

Progressive Muscle Relaxation Exercise in Eating Disorders: A Case Report of Bulimia Nervosa

 Merve Oğur,¹  Hanife Özlem Sertel Berk,²  Başak Yücel³

¹Department of Psychology, Doğuş University, İstanbul, Türkiye

²Department of Psychology, İstanbul University, İstanbul, Türkiye

³Department of Psychiatry, İstanbul University, İstanbul Faculty of Medicine, İstanbul, Türkiye

ABSTRACT

Bulimia nervosa (BN) is characterized by adverse biopsychosocial effects, necessitating a multidisciplinary treatment. Among psychological interventions, Cognitive-Behavioral Therapy remains a leading option. However, as motivation and readiness for change influence treatment outcomes, stage-tailored interventions based on the Transtheoretical Model are proposed. Progressive muscle relaxation exercise (PMRE) is offered as a facilitator of stage transition via reduced tension and anxiety, a technique that has been applied to various disorders across different fields. This study aimed to present a case diagnosed with BN, treated with a PMRE protocol based on the tension model of BN, implemented as a standalone module during the waiting-list period for disorder-specific treatment. The PMRE protocol was intended to help identify the relationship between daily stressors, physical tension, and eating disorder (ED) symptoms. Progress was evaluated through pre-post and follow-up measures of ED symptoms, eating habits, body satisfaction, self-esteem, emotion regulation, alexithymia, depression, anxiety, and stage transition, as well as an urge diary, in-session and between-session tension ratings, and in-session feedback. After eight therapy sessions and a three-month follow-up, improvements in ED symptoms and most other measures were observed. Enhanced awareness and management of physical tension induced by daily stressors were also recorded. To our knowledge, no prior studies in Turkey have implemented this technique in the treatment of EDs. PMRE may contribute to improvements in bodily awareness and treatment motivation associated with symptom regulation in BN. However, because of the single-case design and lack of a control condition, the results should be interpreted with caution. Further controlled studies are needed to clarify the specific role of PMRE in the treatment of BN.

Keywords: Case report, bulimia nervosa, eating disorders, cognitive-behavioral therapy, progressive muscle relaxation exercise, tension model.

ÖZ

Yeme Bozukluklarında Aşamalı Kas Gevşeme Egzersizi: Bulimiya Nervosa Olgu Sunumu

Bulimiya nervosa (BN), olumsuz biyopsikososyal etkilerle karakterize olup multidisipliner bir tedavi gerektirmektedir. Psikolojik müdahaleler arasında bilişsel davranışçı terapi önde gelen yaklaşımlardan biri olarak kabul edilmektedir. Bununla birlikte, motivasyon ve değişime hazır oluş tedavi sonuçlarını etkilemesi nedeniyle, Transteorik Model'e dayalı aşamaya özgü müdahaleler önerilmektedir. Aşamalı kas gevşeme egzersizi (AKGE), gerginlik ve anksiyeteyi azaltarak değişim aşamaları arasındaki geçişi kolaylaştıran bir teknik olarak önerilmekte ve farklı alanlarda çeşitli bozukluklarda uygulanmaktadır. Bu çalışma, fiziksel gerginliğin BN semptomlarıyla ilişkili olduğunu varsayan BN gerginlik modeline dayalı olarak, yeme bozukluğuna özgü tedavi programı için bekleme listesi sürecinde bağımsız bir modül olarak uygulanan AKGE protokolü ile izlenen BN tanılı bir olguyu sunmayı amaçlamaktadır. AKGE protokolü, günlük stre-



Cite this article as:

Oğur M, Sertel Berk HÖ, Yücel B. Progressive Muscle Relaxation Exercise in Eating Disorders: A Case Report of Bulimia Nervosa. J Cogn Behav Psychother Res 2026;15(3): 183–191.

Address for correspondence:

Merve Oğur.
Doğuş Üniversitesi, İktisadi,
İdari ve Sosyal Bilimler Fakültesi,
Psikoloji Bölümü, İstanbul,
Türkiye
Phone: +90 544 719 69 70
E-mail:
mogur@dogus.edu.tr

Submitted: 10.03.2026

Revised: 23.05.2026

Accepted: 24.06.2026

Available Online: 19.08.2026

JCBPR, Available online at
<http://www.jcbpr.org/>



This work is licensed under
a Creative Commons
Attribution-NonCommercial
4.0 International License.

sörler, fiziksel gerginlik ve yeme bozukluğu belirtileri arasındaki ilişkinin fark edilmesine yardımcı olmayı amaçlamaktadır. İlerleme, yeme bozukluğu belirtileri, yeme alışkanlıkları, beden memnuniyeti, benlik saygısı, duygu düzenleme, aleksitimi, depresyon, anksiyete ve değişim aşamalarındaki geçişe ilişkin ön test, son test ve takip ölçümleri kullanılarak değerlendirildi. Ayrıca değerlendirme sürecinde dürtü günlüğü, seans sırasında ve seanslar arasında gerginlik derecelendirmesi ile seans içi geri bildirimlerden yararlanıldı. Sekiz terapi seansı ve üç aylık takip görüşmesi sonunda yeme bozukluğu belirtilerinde ve sonuç ölçümlerinin çoğunda iyileşme gözlemlendi. Ayrıca olgunun günlük stresörlerin neden olduğu fiziksel gerginliğe ilişkin farkındalığı ve bu gerginliği yönetme becerisinin arttığı belirlendi. Bildiğimiz kadarıyla, Türkiye’de yeme bozukluğu tedavisinde bu tekniğin uygulandığı bir çalışma bulunmamaktadır. AKGE, bedensel farkındalık ve tedavi motivasyonu yoluyla BN belirtilerinin azaltılmasına katkı sağlayabilecek destekleyici bir teknik olarak değerlendirilebilir. Ancak çalışmanın tek olguya dayanması ve kontrol grubunun bulunmaması nedeniyle bulgular dikkatle yorumlanmalıdır. AKGE’nin yeme bozuklukları tedavisindeki özgül rolünü daha iyi ortaya koymak için kontrollü çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: Aşamalı kas gevşeme egzersizi, bilişsel davranışçı terapi, bulimiya nervosa, gerginlik modeli, yeme bozuklukları.

