 1974; Blue, 1979; Boey, 1985). Frequently, staff was advised to keep minimal contact or not respond at all to the patient (Agras et al., 1974; Bhanji, 1975; Bhanji & Thompson, 1974; Boey, 1985). To our knowledge, the first published case report about behaviour modification in a patient with AN from Bachrach et al. (1965) describes a treatment procedure in which the patient was highly isolated and nurses were instructed not to respond to the patient other than an initial "good morning."

There is one case series from Bruch (1974), however, that argues a very strong position against these practices of deprivation and isolation. She exemplarily describes three patients that gained weight under a restrictive contingency management programme and went on posttreatment to lose even more weight than at treatment begin. Bruch (1974) depicts a feeling of ineffectiveness as one of the central issues in AN, which is even enhanced by restrictive contingency management plans. She therefore marks a turning point in thinking of contingency management as a stand-alone treatment by emphasizing that it

can only be used as part of a multimodal therapy programme.

This approach of combining contingency management with other intervention techniques can be found in some included articles. Geller et al. (1978) combined a contingency programme with family therapy, Matthews and Peterson (2016) treated a patient with AN with sessions of psychoeducation and meal coaching during her inpatient stay and released her with an outpatient contingency contract. Hauserman and Lavin (1977) describe an outpatient who was on a contingency contract negotiated with the physician and received individual psychotherapy. All three articles describe positive (short-term) effects of the respective treatment, especially regarding increased autonomy and self-monitoring patient behaviour.

3.5 | Descriptive, cohort, and controlled studies

This section comprises 12 studies that report on a total of 765 patients. The included studies differed greatly concerning their study type and variables of investigation with no randomized controlled trials included. There was one study that compared general contingency management with contingency management including a contingency contract (Vandereycken & Pieters, 1978), whereas some studies investigated basic conditions of contingency management (e.g., rate of required weight gain; Goldfarb, Fuhr, Tsujimoto, & Fischman, 1987; Solanto, Hertz, Jacobson, Golden, & Heller, 1994; Touyz, Beumont, Glaun, Phillips, & Cowie, 1984), the effectiveness of their specific treatment programme (Halmi, Powers, & Cunningham, 1975; Lievers et al., 2009; Pertschuk, Edwards, & Pomerleau, 1978; Pierloot, Vandereycken, & Verhaest, 1982; Poole, Sanson-Fisher, & Young, 1978; Powers & Powers, 1984), or provided a survey about aspects of their treatment programmes (Godart et al., 2009; Griffiths et al., 1998).

In terms of study validity when investigating the effectiveness of contingency management, several concerns present themselves. For example, Godart et al. (2009) and Lievers et al. (2009) primarily investigated a sample of psychiatrists and clinical charts, they did not compare their approach to contingency contracts with any other approach nor did they conduct efficacy trials. Another study is purely descriptive without any statistical foundation (Halmi et al., 1975) and further studies only used a consecutive design instead of parallel intervention groups (Powers & Powers, 1984; Solanto et al., 1994; Vandereycken & Pieters, 1978). None of the included studies conducted a randomized controlled trial.

Another concern is the varying operationalization of weight gain used in the included studies: Some studies

assess daily weight gain (Goldfarb et al., 1987; Griffiths et al., 1998; Pertschuk et al., 1978; Poole et al., 1978; Solanto et al., 1994; Touyz et al., 1984), weekly weight gain (Halmi et al., 1975; Vandereycken & Pieters, 1978), or report total weight gain over a certain period of time (Powers & Powers, 1984). Furthermore, the how, when, and by whom weight gain was assessed is often scarcely or not at all described (Griffiths et al., 1998; Halmi et al., 1975; Pertschuk et al., 1978; Powers & Powers, 1984). It therefore appears difficult to compare these studies instead of discussing them individually.

All of the included studies that investigated the effectiveness of their treatment programmes with contingency management as an essential part of treatment found positive effects (Halmi et al., 1975, Lievers et al., 2009, Pertschuk et al., 1978, Pierloot et al., 1982, Poole et al., 1978, Powers & Powers, 1984), with all but one (Lievers et al., 2009) also reporting follow-up results. The follow-up studies were heterogeneous: Some reported continued weight gain and no rehospitalizations (Halmi et al., 1975), group effects for weight maintenance (Pertschuk et al., 1978; Poole et al., 1978; Powers & Powers, 1984), or percentages of recovery, worsening of symptoms, and decrease within the investigated sample (Pierloot et al., 1982). For a more detailed view of the included studies and their characteristics concerning rate of weight gain and time lags to follow-up, see Table 2.

3.5.1 | Studies with a comparison group

Out of the 12 included descriptive, cohort, and controlled studies, only 4 comprise a study design with some kind of a comparison group (Goldfarb et al., 1987; Solanto et al., 1994; Touyz et al., 1984; Vandereycken & Pieters, 1978). Most interestingly, Vandereycken and Pieters (1978) and Touyz et al. (1984) were the only ones to investigate contingency management and contingency contracting in comparison. Vandereycken and Pieters (1978) compared two groups: patients in Group A were severely deprived of reinforcers, put on bed rest, had to gain 100 g per day, and were not informed about their current weight. Patients in Group B were not deprived and isolated, were aware of their weight, had to gain the amount of weight written down in the contingency contract, and usually could have visits by relatives after one third of the required weight gain had been reached (vs. after target weight has been reached). Both groups were allowed to select their individual rewards. After treatment, Group B showed a significantly higher average weekly weight gain of 1.75 kg in comparison with 1.30 kg in Group A. Because many treatment modalities differed between the two groups other than only the existence of a contingency contract, it is not exactly clear what specifically caused

TABLE 2 Overview of included descriptive, cohort, and controlled studies

Author(s)	Study type	Sample size	Diagnostic criteria	Setting	Intervention	Contract	Outcome	Average rate of weight gain	Results	Follow-up	Follow-up result
Godart et al. (2009)	Survey	Survey about 139 adolescents, number of psychiatrists questioned: NS	DSM-IV (except amenorrhoea)	Inpatient	Treatment programme on a psychoanalytic basis, cantered on the weight contract	Yes	Weight goals	NA	Theoretically determined weight goals and achieved weight goals in this clinic correlate	NA	NA
Goldfarb et al. (1987)	Controlled intervention study	18	DSM-III	Inpatient (1 outpatient)	Behavioural contracting and supportive therapy (control group) additionally: - systematic desensitization (interv. Group 1) - relaxation (interv. Group 2)	Yes	Weight gain Self-esteem Fear of fat scale	CG: 0.13 kg/day IG1: 0.10 kg/day IG2: 0.19 kg/day	No significant differences in weight gain	18 months	Ratings of clinical outcome: relaxation group was superior to both other groups
Griffiths et al. (1998)	Survey	48	NS	Inpatient	Bed rest	No	Patients' perception of bed rest	0.14 kg/day	96.3% of patients found BR as unpleasant; majority did not feel humiliated or punished but isolated and bored	NA	NA
Halmi et al. (1975)	Descriptive study	8	Comprehensive tabulation of criteria described in the article	Inpatient	Operant conditioning programme + reeducative therapy	No	Weight gain	1.40 kg/week	Patients gained weight	7 months (on average)	No patients had to be rehospitalized
Lievers et al. (2009)	Predictor analysis	268 hospitalizations (213 patients), number	DSM-IV (except amenorrhoea)	Inpatient	Multimodal treatment with therapeutic	Yes	Length of stay	NS	Weight contract is significantly related to length of stay	NA	NA

(Continues)

TABLE 2 (Continued)

Author(s)	Study type	Sample size of psychiatrists questioned: NS	Diagnostic criteria	Setting	Intervention	Contract	Outcome	Average rate of weight gain	Results	Follow-up	Follow-up result
Pertschuk et al. (1978)	Intervention study	7	Based on Feighner et al. (1972) with minor modifications	Inpatient	Multimodal treatment + behavioural contract contract as focal point	Yes	Weight gain	0.32 kg/day (median)	Significant effect of behavioural contracts on weight gain	3–28 months	Descriptive: As a group, subjects maintained and, in some cases, gained weight after hospitalization
Pierloot et al. (1982)	Descriptive study	145	Based on Feighner et al. (1972) with exception of age at onset (could be older than 25)	Inpatient	Multimodal treatment	Yes	Weight gain	NS	NA	1–12 years (average: 4.2 years)	Outcome concerning AN symptoms (88 patients): - 29 completely recovered - 21 much improved - 20 moderately better - 9 unchanged or worsened - 10 deceased
Poole et al. (1978)	Intervention study	5	NS	Inpatient with transition to outpatient	Family therapy and weight contract	Yes	Weight gain	0.57 kg/day	All patients fulfilled their target weight, rate of weight gain was rapid, did not differ for patients with additional antidepressant medication	3–11 months	Weight gain was maintained with small fluctuations
Powers and Powers (1984)	Descriptive study	32 ^a	DSM-III, Feighner et al. (1972) criteria, with exception of percentage	Inpatient	Multimodal treatment	No	Weight gain meals eaten	27 females: 8.4 kg/av. 78 days 4 males: NS	Females: Av. weight gain of 8.7 kg Males: Av. weight	Females: Averagely 10 months follow-up: 10.4 kg	Females: Av. weight gain until follow-up: 10.4 kg

(Continues)

TABLE 2 (Continued)

Author(s)	Study type	Sample size	Diagnostic criteria	Setting	Intervention	Contract	Outcome	Average rate of weight gain	Results	Follow-up	Follow-up result
Solanto et al. (1994)	Cohort intervention study	53	below body weight (4 patients between 20% and 25%) DSM-III	Inpatient	Multimodal treatment + behavioural contract with differing weight contingencies: - Group 1: 0.36 kg/4 days - Group 2: 0.55 kg/4 days	Yes	Weight gain	Group 1: 0.09 kg/day Group 2: 0.14 kg/day	gain of 10.4 kg Significant difference in weight gain	Males: 3 Averagely 6 months	Males: 3 maintained weight, 1 gained 3 kg
Touyz et al. (1984)	Cohort intervention study	65	As defined by Russell (1970)	Inpatient	Group 1: Strict bed rest programme Group 2: Lenient and flexible behavioural programme	No Yes	Weight gain	Group 1: 0.21 kg/day Group 2: 0.20 kg/day	No significant difference in mean daily weight gain	NA	NA
Vandereycken and Pieters (1978)	Cohort study	32	As described in Feighner et al. (1972)	Inpatient	Group A: Bed rest programme, were not informed about their weight Group B: Behavioural contract, were informed about their weight	No Yes	Weight gain	Group A: 1.30 kg/week Group B: 1.75 kg/week	Significant difference in weekly weight gain and in total weight gain	NA	NA

Note. NA = not applicable; NS = not stated; AN = anorexia nervosa; av. = average; outpat. = outpatient; interv. = intervention; CG = control group; IG1/2 = intervention group 1/2.
*The original sample includes 14 additional outpatients for which no results were reported.

this difference. The authors propose that patients in Group A were not aware of their current weight and might have been anxious about “gaining too much,” whereas Group B was informed about their weight and more autonomous and self-determined in achieving the required weight for rewards.

