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# Testing the efficacy of the Virtual Body Project in a sample of Turkish female university students using a randomized controlled trial

Nice Ergut[1], Emrah Keser[2]

**Keywords**
Virtual Body Project, eating disorders, disordered eating attitudes

**Abstract**
The current study aimed to test the efficacy of the Virtual Body Project (vBP) on self-esteem, eating disorder symptoms, the positive effect of body image on life quality, and psychological symptoms, using a randomized, placebo-controlled pretest-posttest experimental design. Turkish female university students between the ages of 18-25, who were not diagnosed with eating disorders and who had body dissatisfaction participated in the study. The intervention (vBP, N = 77) and placebo (Expressive Writing, N = 70) groups were determined using coin flipping for each participant method. The Brief Symptom Inventory (BSI), Eating Disorder Examination Questionnaire (EDE-Q), Body Image Quality of Life (BIQLI), and Rosenberg Self-Esteem Scale (RSES) were administered to both groups in the pretest and posttest assessments. Forty participants in the intervention group and 33 participants in the placebo group completed the study. Four mixed design ANOVAs were conducted to evaluate the effect of the intervention on dependent variables. Besides, the analyses were repeated using an intention-to-treat analysis with multiple imputation method. Analyses showed that while the EDE-Q and BSI scores significantly decreased, the BIQLI and RSES scores significantly increased in the vBP group. On the other hand, there was no significant difference across time in the EW group. In conclusion, the present study supported that the Virtual Body Project had an effect on eating disorder symptoms, the positive influence of body image on quality of life, psychological symptoms, and self-esteem in female university students. It is thought that the Virtual Body Project can be considered a useful protocol for preventive mental health studies carried out with female university students in Turkey.

**Anahtar kelimeler**
Sanal Beden Projesi, yeme bozuklukları, olumsuz yeme tutumları

**Öz**
**Sanal Beden Projesi'nin etkiliğinin randomize kontrollü bir çalışma ile Türk kadın üniversite öğrencileri örnekleminde test edilmesi**
Seçkisiz atama, plasebo grubu ve pretest-posttest ölçümleri içeren bir deneysel desenle yürütülen bu çalışmada, Sanal Beden Projesi'nin (SBP) benlik saygısı, yeme bozukluğu belirtileri, psikolojik belirtiler ve beden imajının yaşam kalitesine olumlu etkisi değişkenleri üzerindeki etkisinin test edilmesini amaçlamıştır. Araştırmaya yeme bozukluğu tanısı almamış, beden memnuniyetsizliği olan, 18-25 yaş arası Türk kadın üniversite öğrencileri dahil edilmiştir. Müdahale (SBP, N = 77) ve plasebo (Dışavurumcu Yazma, N = 70) grupları, her bir katılımcı için yazı tura atılarak oluşturulmuştur. Her iki gruba da öntest ve sontest değerlendirmelerinde Kısa Semptom Envanteri (KSE), Yeme Bozukluğu Değerlendirme Ölçeği (YBDÖ), Beden İmgesinin Yaşam Niteliğine Etkisi Ölçeği (BİYNEÖ) ve Rosenberg Benlik Saygısı Ölçeği (RBSÖ) uygulanmıştır. Müdahale grubunda 40, plasebo grubunda ise 33 katılımcı çalışmayı tamamlamıştır. Müdahalenin bağımlı değişkenler üzerindeki etkisini incelemek amacıyla dört ayrı karma desen ANOVA yürütülmüştür. Ayrıca, çoklu veri atama yöntemiyle tedavi amacına yönelik analiz (intention-to-treat) yapılarak analizler tekrarlanmıştır. Analiz sonuçlarına göre, müdahale grubunda KSE, YBDÖ puanlarının öntest ve sontest ölçümleri arasında anlamlı bir biçimde düştüğü gözlenmiştir. Öte yandan, BİYNEÖ ve RBSÖ puanları öntest ve sontest ölçümleri arasında anlamlı düzeyde yükselmiştir. Plasebo grubunda ise öntest ve sontest ölçümleri arasında anlamlı bir fark bulunamamıştır. Sonuç olarak, mevcut çalışma, SBP'nin kadın üniversite öğrencilerinde yeme bozukluğu belirtileri, beden imajının yaşam kalitesine etkileri, psikolojik belirtiler ve benlik saygısı üzerinde etkisi olduğunu desteklemiştir. Sanal Beden Projesi'nin Türkiye'deki kadın üniversite öğrencileriyle yürütülen koruyucu ruh sağlığı çalışmaları için kullanışlı bir protokol olabileceği düşünülmektedir.

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✉ **Emrah Keser** · emrah.keser@tedu.edu.tr | [1]Clinical Psychologist, [2]Asst. Prof., Department of Psychology, TED University, Ön Cebeci, Ziya Gökalp Cd., 48/A, 06420 Çankaya, Ankara, Türkiye.
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Eating Disorder Symptoms (EDS) are characterized by fear of gaining weight, obsessive thoughts about food and calories, and disturbances in perception of body weight, shape, and eating patterns (Costarelli et al., 2009). EDS threaten both physical health and psychological well-being, especially in young people. Numerous studies have associated EDS with various psychological problems including depression, anxiety disorders, substance use, bipolar disorder, suicide attempts, impaired functioning, and lower cognitive and academic performance (e.g., Gadalla & Piran, 2008; Santos et al., 2007; Ohring et al., 2002).

