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A Prospective Examination of Psychosocial Outcomes Following Gynecomastia Surgery

D. Luis Ordaz
University of South Florida

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A Prospective Examination of Psychosocial Outcomes Following Gynecomastia Surgery

by

D. Luis Ordaz

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy Department of Psychology College of Arts and Sciences University of South Florida

Co-Major Professor: Jack Darkes, Ph.D.
Co-Major Professor: Diana Rancourt, Ph.D.
Jon Rottenberg, Ph.D.
Eric Storch, Ph.D.
Kristen Salomon, Ph.D.
Brent Small, Ph.D.

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ABSTRACT

Gynecomastia is a condition in which 3% of males will go on to develop permanent excess breast tissue and has been associated with a number of psychosocial consequences. In recent years, gynecomastia surgery has been in the top 5 cosmetic procedures sought out by men. There is a limited amount of research regarding psychosocial outcomes of gynecomastia surgery despite the large number of men seeking surgery, and the current literature on outcomes has yet to examine chest satisfaction within the context of gynecomastia surgery. The current study sought to add to the treatment literature on gynecomastia by examining chest satisfaction, appearance evaluation, chest-related state anxiety, general trait anxiety, self-esteem, depressive symptoms, eating pathology, and various facets of health-related quality of life, before and after surgery. Mixed effects models were used to examine change at baseline, 1 month post-op, 3 months post-op, 6 months post-op, and 12 months post-op. Paired samples t-tests were used to examine change from baseline to 12 months post-op. Additionally, it may be that chest satisfaction in this population has not been examined due to limited body image measures that tap into this construct. Therefore, another aim of this study was to examine the psychometrics of a newly created chest satisfaction measure. The results from the current study showed significant improvement in chest satisfaction and appearance evaluation from baseline to 12 months post-op. Additionally, chest-related anxiety significantly decreased, and social functioning significantly improved over time. The current study also provided preliminary psychometric support for the Chest Satisfaction Questionnaire. Taken together, these findings may indicate the potential for chest-specific and body image-related variables to improve following gynecomastia
surgery and provide a new measure that can be used to assess chest satisfaction within the
gynecomastia population.
CHAPTER ONE: INTRODUCTION

Gynecomastia involves excess glandular growth of breast tissue in males affecting either one (unilateral) or both (bilateral) sides of the chest. Gynecomastia is estimated to affect anywhere from 30 to 70% of males in the course of their lifetime, with increased prevalence during the neonatal period, adolescence, and older adulthood (Cakan & Kamat, 2007; Gikas & Mokbel, 2007; Johnson, Kermott, & Marod, 2011; Nordt & DiVasta, 2008; Nydick, Bustos, Dale, & Rawson, 1961). Recent research indicates the highest prevalence during the neonatal period (60-90%), followed by similar incidence rates during adolescence and old age (50-70%, Johnson, Kermott, & Marod, 2011). Such high prevalence rates would sound alarming; however, gynecomastia is transient in nature, with most cases remitting within 3 years of onset (Cakan & Kamat, 2007; Gikas & Mokbel, 2007; Nydick et al., 1961). While most cases resolve on their own, some cases of gynecomastia are permanent, leaving upwards of 6% of affected individuals with excess breast tissue indefinitely. Moreover, this proliferation of breast tissue is often incongruent with gender identity when experienced unintentionally (Money & Lewis, 1982; Schonfeld, 1962; Wassersug & Oliffe, 2009). This development of opposite sex characteristics can have lasting consequences on psychosocial functioning and body image. While minimal psychological research exists within the unique population of males with gynecomastia, recent research suggests a host of negative psychosocial consequences associated with gynecomastia (e.g., Ordaz & Thompson, 2015).

Internalizing symptoms, primarily consisting of depression, anxiety, and reduced self-esteem, are the most commonly cited problems associated with gynecomastia (e.g., Ordaz &
Thompson, 2015). For example, multiple studies examining youth with gynecomastia
demonstrate elevated levels of depressive and anxiety symptoms when compared to population
norms (Kinsella et al., 2012; Storch et al., 2004). Such symptoms culminate into a diagnosable
mood disorder in 17% of cases and a diagnosable anxiety disorder in approximately 25% of
cases (Kinsella et al., 2012). Additionally, this research has suggested heightened risk for
loneliness in this population (Storch et al., 2004), which may be associated with maladaptive
coping behaviors seen in those with gynecomastia. For example, many individuals with
gynecomastia report socially withdrawing or isolating themselves in response to gynecomastia,
as well as avoiding situations in which their chest might be exposed (Money & Lewis, 1982;
Rosen et al., 2010; Schonfeld, 1962). Such social isolation is frequently associated with
depressive symptoms and is consistent with the experience of social or appearance-related
anxiety. As evidenced, gynecomastia is often associated with a multitude of emotional
consequences and significant distress, yet it remains understudied in behavioral health
psychology.