INTRODUCTION

Eating disorders (ED) are characterized primarily by disturbances in eating behaviors related to excessive concern with weight, body image, and control over these (Fairburn, 2008). In bulimia nervosa (BN), an ED subtype, binge-eating episodes, and compensatory behaviors (e.g., purging or self-starvation) (Amerikan Psikiyatri Birliği [APB], 2013) have adverse biopsychosocial impacts, requiring a multidisciplinary approach (Joy et al., 2003). Although Cognitive-Behavioral Therapy (CBT) is frequently used for ED (Fairburn et al., 1991), as motivation and readiness for change influence treatment outcomes, stage-tailored interventions based on the Transtheoretical Model (TTM) are proposed to improve adherence and treatment outcomes (Ergüney-Okumuş et al., 2016; Dunn et al., 2003). According to the TTM, individuals progress through precontemplation, contemplation, preparation, action, maintenance, and termination stages (Prochaska & DiClemente, 1982). For those with low motivation, interventions such as progressive muscle relaxation exercises (PMRE) have been proposed to facilitate stage transitions by reducing physical tension and anxiety, common barriers to treatment, while improving receptivity and self-efficacy, thereby enhancing motivation (Ergüney-Okumuş et al., 2019). PMRE is a structured relaxation training approach derived from the work of Jacobson (1943) and Wolpe (1968) and implemented in stepwise applied formats such as Linton’s (1982) protocol (as described in Sertel-Berk, 2020). The intervention proceeds through successive stages, including tension-relaxation, relaxation-only practice, breathing-supported relaxation, and cue-controlled relaxation. Through this stepwise process, individuals are expected to increase awareness of bodily tension and develop the ability to regulate tension-related physiological responses before they escalate into maladaptive emotional or eating-related behavioral patterns.

In Türkiye, relaxation exercises have been implemented in the treatment of pain disorders (Salman & Sertel-Berk, 2017; Sertel-Berk, 2002; Uzunkaya & Şen, 2021), obsessive-compulsive disorder (Ergüney-Okumuş et al., 2019), and anxiety disorders (Çenesiz, 2015). With respect to ED, relaxation has been applied to night eating syndrome, with reductions in depression, anxiety, stress, and symptom severity (Allison & Tarves, 2011; Berner & Allison, 2013; De Zwaan et al., 2015; McCuen-Wurst et al., 2018; Pawlow et al., 2003; Vander Wal et al., 2015). It has also been used adjunctively to reduce comorbid anxiety in ED, including binge-eating disorder (Allison & Tarves, 2011), anorexia nervosa, and BN (Breiner, 2003; Bulik et al., 1998; Shapiro et al., 2008). To our knowledge, no study has used relaxation as a standalone intervention in ED, either abroad or in Türkiye.

In contrast, Sertel-Berk (2020, p.134) proposed a tension model for BN, in which physical tension is assumed to precede binge-eating and compensatory behaviors (e.g., purging and excessive exercise). According to this model, PMRE may help manage internal (i.e., negative self-evaluation), external (i.e., interpersonal conflicts), and physiological (i.e., hunger, fatigue, and sleep deprivation) triggers of tension and disrupt the tension-BN symptom cycle (Fig. 1). From a cognitive-behavioral perspective, PMRE can be conceptualized as a self-regulation strategy that targets processes that are central to BN cognitive-behavioral models. Increasing awareness of bodily tension may facilitate the identification of internal and external triggers preceding binge-eating episodes, thereby supporting self-monitoring and early intervention in the binge-purge cycle. In addition, learning to respond to tension with relaxation rather than compensatory behaviors may function as a form