## Prevalence of Eating Disorder Symptoms

EDS are becoming prevalent, and the age of onset is gradually decreasing. Tam and colleagues (2007) determined that the age of onset was as low as eleven. Although EDS can be observed frequently in community samples, regardless of culture, socioeconomic status, or ethnicity, they are especially more prevalent in young females (e.g., Cummins et al., 2005; Tam et al., 2007). The prevalence of EDS was investigated in various cultures and age groups and was reported to be 26% in the USA (D'Souza et al., 2005), 27% in Canada (Jones et. al., 2001), 25% in Saudi Arabia (Fatima, & Ahmad, 2018), 35% in Japan (Mukai et al., 1994), 45% in Turkey (Bas et al., 2005), 4.5 % in China (Yu, et al., 2015), and 21% in South Africa (Caradas et al., 2001). Despite not using representative samples, these studies provide enough evidence of the serious public health threat posed by EDS.

## Treatments & Prevention

Epidemiological studies have revealed a drastic increase in the prevalence of eating disorder diagnosis, especially in women (e.g., D'Souza et al., 2005; Galmiche et al., 2019; Tam et al., 2007), attaching further importance to the development of evidence-based prevention and treatment programs in the last 20 years (Wilson et al., 2007). Studies carried out to develop these programs have yielded positive results and several promising treatment protocols have been developed for the eating disorders such as family therapy, cognitive therapy, acceptance and commitment therapy, dialectical behavior therapy, mindfulness-based cognitive therapy, technology-enhanced interventions, and compassion-focused therapy (Keel & Haedt, 2008; Weissman et al., 2020). Despite the use of the new protocols, the majority of people with eating disorders could not receive therapy (Swanson et al., 2011), research has revealed high drop-out rates (Merrill et al., 2003), and relapse rates were high among those who benefit from treatment (Grilo et al., 2012). The findings of these studies underline the importance of preventing eating disorders by focusing on disordered eating behaviors before they turn into eating disorders. Stice et al. (2001) focused on the prevention of the onset of eating disorders as a public health priority and developed an evidence-based protocol, namely the Body project.

## The Body Project

The Body Project (Stice et al., 2001) consists of four group sessions where negative body image is addressed, and participants discuss the thin-ideal body in groups under the control of a group leader. The sessions aim to create a cognitive dissonance that motivates participants to reduce the internalization of the thin-ideal body. The project focuses on producing alternative thoughts against the imposition of the thin ideal body and changing participants' thoughts and feelings that are related to the difference between their own body and the thin-ideal body. The constituted cognitive dissonance is expected to decrease both body dissatisfaction, body-related negative emotions, and distorted eating patterns (Stice, et al., 2001).

Numerous randomized controlled trials have supported the efficacy of Body Project in reducing the risks associated with eating disorders (e.g., Stice et al., 2001; Stice et al., 2015; Stice et al., 2008). The project is already translated into eight different languages. Over 135 universities have implemented the Body Project since 2008 (Becker & Stice, 2017). In recent years, the Body Project has been updated for application via online sessions, namely the Virtual Body Project (vBP).

In a RCT (randomized controlled trial) study conducted by Stice et al. (2017), 680 young women were randomly assigned to four groups: (1) Clinician-led vBP group, (2) peer-led vBP group, (3) Internet-based vBP group or (4) an educational video control condition. While the eating disorder symptoms, thin-ideal internalization level, and body dissatisfaction level significantly decreased in the vBP groups, no change was observed in the educational video group. The highest decrease was observed in the clinician-led vBP group and peer-led vBP group. Wisting et al. (2021) tested the effectiveness of vBP administration on young women with type 1 diabetes. It was observed that internalized thin ideal body, body dissatisfaction, and clinical impairment reduced only in the vBP group. Ghaderi and his colleagues (2020) showed that the vBP reduced eating disorder risk, clinical impairment, body dissatisfaction, and internalized thin body ideal in young females.

The Virtual Body Project consisted of 4 group sessions of 50-60 minutes, each group consisting of a maximum of 10 participants and one or more group leaders. This manual was customized to deliver the program over the virtual environment through platforms. Sessions took place one week apart as described by Stice and colleagues (Stice et al., 2017). At the end of each session, home assignments were given and recollected until the next session via e-mail.

The initial session began with an introduction and

an icebreaker activity. These were followed by defining the appearance ideal and exploring its origin. Later on, costs associated with the appearance ideal were discussed. The session ended with assigning home exercises. Participants were asked to write a letter to a younger girl who is struggling with body image problems. The second assignment for this session was for the participants to look at a mirror and list their own positive features.

The second session began with debriefing the home assignments from the previous week. This session involved role-plays exercises to discourage the pursuit of appearance ideal. The group leader took the role of a severe dieter or a person with an eating disorder. Each participant gave verbal statements as a reply in order to persuade the person against the appearance ideal. Role-plays were followed by discussion and debriefing. Home assignments were given and explained through the end of the session. This week, participants were asked to write a letter to someone in their lives who pressured them to conform to appearance ideals and to make a list of 10 things girls/women can do to resist this ideal.

The third session focused on further discussion on how to resist appearance ideals and challenge personal body image concerns. The session began with a discussion of the previous assignments. More role-plays were performed so that the participants will produce counter appearance-ideal statements. After role-plays, the leader encouraged discussion amongst the group. Later, the group talked about the reasons for signing up for this study. One of the home exercises for this session was a behavioral challenge where participants were asked to do something that they would not normally do because of their body image concerns. Another assignment was to write a letter to their own younger self on how to avoid developing body image concerns.

The fourth session aimed to discuss the participants' experiences from past assignments. The session focused on how the way we talk influences our body perception and promotes appearance ideal. After debriefings of assignments were completed, the participants were encouraged to find positive alternative ways of talking about their bodies, and they were prepared for dealing with future body image concerns. They were given a final exit exercise so that they can continue challenging these ideals. The session ended with a closure where participants were thanked and appreciated.