On the other hand, Touyz et al. (1984) compared a strict (bed rest) treatment programme with a more lenient and flexible approach (one initial week of bed rest followed by a contingency contract). No differences were found regarding the average daily weight gain (0.21 vs. 0.20 kg) and the proportions of patients in both groups that reached their target weight. The authors concluded that a more lenient approach with the contingency contract should be chosen for ethical reasons.

Of the studies that investigated basic conditions of contingency management, Solanto et al. (1994) found that patients gained more weight with a higher rate of required weight gain (0.55 kg every 4 days) in comparison to a lower rate (0.36 kg per 4 days). They used a written contingency contract for both groups that was signed by the patient, the nurse, and the physician, reinforcers were chosen jointly by the treatment team. Goldfarb et al. (1987) compared three groups: patients that received contingency contracting and supportive therapy plus either systematic desensitization (Group 1) or relaxation (Group 2) and patients that received contingency contracting and supportive therapy only (Group 3). They found that Group 2, who had learned relaxation techniques, were superior to the other groups at 18-month follow-up in terms of global outcome including weight maintenance, absence of abnormal eating patterns, and social-emotional adjustment.

4 | DISCUSSION

4.1 | Summary of evidence

This systematic review analysed the development, utilization, and effectiveness of contingency management for weight gain in the treatment of AN. Analysing theoretical articles, case reports, case series, as well as descriptive, cohort, and controlled studies, it is evident that contingency management for weight gain is a treatment tool that is used for patients with AN, mainly for inpatient treatment.

One of the main topics in all three categories of articles was the need to enhance patients' participation and shared responsibility for the contingency management process (i.e., weight gain). In a range of articles, this was accomplished by setting up a contingency contract for weight gain together with patients that was signed by all parties (e.g., nurse, physician, and patient) involved. Furthermore, early restrictive interventions in the context of contingency management, such as bed rest and social

isolation of patients even from the attending staff, is currently handled with caution and only recommended in extremely severe cases. Contingency management therefore developed from a restrictive (even punishing) application to a more collaborative approach using (rewarding) contingency contracts.

Regarding the effectiveness of contingency management for weight gain, results for short-term outcomes were positive. Noteworthy, however, is that this evidence is mainly based on historical case reports and does not refer to contingency management in its current utilization. Follow-up periods (if available) did differ substantially and results of follow-up assessments were heterogeneous. Overall, evidence for contingency management for weight gain is therefore scarce, there are no randomized controlled trials, and most of the included studies are lacking quality characteristics currently expected of efficacy trials.

4.2 | Contingency management versus contingency contracting

A core short-coming is that the conceptual differentiation between contingency management and contingency contracting is not well-defined. Although most of the descriptive, cohort, and controlled studies explicitly used a contingency contract in contrast to the more historical case reports and case series with bed rest programmes, definitions and classifications are missing. Sometimes, the term contingency contract merely refers to the patients' signing of a contract while conditions of the contingency management programme are determined by the treatment team. In some cases, the contingency contract is the expression of a codetermination of conditions involving the patient. Therefore, it is necessary to further specify the differentiation between contingency management and contingency contracting delineated in Section 1. In view of the elaborated included literature and disorder-unspecific literature on contingency management and contingency contracting (e.g., Janz et al., 1984), we propose the differentiation presented in Table 3.

Specifically, this differentiation illustrates the development from a restrictive and directive utilization of contingency management programmes to a collaborative utilization that enhances patients' autonomy and compliance.

4.3 | Research on contingency contracting for weight gain

The active patient involvement in the contingency management process is an essential aspect of the majority of included articles. This was already established by Janz et al. (1984) in their review about the utilization of

TABLE 3 Proposed differentiation of contingency management and contingency contracting

Factors	Contingency management	Contingency contracting
Conditions	Set by the therapist/psychiatrist/treatment team	Negotiated with the patient (and his/her family)
Form	Verbal information for the patient	Written form, signed by patient and therapist, often in multiple copies
Consequences	Mostly chosen by the therapist/treatment team, often after a phase of observing the patient	Chosen by the patient
Aim	Induce weight gain, decrease eating disorder associated behaviour, for example, vomiting	- induce weight gain - decrease eating disorder associated behaviour, for example, vomiting - enhance compliance and motivation through participation
Modifications	Made by the treatment team	Modifiable by negotiation by the patient and the therapist/treatment team

contingency contracting to enhance patients' compliance. Neither they nor a more recent systematic review about contracts between patients and healthcare practitioners (Bosch-Capblanch, Abba, Prictor, & Garner, 2009) could find any articles about the utilization of contingency contracts for weight gain apart from Agras and Werne (1977; which is included in this review as Agras et al., 1974). Although it is deemed very important to use contingency contracts to enhance patients' participation, this systematic review shows that recommendations for practical use are solely expertise-based and there is scarce empirical evidence investigating this matter.

The scarce evidence base possibly originates in practical reasons: it is challenging to investigate the utilization of contingency contracts in the treatment of AN. As they are usually implemented within the multimodal treatment plans and are routinely used, the overall effects of treatment cannot be lead back to a single component. Additionally, the comparison between a contingency contract group and a no-contingency contract group is ethically questionable as it is an (short-term) effective way to induce weight gain. It is therefore necessary to develop study designs that consider these implications but can still compare the efficacy and effectiveness of contingency contracts with other treatment methods.

4.4 | Implications for clinical practice

From a clinical point of view, it is desirable and common practice to embed the contingency contract in a multimodal therapy because weight gain is only one aspect of recovery. Janz et al. (1984) pointed out that a difficulty of contingency contracting was that it was not used in combination with other methods that influence patients' compliance such as techniques for stabilizing the therapeutic alliance. Additionally, Geller, Brown, Zaitsoff, Goodrich, and Hastings (2003) found that collaborative

treatment approaches for eating disorders as well as a collaborative therapeutic alliance were rated more acceptable and more likely to produce positive outcomes by both therapists and patients. In the current systematic review, one recent article tried to include more collaborative aspects into the contingency contracting process: Wisniewski and Ben-Porath (2015) presented an approach to combine contingency contracting with elements of DBT to specifically address ambivalence and enhance compliance. However, unfortunately, this approach does not seem to have been investigated empirically so far.

Another possible way to incorporate more collaborative approaches into the originally strict behaviouristic contingency management is through the use of motivation enhancing techniques. Motivation and compliance are intertwined concepts, with motivation seen as a key aspect in the treatment of AN (Casasnovas et al., 2007; Treasure & Schmidt, 2001). Therefore, the incorporation of motivational interviewing (MI; Miller & Rollnick, 2012) could be advisable—an approach that is currently followed by our own group in developing a specific MI-treatment manual for the treatment of patients with AN.

Attempts have been made to specifically address motivational aspects in the treatment of AN, for example, in the Maudsley Model of Anorexia Nervosa Treatment for Adults (MANTRA; Schmidt, Wade, & Treasure, 2014), which is based on motivational interviewing as the therapy style. Another treatment approach has been presented by Golan (2013) that relies on motivational interviewing and narrative therapy mainly in the first phase of eating disorder treatment. Her research shows a full recovery or great improvement in 68% of patients with AN at the 4-year follow-up. Although there are new treatment approaches, apart from the combination with DBT, there are no interventions yet that explicitly target the contingency contracting process on the basis of techniques for enhancing motivation.

A possible direction for future research, which we are also currently pursuing, is to further develop the contingency contracting process for weight gain on the basis of motivation-enhancing techniques and compare these adapted processes to the current utilization. In doing so, aside from effectiveness, the focus is especially on preparing patients for a contingency contract and the process of negotiating the terms of the contract. Qualitative approaches also seem promising, because they give insights into what process variables are important from a patients' view point and what potential factors for enhancing and maintaining motivation and compliance could be investigated.

4.5 | Limitations

Given the fact that there were no restrictions regarding study design or type of article included into the current review nor a set outcome, as the outcome can differ in contingency management, a quality rating could not be performed. Additionally, there were only scarce experimental studies included with no randomized controlled trials. Therefore, risk of bias could not be determined in individual studies, nor across studies.

Concerning methodical limitations of the review process, we only looked at published articles, studies, and theses, which implies the risk of a publication bias. This is especially the case for the earlier case reports, where apart from one case series, only positive short time effects of contingency management were reported. Furthermore, a lot of studies are rather historical, dating back as far as 1965: it is therefore possible that not all published articles are listed in the searched databases. In order to address the issue of publication bias, we searched for unpublished articles in dissertation databases and programmes of major international eating disorder conferences. However, these searches did not yield any relevant hits.

4.6 | Conclusions

Despite good short-term effects, contingency management for patients with AN cannot be used as a stand-alone treatment and is usually integrated into a multimodal treatment. For practical use, the use of so-called contingency contracts, where patients negotiate and conclude a treatment contract, stating the principles of contingency management for weight gain is advisable. Using an explicit contract emphasizes patients' participation and shared responsibility in the treatment process and can enhance motivation, compliance, and autonomy. This is especially relevant for patients with AN who typically show a pronounced need for autonomy. However, given the widespread implementation of such

interventions in clinical practice, there is an unacceptable scarcity of sufficient evidence on the matter. The process of contingency contracting should be further developed to include motivational enhancing and conflict dissolving techniques to also address the pronounced ambivalence patients with AN often show.