In addition to social withdrawal and avoidance, gynecomastia is often associated with
efforts to self-treat through a variety of maladaptive coping strategies. For example, individuals
with gynecomastia report wearing multiple shirts, wrapping their chest in duct tape, and making
harmful postural adjustments in order to hide the appearance of the chest (Kinsella et al., 2012).
Such behaviors mimic those often seen in cases of body dysmorphic disorder, in which
individuals hide perceived flaws through use of clothing or makeup. Moreover, behavioral
components of traditional eating disorders have been endorsed by the gynecomastia population
in an attempt to change the appearance of the chest. For example, one case study described
vomiting and excessive exercise in two adolescent boys with gynecomastia, which were used as
attempts to change the appearance of their chest (Fisher & Fornari, 1990). Other research highlights food restriction as a means of trying to self-treat gynecomastia (Kinsella et al., 2012). Additionally, more recent research highlights differences between males with and without gynecomastia on disordered eating measures, though this may be due to a higher BMI associated with gynecomastia (Nuzzi et al., 2013). Such maladaptive coping behaviors in an attempt to either hide or change the appearance of the chest indicates significant distress associated with gynecomastia and an increased effort to self-treat through pathological means. Moreover, it highlights the need for more treatment-focused research within this population, as attempts to self-treat concerns associated with gynecomastia are likely to do more harm than good.

Treatment options for gynecomastia are limited, especially during earlier stages of development where there is more hesitance to treat the condition. This lack of early intervention may be why individuals with gynecomastia find the need to self-treat through a variety of maladaptive coping mechanisms. For example, sympathetic reassurance from health-care professionals consisting of reassuring those with gynecomastia of its transient nature and monitoring of the condition is commonly cited as the primary form of action taken for early-onset gynecomastia (Cakan & Kamat, 2007; Nordt & DiVasta, 2008; Nydick et al., 1961). Meanwhile, it is likely that adolescents with gynecomastia may still endorse efforts to self-treat their gynecomastia through pathological eating- and body-related behaviors in this stage of development as evidenced by previous research (Fisher & Fornari, 1999; Kinsella et al., 2012). When gynecomastia is deemed permanent, patients are typically referred to a cosmetic surgeon for a combination of glandular removal of breast tissue and liposuction (Gikas & Mokbel, 2007; Johnson & Murad, 2009; Nordt & DiVasta 2008). In fact, according to an American Society of Plastic Surgeons (2017) statistical report, breast reduction for gynecomastia has recently been in
the top five most frequently sought cosmetic surgery procedures for males, and the number of
breast reduction procedures has increased from previous years.

While an abundance of research exists outlining a variety of surgical techniques for
gynecomastia, the research concerning psychological outcomes of surgery is scant, and such
research shows conflicting results. For example, some research suggests high satisfaction rates
with surgery (e.g., Barone et al., 2017) and increases in self-esteem (Fricke, Lehner, Stark, &
Penna, 2017) and quality of life (Davanco et al., 2009; Kasielska-Trojan & Antoszewski, 2017;
Nuzzi et al., 2018). Other work, however, suggests that surgery alone is inadequate for reducing
psychological distress and improving self-esteem (Davanco et al., 2009; Schonfeld, 1962).
Moreover, most individuals with gynecomastia report some form of dissatisfaction with the
appearance of their chest as motivation for trying to change the appearance of their chest either
on their own or through surgery (Fisher & Fornari, 1990; Schonfeld, 1962; Wassersug & Oliffe,
2009), yet no research to date quantitatively examines the impact of surgery on gynecomastia-
related body image. Instead, satisfaction rates with surgery have commonly served as a proxy for
chest satisfaction. The primary goal of surgery for gynecomastia is often to remove glandular
breast tissue and create a more masculine appearance of the chest. As such, it would be
informative to know if such procedures do in fact improve patients’ body image, yet the current
evidence remains unclear.