### Placebo Group Activity: Expressive Writing

The Expressive Writing task consisted of 4 weekly writing tasks over a month. Participants were instructed to take 40 minutes to write about their thoughts, images, emotions, or anything that comes to their mind about their body 40 minutes. If their writing takes less than 40 minutes, they were told to reflect on their feelings by rereading what they have written so far in the remaining time. The instructions were sent via e-mail, and they were asked to send their writings back when they completed. The participants were told that their writings will not be read or graded. They were also given an explanation that body image concerns are linked to emotional issues and expressive writing might help resolve those issues.

In previous studies, participants assigned to the EW group had a greater reduction in body dissatisfaction and eating disorder symptoms than participants in the waiting group (Stice et al., 2006). In addition, the EW task was found to be as credible as the Body Project in terms of content (Stice et al., 2006; Stice et al., 2008). Ghaderi et al. (2020) also observed that the EW task functioned as a good placebo and did not harm the participants in any way in the RCT study in which they tested the efficacy of vBP. Consistent with these studies in the literature, EW application was determined as a placebo in the current study.

### Aim and Scope

The current study aimed to test the efficacy of the vBP in a Turkish sample consisting of young female participants using a randomized controlled trial. The prevention program was evaluated with reference to its efficacy in creating a change in outcomes such as self-esteem, eating disorder symptoms, the positive effect of body image on life quality, and psychological symptoms.

It is known that body dissatisfaction and eating disorder symptoms are associated with decreased self-esteem in young women (Tiggeman, 2005). In addition, numerous studies have shown that eating disorder symptoms are associated with many psychological difficulties such as depression, anxiety, obsessive-compulsive disorder, substance use, and suicidal thoughts (Blinder et al., 2006; Erol et al., 2002; Santos et al., 2007). Blinder et al. (2006) found that approximately 97% of eating disorder cases have comorbid psychological problems. When these findings are considered together, it can be concluded that while testing the efficacy of a treatment or prevention protocol, it is crucial to measure not only eating disorder symptoms but also other psychological symptoms and self-esteem. Therefore, in the current study, the effect of the vBP on not only the symptoms of eating disorders but also on variables such as psychological symptoms, quality of life, and self-esteem was also investigated.

Few studies have been conducted on EDS in Turkey, and none had focused on their prevention or intervention. Turkey differs from both Eastern and Western countries in terms of culture, religious beliefs, and daily life rituals (Bugay et al., 2021). Turkey's culture is a synthesis of individualistic and collectivist cultures (Bugay et al., 2021; Gonzales-Mesa

et al., 2018). Eating disorders are known to be prominent in western cultures. On the other hand, in developing countries like Turkey, with urbanization and modernization, components of eastern culture can be influenced by western culture (Tayfur & Evrensel, 2020). Although Turkey is culturally influenced by both the west and the east, it can be said that there has been an increase in young people's exposure to western media in recent years (Thompson et al., 2020). Internalizations about the ideal body and physical appearance are also shaped by western media rather than eastern traditions (Uzun et al., 2006; Thomphson et al., 2020). It is worth investigating how the cultural climate that emerges when the effects of western media are added to the beauty schemes specific to Anatolian culture affects the body satisfaction, self-esteem and eating behaviors of young people. Although this study does not focus on the effect of culture, it is considered to be very valuable to study body dissatisfaction and eating disorder symptoms with eastern individuals who have been influenced by western culture and media. Therefore, the translation of the Body Project into Turkish, its adaptation to this specific culture, and testing whether it will work as a prevention program for young females in this culture are of great importance.

## Hypotheses

It was expected that eating disorder symptoms and psychological symptoms significantly decrease from the pretest to the posttest in the vBP group. Besides, the self-esteem and the positive effects of body image on quality-of-life scores were expected to significantly increase from the pretest to the posttest. On the other hand, it was predicted that there is no significant change from the pretest to the posttest in terms of eating disorder symptoms, negative effects of body image on quality of life, psychological symptoms, and self-esteem.

## METHODS

### *Participants*

The sample of this study consisted of an intervention (Virtual Body Project group, N =40) and a placebo (Expressive Writing group, N = 33) group. Participants were reached with the convenience sampling method. An announcement text was shared on social media, and TED University psychology department students were asked to share the announcement and increase its visibility. Besides, announcement flayers were sent to state universities in Ankara. Participants who volunteered for the research reached the researchers using the contact information found in the announcement text. Inclusion criteria were: (a) being a young female between ages 18-25 (b) feeling body dissatisfaction, (c) having a body mass index in the normal range (18-30), (d) not being diagnosed with an eating disorder, and (e) not being treated for eating disorders. While determining the groups, a coin was tossed for each participant. Heads were assigned to the experimental group and tails to the placebo group. Descriptive features of the sample were represented in Table 1.

**Table 1. Characteristics of the Sample**

| | | The Virtual Body Project (N = 40) | The Expressive Writing (N = 33) |
|---|---|---|---|
| Age | | | |
| | Mean | 22.00 | 21.85 |
| | SD | 1.52 | 1.54 |
| Body Mass Index | | | |
| | 18-25 | 62.5% | 72.8% |
| | 25-30 | 37.5% | 27.2% |
| Education | | | |
| | University students | 100% | 100% |
| Income level | | | |
| | Low | 25.0% | 33.3% |
| | Middle | 60.0% | 48.5% |
| | High | 15.0% | 18.2% |
| Marital Status | | | |
| | Married | 2.5% | 3% |
| | Unmarried | 97.5% | 97% |

### *Measures*

***Demographic Information Form*** This form included some items assessing descriptive information such as age, gender, education, income, marital status, current height/weight, eating disorders diagnosis.