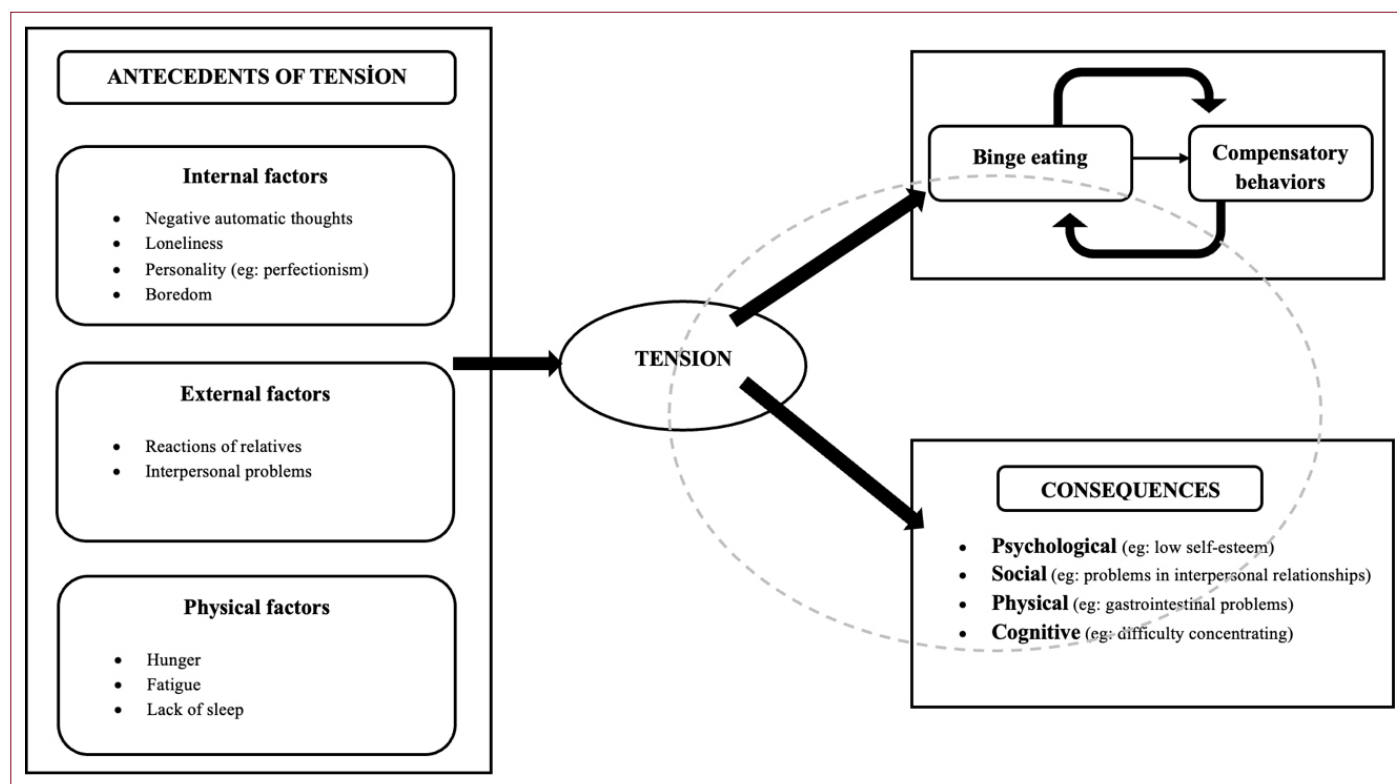


Figure 1. The BN tension model (Sertel-Berk, 2020).

of alternative response training and stimulus control. In this respect, PMRE may be understood as a behavioral technique compatible with cognitive-behavioral approaches that aim to modify antecedents and maintaining mechanisms of ED symptoms. This study aimed to present a BN case in which a structured PMRE protocol based on the tension model of BN was implemented as a primary intervention during the waiting-list period for disorder-specific treatment.

CASE REPORT

The case was a 21-year-old female university student diagnosed with BN and referred from the Eating Disorders Unit of İstanbul University, İstanbul Faculty of Medicine, by the third author, who continued to monitor the clinical process following the referral. At intake, her height was 160 cm and her weight was 50.5 kg, corresponding to a body mass index of 19.53 kg/m². The intervention was conducted under the supervision of the second author. Consent for audio-recording and publication was obtained, and confidentiality ensured.

The patient's disordered eating behavior started approximately seven years ago. At referral, the patient experienced binge-eating episodes and purging three and six times per week, respectively. The patient also reported impaired daily

functioning, including food preoccupation, restlessness, poor concentration, and social withdrawal. Predisposing factors included parental divorce at age 2, maternal depression, age-inappropriate responsibilities, perfectionism, and core beliefs of being unlovable, inadequate, and worthless. Current triggers and maintaining factors included fear of attack-driven vigilance, boredom, prolonged self-starvation, insomnia, fatigue, and reactions from relatives (e.g., her father's criticism). Before PMRE, the patient had been followed in a psychiatry outpatient clinic and was receiving methylphenidate treatment (20 mg/day) for Attention-Deficit/Hyperactivity Disorder (ADHD), which remained stable throughout the intervention period. According to the patient's clinical history, ADHD was diagnosed during childhood, at ages 10 and 12, by child psychiatry services. Eating-related preoccupations, body image concerns, binge-eating episodes, and purging behaviors had been present since the second year of high school. ADHD remained clinically active during the PMRE intervention period, and methylphenidate treatment (20 mg/day) was maintained at a stable dose.

During the PMRE intervention period, the patient was on the waiting list for disorder-specific ED treatment and did not receive any BN-targeting structured psychotherapy or

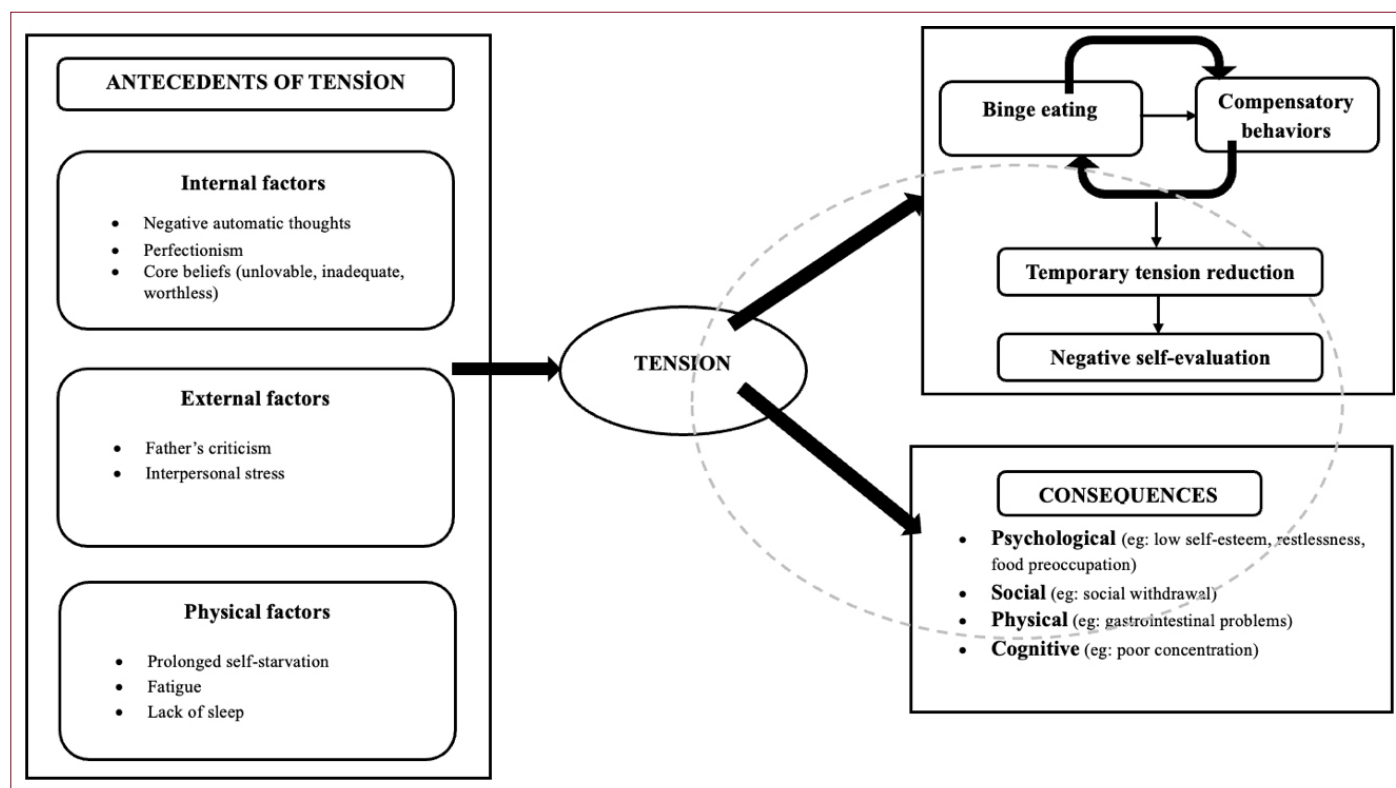


Figure 2. Case-specific formulation of BN symptoms based on the tension model.