Despite growing evidence of psychosocial distress associated with gynecomastia and
increasing rates of breast reduction surgeries for males, no research to date has quantitatively
examined body image outcomes in this population (e.g., Ordaz & Thompson, 2015). Yet, body
image has garnered attention in the context of other similar surgical procedures. Assessing body
image concerns within a surgical context can provide insight into the motives for seeking
treatment and the effectiveness of such procedures on body satisfaction (Sarwer & Crerand, 2004). For example, previous studies have examined body image outcomes in women seeking cosmetic surgery for a variety of reasons including general appearance enhancement and reconstructive purposes (Sarwer, Wadden, & Whitaker, 2002; Schover et al., 1995; von Soest, T., Kvalem, Roald, & Skolleborg, 2009). Macromastia occurs when women develop increased breast tissue and is commonly associated with pain and psychosocial distress (Cerrato et al., 2012; Iwuagwu, Stanley, Platt, Drew, & Walker, 2006; Pérez-Panzano, et al., 2017; Sarwer et al., 1998). In the context of female breast reduction, surgery is associated with improvements in body satisfaction and other psychosocial factors (Borkenhagen, Röhrich, Prei, Schneider, & Brähler, 2007; Glatt et al., 1999; Iwuagwu et al., 2006; Pérez-Panzano, et al., 2017; Rogliani, Gentile, Labardi, Donfrancesco, & Cervelli, 2009). While gynecomastia and macromastia share many similarities, there remains a gap in the body image literature when it comes to abnormal breast development in males, perhaps due to a lack of appropriate body image measures for the gynecomastia population.

The field of male body image has largely focused on muscularity and fat concerns (Cafri & Thompson, 2004; Tiggemann, Martins, & Churchett, 2008), resulting in body image measures that tap into such constructs, yet none capture chest satisfaction as it might relate to gynecomastia. For example, the Body Areas Satisfaction Scale is a site-specific body image measure that assesses satisfaction with a number of different body sites (e.g., lower torso, upper torso, face, etc.), but it does not assess chest satisfaction specifically (Cash, 2000). A similar measure exists specifically for men that includes items addressing the chest/upper torso – The Body Parts Satisfaction Scale for Men (BPSS-M; McFarland & Petrie, 2012). This measure, however, focuses on satisfaction with leanness and muscularity rather than chest appearance.
more generally. The Chest Rating Scale (CRS), a silhouette scale portraying male figures with varying levels of muscularity, also assesses musculature-oriented body dissatisfaction with the torso (Thompson & Tantleff, 1992). Such scales are useful when looking at body image relevant to muscularity, but gynecomastia and its surgical intervention are independent of muscularity, making the BPSS-M and CRS less appropriate for this population. While individuals with gynecomastia may be influenced by the muscular ideal, body image in this population may be more strongly influenced by the appearance of the chest specifically, versus general indices of muscularity and body fat. Given that gynecomastia surgery is often sought out specifically to improve the appearance of the chest through removal of breast tissue, a psychometrically strong chest-specific body image measure is warranted.

**The Current Study**

The first aim of this study used longitudinal data to examine psychosocial functioning over time in men who had undergone gynecomastia surgery. Given past research suggesting the potential for improvements in health-related quality of life after surgical gynecomastia treatment (Davanco et al., 2009; Kasielska & Antoszewski, 2011), I hypothesized that participants would exhibit improved quality of life following surgery. While there are no data to suggest quantitative improvements in body image following gynecomastia surgery, there is research to suggest high satisfaction rates with this type of surgery (e.g., Barone et al., 2017). While to date no studies have explicitly measured pre- and post-surgery chest satisfaction, I hypothesized that satisfaction with surgery would generalize to increased chest satisfaction following surgery. Additionally, some research has attempted to examine the effects of surgery on self-esteem producing mixed findings (Davanco et al., 2009; Fricke, Lehner, Stark, & Penna, 2017; Schonfeld, 1962); thus, it is unclear how self-esteem will be impacted following surgery based
on previous research. Other psychological factors (e.g., depressive symptoms, anxiety, eating pathology, and global appearance evaluation) have yet to be examined in a treatment context within this population; thus, analyses regarding these psychological outcomes were exploratory in nature.

The second aim was to examine the psychometrics of a newly developed chest satisfaction measure. This aim included examining the factor structure of the measure and assessing reliability and convergent validity. Additionally, as there is also a significant amount of research examining body image in the context of macromastia (Borkenhagen et al., 2007; Glatt et al., 1999; Perez-Panzano et al., 2017), the factor structure of the new chest satisfaction measure was examined in both men and women with the goal of producing a psychometrically sound measure of chest satisfaction that works similarly for men and women. Such a measure could prove useful for cosmetic and reconstructive surgery, especially for gynecomastia, as satisfaction with the surgical procedure is currently serving as a proxy for chest satisfaction. Convergent validity for the chest satisfaction measure was investigated by examining its association with other psychosocial variables of interest (e.g., appearance evaluation, eating pathology, appearance anxiety, and self-esteem) in three separate groups: men with gynecomastia, men without gynecomastia, and women.
CHAPTER TWO: METHOD

Participants

For the first aim, a group of 25 men with gynecomastia presenting for breast reduction surgery, between the ages of 18 and 65, was recruited. For the second aim, an additional 183 men and 280 women were recruited. The second aim consisted of three different subsamples: 98 men with gynecomastia (including the 25 from aim one), 110 men without gynecomastia, and 280 women.