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Article

Contingency Contracts for Weight Gain of Patients with Anorexia Nervosa in Inpatient Therapy: Practice Styles of Specialized Centers

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Abstract: The treatment of patients with anorexia nervosa (AN) is often challenging, due to a high degree of ambivalence towards recovery and weight gain these patients often express. One part of the multimodal treatment is the utilization of treatment contracts (i.e., contingency contracts) that aim to motivate patients to gain weight by applying positive and negative consequences for the (non-)achievement of weight goals. The main aim of this study is to assess and analyze current standards of contingency contracts' utilization in German eating disorder centers. $n = 76$ mental health

professionals of twelve specialized university centers in Germany that are currently or were formerly treating patients with AN in an inpatient setting participated. Most experts use contingency contracts in their clinic with weekly weight goals ranging between 500 and 700 g. Overall effectiveness and significance of contingency contracts for the inpatient treatment of patients with AN was rated high. Typical characteristics of a contingency contract in specialized German university hospital centers, such as the most frequent consequences, are described. The survey results assist the planning of further studies aiming to improve the multimodal treatment of patients with AN. For clinical practice, using external motivators such as contingency contracts as well as targeting internal motivation (e.g., by using motivational interviewing) is proposed.

Keywords: Anorexia nervosa; treatment contracts; weight gain; inpatient treatment; survey

1. Introduction

According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), anorexia nervosa (AN) is a mental disorder characterized by an intense fear of gaining weight and body image disturbances that lead to restricted food intake relative to the required food intake (restrictive subtype) or other behaviors promoting weight loss such as excessive exercising or purging behavior (binge-purge subtype) [1]. Despite a twelve-month prevalence rate of 0.8% within the German population, AN is one of the mental disorders with the highest mortality [2–4]. In the long term, only approximately half of patients completely recover, whereas roughly 20 percent develop a chronic form of the disorder [5,6]. It takes an average of five to six years to achieve complete recovery [2]. This reflects the challenges associated with treatment, resulting from a high degree of ambivalence towards recovery and weight gain patients with AN often express [7,8].

According to German treatment recommendations, patients with severe AN (Body Mass Index (BMI) < 15) are treated in inpatient settings that regard weight restoration as one of the focal points for recovery [9]. Initial weight gain and symptom-orientation have been shown to predict good outcomes [10,11]. Nonetheless, a study by Schlegl and colleagues suggests that about one third of patients with AN do not show a significant response to intensive inpatient treatment [12]. Thus, there is still room for improvement in inpatient treatment approaches for patients with AN [13].

One indispensable part of the multimodal treatment approach for patients with AN is the utilization of a treatment contract, which is implemented to induce motivation for weight gain. Treatment contracts are currently routinely used in the inpatient treatment of patients with AN in Germany [14–17]. They are verbal or written agreements with the patient that contain mostly, but not exclusively, weight goals. Frequently, they outline the amount of weight that should be gained in a defined period of time during the inpatient stay (e.g., each week). Positive consequences for reaching these weight goals and negative consequences for not fulfilling weight goals are determined. Treatment contracts to induce weight gain in patients with AN can also be called weight contracts or contingency contracts for weight gain.

A recent systematic review by our group showed that despite their routine usage in inpatient treatment, contingency contracts for weight gain are an understudied topic and the empirical evidence base is scarce [18]. The majority of publications included in our review were of rather historical nature with few current contributions. We could, however, identify a development from restrictive applications of treatment contracts, e.g., in the form of bed rest to more collaborative approaches. These collaborative approaches try to actively involve patients into the contingency contracting process, e.g., by negotiating terms of the contract or letting patients choose consequences.

In terms of clinical application, there is some guidance in available treatment manuals for AN [15,19] with written examples of contracts. However, this guidance seems to stem from clinical expertise which is valuable but not sufficient to ensure high treatment standards. Currently, it is

unclear whether treatment manuals are used and if done so, how the contingency contract process is organized in German eating disorder centers.

The main aim of the present study is to assess and analyze the utilization of contingency contracts for weight gain in German university hospitals specializing in eating disorders by means of a survey. Current approaches used by these specialized centers for collaboration with the patient are investigated, as well as strategies to enhance the patients' autonomy and motivation in the treatment contract process. Experiences of mental health professionals during the treatment contract process are also described. Finally, as an exploratory question, the role of professional characteristics in the contingency contract process is examined.

2. Experimental Section

2.1. Study Centers

Twelve specialized university hospital centers in Germany were invited and participated in this multicenter study. Mental health professionals who are currently or were formerly treating patients with AN in an inpatient setting were eligible for participation.

2.2. Sample

The study sample consists of $n = 76$ medical doctors and clinical psychologists between the ages of 24 and 60 ($M = 37.95$, $SD = 8.28$). For a detailed sample description, see Table 1.

Table 1. Demographic characteristics of the study sample ($n = 76$).

Variables	<i>M (SD)</i>	%
Gender: female		71.1
Clinical experience in psychotherapy/psychosomatic medicine/psychiatry in years	7.75 (7.20)	
Occupational group		
Medical doctor		61.8
Clinical psychologist		36.8
Both		1.3
Estimated number of treated patients with anorexia nervosa		
<20		34.2
20–40		23.7
41–60		14.5
61–80		6.6
81–100		9.2
>100		11.8
Main therapeutic orientation		
Cognitive-behavior psychotherapy		29.7
Psychodynamic psychotherapy		70.3

2.3. Measures

The online survey contained questions concerning the following topics: (1) demographic characteristics (including e.g., therapeutic orientation and clinical work experience); (2) questions about the utilization of and criteria for implementing contingency contracts into the inpatient treatment routine (e.g., percentage of patients that receive a contingency contract, timepoint of conclusion, duration, standardization of the procedure); (3) precise form of the contingency contract (e.g., verbal, written, freely formulated); (4) weight goals, control days and consequences for achieving or not achieving the weight goals; (5) circumstances that lead to a termination of contingency contracts; (6) experienced emotions of experts during the contingency contract process and appraisal of effectiveness. Items were either dichotomous (applicable–not applicable) or measured on a seven-point Likert scale (e.g., 1 never–7 always). All items relating to the contingency contract were newly developed for this survey.

After the demographic questions, a definition of contingency contracts in the context of inpatient treatment of patients with AN was given for clarification. Contingency contracts in the form of a weight contract were defined as follows: "A weight contract is a verbal or written agreement with a patient that determines weight changes and/or behavioral changes (e.g., eating behavior) that are linked to consequences for the patient."

2.4. Procedure

Invitational links were sent to representatives of all of the study centers, who then forwarded the invitation to eligible expert staff. Upon clicking on the survey link, experts were informed about the survey and protection of data privacy. They had to give consent in order to start the survey. Upon reaching the final page, experts were informed that the survey is finished and thanked for their participation.

2.5. Statistical Analyses

Means, standard deviations and percentages are reported for sample descriptions. Since variables were mostly not normally distributed, Mann–Whitney *U* tests for the analyses of single differences of means were used. To analyze potential associations between variables, Spearman rho correlations are reported. All statistical analyses were performed using IBM SPSS Statistics version 24 (IBM Corporation, Armonk, NY, USA). The level of significance for all analyses was set at $\alpha = 0.05$.

3. Results

3.1. Utilization

All of the experts reported that contingency contracts are utilized in their institution for inpatients with AN. They estimated that 87.6 percent of patients with AN in their department and 87.9 percent of their own patients with AN receive a contingency contract (annualized rate). The majority of experts (90.8%) reported using a standardized procedure to put contingency contracts in place. Of those, almost all reported having a guideline/manual provided within the department (98.6%) versus e.g., a published manual.

3.2. Preparation and Conclusion

About two thirds of experts (65.8%) reported preparing contingency contracts before inpatient treatment, for example at a preliminary (outpatient) consultation. 14.5 percent of the experts reported on giving written information about contingency contracts to the patient before admission to the ward. The majority of experts (78.4%) reported that contingency contracts are finalized in the first week of the inpatient stay. Only 5.2 percent of experts reported finalizing contingency contracts in the second week of inpatient treatment and 5.3 percent reported on not having a set time point for concluding contingency contracts.

3.3. Weight Contingencies and Weight Goals

Most experts (88.2%) reported setting standardized weekly contingents for weight gain, ranging between 300 g and 800 g per week. The most frequent weight gain goals are 700 g per week (44.8%), 500 g per week (37.3%) and 800 g per week (10.4%). The determination of the designated weight goal differs between the institutions: 46.1 percent of experts indicated individually negotiating the weight goal with the patients, and 39.5 percent of experts indicated that the weight goal is orientated at normal or close to normal weight with BMIs ranging between 17 and 19 kg/m². One expert indicated using different BMIs according to the age group of the patient for determining normal weight. For 15.8 percent of experts, weight goals were adapted to the planned duration of treatment. Only 6.6 percent of experts reported on not having a determined weight goal.

3.4. Revisiting, Changing and Terminating Contingency Contracts

Experts reported on revisiting the contingency contract with the patients at determined time points (47.4%), predominantly during ward rounds. Some other cases, e.g., if weight loss occurred, also made it necessary to revisit contingency contracts. For a smaller proportion of experts, revisiting the contingency contract occurred routinely after weighing the patient (28.9%), in the event of negative consequences (28.9%) or in the event of positive consequences (25.0%). Only 27.6 percent of experts reported on revisiting the contingency contract in each session.

Changing contingency contracts in the course of the inpatient treatment seemed to be handled quite differently: About one third of the experts (32.9%) reported on changing contingency contracts when patients lost weight and/or dropped below a certain BMI or when patients could not catch up to the required amount of weight gain anymore (31.6%). Some experts (7.8%) reported that changes/adaptions of the contingency contract were not intended whereas other experts reported on individually adapting contingency contracts over the course of treatment. Individually adapting might for instance take the form of temporarily changing from weight gain to weight maintenance. Some experts also reported on discharging patients from the ward for motivational reasons if weight goals were repeatedly not achieved. Patients were then offered the possibility of a re-admission after one or two weeks if they achieved some weight gain on their own.

About half of the experts (48.6%) reported that terminating contingency contracts did not happen in their institution, whereas 39.2 percent indicated that contingency contracts were terminated in special cases. These include the achievement of normal weight, somatic reasons (e.g., refeeding syndrome, infections) or if other symptoms gain priority (e.g., impulsive behavior).

3.5. Consequences

Consequences mostly depended on weight loss (90.8%) and weight gain (86.8%). One quarter of experts also reported that consequences could depend on symptoms like vomiting/purging, exercising/physical activity and eating behavior. Consequences were routinely applied after checking weight, either after every weighing (31.6%) or every second weighing (47.4%). Experts reported on choosing positive consequences themselves (23.7%) or letting the patient choose positive consequences from a list (17.1%) or freely (26.3%). In about a quarter of cases (24.7%), consequences were already determined in the contingency contract or were negotiated with the patient (13.0%). In regards to negative consequences, 36.8% experts reported determining the consequences themselves, as opposed to letting patients choose from a list (21.1%) or freely (11.8%).