nutrition-related intervention targeting BN. However, the patient continued regular monthly psychiatric outpatient follow-up and stable psychopharmacological treatment. After completing the PMRE intervention and the three-month follow-up period, the patient was enrolled in a multidisciplinary treatment program that included nutritional counseling and eating disorder-specific psychotherapy.

Consistent with the tension model of BN (Sertel-Berk, 2020), interpersonal stressors, such as criticism from her father, together with prolonged self-starvation, insomnia, and perfectionistic tendencies, appeared to contribute to increases in bodily tension in the present case. The patient reported that heightened tension typically preceded binge-eating and compensatory behaviors, which temporarily reduced tension but were followed by negative self-evaluation, thereby maintaining the symptom cycle. Based on this case-specific formulation, PMRE was introduced to increase awareness of bodily tension and support the development of alternative coping responses before binge-eating episodes (Fig. 2).

PMRE Protocol

The PMRE intervention was delivered by the first author, a psychologist who had completed formal training in

psychology and had three years of supervised clinical experience in an EDs unit within a CBT-oriented clinical setting, including conducting individual patient interviews. The therapist also received specific supervision in the application of the PMRE protocol. The implementation process was supervised by the developer of the tension model (a psychologist) and additionally monitored by a psychiatrist, ensuring a multidisciplinary clinical framework throughout the intervention period.

Based on Sertel-Berk's (2020) tension model of BN, the protocol comprised four steps of: tension-relaxation, relaxation-only, breathing-relaxation, and cued-relaxation, delivered over eight sessions, including psychological assessment, and a three-month follow-up.

The intervention was delivered individually in a face-to-face format in weekly 50-min sessions across eight intervention sessions, followed by a three-month follow-up assessment, resulting in nine sessions in total. The first session included a psychological assessment and relaxation training preparation. The next two sessions focused on the tension-relaxation step, followed by two sessions involving relaxation-only practice. The urge diary was introduced during the relaxation-only phase

rather than at the beginning of treatment because the development of bodily tension awareness through earlier PMRE stages was considered necessary to facilitate the recognition and monitoring of urge-related antecedents. The two subsequent sessions introduced breathing-based relaxation, and the eighth session focused on cue-controlled relaxation. Between-session practice was assigned on a weekly basis and included daily repetition of the relaxation exercises practiced during sessions, together with pre- and post-exercise tension ratings on a 0–10 scale and completion of an urge diary.

Treatment adherence was monitored through weekly therapist review of between-session practice, including completion of daily relaxation exercises, pre- and post-exercise tension ratings, and entries in the urge diary. Across the tension-relaxation and relaxation-only phases, the patient reported performing the assigned exercises on a daily basis as instructed. During the breathing-based relaxation phase, the patient completed the prescribed brief breathing exercises multiple times per day as planned. Pre- and post-exercise tension ratings were regularly recorded throughout the intervention period. Completion of the urge diary was more variable, with occasional reluctance to record entries, although the patient continued to report awareness of urge-related triggers during session reviews. Overall, adherence to the structured relaxation exercises was high, as evidenced by consistent daily practice across intervention phases and regular monitoring of tension levels.

The duration of home practice varied according to the step of the protocol: approximately 20 min for tension-relaxation exercises, 10 min for relaxation-only exercises, and 3–5 min for breathing-based relaxation. During the cue-controlled relaxation phase, the patient was instructed to take a single breath and deliver a relaxation cue to the whole body whenever encountering the designated cue. Exercises were initially conducted with therapist guidance during sessions; audio recordings were provided to support independent practice of the tension-relaxation step, and later steps were practiced using self-guided verbal cues. The intervention followed a structured protocol originally developed for pain conditions and was implemented according to predefined sequence of steps.

The primary aim of this study was to increase awareness of bodily tension and its relation to daily stressors rather than to achieve mere relaxation or symptom relief. Each session began with a weekly review followed by PMRE practice, emphasizing the recognition of tension and its antecedents.

The session content followed a predefined stepwise protocol structure, and symptom-related observations were recorded separately from the procedural description of the intervention. Progress was evaluated through pre-post and follow-up measures of ED symptoms using the Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 1994), eating habits using the Eating Habits Questionnaire (EHQ; Bozan, 2009), body satisfaction using the Body Parts Satisfaction Scale (BPSS; Gökdoğan, 1988), self-esteem using the Rosenberg Self-Esteem Scale (RSES; Çuhadaroglu, 1986), emotion regulation using the Difficulties in Emotion Regulation Scale (DERS; Rugancı & Gençöz, 2010), alexithymia using the Toronto Alexithymia Scale (TAS-20; Güleç et al., 2009), depression using the Beck Depression Inventory (BDI; Hisli, 1988), anxiety using the Beck Anxiety Inventory (Ulusoy et al., 1998) and the State-Trait Anxiety Inventory (STAI; Öner, 1977), and stage transition using the BN Stages of Change Scale (BN-SOCS; Ergüney-Okumuş et al., 2018) (see Appendix 1), as well as an urge diary (see Appendix 2), in-session and between-session tension ratings (Erdoğan-Demir et al., 2026), and in-session feedback. These instruments were selected to capture changes across core domains relevant to the tension model of BN, including ED symptoms, body-related concerns, emotional awareness, emotion regulation, anxiety, depression, self-esteem, and motivational readiness for change. The primary outcome indicators included changes in binge-eating and purging frequency, ED symptom severity, and stage of change. Secondary outcome indicators included body satisfaction, self-esteem, emotion regulation, alexithymia, depression, anxiety, and self-reported tension awareness.