Aim 1 Procedure

Participants were recruited from an outpatient plastic surgery center in Orlando, Florida, prior to receiving gynecomastia surgery. The surgeon at the outpatient surgery center had several years of experience in providing gynecomastia surgery, utilizing combined mastectomy and liposuction. Individuals were considered appropriate for this study if they currently had gynecomastia, signed up for surgery at the clinic, and were between the ages of 18 and 65. Thirty men were approached about the study, and 25 consented and agreed to participate. Upon consenting to the study, participants were awarded $20 dollars as compensation for their time. Participants completed a baseline questionnaire within a week prior to surgery, and then completed surveys at 4 additional time points post-surgery: 1 month, 3 months, 6 months, and 12 months. These five time points were chosen considering recovery time as well as longitudinal change. See Appendix A for a timeline of study time points.
**Baseline Assessment**

After the initial consultation with the surgeon, the plastic surgery coordinator informed patients about the study and obtained informed consent. Participants were given an iPad with a link to the online survey hosted by SurveyMonkey. Participants provided their age, height, and weight and completed seven psychological measures. Completion of these measures took approximately 20 minutes. The plastic surgery coordinator was available to answer any procedural questions regarding the study, and if participants preferred to complete the measures at home, they were emailed a link to the survey to complete prior to surgery. Baseline surveys were completely within one week prior to surgery for all participants.

**Follow-up Assessments**

When participants had scheduled follow-up visits at the surgery center, they were given the option to complete the online follow-up survey(s) via an iPad given to them by the plastic surgery coordinator, or on their own time through a survey link that was emailed to them by a member of the study team. These time points took place 1 month, 3 months, 6 months, and 12 months following surgery. Participants were sent a weekly reminder email and phone text to complete their survey by a member of the study team at each follow up, with weekly reminders being sent until the last week they were able to complete follow-up surveys. Participants were allowed to complete follow-up surveys up to half-way until the next follow-up appointment. Specifically, participants had four weeks to complete the 1 month follow-up (time point 2), six weeks to complete the 3 month follow-up (time point 3), 12 weeks to complete the 6 month follow-up (time point 4), and 24 weeks to complete 12 month follow-up (time point 5). Participants self-reported their height and weight and completed all seven psychological measures at time points two through five.
Aim 2 Procedure

Aim 2 included men with gynecomastia, as well as comparison groups of men without gynecomastia and women. The 25 men with gynecomastia recruited for aim 1 were also included in aim 2. An additional group of men with gynecomastia were recruited from an online forum for gynecomastia (gynecomastia.org) to increase the total sample size. An IRB-approved forum post provided a brief study description and a direct link to the questionnaires to recruit participants (see Appendix B for the forum post). Men were allowed to participate in the study if they had gynecomastia and were between the ages of 18 and 65. Participants were able to reach out to the study team via email or phone if they had questions prior to participating.

Men and women were recruited through the psychology participant pool (SONA) at the University of South Florida to generate non-gynecomastia comparison samples. Out of the men who participated, 2% endorsed gynecomastia. Students at the university were able to participate in the study if they were between the ages of 18 and 65. Participants recruited from these sources were asked to complete a one-time assessment of their age, height, weight, and seven psychological measures. Participants from gynecomastia.org and SONA were recruited and provided informed consent completely online prior to completing questionnaires. Participants from SONA were given extra credit points for participation in the study.

IRB Approval

Both aim 1 and aim 2 were submitted to the University of South Florida’s Institutional Research Board (IRB) as one study. The study was approved at the expedited level.

Measures

All participants provided their age, height, and weight and completed the seven psychological measures listed below.
Patient Health Questionnaire-9 (PHQ-9)

The PHQ-9 (Spitzer, Kroenke, & Williams, 1999) is a self-report depression severity scale commonly used in medical settings with questions pertaining to the nine depression criteria based on the Diagnostic and Statistical Manual of Mental Disorders - IV (DSM-IV). The measure consists of 10 items, with the first 9 items asking the patient how often they have been bothered by each problem over the last two weeks and an additional item at the end for patients who checked off any of the symptoms asking: “How difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?” For the purpose of this study, the time frame was changed to three weeks. One question asks about suicidal ideation. All participants were given potential resources for suicidal ideation at the top of each measure and at the final page of the online survey. Each question is answered on a scale of 0 (not at all) to 3 (nearly every day), and the measure is scored by adding the scores for the first nine questions with a possible score of 0 to 27. The total score indicates depression severity, with 1-4 indicating minimal depression, 5-9 indicating mild depression, 10-14 indicating moderate depression, 15-19 indicating moderately severe depression, and 20-27 indicating severe depression. Internal consistency was acceptable to good, with Cronbach’s alphas of .75, .88, .89, and .88 for men with gynecomastia receiving surgery, men with gynecomastia, men without gynecomastia, and women respectively. See Appendix C for the full measure.