Most frequently used positive consequences were the cessation of ward restriction (84.2%), being able to temporarily leave the hospital (82.9%) and the cessation of a liquid diet. Other mentioned positive consequences were: extension of treatment opportunities (e.g., patients could also participate in art or music therapy), cessation of accompanied eating, cessation of nasogastric feeding, and opportunities to temporarily leave the ward. When patients could choose their own positive consequences, chosen consequences included: buying themselves something nice, having their hair done, having a meal outside of the hospital, meeting friends, taking a bath, watching a movie/going to the cinema, bringing one's musical instrument to the ward and using the music room.

The most frequently used negative consequences were restriction to the ward (86.8%) and additional high caloric nutrients (69.7%). Further mentioned negative consequences were movement bans, nasogastric feeding, closely accompanied eating, and restrictions on using the phone or having visitors. The ultimate negative consequence was discharge from the hospital.

3.6. Overall Effectiveness and Factors of Success from the Experts' Points of View

Overall effectiveness of contingency contracts in the inpatient treatment of patients with AN was rated as 'effective for the most part' ($M = 5.72$, $SD = 0.74$). Greater clinical work experience was

associated with a higher appraisal of the relevance of contingency contracts for the inpatient treatment of patients with AN ($r_s = 0.328, p = 0.006$).

Among the factors experts rated as important for the success of a contingency contract were general factors such as therapeutic alliance ($M = 6.67, SD = 0.53$), empathy of the therapist ($M = 6.58, SD = 0.62$) and motivation of the patient ($M = 6.53, SD = 0.67$). Factors such as having a written record of the contingency contract ($M = 6.56, SD = 0.67$) and having a copy of the contingency contract available for the patient ($M = 6.47, SD = 0.71$) were also rated as important. For a detailed rating of factors of success, see Figure 1.

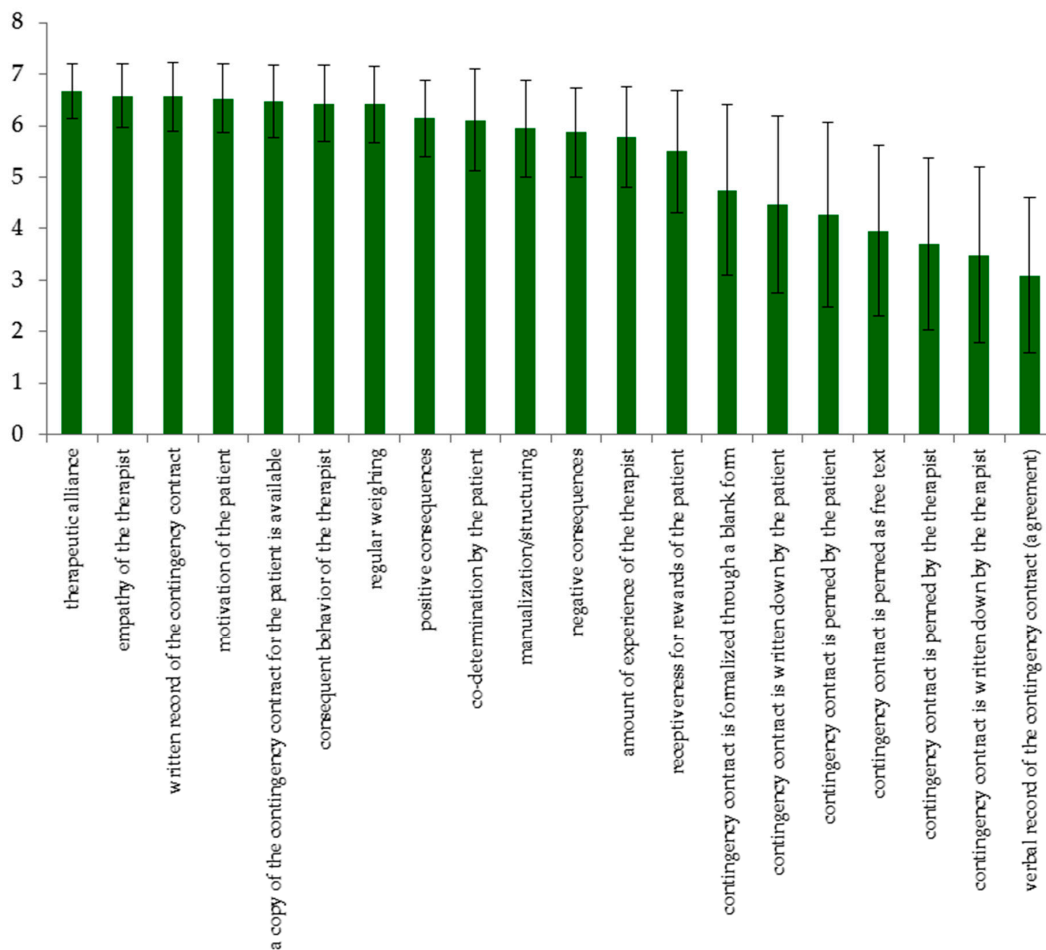


Figure 1. Factors of success of contingency contracts for anorexia nervosa (AN) by expert ratings. Factors of success were rated on a 7-point Likert scale from 1 ‘not important at all’ to 7 ‘very important’.

3.7. Emotions Experienced by the Experts during the Contingency Contract Negotiation and Emotional Burden

On average, experts rated the overall significance of contingency contracts for the inpatient treatment of patients with AN as ‘significant for the most part’ to ‘very significant’ ($M = 6.27, SD = 1.00$). They reported on not experiencing the contingency contract process (preparation, negotiation and conclusion) as emotionally straining ($M = 3.95, SD = 1.65$), however there was a significant correlation between experiencing emotional strain and the amount of clinical work experience in years of $r_s = -0.355, p = 0.002$. This indicates that when clinical work experience increases, emotional strain during the contingency contract process decreases.

Experts reported mainly experiencing a sense of responsibility ($M = 5.20$, $SD = 1.09$), compassion ($M = 4.80$, $SD = 1.09$) and strain ($M = 4.54$, $SD = 1.20$) during the negotiation of contingency contracts. Other emotions (tension, relaxation, ambivalence, frustration, anger and rejection) were reported as being experienced 'rarely' to 'occasionally'.

3.8. Group Differences

Potential differences in appraising contingency contracts in the inpatient treatment of patients with AN were tested between occupational groups (medical doctors vs. psychologists) and between therapeutic orientations (behavior therapy vs. psychodynamic therapy). Regarding differences between occupational groups, there were no significant differences in emotions experienced during the negotiation of contingency contracts (all $Us > 406.50$, all $ps > 0.171$). However, medical doctors rated the ethical tenability of contingency contracts, especially regarding the application of negative consequences such as restriction to the ward, higher than psychologists ($U = 373.50$, $p = 0.008$).

Regarding the emotions experienced during the contingency contract process, differences in how ambivalence was experienced were found between therapeutic orientations ($U = 314.00$, $p = 0.060$). Specifically, psychodynamic therapists experienced more ambivalence while negotiating a contingency contract. There were no group differences for the other listed emotions (all $Us > 362.00$, all $ps > 0.302$). For the ratings of factors of success, there was only one significant difference between the therapeutic orientations: Behavioral therapists rated recording the contingency contract in a written form as more important compared to psychodynamic therapists ($U = 359.00$, $p = 0.019$).

4. Discussion

This study analyzed characteristics, utilization and appraisal of contingency contracts for weight gain in AN in German university hospitals specializing in the treatment of eating disorders. Experts were asked about their preparation, negotiation, conclusion and revisions of contingency contracts for patients with AN, their overall rating of effectiveness, as well as experienced emotions and possible emotional strain during this process.

4.1. Similarities of Contingency Contracts in Specialized Eating Disorder Centers

As expected, the majority of patients with AN receive a contingency contract in the participating institutions. Although not following a published manual, utilization in all centers follows internal guidelines or manuals. The most commonly used weight goals range between 500 and 800 g per week and are therefore in line with current recommendations of treatment guidelines for eating disorders [9,20].

Consequences are usually dependent on weight gain and/or weight loss. Only a few experts reported also putting consequences on other eating disorder related behaviors such as excessive exercising or vomiting. Having weight gain or weight loss as a sole focus of contingency contracts for patients with AN presumably originates from early behavioristic approaches of contingency management [18]. In light of a holistic treatment approach however, it seems advisable to consider other eating disorder related behaviors such as excessive exercising or vomiting as part of the contingency contract as well.

In sum, the present study uncovered basic characteristics of contingency contracts shared by the majority of experts. A typical contingency contract in specialized eating disorder centers in Germany can therefore be described as presented in Figure 2.

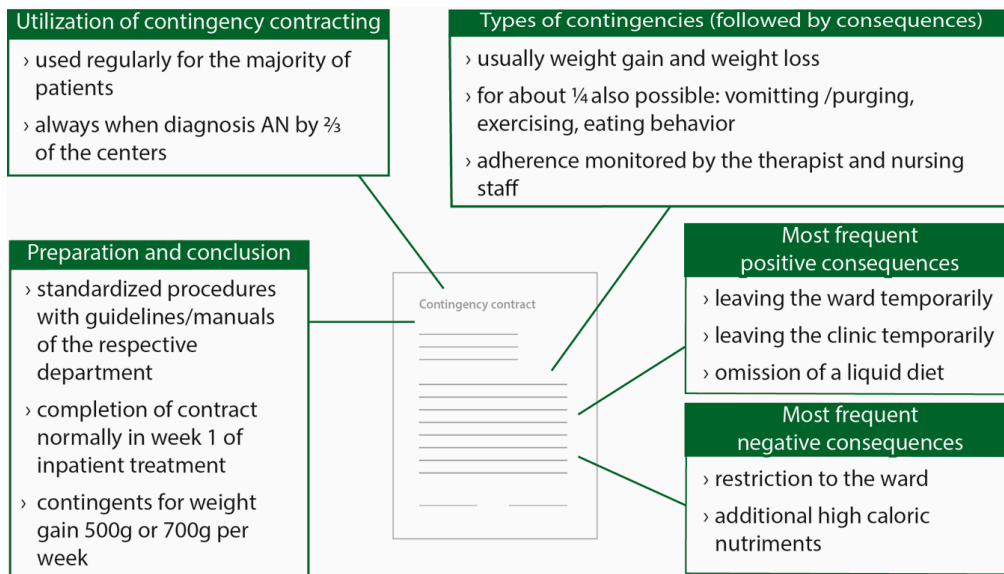


Figure 2. Characteristics of typical contingency contracts in specialized German university centers; AN = anorexia nervosa.