***Body Mass Index (BMI)*** BMI was calculated according to the participants current weight and height using BMI = $kg/m^2$ formula.

***Eating Disorder Examination Questionnaire (EDE-Q)*** The EDE-Q, developed by Fairburn and Beglin (1994), is a widely used self-report assessment tool for measuring eating disorder symptoms. It has four subscales: Restraint, Shape Concern, Weight Concern, and Eating Concern. The questionnaire includes 28 items on 6-point Likert-type (0: not on any day; 6: every day). Higher scores on the entire scale and subscales reflect greater levels of eating disorders symptomatology. The adaptation study of the EDE-Q was conducted by Yucel and colleagues (2011). They found the test re-test reliability to be .91 and Cronbach's Alpha to be high (α = .93) for the entire questionnaire. Cronbach's alpha values were calculated as .85 for pretest measurements and .93 for posttest measurements in the current study.

***Body Image Quality of Life Inventory (BIQLI)*** BIQLI was developed by Cash and Fleming in 2002.

The inventory consists of 19 items that are rated between -3 and +3 likert scale (negative, neutral, positive). BIQLI is used to assess the effect of body image on different aspects of life with subscales on body image's effect on: self-confidence, interpersonal relationships, daily life, mood, eating behavior, and general life satisfaction. Higher total scores show that body image positively affects the quality of life, while lower values indicate that body image negatively affects the quality of life. Turkish validity and reliability measurements were made in 2015 by Demiralp and colleagues. The internal consistency of the test was found to be .89. In the present study, Cronbach's alpha values were found as .93 for pretest measurements and .95 for posttest measurements.

***Brief Symptom Inventory (BSI)*** Brief Symptom Inventory (BSI), the short version of Symptom Checklist-90 (Derogatis, 1975), is a Likert-type scale assessing psychological symptoms. The BSI consists of 53 items and 5 sub-dimensions: depression, anxiety, negative self-concept, somatization and hostility. Boulet and Boss (1991) calculated Cronanbach's Alpha values of the sub-scales and found to be between .78 and .85. The Turkish standardization was carried out by Şahin et al. (2002). In the adaptation study, Cronbach's alpha values were found between .70 and .88. In the current study, Cronbach's alpha values were calculated as .96 for pretest measurements and .97 for posttest measurements.

***Rosenberg Self-Esteem Scale*** The scale that was originally developed by Rosenberg (1965) was used in literature to assess self-esteem. The scale consists 10 self-report items with 4-point Likert-scale (ranging between "Very Wrong" to "Very True"). Half of the questions were worded as positively and half as negatively. Higher scores represent higher self-esteem. Scores lower than 25 are considered to be low self-esteem while scores between 30-40 representing healthy level of self- esteem. The standardization for Turkish samples was conducted by Çuhadaroğlu (1986). The test-retest reliability coefficient was found to be .71 and the internal consistency measurement Cronbach's Alpha was .75 (Çuhadaroğlu, 1986). Cronbach's alpha values were calculated as .81 for pretest measurements and .80 for posttest measurements in the current study.

### *Procedure*

The study was approved by TED University Human Research Ethics Committee (number: 1996, date: 30 September 2020) and funded by TED University Institutional Research Fund (IRF). The adaptation permission of the Virtual Body Project (vBP) manual was received from Prof. Dr. Eric Stice. Invitation announcements were made via social media (Instagram, Twitter, Facebook and WhatsApp). Besides, students at TED University Psychology Department were asked to announce the study to their social environment. Volunteer participants were able to fill out the surveys of the study by clicking on a link in the announcement that provides access to the surveys of the research. To evaluate inclusion criteria, the demographic form included questions about current weight & height and history of eating disorders. Additionally, participants were asked to rate their body dissatisfaction level on a 10-points Likert type question (*To what extent are you satisfied with physical appearance of your body?* 0 = Not at all satisfied, 10 = Extremely satisfied). Participants not completely satisfied with their body (8 or lower on the 10-points Likert type question), has normal body mass index (in the 18-30 range) and not diagnosed with eating disorders were included in the study. Volunteer participants were divided into two groups (Body Project Group *vs* Expressive Writing Group) by random assignment method. That is, a coin was tossed for each participant. Heads were assigned to the experimental group and tails to the placebo group. Participant enrollment process is summarized in Figure 1.

To control the expectation and placebo effect, and increase internal and construct validities of the study, several precautions were taken. First, an expressive writing activity was designed for control group. In this way, the experimental group and the control group were equalized in terms of the frequency and duration of the activities. In addition, the control group was given instruction that the writing activity could have a positive effect on body dissatisfaction, and it was ensured that the expectation that was likely to occur in the experimental group also occurred in the control group. Secondly, the hypotheses of the research were not shared with the participants. They were just told that the study aims to compare the Virtual Body Project and Expressive Writing techniques. Besides, they were informed that the groups were determined by the chance factor. Third, the psychologists who administered the group sessions did not apply the pretest and posttest measurements. Instead, a researcher shared the online survey links of the pretest and posttest assessments.