State Trait Anxiety Index – Y Form (STAI-Y)

The STAI-Y (Spielberger, 1983) is a self-report measure of state and trait anxiety. The measure consists of two forms, Y-1 and Y-2. Y-1 consists of 20 state anxiety questions asking participants to rate how they feel “right now” on a scale of 1 (not at all) to 4 (very much so), and Y-2 consists of 20 trait anxiety questions asking participants to rate how they feel “generally” on
a scale of 1 (almost never) to 4 (almost always). The state anxiety questions of the measure are able to reflect a certain situation rather than how the person feels “right now.” As such, the questions regarding state anxiety were changed from “right now” to “when your chest is exposed (wearing a thin shirt, a tight shirt, or no shirt at all).” A sample statement for the state anxiety questions is, “I feel self-confident.” A sample statement for the trait anxiety questions is, “I feel like a failure.” Scores can range from 20 to 80 for each form by summing the weighted scores. Items 1, 2, 5, 8, 10, 11, 15, 16, 19, and 20 on form Y-1 are reverse coded. Items 21, 23, 26, 27, 30, 33, 34, 36, and 39 on form Y-2 are reverse coded. Higher scores on form Y-1 indicate greater chest-related state anxiety while higher scores on form Y-2 indicate greater trait anxiety. For the state anxiety subscale, internal consistency was excellent, with Cronbach’s alphas of .95, .97, .95, and .94 for men with gynecomastia receiving surgery, men with gynecomastia, men without gynecomastia, and women respectively. For the trait anxiety subscale, internal consistency was excellent, with Cronbach’s alphas of .94, .96, .95, and .94 for men with gynecomastia receiving surgery, men with gynecomastia, men without gynecomastia, and women respectively. See Appendix D for the full measure.

**Eating Disorders Inventory – Drive for Thinness and Bulimia (EDI-DT and B)**

The EDI (Garner, Olmstead, and Polivy, 1983) is a self-report multidimensional measure of feelings, attitudes, and behaviors regarding eating. For the purpose of this study the drive for thinness (DT) and bulimia (B) subscales were used to assess eating pathology. Both subscales consist of 7 items totaling to 14 items. Participants are asked to rate how often each statement applies on a scale from 1 (always) to 6 (never). A sample statement is: “I think about dieting.” Typically, when a participant indicates 1, 2, or 3, his score is 3, 2, or 1, respectively for that item while indicating 4, 5, or 6 earns a score of 0. For ease of examining eating pathology on a
continuum, scores will remain on a scale from 1 to 6 with the first item being reverse scored. When this approach is taken, subscale scores are then summed (Schoemaker, van Strien, & van der Staak, 1994). Total subscale scores can range from 7 to 42. Higher scores indicate greater eating pathology. For the drive for thinness subscale, internal consistency ranged from good to excellent, with Cronbach’s alphas of .90, .87, .90, and .92 for men with gynecomastia receiving surgery, men with gynecomastia, men without gynecomastia, and women respectively. For the bulimia subscale, internal consistency ranged from acceptable to excellent, with Cronbach’s alphas of .79, .93, .84, and .88 for men with gynecomastia receiving surgery, men with gynecomastia, men without gynecomastia, and women respectively. See Appendix E for the full measure.

Rosenberg Self-Esteem Scale (RSES)

The RSES (Rosenberg, 1965) is a commonly used measure of global self-esteem. The measure consists of 10 statements pertaining to self-esteem and self-worth to be rated on a 4-point scale ranging from strongly agree to strongly disagree. A sample statement is: “I feel that I have a number of good qualities.” Strongly agree is weighted at 0, and strongly disagree is weighted at 3. Items 2, 5, 6, 8, and 9 are reverse coded, and scoring consists of summing the scores. Total scores can range from 0 to 30. Higher scores indicate greater self-esteem. Internal consistency ranged from good to excellent, with Cronbach’s alphas of .89, .92, .92, .92 for men with gynecomastia receiving surgery, men with gynecomastia, men without gynecomastia, and women. See Appendix F for the full measure.
Multidimensional Body Self-Relations Questionnaire – Appearance Evaluation

Scale (MBSRQ-AE)

The appearance evaluation subscale of the MBSRQ-AE (Cash, 2000) is a seven-item measure of global appearance evaluation. Participants are asked to rate their agreement with seven statements concerning how they feel about their body or appearance on a scale from 1 (definitely disagree) to 5 (definitely agree). A sample statement is: “My body is sexually appealing.” Scores are averaged, and items 6 and 7 are reverse scored. Total scores can range from 1 to 5, and higher scores indicate greater appearance evaluation. Internal consistency ranged from good to excellent, with Cronbach’s alphas of .84, .89, .92, and .91 for men with gynecomastia receiving surgery, men with gynecomastia, men without gynecomastia, and women respectively. See Appendix G for the full measure.