4.2. Differences of Contingency Contracts in Specialized Eating Disorder Centers

The three major aspects, in which participating institutions differ, are their definitions of weight goals, when and how contingency contracts are revisited and the choice of consequences. The definition of weight goals and the revisiting of contingency contracts possibly reflect the different self-developed manuals of the eating disorder centers. One half of experts negotiate weight goals with the patient, also taking aspects such as planned duration of stay into consideration. Another 40% orientate themselves toward a BMI value that should be achieved (low normal). One possible explanation for different BMI goals, ranging between 17 and 19 kg/m², is the continued discussion surrounding which BMI cut-off should be used to indicate non-anorectic weight for patients with AN [1,21].

Herzog and colleagues [22] showed that lower weekly weight goals (500 g) led to a higher achieved weight at the end of treatment, compared to higher weekly weight goals (750 g). In contrast, there are studies showing that higher weekly caloric intake led to higher overall weight gain (e.g., [23]). A recent systematic review [24] demonstrated that higher calorie refeeding is not associated with increased risk of the refeeding syndrome, at least for mildly and moderately affected patients. However, inpatient therapy is mainly indicated for severely ill patients and caution regarding caloric intake in the first days of treatment should be applied. Hence, for severely malnourished patients, there is no evidence to change current approaches. However, the long-term impact of different approaches is unknown [24], therefore no clear recommendation can be made from the literature concerning what (weekly) weight goals or BMI goals should be set [9].

4.3. Collaborative Approaches within the Contingency Contract Process

One of the aims of the current study was to identify approaches to incorporate patients into the contingency contract process in order to motivate them and enhance compliance and autonomy. In concrete terms, patients (and parents for younger patients) can for example co-determine weight goals, choose consequences and write down the contingency contract in their own words. We found that about 30% of experts let their patients choose consequences or negotiate consequences with the patient and almost half of the experts negotiate weight goals with their patients. This seems promising especially considering that patients are often ambivalent to restore weight [25]. However,

letting patients co-determine weight goals can bare the risk of setting weight goals that are too small. Additionally, negotiating weight goals and weight contingencies with the patient instead of setting them oneself can be a wearisome task for the therapist.

In the literature covering the topic of collaboration in the field of AN, there is a clear preference for collaborative approaches by patients as well as therapists [26]. Furthermore, Williams and Reid [25] showed in their qualitative study that patients with AN feel low self-efficacy about changing behaviors. On one side, AN gives them a sense of control, but the disorder also causes strong feelings of loss of control. The authors conclude that this ambivalence patients experience should be targeted in a collaborative manner [25]. In line with this evidence and the systematic review, which shows an overall movement from the utilization of (directive) contingency management towards more collaborative contingency contracts [18], contingency contracts in Germany should intensify their focus on collaboration within the weight contract process.

4.4. Implications for Clinical Practice

Motivational aspects are one of the main considerations for the improvement of treatment and care for patients with AN [27] and are taken into consideration for example by integrating motivation-based therapeutic styles into treatment [28,29]. Motivation of patients has been shown to play an essential role concerning dropout rates and treatment compliance [30]. Furthermore, internal motivation to change was identified as one of the positive predictors of clinically significant changes in eating disorder psychopathology in patients with AN quantitatively [12] as well as qualitatively in patients' reports [31]. It is therefore worth considering a shift in the treatment approach, from motivating the patients externally through a contingency contract, to enhancing internal motivation for example by incorporating a motivations-based treatment style. Indeed, some of the authors are currently developing a motivation-based intervention, incorporating motivational aspects into the inpatient treatment of patients with AN, which they plan to soon test against existing treatment options.

4.5. Experiences of Experts with the Contingency Contract Process

Although there was great variation in emotions experienced by the participating experts during the contingency contract process, on average there was no extremely negative or positive emotions which evidently accompanied this process. Additionally, it could be shown that the emotional burden for experts decreased with the years of experience, which coincides with clinical impressions. We found no significant differences between occupational groups (physician versus psychologist) or therapeutic orientation (behavioral versus psychodynamic psychotherapy). It would be interesting, however, to also investigate the emotional experiences of nurses and other caregivers in the inpatient environment.

4.6. Limitations and Prospects

The main limitation of the study is its descriptive nature; as no causal conclusions about the reported associations and group differences can be drawn. Furthermore, only specialized university centers were included which heightened the risk of a selection/recruitment bias. Although a fair amount of specialized university centers in Germany participated, not all could be included, raising the question of representativeness. However, given that this is the first study attempting to describe the contingency contract process in specialized centers in Germany, this account provides a valuable contribution to the evidence base.

The usefulness of contingency contracting practice styles for patients with AN in other countries would also be of high interest. Taking into account that patients in other countries might be treated in outpatient or day-patient settings more frequently, it might be more difficult to track positive and negative consequences. However, this would also entail the chance for greater collaboration between patients and therapists, potentially lessening the chance of patients fearing 'to be controlled' and enabling them to gain more autonomy. There are some reports about the utilization of contingency

contracts around the world [18], however to the best of our knowledge, studies about practice styles that go beyond the treatment program of one specific clinic, are missing.

5. Conclusions

The majority of experts use contingency contracts for their patients with AN. Most contracts involve weekly weight goals and there is strong consensus regarding the most frequent positive and negative consequences following weight gain or loss. This knowledge can help define and implement best practices concerning contingency contracting in the treatment of patients with AN. It also gives insight into current practice, and is therefore useful for the planning of further studies aiming to improve the efficacy of treatments procedures for patients with AN. For clinical practice, using external motivators such as contingency contracts as well as targeting internal motivation (e.g., by using motivational interviewing) is proposed.

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Motivation-Enhancing Psychotherapy for Inpatients With Anorexia Nervosa (MANNA): A Randomized Controlled Pilot Study

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Patients with anorexia nervosa (AN) are frequently characterized by an unstable readiness to change and high ambivalence toward treatment. Enhancing readiness to behavioral change therefore plays an essential role for adherence to treatment especially for severely ill patients treated in inpatient settings. Therefore, a novel 10 week program for the individual psychotherapy sessions was designed using elements from motivational interviewing to be applied within the multidisciplinary inpatient treatment for patients with AN. In a randomized controlled pilot trial, $N = 22$ patients with AN received either the new intervention or treatment as usual in one of two recruiting university hospitals. Readiness to change, eating disorder pathology, therapeutic alliance as well as acceptance and feasibility of the new intervention were measured from patients and therapists in week 1, 5, and 10 of inpatient treatment. Results confirm acceptance and feasibility of the MANNA intervention as evaluated by patients as well as therapists. Patients receiving the new intervention completed their inpatient treatment significantly more often on regular terms than patients receiving treatment as usual. No differences between the groups could be found concerning therapeutic alliance during and at the end of treatment and readiness to change. Absolute numbers of BMI increase indicate a larger increase in the intervention group albeit not significant in this pilot study sample. Limitations of the study such as the small sample size as well as possible adaptations and advancements of the intervention that need to be examined in a larger clinical trial of efficacy are discussed. This phase II study is registered with the German Clinical Trials Register (DRKS) under the trial number DRKS00015639.

Keywords: anorexia nervosa, inpatient treatment, psychotherapy, readiness to change, ambivalence, therapeutic alliance

INTRODUCTION

Anorexia nervosa (AN) is an eating disorder characterized by significantly low body weight, an intense fear of weight gain or becoming fat and body image disturbances [DSM-5; (1)]. Due to their low weight, patients are at risk for somatic complications such as cardiovascular complications, impairment of the gastro-intestinal tract or osteoporosis (2). Psychological sequelae such as

depressed mood, social isolation, and a low quality of life are also highly prevalent (2–4). Taken all of these risks together, AN is known to be the mental disorder with the highest mortality rate in young females (5). Despite the seriousness of the disorder, patients with AN frequently experience an unstable readiness to change and high ambivalence toward treatment due to the ego-syntonic nature of the eating disorder (6).

This is especially relevant for severely ill patients who need high intensity treatment in inpatient settings due to potentially life-threatening stages of the disease. Patients with severe AN are usually admitted to inpatient therapy under difficult conditions such as very low body weight with acute malnutrition including e.g., disturbed serum minerals and the risk of refeeding-syndrome. They might have experienced failure of multiple other treatment approaches in varying settings in the past and may experience emotional pressure from families/friends to seek therapy. Still, patients with AN often display insufficient comprehension of the severity of their medical situation and might even oppose weight gain. The therapeutic structures however usually include contingency contracts for controlled weight gain as one of the main goals of treatment. They often foster ambivalence since patients with AN often may want to “overcome” the eating disorder but are reluctant to any weight gain (7, 8).

In Germany, inpatient treatment for patients with AN is advised if the body mass index (BMI) is below 15 kg/m², rapid weight decrease happened (<20% in 6 months) or if there are severe other eating disorder symptoms, psychological, familial, or social factors that make success in outpatient or partial hospitalization settings unlikely (9). In addition to somatic monitoring and treatment, patients with AN routinely receive high doses of individual psychotherapy (2–3 sessions per week) as well as group psychotherapy, nutritional counseling, body-oriented therapy, and art or music therapy. The inpatient treatment is usually provided by a multidisciplinary treatment team consisting of physicians, psychologists, specialized nurses, nutritionists, physiotherapists, and other specialized therapists.

Despite efforts to improve outcomes through the described multidisciplinary treatment settings, about one third of patients did not show a significant response to inpatient therapy in a study by Schlegl et al. (10). Their results from analyzing a sample of over 400 patients with AN however emphasize the relevance of high internal motivation as a predictor of good outcome in therapy at the time of discharge (10). They therefore suggest the utilization of techniques for enhancing motivation and increasing patients’ readiness to change such as motivational interviewing (MI).

MI according to Miller and Rollnick (11) is an approach for helping people to change their thinking and behavior. It was initially developed for the areas of substance abuse and health-related problems (e.g., smoking cessation) and has since been applied and shown promise for behavior change in various medical care settings such as dangerous drinking, dental caries, smoking abstinence, quality of life, and self-monitoring as well as psychotherapy (12, 13). Especially in psychotherapy, MI is frequently not used as a “stand-alone treatment” but integrated

as the framework or stance under which psychotherapeutic interventions are conducted (14).

Due to the primary goal of resolving ambivalence and increasing intrinsic motivation to change, integrating MI into the treatment of patients with AN seems promising (15, 16). A review found mixed results but some promise of MI interventions in the field of eating disorders (17). For the treatment of AN specifically, more recent studies also show support for MI in enhancing treatment adherence and building a good therapeutic alliance between patients and therapists (18, 19).