The vBP protocol was translated into Turkish using the translation-back translation method. That is, the vBP protocol was translated from English to Turkish by a professional translator and a clinical psychologist. These two translations were compared and merged by the researchers and decided on a single text. Later, the Turkish version was translated back into English by a professional translator. The research team compared the original vBP with the translated text from Turkish to English and modified any inconsistencies. The Virtual Body Project and Expressive Writing Tasks were applied by two trained clinical psychologist candidates as online. The psychologists applied the Virtual Body Project protocol at least two times under the supervi-

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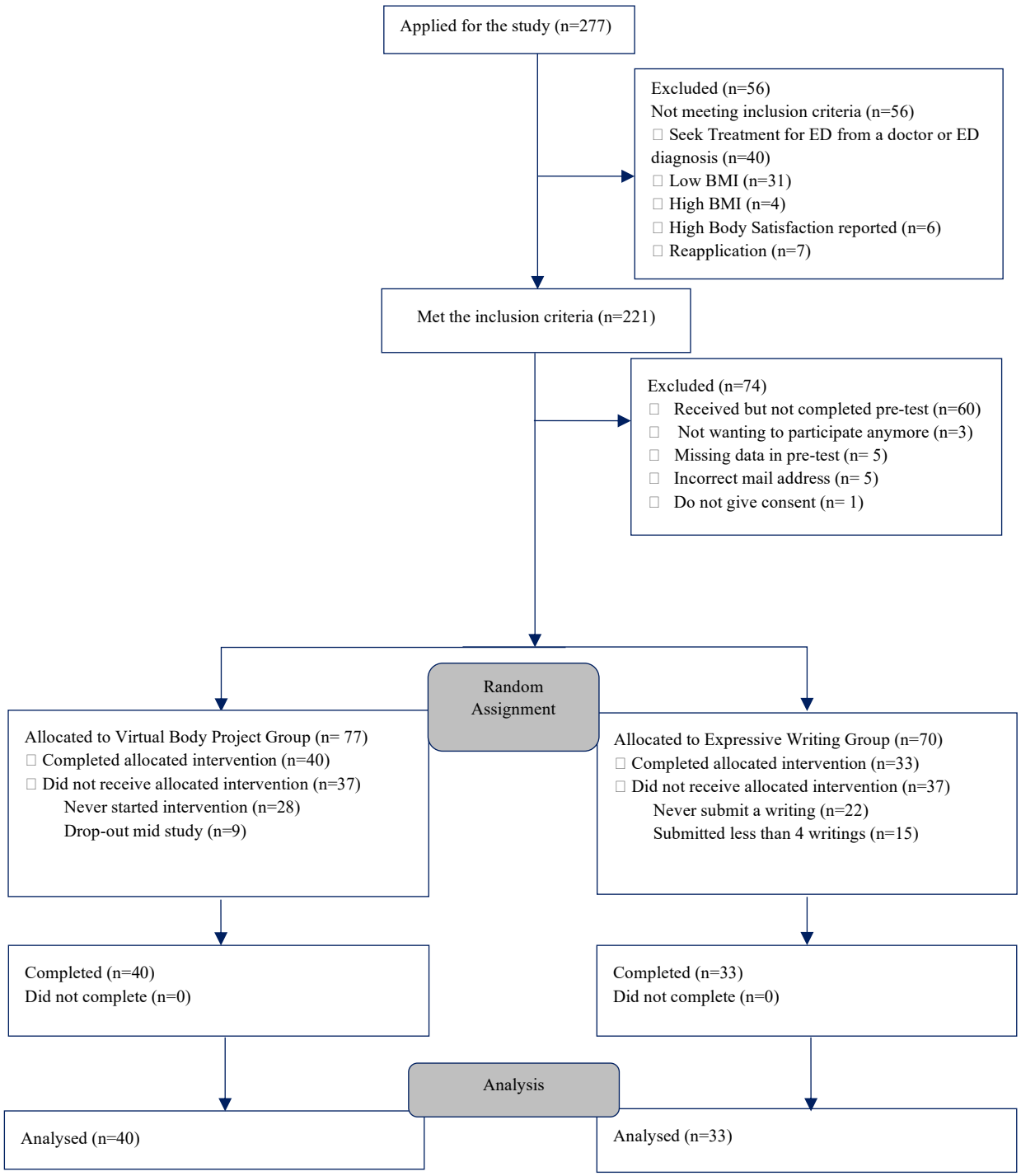


**Figure 1. Participant Flowchart**

sion of an experienced clinical psychologist (PhD). Scores of participants attended the groups in the training process were not included in the data. The Virtual Body Project intervention was applied once a week, in 4 sessions in total. Zoom platform was used for all sessions. While the intervention group was taking the virtual Body Project intervention, the control group was given an expressive writing task. Research design and assessments are represented in Figure 2.

### *Data Analysis*

SPSS 24 (Statistical Package for Social Sciences) was used to analyze the data. Four Mixed ANOVAs (Analysis of Variance) were performed to compare the effects of Body Project protocol and the Expressive Writing task on the Body Image Quality of Life Inventory (BIQLI) scores, Eating Disorder Examination Questionnaire (EDE-Q) scores, Rosenberg Self-Esteem Scale (RSES) scores, and Brief Symptom Inventory (BSI) scores. That is, the EDE-Q, BIQLI, RSES, and BSI scores were assigned as dependent variables, and the group variable (Body Project vs Expressive Writing) was used as the independent variable. Because of the high drop-out rates, intention-to-treat analyses were conducted with multiple imputation methods in addition to the analysis of the original data. The intention-to-treat analysis is a method in which all