Session 1

The first session consisted of a psychological assessment exploring the patient's complaints and developmental, family, social, and academic history. PMRE was also introduced, conceptualizing binge-eating as a consequence of accumulated tension. The treatment goal was to recognize bodily tension and the antecedents of binge-urges and to monitor the bodily impact of daily stressors in relation to ED symptoms.

Sessions 2–3

These sessions focused on the first PMRE step (tension-relaxation). The homework involved daily audio-guided practice with tension ratings before and after the exercise (0–10 scale). The patient reported recognizing tension, particularly in her shoulders when urges emerged, and noted that PMRE prevented some binge episodes. The mean tension decreased from 7 to 5 after practice.

Sessions 4–5

After Session 3, the patient reported three binge episodes and daily urges, none between Sessions 4 and 5, and two managed urges. Awareness of bodily tension increased, and insight into the antecedents of binge episodes was gained:

“...When I’m alone, I feel uncomfortable... I get (feel) the urge to have an attack... I generally feel very uncomfortable when I’m alone... and I want to distract myself with food, so I don’t have to think about what to do...”

These sessions introduced the second PMRE step (relaxation-only). The homework included daily relaxation, tension ratings, and an urge diary.

Sessions 6–7

Between these sessions, she reported managed food cravings and no binge episodes. The mean tension decreased from 7 to 6 in week one and from 7 to 5 in week two. She noted that focusing on the urge often reduced it. These sessions introduced breathing and relaxation. The homework involved practicing breathing-relaxation three times daily in standing, sitting, and supine positions while relaxing during exhalation. In Session 7, feedback was requested, as the 8th session would be for termination. The patient expressed confidence in continuing the exercises:

“Actually, I’m a little sad that it’s over, but I’m also a little happy. I know I will continue these practices after it’s over. I’ve become very accustomed to these breathing exercises and know I’ll always use them because I’ve internalized them.”

Session 8

In the final PMRE session, she reported one binge-episode from the previous week. A three-month follow-up was scheduled. The final PMRE step, i.e., placing reminder stickers on frequently used objects and practicing brief breathing-relaxation when noticing them (cued-relaxation) was introduced as homework until follow-up. Treatment adherence remained high, with consistent completion of homework. Bodily awareness increased, and the patient coped more effectively with ED symptoms and interpersonal situations:

“During this process, my perspective completely changed. Instead of being tense, I became more relaxed. I used to react immediately, but now I relax and accept things. Even if I’m not relaxed, it’s easier because I know how to relax.”

Session 9 (Follow-up)

At the three-month follow-up, treatment gains were largely maintained. The frequency and severity of ED symptoms decreased. She reported tolerating negative emotions and using functional coping strategies instead of acting on urges:

Therapist: *“So, did you feel you were able to maintain your gains during this period?”*

Patient: *“Yes, definitely felt that. At least I realized I was able to manage... In the past, when I felt the urge to eat, I would immediately act on it. Now I say, ‘Let’s see what happens,’ and I feel more relaxed about it...”*

DISCUSSION

This study examined the implementation of a PMRE protocol based on the tension model of BN (Sertel-Berk, 2020) in a DSM-5–diagnosed BN case (APB, 2013). To our knowledge, this is the first report describing the use of PMRE as a structured standalone module targeting eating-related tension in an individual with BN during the waiting-list period for disorder-specific treatment. As binge-eating episodes in BN are influenced by multiple internal and external stressors (Stein et al., 2007), PMRE may help individuals recognize stress-related bodily tension before it escalates into binge-eating behavior.

Consistent with these findings, the patient became more aware of how daily stressors affected her body. The patient reported reductions in perceived tension preceding and following ED symptoms. Increased awareness of binge-episode antecedents helped her use alternative coping strategies instead of acting on urges. The patient also reported increased self-efficacy in managing the process after treatment and at follow-up. Pre-post-follow-up and weekly changes were monitored via a multimethod evaluation.

The reported binge-eating and purging at baseline decreased during treatment and fell below the BN threshold at follow-up (APB, 2013). Although this change suggests a clinically meaningful reduction in symptom frequency, conclusions regarding sustained remission should be interpreted cautiously given the single-case design and limited follow-up period. In addition to reductions in binge-eating and purging frequency below diagnostic threshold levels, improvements across several domains—including eating-related symptoms, stage of change, emotion regulation, and self-reported coping with urges—were accompanied by observable functional changes reported by the patient in daily stress management and interpersonal coping. Although the interpretation of questionnaire score changes should remain cautious in a single-case design, the convergence of behavioral indicators, motivational shifts, and patient-reported functional

improvements suggests that the observed changes were clinically meaningful rather than merely numerical. While scores on ED symptoms and eating habits decreased, the BN-SOCS (Ergüney-Okumuş et al., 2018) revealed a stage change from Preparation at pre-treatment to Action at post-treatment which remained at the three-month follow-up. This pattern may suggest the maintenance of treatment-related motivational changes. However, this stage transition should be interpreted cautiously, as motivational changes may also reflect nonspecific factors such as the passage of time during the waiting-list period, expectancy effects related to participation in a structured intervention, and repeated self-monitoring processes rather than the specific effects of PMRE alone. Furthermore, mild depression and anxiety scores at baseline decreased by the treatment end, and emotion regulation improved. These findings align with PMRE studies reporting reduced stress, anxiety, and depressive symptoms (Jacob & Sharma, 2018). However, improvements in these domains may also reflect nonspecific therapeutic factors, such as repeated self-monitoring and regular clinical contact. Notably, trait anxiety scores increased during follow-up despite reductions immediately after treatment. Although this pattern may partly reflect increased emotional awareness accompanying reductions in alexithymia, it may also indicate that PMRE alone was insufficient to produce durable changes in broader emotional processing domains. The parallel decrease in alexithymia and trait anxiety from pre- to post-treatment, followed by a concurrent increase at follow-up, may further suggest that improvements in emotional awareness were not fully stabilized over time and that longer or disorder-specific interventions may be required to support sustained change in these domains. Changes in body-related concerns were more limited. In particular, body satisfaction decreased at follow-up to a level below baseline, suggesting that improvements observed immediately after the intervention were not maintained over time and that PMRE alone may be insufficient to produce durable changes in body image-related domains. Similarly, concerns related to body shape and weight showed minimal improvement across assessment points, further supporting the interpretation that PMRE alone may be insufficient to address core body image-related aspects of BN, which are typically targeted through structured cognitive-behavioral interventions. Taken together, these mixed outcome trajectories suggest that while PMRE may contribute to improvements in tension awareness, coping with urges, and motivational readiness, its effects appear to be more limited in domains related to body image and broader emotional vulnerability, highlighting the importance of integrating relaxation-based approaches with disorder-specific cognitive-behavioral interventions. Although PMRE was implemented as the primary structured intervention targeting eating-