Chest Satisfaction Questionnaire (CSQ)

The CSQ is an eight-item measure of chest satisfaction that was developed in a previous study (Ordaz, 2016). During the development process, a pool of questions was created and modeled after the MBSRQ-AE. After expert review, eight questions were retained and internal consistency was deemed excellent in a sample of men with gynecomastia. Similar to the MBSRQ-AE, participants are asked to rate their agreement with seven statements concerning how they feel about their chest on a scale from 1 (definitely disagree) to 5 (definitely agree). A sample statement is: “I am comfortable with the shape of my chest.” Scores are averaged, and item 4 is reverse coded. Total scores can range from 1 to 5, and higher scores indicate greater chest satisfaction. Internal consistency ranged from poor to excellent, with Cronbach’s alphas of .69, .91, .94, and .90 for men with gynecomastia receiving surgery, men with gynecomastia, men without gynecomastia, and women respectively. See Appendix C for the full measure.
**Short Form – 36 Version 2.0 (SF-36 V2)**

The SF-36 V2 (Ware, Kosinski, & Dewey, 2000) is a widely used measure of health-related quality of life that measures multiple domains of quality of life. For the purpose of this study, six of the eight subscales were used: bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role-emotional (RE), and mental health (MH). These subscales were picked based on topics of interest for this study, as well as past research suggesting these domains are particularly relevant to gynecomastia (Davanco et al., 2009; Nuzzie et al., 2013). These subscales total to 21 items. Statements related to physical health, mental health, and quality of life are rated on 5- to 6-point likert scales. A sample item is: “During the past 3 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?” Domain scores are transformed into scaled scores ranging from 0 to 100, and items 9, 10, 13, 14, 16, 18, and 20 are reverse coded. Higher scores indicate greater health-related quality of life. Internal consistency ranged from good to excellent, with Cronbach’s alphas of .94, .93, .89, and .91 for men with gynecomastia receiving surgery, men with gynecomastia, men without gynecomastia, and women respectively. See Appendix I for the full measure.
CHAPTER THREE: DATA ANALYSES

As there is not enough research to extrapolate effect sizes for surgery on relevant outcomes, scatter plots from the longitudinal data were used to estimate effect sizes. Examination of scatter plots revealed potential for medium effects of surgery on related outcomes. As such, an effect size of $f = .25$ was used for power analyses. Post-hoc power analyses were calculated for within factors, repeated measures ANOVA, a similar, but more conservative method than linear mixed-effects modeling (Krueger & Tian, 2004). As such, the proposed analyses should have sufficient power to detect effects. SPSS 25.0 and G*Power 3.1 were used for power analyses. With the noted effect size and five repeated measurements, a total sample size of 21 was estimated to achieve .80 power. The current sample size of 25 participants allowed for sufficient power to detect medium effect sizes.

For aim 1, linear mixed-effects models were used to examine symptom change over time for all outcomes of interest (depressive symptoms, chest-related state anxiety, trait anxiety, eating pathology, self-esteem, appearance evaluation, chest satisfaction, and health-related quality of life), with a fixed effect of time and random intercept and $\alpha = .05$ in SPSS 25.0. As spacing between time points was not equal, the time variable reflected months since surgery. Full Information Maximum Likelihood (FIML) estimation was used for all analyses to account for missing data. There was a significant amount of data lost at follow up, with time points 1 through 5 having 4%, 45%, 50%, 45%, and 65% missing data respectively. Paired samples t-test was also used to examine pre to post change and Cohen’s $d$ was used for effect size. A one-way ANOVA was used to assess differences on age, BMI, and all outcome variables between participants who
completed versus did not complete the study. Completers and non-completers did not significantly differ on any variable. Differences in descriptive statistics across men with gynecomastia presenting for surgery, men with gynecomastia, and men without gynecomastia were examined for aim 1 using a one-way ANOVA. Post-hoc differences were examined using Tukey HSD when variances were equal and Games-Howell when variances were not equal.Eta-squared ($\eta^2$) was used for estimates of effect size. All analyses were done using SPSS 25.0.