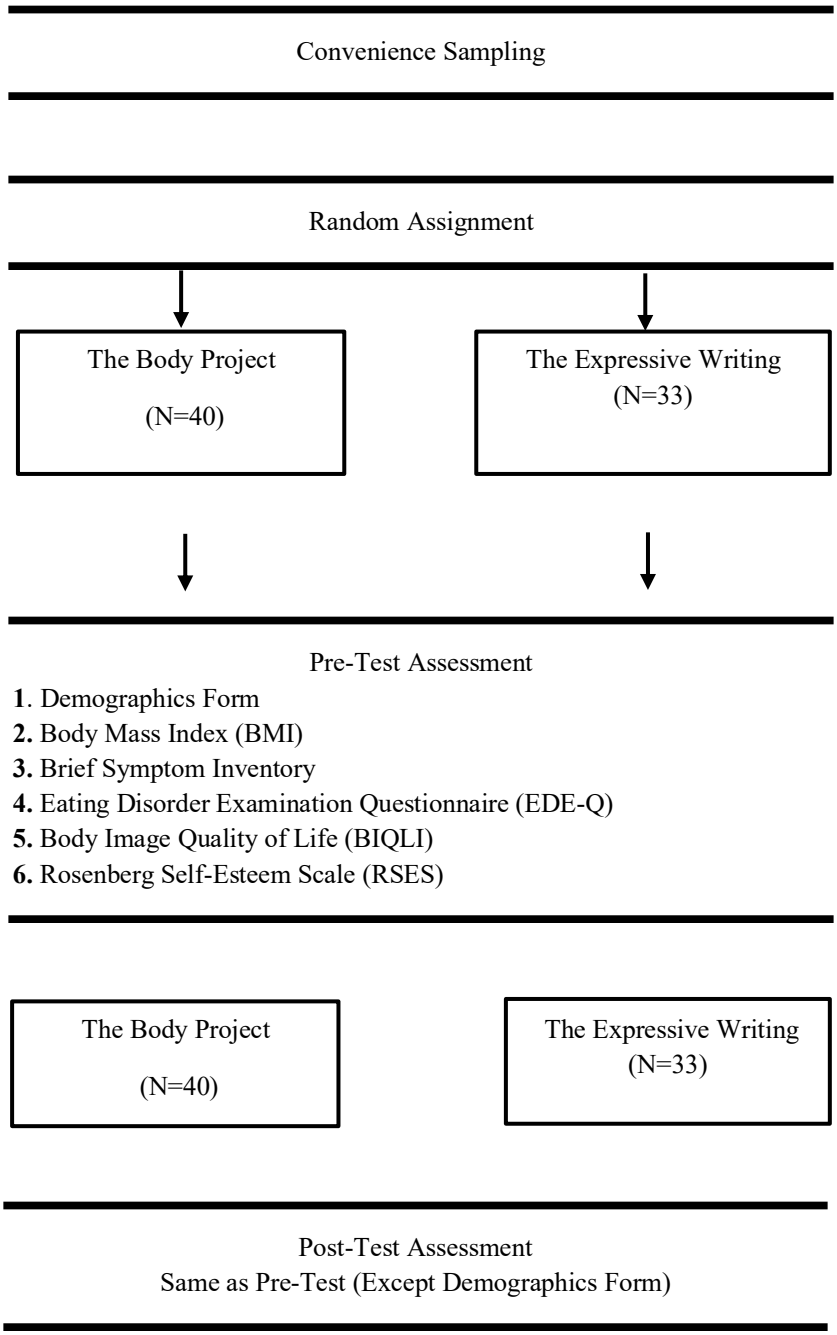


**Figure 2. Research Design and Data Collection Procedure**

participants assigned to groups by the random assignment are included in the analysis. After being assigned a random assignment, participants are included in the analysis regardless of whether they drop out, receive treatment, or participate in the post-test measurement. This method has the potential to reduce the risks of disruption of group equations due to dropout (McCoy, 2017). In the present study, intention-to-treat analysis was carried out with multiple imputation methods. According to the multiple imputation method, the original data containing missing values is copied several times. Missing values for each copied dataset are imputed by Bayesian regression models. Finally, all reproduced datasets are merged, and a pooled imputation is created.

Before conducting the Mixed ANOVAs, the data were evaluated in terms of missing values and outliers. The frequency analysis showed that more than 99% of all items were filled completely. Z-scores that were calculated using the total scores of the scales were inside of the -3 and +3 ranges. That is, no participant was considered an outlier (Field, 2018).

## RESULTS

### *Mixed ANOVA results in the original data*

Four mixed ANOVAs were conducted to see the within-subject effect (Time: Pretest vs Posttest), the between-subject effect (Groups: Virtual Body Project vs Expressive Writing), and the interaction effect (Group x Time). It was seen that the group variable had

**Table 2. Main Effects of Group, Time, and Interaction in the Original Data**

| | EDE-Q | BIQLI | BSI | RSES |
|---|---|---|---|---|
| Group | $F$ (1,71) = 14.39** $\eta_p^2$ = .17 | $F$ (1,71) = 2.96 $\eta_p^2$ = .04 | $F$ (1,71) = 6.65* $\eta_p^2$ = .09 | $F$ (1,69) = 3.80* $\eta_p^2$ = .05 |
| Time | $F$ (1,71) = 62.79** $\eta_p^2$ = .47 | $F$ (1,71) = 11.63** $\eta_p^2$ = .14 | $F$ (1,71) = 22.74** $\eta_p^2$ = .24 | $F$ (1,69) = 11.80** $\eta_p^2$ = .16 |
| Interaction | $F$ (1,69) = 58.42** $\eta_p^2$ = .45 | $F$ (1,71) = 9.88** $\eta_p^2$ = .12 | $F$ (1,69) = 19.43** $\eta_p^2$ = .22 | $F$ (1,69) = 6.94* $\eta_p^2$ = .09 |

***Note.*** *p< .05, **p < .01, $\eta_p^2$ : Partial Eta Square, Group: The main effect of group variable, Time: the main effect of within-subject factor, EDE-Q: Eating Disorder Examination Questionnaire, BIQLI: Body Image Quality of Life Inventory, BSI: Brief Symptom Inventory, RSES: Rosenberg Self-Esteem Scale.