related tension during the waiting-list period for disorder-specific treatment, the patient continued to receive regular psychiatric outpatient follow-up and stable methylphenidate treatment (20 mg/day) for ADHD. In the present protocol, the urge diary was not conceptualized as an independent intervention component but rather as a complementary self-monitoring tool introduced after the development of bodily tension awareness through earlier PMRE stages. Accordingly, the recognition of urge-related antecedents was considered part of the broader self-regulation process targeted by the intervention. Therefore, the observed improvements cannot be attributed solely to PMRE, and pharmacological treatment and repeated self-monitoring may also have contributed to symptom change. Furthermore, after the completion of the PMRE intervention and follow-up period, the patient entered a multidisciplinary treatment program, including nutritional counseling and disorder-specific psychotherapy, which should be considered when interpreting long-term outcomes.

Although the gains were largely maintained, pre-follow-up measures showed a slight reduction in positive changes.

Limitations

Several limitations of this study should be considered when interpreting the findings. First, the results are based on a single-case design and therefore cannot be generalized beyond the present clinical context. Second, the absence of a control condition limits the ability to isolate the specific effects of PMRE. Third, although the urge diary was introduced as part of the broader PMRE self-regulation process, repeated self-monitoring procedures may also have contributed to symptom change. In addition, the patient continued to receive stable methylphenidate treatment during the intervention period, which may have influenced attentional and emotional regulation processes. Furthermore, reliance on self-report measures may have introduced reporting bias. Although multidisciplinary eating disorder treatment was initiated only after the completion of the PMRE intervention and follow-up period, its later implementation should be considered when interpreting long-term clinical implications. Finally, no additional assessment was conducted beyond the three-month follow-up period, despite evidence suggesting that extended follow-up may strengthen treatment effects (Yenice, 2025).

CONCLUSION

Overall, this case study suggests that PMRE may contribute to improvements in bodily awareness and self-regulation processes associated with binge-eating symptoms in BN. However, conclusions regarding its standalone efficacy cannot be drawn from a single-case design, and further research using case series, controlled comparative designs, and randomized controlled trials is needed to clarify its specific role within ED treatment.

Ethics Committee Approval: This is a single case report, and therefore ethics committee approval was not required in accordance with institutional policies.

Informed Consent: Written informed consent for audio recording and publication of the case report was obtained from the patient, and confidentiality was maintained.

Conflict of Interest: The authors declare that there is no conflict of interest.

Financial Disclosure: No funding was received for the preparation, writing, or publication of this study.

Use of AI for Writing Assistance: OpenAI ChatGPT was used solely for language editing and improving the clarity of selected sentences. The authors reviewed and approved all AI-assisted revisions and take full responsibility for the content of the manuscript.

Authorship Contributions: Concept – MO, HÖSB, BY; Design – MO, HÖSB, BY; Supervision – HÖSB, BY; Data Collection and/or Processing – MO; Analysis and/or Interpretation – MO, HÖSB; Literature Review – MO; Writing – MO, HÖSB, BY; Critical Review – MO, HÖSB, BY.

Peer-review: Externally peer-reviewed.