Considering these aspects, we aimed at developing an intervention for the inpatient treatment of severely ill patients with AN. This intervention integrates MI into established inpatient intervention modules/techniques in the treatment of AN to enable incremental adaptation of treatment settings in case of the success of the trial. The aim is to increase intrinsic motivation to change in patients with AN, improve adherence to treatment (reduce dropouts) and strengthen therapeutic alliance.

For the development of the novel treatment manual, structural guidance was taken from Carroll and Nuro (20) with regard to developing a stage I psychotherapy manual suitable for pilot and feasibility testing. The authors provide advice on the general outline of such manuals in terms of elements to be included [see Table 2 in (20)], elements critical to this stage of development and suggest a model for delineating treatments. This guided approach enables the development of a “clinician-friendly” manual that can facilitate its implementation into clinical practice.

The objective of the present pilot study was to investigate the newly developed manual for inpatient treatment of patients with AN in comparison to the usual treatment concerning its acceptance and feasibility as well as impact on treatment adherence and therapeutic alliance. Our hypotheses were: (1) The investigated intervention is acceptable and feasible for patients as well as therapists, (2) Patients receiving the new intervention show a higher motivation to change, better treatment adherence as well as a stronger therapeutic alliance than patients receiving the treatment-as-usual, (3) Patients receiving the new intervention show greater weight gain and improvement in eating disorder associated psychopathology than patients receiving the treatment-as-usual (exploratory analysis). Additionally, one important aim of this study was to gain insight into (subjectively) needed improvements and adaptations to the intervention as suggested by patients and therapists.

MATERIALS AND METHODS

The MANNA Intervention

The therapeutic style used in MANNA is that of MI according to Miller and Rollnick (11) as described in the introduction. Two experienced experts performed training sessions with all study therapists on the theoretical background and structure of MI, different techniques as well as conducting practice exercises. Emphasis in the training was put on the therapeutic stance of MI as well as basic skills.

Basic skills in MI are represented by the OARS acronym. O thereby refers to asking open questions, A refers to using affirmations, R to reflective listening and S to summarizing.

Additionally giving information and advice is a basic skill used to prevent the therapist from adopting the role of “the expert” and providing uninvited advice to the patient (e.g., “You really should quit...,” “I would...”) (14).

Core of the intervention materials and orientation over the course of treatment are worksheets that are worked on (often after the patient has started the worksheet on his/her own as a homework) at a mean frequency of one worksheet per week. This mean frequency was chosen to account for the structured environment of inpatient setting on one hand and allow for the need for flexibility to address the patients’ individual needs and potential comorbidities by the therapist on the other hand. An overview and brief descriptions of the worksheets of the MANNA intervention can be found in **Figure 1**.

The MANNA intervention was designed for the first 10 weeks of inpatient individual psychotherapy sessions in the multidisciplinary treatment of severely ill patients with AN. The manual is based on the principles of motivational interviewing and the related therapeutic techniques and it contains elements of the Maudsley Model of Anorexia Nervosa Treatment for Adults [MANTRA; (21)]. Furthermore, the manual includes interventions that have been successfully integrated in the treatment of eating disorders before (such as letter to the eating disorder as a friend/foe, or explicit therapy goals for the time of inpatient treatment).

Each worksheet exists in a patient version that is to be distributed to the patient as well as a therapist version. The therapist version consists of three sections: (1) a summary of purpose and goals of the worksheet, (2) instructions/reflections for the use of motivational interviewing for discussing this particular worksheet with the patient, and (3) helpful phrases for the therapist, considerations for different motivational stages or potential “therapeutic traps.” This version also functions as a summary of the most important aspects of the present worksheet that can help the therapist to orientate himself/herself within the MANNA intervention on quick glance before a therapy session in the frequently time-limited inpatient setting.

The course of individual therapy on the MANNA intervention is divided into three phases. Phase 1 (weeks 1–4) is about getting to know the patient and building a therapeutic relationship and the working alliance, exploring reasons for undergoing inpatient therapy, exploring short- as well as long-term goals of the patients and identifying how the AN disorder seems to help or where it hinders to achieve these life-goals of the patient. Biographical aspects and other factors that contributed to the development of AN are discussed. All provided worksheets in this phase are obligatory.

To provide some flexibility to therapists, week 4 contains a selection of four alternative worksheets all addressing pros and cons of AN and beliefs associated with AN in different ways. This enables the therapist to choose the worksheet that seems most suitable to the patient at the present moment (e.g., choosing a narrative task vs. a cognitive-rationale task). Additionally, the alternative worksheets can further be used in case ambivalence remains very high at this stage and needs further exploring and developing discrepancies between the status quo and wishes/goals for the future.

In transition to phase 2 (starting in week 5), readiness and confidence rulers are used to visualize the motivational standpoint of the patient and planning steps for the further course of treatment. This involves the selection and prioritization of focal treatment topics by the patient together with her therapist. A variety of potential topics are given on worksheet 6, representing topics patients with AN frequently struggle with including self-esteem (22), identity (23), relationships/social interactions (24), body image (25) as well as emotions, and needs (26). Patients can add own topics and therapists can bring in own worksheets accordingly as long as they are discussed in the therapeutic style of motivational interviewing.

Phase 3, the end of the MANNA therapy, entails a central worksheet called “motivational map” on which significant parts of the last 10 weeks of treatment are integrated: Patients principles and values, long-term goals in different areas of the patients life, consequences of the eating disorder and what motivates the patients to move forward with regard to their recovery from AN as well as the next goals in treatment and focal topics for further (outpatient) treatment. This enables a reflection of the past individual therapy sessions, visualizes the patients current motivational stance, and can be a summary that facilitates transition into a setting of partial hospitalization or outpatient care.

Sample

Patients with AN being admitted to one of the two university hospital study sites for specialized inpatient treatment were invited to participate in this study over a period of 1 year. Inclusion criteria consisted of a minimum age of 18 years and full-syndrome AN according to the DSM-5. Exclusion criteria were a BMI below 12 kg/m² since continuous attendance of individual psychotherapy sessions cannot be guaranteed below that weight due to probable cognitive impairments or somatic complications. Further exclusion criteria were: comorbidities of schizophrenia spectrum disorders, bipolar disorder as well as current substance abuse. Notably, although being female was not an inclusion criterion, only female patients with full-syndrome AN presented at the recruiting sites during the study period.

Measures

The following measures and questionnaires were presented to all participants.

Diagnostic and Clinical Interviews (SCID-I, EDE Interview)

The German version of the Structured Clinical Interview for DSM-IV [SCID-I; (27)] was administered and adopted to fit DSM-5 criteria (the SCID interview for DSM-5 was not yet available in German). It is a semistructured interview guide for administering valid diagnoses according to DSM-5 and was used to assess comorbidities in the present sample. For verification of the AN diagnosis and exploration of eating disorder pathology, the Eating Disorder Examination Interview [EDE-I; (28)] was administered.

Phase of therapy	Week	Worksheet	Purpose and goal
1 Motivational positioning	1	My journey into therapy	Establishing a relationship, exploring where patients are coming from (barriers/resources)
	2	Therapy goals	Setting up the treatment framework and goals
	3	Wishes for life domains	Developing discrepancies between the future and the current situation (eating disorder)
	4	<i>Choose at least 1 of 4</i> Decisional balance sheet Letter to the eating disorder Imagining extremes Implications of chronic AN	Exploring pros and cons concerning AN, strengthening reasons for change
	5	Ready, willing and able	Visualizing the current motivational standpoint with readiness and confidence rulers
2 Working on focal topics	5-9	My most important topics	Reflecting and prioritizing topics for further inpatient therapy
		<i>Focal topics in no particular order</i> Guiding principles	Exploring personal principles and values, developing discrepancies
		Personal strengths and what I like about me	Strengthening facets of identity not associated with AN
		House of self-esteem	Stabilizing and strengthening self-esteem
		Relationships	Exploring social relationships and planning desired changes
		Body image	Exploring and adapting cognitions and attitudes towards the body
		Emotions	Recognizing and distinguishing between different emotions
My feelings	Getting in touch with frequent own emotions		
Emotions and needs	Exploring emotions as signaling of needs		
3 Summary and prospects	10	Motivational map	Reflecting past weeks of treatment, reasons for change and future goals

FIGURE 1 | Overview of the MANNA intervention.

Sociodemographic and Closure Questionnaires

At the beginning of the diagnostic interview, patients filled in a demographic questionnaire with basic information such as gender, age, living situation, education as well as year of initial diagnosis of AN and former treatments (if any). Height and weight were measured in the inpatient unit at admission (and regularly during the course of treatment) and were extracted from the patients' clinical file.

At the end of inpatient treatment or at the end of the study period (week 10), therapists filled in a closure questionnaire for each participating patient that documented the date of discharge from inpatient treatment and kind of discharge (e.g., regular treatment termination, dropout of treatment, need to transfer the patient to another department or another hospital) as well as other characteristics of the treatment course such as changes of therapists.

Psychiatric Status Rating (PSR) for AN

The German version of the Psychiatric Status Rating [PSR; (29)] is a rating completed by the therapist to evaluate the patient's current psychopathological state and indicates the severity of the disorder (i.e., AN). It consists of 6 stages ranging from 1 (no symptoms of AN) to 6 (severe symptoms of AN) whereof the ratings 5 and 6 refer to full-syndrome AN according to the DMS-5.

University of Rhode Island Change Assessment—Short (URICA-S)

The University of Rhode Island Change Assessment—Short [URICA-S; (30)] is a self-report measure for assessing the four stages of change according to the transtheoretical model [TTM; (31)]. A total of 16 items are rated on a 5-point likert scale from 0 (do not agree at all) to 4 (agree very strongly) which can be computed into the four subscales precontemplation, contemplation, action, and maintenance. Internal consistencies in the present sample proved to be good with Cronbachs α between 0.562 and 0.850 for the contemplation, action and maintenance scales. A floor effect for the precontemplation scale could be observed which was however to be expected. Since all of the patients decided to attend inpatient therapy for their AN, precontemplation was expected to be very low. Otherwise the decision for receiving treatment would likely not have been made by the patients.