**Table 3. Mean and Standard Deviations of the Groups in the Pretest and Posttest Assessments**

| | Virtual Body Project | | Expressive Writing | |
|---|---|---|---|---|
| | Mean | *SD* | Mean | *SD* |
| EDE-Q Pretest | 83.28 | 31.79 | 81.45 | 37.99 |
| EDE-Q Posttest | 27.68 | 18.76 | 80.45 | 39.20 |
| BIQLI Pretest | 5.23 | 22.12 | 6.27 | 21.98 |
| BIQLI Posttest | 23.13 | 17.09 | 7.0 | 26.53 |
| BSI Pretest | 76.00 | 33.84 | 78.30 | 37.98 |
| BSI Posttest | 40.55 | 30.07 | 76.91 | 42.03 |
| RSES Pretest | 25.13 | 1.71 | 25.18 | 1.61 |
| RSES Posttest | 26.73 | 1.63 | 25.45 | 1.86 |

***Note.*** EDE-Q: Eating Disorder Examination Questionnaire, BIQLI: Body Image Quality of Life Inventory, BSI: Brief Symptom Inventory, RSES: Rosenberg Self-Esteem Scale

a significant effect on the EDE-Q, BSI, and RSES scores when evaluated without considering the within-subject effect. Besides, the within-subject effects were significant for all dependent variables when calculated without considering the between-subject effect. Finally, the interaction effects (Group x Time) were also found significant for all dependent variables (see Table 2).

While there were significant differences in the EDE-Q, BIQLI, BSI, and RSES scores among the pretest and posttest scores in the vBP group, these differences were not observed in the EW group. Table 3 illustrated how mean scores of the EDE-Q, BIQLI, BSI, and RSES differentiated from the pretest to the posttest assessments in both groups.

### *Mixed ANOVA results in the imputed data*

After the multiple imputation procedure, the mixed ANOVA results were calculated again. As seen in Table 4, the main effects of the group (vBP vs EW) were not significant except for the RSES scores. That is, when the mean scores of EDE-Q, BIQLI, and BSI were compared without taking the within-subject effect (time) into account, there were no significant differences between the vBP and EW groups. On the other hand, the main effects of time (pretest vs posttest) were found significant for all dependent variables. There were significant differences between the pretest and posttest scores of the EDE-Q, BIQLI, BSI, and RSES when evaluated without considering the group effect. Finally, it was found that the interaction effects were significant for all dependent variables. While there were significant differences between the pretest and posttest scores in the vBP group, the scores did not differentiate in the EW group (Table 4 and Table 5).

## DISCUSSION

In the present study, the efficacy of the Virtual Body Project (vBP) (Stice et al., 2017) was investigated in a Turkish female university students sample using a randomized controlled trial. To control the placebo effect, the vBP intervention was compared to a group performing the Expressive Writing (EW) task instead of a waiting list. The results of the study showed that the vBP intervention was effective in reducing eating disorder symptoms and psychological symptoms. The vBP was also effective in increasing the self-esteem level and the positive effect of body image on life quality.

First, a remarkable decrease was observed in eating disorder symptoms such as dietary restraint, binge eating, body shape concerns, eating concerns, and fear of putting on weight in the vBP group between the pretest and the posttest assessment. Second, participants who were assigned to the vBP group showed a significant decrease in terms of the effect of negative attributes towards their body shape and physical appearance on quality of life. Third, the vBP intervention also had a significant effect on reducing participants' psychological symptoms. Finally, the self-esteem level of the participants increased in the vBP group between the pretest and posttest assessments but not in the EW group.

**Table 4. Main Effects of Group, Time, and Interaction in the Imputed Data**

| | EDE-Q | BIQLI | BSI | RSES |
|---|---|---|---|---|
| Group | $F$ (1,145) = 2.45<br>$\eta_p^2$ = .02 | $F$ (1,145) = 0.99<br>$\eta_p^2$ = .001 | $F$ (1,145) = 2.52<br>$\eta_p^2$ = .02 | $F$ (1,145) = 6.86*<br>$\eta_p^2$ = .05 |
| Time | $F$ (1,145) = 90.12**<br>$\eta_p^2$ = .39 | $F$ (1,145) = 16.65**<br>$\eta_p^2$ = .11 | $F$ (1,145) = 63.25**<br>$\eta_p^2$ = .31 | $F$ (1,145) = 10.65**<br>$\eta_p^2$ = .07 |
| Interaction | $F$ (1,145) = 37.53**<br>$\eta_p^2$ = .21 | $F$ (1,145) = 8.91**<br>$\eta_p^2$ = .06 | $F$ (1,145) = 8.00**<br>$\eta_p^2$ = .05 | $F$ (1,145) = 4.56<br>$\eta_p^2$ = .08 |

*Note*. *p< .05, **p < .01, $\eta_p^2$ : Partial Eta Square, Group: The main effect of group variable, Time: the main effect of within-subject factor, EDE-Q: Eating Disorder Examination Questionnaire, BIQLI: Body Image Quality of Life Inventory, BSI: Brief Symptom Inventory, RSES: Rosenberg Self-Esteem Scale.