REFERENCES

- Allison, K. C., & Tarves, E. P. (2011). Treatment of night eating syndrome. *Psychiatric Clinics of North America*, 34(4), 785-796. [CrossRef]
- Amerikan Psikiyatri Birliği. (2013). *Ruhsal bozuklukların tanınal ve sayımsal el kitabı* (5. baskı; E. Köroğlu, Çev. Ed.). Ankara, Türkiye: Hekimler Yayın Birliği. [In Turkish]
- Berner, L. A., & Allison, K. C. (2013). Behavioral management of night eating disorders. *Psychology Research and Behavior Management*, 6, 1-8. [CrossRef]
- Bozan, N. (2009). Hollanda Yeme Davranışı Anketinin Türk üniversite öğrencilerinde geçerlik ve güvenilirliğinin sınanması [Yüksek lisans tezi]. Başkent Üniversitesi Sağlık Bilimleri Enstitüsü, Ankara, Türkiye. [In Turkish]
- Breiner, S. (2003). An evidence-based eating disorder program. *Journal of Pediatric Nursing*, 18(1), 75-80. [CrossRef]
- Bulik, C. M., Sullivan, P. F., Joyce, P. R., Carter, F. A., & McIntosh, V. V. (1998). Predictors of 1-year treatment outcome in bulimia nervosa. *Comprehensive Psychiatry*, 39(4), 206-214. [CrossRef]
- Çenesiz, G. Z. (2015). Kaygı durumlarında gevşeme egzersizi ve sistematik duyarsızlaştırma kullanımı: Bir vaka örneği. *Ayna Klinik Psikoloji Dergisi*, 2(1), 40-48. [CrossRef]
- Çuhadaroglu, F. (1986). *Adolesanlarda benlik saygısı* [Yayımlanmamış uzmanlık tezi]. Hacettepe Üniversitesi, Tıp Fakültesi, Psikiyatri Bölümü, Ankara, Türkiye. [In Turkish]
- De Zwaan, M., Marschollek, M., & Allison, K. C. (2015). The night eating syndrome (NES) in bariatric surgery patients. *European Eating Disorders Review*, 23(6), 426-434. [CrossRef]
- Dunn, E. C., Neighbors, C., & Larimer, M. (2003). Assessing readiness to change binge eating and compensatory behaviors. *Eating Behaviors*, 4(3), 305-314. [CrossRef]
- Erdoğan Demir, T., Alçalar, A. N., & Sertel Berk, H. Ö. (2026). Self-reported muscle tension assessment: Validation study of the visual analog scale for tension. *Ağrı*, 38(2), 75-82. [CrossRef]
- Ergüney Okumuş, F. E., Sertel Berk, H. Ö., Yücel, B., & Rieger, E. (2018). The anorexia nervosa stages of change questionnaire and the bulimia nervosa stages of change questionnaire: Their psychometric properties in a Turkish sample. *Anadolu Psikiyatri Dergisi*, 19(Special Issue 1), 29-33. [CrossRef]
- Ergüney-Okumuş, F. E., Sertel-Berk, H. Ö., & Yücel, B. (2016). Yeme bozukluklarında tedavi motivasyonu ve yordayıcıları. *Psikoloji Çalışmaları*, 36(1), 41-64. [Article in Turkish]
- Ergüney-Okumuş, F. E., Sertel-Berk, H. Ö., & Yücel, B. (2019). Obsesif kompulsif bozuklukta gevşeme eğitimi ve bilişsel davranışçı tekniklerin uygulanması: Vaka örneği. *Bilişsel Davranışçı Psikoterapi ve Araştırmalar Dergisi*, 8(1), 59-66. [CrossRef]
- Fairburn, C. G. (2008). *Cognitive behavior therapy and eating disorders*. New York, NY: Guilford Press.
- Fairburn, C. G., & Beglin, S. J. (1994). Assessment of eating disorders: interview or self-report questionnaire?. *International Journal of Eating Disorders*, 16(4), 363-370. [CrossRef]
- Fairburn, C. G., Jones, R., Peveler, R. C., Carr, S. J., Solomon, R. A., O'Connor, M. E., Burton, J., & Hope, R. A. (1991). Three psychological treatments for bulimia nervosa. *Archives of General Psychiatry*, 48(5), 463-469. [CrossRef]
- Gökdoğan, F. (1988). Orta eğitime devam eden ergenlerde beden imajından hoşnut olma düzeyi [Yüksek lisans tezi]. Ankara Üniversitesi Sosyal Bilimler Enstitüsü, Ankara, Türkiye. [In Turkish]
- Güleç, H., Köse, S., Güleç, Y. M., Çitak, S., Evren, C., Borckardt, J., & Sayar, K. (2009). Reliability and factorial validity of the Turkish version of the 20-item Toronto Alexithymia Scale (TAS-20). *Klinik Psikofarmakoloji Bülteni*, 19, 214-220.
- Hisli, N. (1988). Beck Depresyon Ölçeği'nin bir Türk örnekleminde geçerlilik ve güvenilirliği. *Psikoloji Dergisi*, 6, 118-122. [Article in Turkish]
- Jacob, S., & Sharma, S. (2018). Efficacy of progressive muscular relaxation on coping strategies and management of stress, anxiety and depression. *International Journal of Indian Psychology*, 6(1), 106-124.

- Jacobson, E. (1943). The cultivation of physiological relaxation. *Annals of Internal Medicine*, 19(6), 965-972. [CrossRef]
- Joy, E. A., Wilson, C., & Varechok, S. (2003). The multidisciplinary team approach to the outpatient treatment of disordered eating. *Current Sports Medicine Reports*, 2(6), 331-336. [CrossRef]
- Linton, S. J. (1982). Applied relaxation as a method of coping with chronic pain: A therapist's guide. *Cognitive Behaviour Therapy*, 11(4), 161-174. [CrossRef]
- McCuen-Wurst, C., Ruggieri, M., & Allison, K. C. (2018). Disordered eating and obesity: Associations between binge-eating disorder, night-eating syndrome, and weight-related comorbidities. *Annals of the New York Academy of Sciences*, 1411(1), 96-105. [CrossRef]
- Öner, N. (1977). *Durumluk-sürekli kaygı envanterinin Türk toplumunda geçerliği* [Yayımlanmamış doçentlik tezi]. Hacettepe Üniversitesi, Ankara, Türkiye. [In Turkish]
- Pawlow, L. A., O'Neil, P. M., & Malcolm, R. J. (2003). Night eating syndrome: Effects of brief relaxation training on stress, mood, hunger, and eating patterns. *International Journal of Obesity*, 27(8), 970-978. [CrossRef]
- Prochaska, J. O., & DiClemente, C. C. (1982). Transtheoretical therapy: Toward a more integrative model of change. *Psychotherapy: Theory, Research and Practice*, 19(3), 276-288. [CrossRef]
- Rugancı, R. N., & Gençöz, T. (2010). Psychometric properties of a Turkish version of the Difficulties in Emotion Regulation Scale. *Journal of Clinical Psychology*, 66(4), 442-455. [CrossRef]
- Salman, İ. B., & Sertel-Berk, H. Ö. (2017). Kronik gerilim tipi baş ağrısında kognitif davranışçı terapi: Olgu sunumu. *Ağrı*, 29(4), 177-184. [Article in Turkish] [CrossRef]
- Sertel-Berk, H. (2020). *Kronik ağrı sendromlarında psikolojik uygulamalar: Gevşeme egzersizi klinisyen el kitabı*. Ankara: Mentis Yayıncılık. [In Turkish]
- Sertel-Berk, H. Ö. (2002). Klinik kavramlar ve yorumlar: Psikolojik bakış açısıyla kronik ağrı. *Ağrı Dergisi*, 14(2), 45-47. [Article in Turkish]
- Shapiro, J. R., Pisetsky, E. M., Crenshaw, W., Spainhour, S., Hamer, R. M., Dymek-Valentine, M., & Bulik, C. M. (2008). Exploratory study to decrease postprandial anxiety: Just relax! *International Journal of Eating Disorders*, 41(8), 728-733. [CrossRef]
- Stein, R. I., Kenardy, J., Wiseman, C. V., Douchis, J. Z., Arnou, B. A., & Wilfley, D. E. (2007). What's driving the binge in binge eating disorder? A prospective examination of precursors and consequences. *International Journal of Eating Disorders*, 40(3), 195-203. [CrossRef]
- Ulusoy, M., Şahin, N., & Erkman, H. (1998). Turkish version of the Beck Anxiety Inventory: Psychometric properties. *Journal of Cognitive Psychotherapy*, 12(2), 163-172.
- Uzunkeya, A. H., & Şen, E. T. (2021). Fibromiyalji sendromlu hastalarda gevşeme odaklı bilişsel davranışçı grup psikoterapisinin karma yöntemle değerlendirilmesi. *Ağrı*, 33(2), 64-83. [CrossRef]
- Vander Wal, J. S., Maraldo, T. M., Vercellone, A. C., & Gagne, D. A. (2015). Education, progressive muscle relaxation therapy, and exercise for the treatment of night eating syndrome: A pilot study. *Appetite*, 89, 136-144. [CrossRef]
- Wolpe, J. (1968). Psychotherapy by reciprocal inhibition. *Conditional Reflex: A Pavlovian Journal of Research & Therapy*, 3(4), 234-240. [CrossRef]
- Yenice, E. (2025). *Toplu taşıma otobüs şoförlerine yönelik öfke yönetimi grup terapisi müdahalesinin geliştirilmesi ve etkinliğinin değerlendirilmesi* [Yayımlanmamış doktora tezi]. İstanbul University, İstanbul, Türkiye. [In Turkish]