Helping Alliance Questionnaire (HAQ)

The Helping Alliance Questionnaire (32) is an instrument assessing the therapeutic alliance in therapy. 11 items are rated on a 6-point likert scale (0 not at all –5 very much) that are computed to the two subscales "relation to the therapist" and "satisfaction with therapeutic outcome" which can be combined to a total score of therapeutic alliance. The HAQ can be used in a self-report version (e.g., patients' perspective) as well as a third-party assessment (e.g., rated by the therapist). Both versions were used in the present study and proved to be reliable measures with Cronbachs $\alpha = 0.585 - 0.919$.

Eating Disorder Pathology (EDE-Q)

The Eating Disorder Examination—Questionnaire (33) is the questionnaire version of the Eating Disorder Examination Interview used for diagnostics and was used as an indication of eating disorder pathology in the course of treatment. Twenty-four items are computed to the four subscales "restraint," "eating concern," "weight concern," and "shape concern." Internal consistencies of the EDE-Q proved to be excellent in the present study with Cronbachs $\alpha = 0.730 - 0.989$.

Acceptance and Feasibility Questionnaire

A self-administered questionnaire was used for assessing acceptance, feasibility and benefits from the patients' perspective on a 5-point likert scale as well as free text for comments and suggestions for improvement. Therapists that had patients in the intervention group also gave feedback on acceptance and feasibility of the MANNA intervention as well as a rating of benefits and possible improvements of the individual worksheets of the MANNA treatment.

Procedure

Patients were informed about the study and invited to participate consecutively upon presentation for inpatient treatment at one of the two participating university hospitals. If they consented to participate, patients were randomly assigned to the intervention, or the control group according to predefined randomization lists. The patients' individual psychotherapist was informed about the inclusion of the patient into the study and her allocation to the intervention or control group. An appointment for the diagnostic interview with an independent interviewer (not the individual therapist) was scheduled before or within the first days of inpatient treatment. Patients underwent the diagnostic interview and received the MANNA treatment in individual psychotherapy sessions (intervention group) or the treatment-as-usual (control group). Questionnaires were filled in in week 1, 5, and 10 of inpatient treatment by the patient as well as the individual psychotherapist. For all patients, (regular or irregular) end of treatment as well as changes in psychotherapists and other events were documented.

This study was carried out in accordance with the recommendations of good clinical practice. The protocol was approved by the ethics committee of the medical faculty of the University of Tuebingen (No. 148/2018BO1) as well as the ethics committee of the medical faculty of the University of Duisburg-Essen (No. 19-8653-BO). All participants gave written informed consent in accordance with the Declaration of Helsinki. The study was registered with the German Clinical Trials Register (DRKS) under the trial number DRKS00015639.

Analyses

All statistical analyses were performed in IBM SPSS Statistics (version 27). The level of significance for all analyses was set at $\alpha = 0.05$. Means, standard deviations and percentages are reported for sample descriptions. Kolmogorov-Smirnov tests were used to assess variables for normal distribution. *T*-tests were used for normally distributed variables and Mann-Whitney-*U*-tests for not normally distributed variables to assess differences between

the two study groups at baseline and at the end of treatment. For all single comparisons, Cohens *d* is reported as a measure of effect sizes. According to Cohen (34), $d > 0.2$ thereby indicates a small effect, $d > 0.5$ a medium effect and $d > 0.8$ a large effect. For the comparison of the distributions of AN subtypes in the two study groups at baseline, a chi-squared test is used. To assess treatment adherence, Fishers exact test and the subsequent calculation of an odds ration including a confidence interval are reported.

RESULTS

A total of 27 patients initially agreed to participate in the study. After omitting data sets of patients that did not hold up with their diagnosis of full syndrome AN during the diagnostic interview or were scheduled but not admitted to inpatient therapy, a total of $N = 22$ females participated in the study.

Descriptive Statistics

An overview of the demographic and clinical characteristics of the participants at baseline can be found in **Table 1**.

Unfortunately, there was a significant difference at baseline concerning the HAQ sum score in the self-report version between the intervention and the control group with patients in the intervention group rating the therapeutic alliance to be better (indicated by a higher score) than patients in the control group. There were no other significant differences of both groups at baseline.

Acceptance and Feasibility

Overall acceptance and feasibility of the MANNA intervention was rated high to very high by patients as well as therapists concerning nearly all investigated aspects. The individual ratings can be found in **Table 2**.

Concerning the question of “missing topics in the first weeks of treatment,” the low average ratings in this regard indicated that patients were satisfied with the topics addressed in phase 1 and no essential topics were missing in the MANNA intervention from a patients perspective. As for comments on potential useful additions to the intervention, patients indications were mainly related to worksheet 2 (goals for inpatient therapy) for which one patient wished to shorten this process of writing down inpatient therapy goals and defining steps toward achieving them. Whereas, another patient wished to discuss inpatient therapy goals in more detail and would like to add a more creative approach (such as visual or narrative accounts). Another useful addition might be a designated worksheet to explore more about the family background, as suggested by a patient as well as a therapist. Finally, compiling the worksheets in a therapy folder and/or incorporating accompanying tasks such as small homework or therapy diary task was suggested by a patient.

Readiness to Change, Treatment Adherence, and Therapeutic Alliance

Concerning treatment adherence, patients of the intervention group completed inpatient treatment on regular terms significantly more often than patients of the control group who dropped out or were transferred or discharged before the

TABLE 1 | Demographic and clinical characteristics of the study population at baseline ($N = 22$).

Variable	Intervention group ($n = 11$)	Control group ($n = 11$)	Analysis
	<i>M (SD)</i>	<i>M (SD)</i>	
Age	31.5 (9.5)	31.9 (12.6)	$U = 56.50, p = 0.797, d = 0.11$
BMI	15.6 (1.3)	15.3 (1.5)	$t(19) = -0.51, p = 0.614, d = -0.22$
Illness duration in years	10.9 (8.6)	7.2 (5.9)	$t(17) = -1.09, p = 0.290, d = -0.50$
No. of comorbidities	1.1 (1.0)	2.0 (1.9)	$U = 38.00, p = 0.393, d = 0.41$
AN subtype			$\chi^2(1) = 0.19, p = 0.665$
- restrictive	45.5 %	36.4 %	
- binge-purge	54.5 %	63.6 %	
EDE-Q			
- restraint	4.4 (2.0)	4.6 (1.6)	$U = 59.50, p = 0.949, d = 0.03$
- eating concern	3.4 (2.0)	3.7 (1.5)	$t(20) = 0.51, p = 0.617, d = 0.22$
- weight concern	4.1 (1.6)	4.5 (1.4)	$t(20) = 0.66, p = 0.519, d = 0.28$
- shape concern	4.4 (1.6)	5.0 (0.8)	$U = 51.50, p = 0.562, d = 0.25$
- sum score	4.1 (1.7)	4.5 (1.2)	$U = 56.00, p = 0.797, d = 0.13$
PSR	5.2 (0.6)	5.6 (0.5)	$U = 35.00, p = 0.173, d = 0.65$
URICA-S			
- precontemplation	0.6 (0.5)	0.4 (0.4)	$U = 41.50, p = 0.217, d = 0.55$
- contemplation	3.2 (0.5)	3.2 (0.9)	$t(20) = 0.15, p = 0.884, d = 0.06$
- action	3.3 (0.6)	2.7 (1.0)	$t(20) = -1.68, p = 0.109, d = -0.72$
- maintenance	2.9 (1.0)	2.0 (1.4)	$t(20) = -1.80, p = 0.088, d = -0.77$
HAQ sum score			
- self-report	44.3 (9.1)	35.3 (7.0)	$t(19) = -2.56, p = 0.019, d = -1.12$
- therapist report	33.5 (5.2)	33.8 (7.2)	$t(18) = 0.11, p = 0.916, d = 0.05$

AN, Anorexia nervosa; BMI, body mass index (kg/m^2); EDE-Q, Eating Disorder Examination-Questionnaire; HAQ, Helping Alliance Questionnaire; PSR, Psychiatric Status Rating; URICA-S, University of Rhode Island Change Assessment – Short.

intended end of treatment more often. The odds ratio indicated that patients of the control group were nearly eight times more likely to drop out of treatment although the confidence interval indicates a very large possible range.

There were no significant differences concerning readiness to change as measured in the URICA-S at the different measurement time points between the intervention and the control group in this pilot sample of patients. For a detailed account of the single comparisons, see **Table 3**.

TABLE 2 | Evaluation of acceptance and feasibility of the MANNA intervention.

Evaluation	Patients (n = 9) Therapists (n = 9)	
	M (SD)	M (SD)
Personal/Patients overall benefits from the MANNA intervention	3.3 (1.1)	3.6 (0.7)
Overall satisfaction with the worksheets	4.7 (0.7)	4.2 (0.8)
Comprehensibility of the worksheets	4.6 (0.7)	4.4 (0.5)
Usefulness of the worksheets	3.7 (1.4)	3.9 (0.9)
Logical sequencing of worksheets	3.8 (0.8)	4.1 (0.6)
Balance of worksheets and space for emerging topics	3.9 (1.1)	3.9 (1.1)
Essential topics in the first weeks of treatment were missing	2.2 (1.2)	1.6 (0.9)
Usefulness of therapists instruction sheet		4.3 (0.5)

Ratings were given on a 5-point likert scale (1–5) with higher values indicating higher acceptance or satisfaction.

Bold values indicate significant results.

Contrary to our hypothesis, no significant differences of the therapeutic alliance ratings in self-report as well as therapist report could be found between the intervention group and the control group for the different measurement time points except for the difference between groups in the self-report version at baseline. Potential reasons for this difference are examined in the discussion section.

Exploratory Analyses of Weight Gain and Psychopathology

Exploratory completer analyses were performed for differences in increase in BMI and decrease in eating disorder psychopathology at the end of the MANNA intervention. Mean BMI increase in the intervention group from baseline to the end of the MANNA intervention was higher than in the control group (1.79 vs. 1.26). This indicates a larger BMI increase in the intervention group albeit not significant in this small pilot study sample. Details of these comparisons are also reported in **Table 3**.

Concerning eating disorder psychopathology, absolute numbers indicate a lower EDE-Q sum score in the intervention group than the control group at the end of inpatient treatment but no significant differences between emerged concerning any scales of the EDE-Q. The PSR as rated by the respective therapists also indicated no differences between the intervention and the control group at the end of treatment.

DISCUSSION

This pilot study of the novel MANNA intervention for inpatients with AN examined acceptance, feasibility and outcomes in German inpatient settings as well as its effects on treatment adherence and therapeutic alliance compared to treatment as usual. The MANNA intervention thereby proved to be very well-accepted and feasible according to its evaluations by patients as well as therapists, thus confirming the first hypothesis.