**Table 5. Mean and Standard Deviations of the Groups in the Pretest and Posttest Assessments**

| | Body Project | | Expressive writing | |
|---|---|---|---|---|
| | Mean | *SD* | Mean | *SD* |
| EDE-Q Pretest | 88.32 | 34.77 | 76.35 | 42.02 |
| EDE-Q Posttest | 40.08 | 18.41 | 65.95 | 30.57 |
| BIQLI Pretest | 4.56 | 23.61 | 9.33 | 22.21 |
| BIQLI Posttest | 18.66 | 13.52 | 11.52 | 18.92 |
| BSI Pretest | 84.17 | 38.86 | 82.49 | 37.56 |
| BSI Posttest | 50.16 | 23.44 | 66.32 | 30.93 |
| RSES Pretest | 25.44 | 1.71 | 24.41 | 1.61 |
| RSES Posttest | 26.94 | 1.54 | 24.66 | 1.55 |

***Note.*** EDE-Q: Eating Disorder Examination Questionnaire, BIQLI: Body Image Quality of Life Inventory, BSI: Brief Symptom Inventory, RSES: Rosenberg Self-Esteem Scale

The Body Project (Stice et al. 2001) has been translated into many different languages after its introduction and the findings of numerous studies have supported its efficacy (Becker & Stice, 2017). Studies that were conducted in different countries using different gender and age groups have revealed the efficacy of the Body Project on thin-ideal internalization (Cruwys et al., 2015), eating disorder symptoms (Stice et al., 2020), body dissatisfaction (Ghaderi et al. 2020), negative affect (Stice et al., 2017), dieting (Rohde et al., 2014), alexithymia (Mitchell et al., 2007), anxiety (Mitchell et al., 2007), depression (Stice et al., 2013), and sociocultural pressures (Atkinson & Wade, 2016). The findings of the current study are consistent with the findings in the literature. Moreover, the findings of this study expand previous research by showing the effect of the vBP on the psychological symptoms that were measured using the BSI and on self-esteem that was measured using the RSES. Moreover, the study uniquely contributes to the literature by being the first implementation of the Body Project to the Turkish culture. Previous efficacy studies have generally been conducted in Western cultures. Turkey has a quite different culture from that of Western countries in terms of family structure, religious beliefs, cultural values, and coping styles (Bugay et al., 2021; Gonzales-Mesa et al., 2018). Thus, testing the effect of the vBP on young women in Turkey contributes to the generalizability of eating disorder prevention studies.

The effect of the vBP on different variables such as the risk of eating disorders, thin-ideal internalization, body image concerns, self-esteem, and psychological symptoms can be explained by several therapeutic components of the sessions. In the vBP sessions, the participants expressed their thoughts, emotions, and experiences related to their physical appearance and body in a group setting where they did not have to worry about being judged. In other words, they made self-disclosure in the face of the unconditional positive acceptance of the group leader and group members. In addition, the participants met and interacted with the group members who were dissatisfied with their bodies, afraid of gaining weight, and constantly preoccupied with diet and eating issues in the sessions. This can ease the normalization of their thoughts and emotions that are related to their body shape, eating attitudes, concerns about gaining weight, etc. Moreover, the participants collectively produced alternative cognitions against their cognitive distortions about their body shape concerns and thin-ideal internalization. Supportive and relational atmosphere of the group might have helped them to strength their coping abilities against negative emotions arising from body dissatisfaction. Group sessions may have enabled the participants to accept and love their own bodies as they are by modeling each other. Through the home assignments, letters, and role-play activities, the participants worked on questioning their internalized thin-ideal and being more aware of the positive aspects of their bodies. In conclusion, factors such as self-disclosure, unconditional positive acceptance (Rogers, 1995), normalization, generating alternative thoughts, home assignments, role-play activities (Beck, 2020), modeling, and social support (Bandura & Walters, 1977) could be the mechanisms underlying the changes that were observed in the participants.

## Limitations

The findings of this study should be evaluated within the framework of certain limitations. Firstly, the dropout rates were quite high, about 50% for both groups. Although there is no finding showing a threat posed by dropouts to the internal validity of the study, the reasons behind the dropouts should be examined. Some aspects of the interventions such as the low compensation fee, the burden of the sessions, and home assignments could have affected participation motivation. Another important limitation of the study is that the placebo group did not receive the vBP application and the follow-up study was not performed. Because of this deficiency, it is difficult to understand whether the effect of vBP will continue in the long term. Besides, there was no objective scoring system showing the adherence of the psychologists who applied the vBP to the protocol. This can be considered a threat to the structure validity. Lastly, the generalizability of the findings is low due to the small sample size and convenience sampling.

## Conclusion and Future Directions

In the current study, the Turkish version of the Virtual Body Project, which has been used for years in the scope of preventive mental health in many countries, has been generated and its efficacy has been supported. This is the first experimental study conducted in Turkey to reduce the risk of body dissatisfaction, negative eating attitudes, and eating disorders in young women. The Turkish version of the Virtual Body Project was found to be effective not only on the risk of eating disorders but also on self-esteem and psychological symptoms. In this respect, it is thought that the present study contributes to the existing literature. On the other hand, this research was conducted only with young women who were university students. Besides, only two psychologists implemented the Virtual Body Project. To reduce construct validity and external validity concerns, it is crucial for further research to test the efficacy of the Turkish version of the Virtual Body Project in high school students, young women from different educational and economic levels, adults, and clinical samples. It is expected that the Virtual Body Project, which is easy to implement and lasts only four weeks, will be a useful tool for clinicians who study in the preventive mental health field.

## DECLARATIONS

***Compliance with Ethical Standards*** This study was approved by TED University Human Research Ethics Committee (Number: 1996, Date: 30 September 2020).

***Conflict of Interest*** The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

***Availability of Data and Materials*** The datasets generated during and/or analysed during the current study are available in the 'Figshare' repository (https://figshare.com/) DOI: 10.6084/m9.figshare.19514038

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