Appendix 1. Pre-treatment, post-treatment, and follow-up outcome measures and assessment instruments

Outcome variables	Instruments	Before treatment	After treatment	Follow-up (after 3 months)	Min–Max
BMI ¹		19.53	19.53	19.53	
Weight		50.5	50	50	
Ideal weight		49	50	50	
Vomiting	Frequency (per week)	6	1	0	
Weighing	Frequency (per week)	1–2	1–2	1–2	
Stages of change	BN-SOCS ²	63/3.15	81/4.05	81/4.05	
Self-esteem	RSES ³	2	2	2	
Eating disorder symptoms	EDE-Q ⁴				
	Total	3.5	1.5	2.5	
	Restraint	0.8	0.2	0.4	
	Eating-related concerns	0.8	0	0.4	
	Body-shape concerns	0.5	0.375	0.5	
	Weight concerns	0.4	0.4	0.4	
Body satisfaction	BPSS ⁵	109/4.36	113/4.52	107/4.28	0–125
Eating habits	EHQ ⁶				
	Total	126	113	102	0–165
	Emotional eating	61	61	49	0–65
	External eating	28	24	25	0–50
	Restricted eating	37	28	28	0–50
Emotion regulation	DERS ⁷	122	106	111	0–180
Alexithymia	TAS ⁸	42	31	38	
Depression	BDI ⁹	11	3	2	
Anxiety	BAS ¹⁰	14	9	7	
State & trait anxiety	STAI-S ¹¹	40	32	32	20–80
	STAI-T ¹²	39	32	43	20–80

1: Body Mass Index classification according to WHO criteria (WHO, 2000) [World Health Organization. (2000). Obesity: Preventing and managing the global epidemic (WHO Technical Report Series No. 894). Geneva, Switzerland]. **2:** Bulimia Nervosa Stages of Change Scale (Turkish adaptation: Ergüney-Okumuş et al., 2018). **3:** Rosenberg Self-Esteem Scale (Turkish adaptation: Çuhadaroglu, 1986). **4:** Eating Disorder Examination Questionnaire (Turkish adaptation: Yücel et al., 2011). [Yücel, B., Polat, A., İkiz, T., Düşgor, B. P., Elif Yavuz, A., & Sertel Berk, O. (2011). The Turkish version of the eating disorder examination questionnaire: Reliability and validity in adolescents. *European Eating Disorders Review*, 19(6), 509–511]. **5:** Body Parts Satisfaction Scale (Gökdoğan, 1988). **6:** Eating Habits Questionnaire (Turkish adaptation: Bozan, 2009). **7:** Difficulties in Emotion Regulation Scale (Turkish adaptation: Rugancı & Gençöz, 2010). **8:** Toronto Alexithymia Scale (Turkish adaptation: Güleç et al., 2009). **9:** Beck Depression Inventory (Turkish adaptation: Hisli et al., 1988). **10:** Beck Anxiety Scale (Turkish adaptation: Ulusoy et al., 1988). **11:** Self-Assessment Questionnaire – State anxiety (STAI-S) (Turkish adaptation: Öner, 1977). **12:** Self-Assessment Questionnaire – Trait anxiety (STAI-T) (Turkish adaptation: Öner, 1977).

Interpretation notes:

BMI: <18.5: weak, 18.5–24.9: normal, 25.0–29.9: overweight, 30.0 and above: obese; BN-SOCS: <1.5 = precontemplation, 1.5–2.4 = contemplation, 2.5–3.4 = preparation, 3.5–4.4 = action, ≥4.5 = maintenance; RSES: 0–1 high, 2–4 medium, 5–6 low self-esteem; EDE-Q: High scores indicate increased eating pathology; BPSS: Increase in points indicates an increase in body satisfaction; EHQ: High scores indicate an increase in disturbed eating habits; DERS: High scores indicate increased difficulty in emotion regulation; TAS: Scores of 59 and above are alexithymic; BDI: 10–16 mild, 17–29 mid-level, 30–63 severe depressive symptoms; BAS: 8–15 mild, 16–25 mid-level, 26–63 severe anxiety symptoms; STAI-A/STAI-T: 20–39 low, 40–59 Moderate, 60–80 high anxiety. Generally, a score of ≥40 is considered a clinically significant level of anxiety.

Appendix 2. Urge diary

Date	Time	With whom	Emotions	What you eat	Emotions after eating