Separate analyses were used to examine the effects of time on the following dependent variables (DVs): depressive symptoms, chest-related state anxiety, trait anxiety, eating pathology, self-esteem, appearance evaluation, chest satisfaction, and various facets of health-related quality of life. Models were first run with an added random factor of time, but they did not converge. This random factor was removed from subsequent models. While this resulted in losing some information from the models, it also allowed for greater flexibility. For each analysis, Model 1 included a fixed factor of time and a random factor of intercept. Model 2 included an additional fixed factor of baseline BMI to assess whether controlling for BMI provided a better fit for the data. This decision was made on the basis that some of the variables of interest (e.g., body image related variables) are often correlated with BMI (Weinberger, Kersting, Riedel-Heller, & Luck-Sikorski, 2016). For non-body image dependent variables, BMI was retained in the models for consistency. Lastly, Model 3 included an additional fixed factor of the interaction between baseline BMI and time to assess whether baseline BMI influenced change in outcomes over time. Moderation was further assessed using computational procedures and guidelines for interpreting multilevel modeling interactions provided by Preacher, Curran, & Bauer (2006), using simple slopes for the mean level of the moderator and at $\pm 1$ standard
deviation of the moderator. An autoregressive covariance structure was specified on the basis that measurement points would be less correlated with each other the farther apart in time.

For aim 2, the factor structure for the CSQ was examined in a combined sample of men (with and without gynecomastia) and a sample of women. An exploratory factor analysis (EFA) using principal axis factoring and promax oblique rotation was used to examine the factor structure of the CSQ in SPSS 25.0. The decision to use promax oblique rotation was made as underlying factors, should there be more than one, are expected to correlate. A statistically significant Bartlett’s test of sphericity and a Kaiser-Meyer-Olkin value at or above .60 was used to determine appropriate items (Tabachnick & Fidell, 2007). The scree plot (Floyd & Widaman, 1995; Cattell, 1966), Kaiser-Guttman criterion of an eigenvalue of 1.0 or greater (Guttman, 1954; Kaiser, 1960), and parallel analysis using 1000 samples (Horn, 1965), was used to determine the number of factors. Item factor loadings were assessed, and items with at least a .40 factor loading were retained (Floyd & Widaman, 1995; Ford, MacCallum, & Tait, 1986). There was 3% missing data for the sample of men and 6% missing data for the sample of women. Listwise deletion was used for missing data. Similarity between factor structures of the CSQ for men and women was assessed using Tucker’s coefficient of congruence, with a coefficient of .85-.94 suggesting fair similarity and a coefficient of .95 or greater suggesting equal factors (Lorenzo-Seva & ten Berge, 2006). Additionally, separate correlation matrices including all variables of interest were created for men with gynecomastia, men without gynecomastia, and women to examine patterns of associations between chest satisfaction and other indices of mental health within these groups and to examine convergent validity for the CSQ. Lastly, differences in descriptive statistics between men (with and without gynecomastia) and women
were examined for aim 2 using independent samples t-tests in SPSS 25.0. Levene’s test was used to assess equality of variances and Hedge’s g was calculated for effect sizes.
CHAPTER FOUR: RESULTS

Aim 1

Results from the one-way ANOVA showed significant differences on a number of variables when comparing men with gynecomastia presenting for surgery, men with gynecomastia, and men without gynecomastia. Significant differences were found for the following variables: age ($F(2, 230) = 60.24, p < .001, \eta^2 = .34$), BMI ($F(2, 230) = 5.51, p < .01, \eta^2 = .05$), chest satisfaction ($F(2, 223) = 67.34, p < .001, \eta^2 = .38$), appearance evaluation ($F(2, 223) = 25.00, p < .001, \eta^2 = .18$), drive for thinness ($F(2, 219) = 10.44, p < .001, \eta^2 = .09$), chest-related state anxiety ($F(2, 206) = 19.59, p < .001, \eta^2 = .16$), general trait anxiety ($F(2, 206) = 3.52, p < .05, \eta^2 = .03$), self-esteem ($F(2, 221) = 5.44, p < .01, \eta^2 = .05$), depressive symptoms ($F(2, 217) = 3.05, p < .05, \eta^2 = .03$), bodily pain ($F(2, 226) = 4.02, p < .05, \eta^2 = .03$), and social functioning ($F(2, 222) = 7.19, p < .01, \eta^2 = .06$). For post-hoc differences, see Appendix D. There were no significant differences on the following variables: bulimia ($F(2, 216) = 2.99, p = .05, \eta^2 = .03$), health-related quality of life ($F(2, 198) = 2.39, p = .09, \eta^2 = .02$), general health ($F(2, 205) = 1.12, p = .33, \eta^2 = .01$), vitality ($F(2, 224) = 1.25, p = .29, \eta^2 = .01$), role emotional ($F(2, 229) = 1.41, p = .25, \eta^2 = .01$), and mental health ($F(2, 222) = 2.55, p = .08, \eta^2 = .02$). Overall, the surgery group was similar to the larger gynecomastia group with a few exceptions. The surgery group experienced significantly more chest dissatisfaction, significantly less depression, and significantly greater quality of life related to bodily pain.