TABLE 3 | Single comparisons between the study groups at week 5 (t1) and at the end of treatment (t2).

Variable	Intervention group n = 11* Control group n = 11*		Analysis
	M (SD)	M (SD)	
READINESS TO CHANGE, TREATMENT ADHERENCE AND THERAPEUTIC ALLIANCE			
URICA-S t1			
- precontemplation	0.3 (0.4)	0.2 (0.2)	$U = 34.00, p = 0.633, d = 0.25$
- contemplation	3.1 (0.7)	3.4 (0.6)	$t(16) = 1.06, p = 0.307, d = 0.50$
- action	3.3 (0.5)	3.2 (0.7)	$t(16) = -0.23, p = 0.818, d = -0.11$
- maintenance	2.4 (1.3)	2.5 (0.9)	$t(16) = 0.18, p = 0.861, d = 0.08$
URICA-S t2			
- precontemplation	0.2 (0.3)	0.4 (0.4)	$t(7) = 1.10, p = 0.307, d = 0.74$
- contemplation	2.9 (0.6)	3.2 (0.9)	$t(7) = 0.61, p = 0.563, d = 0.41$
- action	3.4 (0.5)	3.3 (0.8)	$t(4,5) = -0.20, p = 0.854, d = -0.14$
- maintenance	2.3 (0.6)	2.6 (0.9)	$t(7) = 0.51, p = 0.625, d = 0.34$
Irregular treatment termination ⁺	2	7	Fishers exact test $p = 0.040, OR = 7.88, CI [1.11; 56.12]$
HAQ sum score t1			
- self-report	45.0 (5.6)	40.5 (8.7)	$t(16) = -1.33, p = 0.202, d = -0.63$
- therapist report	35.9 (9.0)	35.6 (7.3)	$U = 34.00, p = 0.633, d = 0.25$
HAQ sum score t2			
- self-report	45.5 (4.2)	43.8 (5.6)	$t(6) = -0.50, p = 0.633, d = -0.36$
- therapist report	37.5 (3.5)	36.4 (6.3)	$t(7) = -0.31, p = 0.766, d = -0.21$
WEIGHT GAIN AND PSYCHOPATHOLOGY AT THE END OF INPATIENT TREATMENT (EXPLORATORY ANALYSES)			
BMI t2	16.6 (1.0)	16.5 (1.5)	$t(7) = -0.12, p = 0.906, d = -0.08$
BMI gain t0 to t2	1.79 (0.9)	1.26 (0.8)	$t(7) = -0.95, p = 0.375, d = -0.64$
EDE-Q t2			
- restraint	1.3 (0.9)	2.5 (2.4)	$t(3,7) = 0.90, p = 0.425, d = 0.66$
- eating concern	1.6 (1.3)	2.8 (2.0)	$t(7) = 1.11, p = 0.304, d = 0.74$
- weight concern	2.2 (1.0)	2.8 (1.9)	$t(7) = 0.61, p = 0.559, d = 0.41$
- shape concern	2.9 (1.5)	3.9 (1.6)	$t(7) = 0.98, p = 0.360, d = 0.66$
- sum score	2.0 (1.0)	3.0 (1.0)	$t(7) = 1.00, p = 0.352, d = 0.67$
PSR t2	4.8 (0.4)	4.6 (1.1)	$U = 11.50, p = 0.841, d = 0.13$

BMI, body mass index (kg/m²); CI, confidence interval; EDE-Q, Eating Disorder Examination-Questionnaire; HAQ, Helping Alliance Questionnaire; OR, Odds ratio; PSR, Psychiatric Status Rating; t1, week 5 of treatment; t2, week 10 of treatment; URICA-S, University of Rhode Island Change Assessment—Short; *n refers to the sample size at baseline (week 1), ⁺irregular treatment terminations consisted of dropouts, transfers to another clinic/department or termination by the treatment team. Bold values indicate significant results.

Beyond its acceptance and feasibility, patients receiving the MANNA intervention completed their treatment significantly more often on regular terms compared to patients receiving treatment as usual that terminated treatment irregularly more often (through dropout, transfer to another clinic/department or termination by the treatment team). This indicates a higher treatment adherence of patients in the intervention group and confirms our second hypothesis about the positive influence of the MANNA intervention on treatment adherence. Since treatment dropout can be seen as one of the major risks in early stages of therapy for inpatients with AN (35), this effect can be seen as a very promising finding toward the potential effects of the novel approach of the MANNA intervention.

The other part of our second hypothesis however, concerning the MANNA intervention improving therapeutic alliance could not be confirmed in this pilot sample. There were no differences of patients' perception of the therapeutic alliance with their individual psychotherapist during or at the end of inpatient treatment between the intervention and the control group. At baseline, patients in the intervention group indicated a stronger subjective therapeutic alliance than patients in the control group. This difference could originate in several reasons.

On one hand, the small sample size could have produced this difference in therapeutic alliance ratings by chance. The effect would subsequently diminish in a larger sample size. As another possibility, a bias by therapist could have the difference although we tried to control for therapists influence on treatment effects by randomizing patients. Therefore, participating therapists had patients in the intervention group as well as patients in the control group which makes the assumption of a therapist effect less likely.

On the other hand, the difference in therapeutic alliance ratings at baseline might have been an early product of the MANNA intervention. Since the baseline questionnaires were frequently given out by the individual therapist, patients might have already had some interactions with their individual therapists (e.g., admission session). They therefore came in contact with the MANNA intervention and the therapeutic stance of motivational interviewing, possibly resulting in the initiation of a stronger early therapeutic alliance. This effect might have dissolved over the course of treatment when patients in the control group got to know their individual therapists better and rated their respective therapeutic alliance comparable to the intervention group.

In the literature, we could not find valid evidence for the impact of MI on early therapeutic alliance, therefore neither supporting nor weakening this assumption. There was one therapists' report about building up a good therapeutic relationship in a MI-based treatment of patients with AN from the MOSAIC trial (18). This process evaluation did however not specifically address early therapeutic alliance.

Apart from the direct effect of MI on early therapeutic alliance, evidence could be found for the effect of motivation to change. A study with inpatients with AN by Marzola et al. (36) shows the importance of motivation to change as a prerequisite or a moderator of early clinical improvement and the formation of a strong therapeutic alliance. Since strengthening motivation to

change is one of the key goals and effects of MI, this finding might also apply to MI.

Assuming therapists utilization of MI in the treatment of inpatients with AN strengthens early therapeutic alliance implies other possible effects: A cohort study about adolescent patients with AN showed that a higher rating of early therapeutic alliance was associated with reaching the target weight faster irrespective of the treatment setting (37). Another study with adult outpatients with AN however showed no impact of early therapeutic alliance on changes in weight but in parts of eating disorder pathology (namely restraint and shape concern) (38). Although at this time these are speculative assumptions that should be examined in future studies, the utilization of MI such as in the MANNA intervention might strengthen early therapeutic alliances which positively affect the outcome of treatment and/or changes in eating disorder pathology.

Only partial support could be found in the present pilot study for the third exploratory hypothesis. Patients in the intervention group did show greater BMI increase and improvement in eating disorder associated psychopathology at the end of inpatient treatment compared to the control group in absolute numbers. However, these differences did not turn out to be statistically significant. This probably originates in the small sample size at this measurement time point (four and five patients, respectively), therefore a larger sample could examine the validity of these differences.

Concerning further development of the treatment manual of the MANNA intervention, there are some advances that can be made for a stage II manual for a phase III MANNA study. According to Carroll and Nuro (20) these may lay in the explication of procedures and standards for therapist selection, in further elaborating the training and supervision of therapists conducting the intervention as well as in implementing guidelines for troubleshooting. From the experience with therapist trainings in the current study, especially the training of therapists might be further improved.

Therapist training in the current study contained an overview of MI and all of its aspects as well as training of different techniques. From the feedback of the trained therapists, it might be of benefit to keep the overview part to a minimum in favor of focusing on the core techniques to be used in the intervention. The focus can thereby be put on the training of basic MI skills such as the OARS techniques and giving information and advice. For further development of the therapist training, we would add a focus on techniques for rolling with resistance since therapists identified these as especially useful with patients with AN.

Another suggestion by therapists to the MANNA intervention was the inclusion of significant others and families. Outpatient interventions such as the MANTRA treatment (21) routinely incorporate significant others and dedicate a whole part of their treatment manual to this topic, thus emphasizing its importance. For our inpatient manual however, since sessions with significant others and relatives are an inherent part of the multidisciplinary treatment approach and not exclusive to individual psychotherapy, we did not dedicate a specific worksheet to this. It might be useful in the future however, to either offer an optional

worksheet that can be used at any given time in the intervention or at least provide some information on MI and the inclusion of significant others and relatives into the treatment.

The current study contains some limitations that need to be mentioned. First of all, the sample size was small for a comparative study in this pilot phase of the evaluation of the new manual. Potentially due to the even smaller sample at the end of treatment, some of the utilized measures did not reach a satisfactory reliability at the last measurement time point. Although significant differences in e.g., dropout rates were found, this results in a wider variability and therefore a large confidence interval for this finding. The replication of these findings in a larger sample should therefore be aimed for.

Another limitation resulting from the small sample size is the lack of subgroup analyses as well as analyses of potentially confounding variables such as therapist effects that could not be investigated in the context of this study. These analyses enable tailoring the MANNA intervention to specific subgroups and help differentiate cases in which other/additional interventions are needed for example due to cognitive impairments of patients due to the severe state of malnutrition. A future, fully powered RCT on the concept will add to the evidence base through more in-depth statistical analyses (e.g., survival analysis) but also minimize risk of biases through e.g., rater ratings of therapist behaviors with the Motivational Interviewing Skill Code (39) that was not possible in this pilot study setting.

In conclusion, this pilot study confirms high acceptance and very good feasibility of the newly developed MANNA intervention for the treatment of inpatients with AN. Although the sample size was relatively small and no significant differences concerning stages of change and treatment outcomes were found, patients receiving the MANNA interventions finished treatment

on regular terms significantly more often than patients in the control intervention, thus pointing at potential benefits in crucial dimensions of the therapy of AN.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the ethics committee of the medical faculty of the University of Tuebingen and the ethics committee of the medical faculty of the University of Duisburg-Essen. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

KZ, KK, SB, GR, KEG, SZ, and FJ contributed to the conception and design of the study. KZ, NR, SB, E-MS, and MT substantially contributed to the acquisition of data for the study. KZ performed the statistical analysis and wrote the first draft of the manuscript. All authors contributed to manuscript revision and read and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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