Results for the paired samples t-test showed a significant difference from baseline to 12 month follow-up for chest satisfaction ($t(9) = -5.31, p < .001, d = 1.69$) and appearance
evaluation ($t(8) = -4.92, p < .01, d = 1.65$), such that both chest satisfaction and appearance evaluation significantly improved at 12 month follow-up. The following variables did not significantly change based on the paired samples t-test: BMI ($t(9) = -.97, p = .36, d = .31$), health-related quality of life ($t(7) = .56, p = .59, d = .20$), bodily pain ($t(8) = .62, p = .55, d = .21$), general health ($t(7) = 1.07, p = .32, d = .38$), vitality ($t(8) = .38, p = .72, d = .13$), social functioning ($t(8) = -1.21, p = .26, d = .40$), role emotional ($t(8) = .40, p = .70, d = .13$), mental health ($t(8) = .36, p = .73, d = .12$), drive for thinness ($t(8) = 1.70, p = .13, d = .56$), bulimia ($t(8) = -.39, p = .71, d = .14$), chest-related state anxiety ($t(6) = -1.49, p = .19, d = .67$), and general trait anxiety ($t(8) = -.73, p = .49, d = .24$). For a table including means, standard deviations, and effect sizes for the paired sample t-tests, see Appendix E. For a visual depiction of the data at each time point, see Appendices F, G, H, I, and J, and for a visual depiction of individual trajectories, see Appendices K, L, M, and N.

**Model 1**

The first set of mixed effects models showed significant change over time for chest satisfaction, chest-related state anxiety, and social functioning, such that chest satisfaction and social functioning increased, and chest-related state anxiety decreased following surgery. See Appendix O for significant fixed effects and covariances. Fixed effects for time were not significant for depressive symptoms = .08 ($SE = .09, p = .41$), general trait anxiety = -.04 ($SE = .15, p = .78$), drive for thinness = -.11 ($SE = .09, p = .25$), bulimia symptoms = -.02 ($SE = .05, p = .70$), self-esteem = .00 ($SE = .07, p = .98$), appearance evaluation = .03 ($SE = .02, p = .07$), health-related quality of life = .06 ($SE = .27, p = .82$), bodily pain = .26 ($SE = .43, p = .55$), general health = -.20 ($SE = .38, p = .60$), vitality = .23 ($SE = .36, p = .53$), role emotional = .19
(SE = .50, p = .70), and mental health = .04 (SE = .36, p = .92). Taken together, these findings indicate that while social and chest-specific outcomes improved, broader indices of mental health such as depressive symptoms, general trait anxiety, and self-esteem did not significantly change following gynecomastia surgery. Additionally, attitudes and behaviors associated with eating pathology were not significantly influenced following gynecomastia surgery. Lastly, overall health-related quality of life, including various physical and emotional aspects of quality of life, did not significantly change following gynecomastia surgery.

Model 2

The second set of mixed effects models showed significant change over time for chest satisfaction, chest-related state anxiety, and social functioning, such that chest satisfaction and social functioning increased and chest-related state anxiety decreased following surgery, even with the addition of baseline BMI entered into the model. Baseline BMI was also a significant predictor of eating attitudes and behaviors associated with drive for thinness (aggregated across all time points), but drive for thinness did not significantly change over time. See Appendix P for significant fixed effects and covariances. After controlling for baseline BMI, fixed effects for time were not significant for depressive symptoms = .07 (SE = .09, p = .48), general trait anxiety = -.05 (SE = .15, p = .75), drive for thinness = -.10 (SE = .09, p = .28), bulimia symptoms = -.02 (SE = .05, p = .74), self-esteem = .00 (SE = .07, p = .98), appearance evaluation = .03 (SE = .02, p = .07), health-related quality of life = .07 (SE = .27, p = .79), bodily pain = .24 (SE = .43, p = .58), general health = -.20 (SE = .38, p = .61), vitality = .29 (SE = .37, p = .44), role emotional = .22 (SE = .50, p = .66), and mental health = .07 (SE = .37, p = .85). Taken together, these findings indicate that changes over time for chest-specific indices of body image and general social functioning were not better accounted for by baseline BMI, and that baseline BMI was a
better predictor of eating pathology than time. Lastly, findings related to health-related quality of life and other indices of mental health remained unchanged from Model 1.

**Model 3**

A significant interaction of time and baseline BMI was observed for vitality as an index of health-related quality of life. This association was only significant for individuals with a higher baseline BMI ($b = 1.46, p < .05$), such that individuals with higher baseline BMI saw improvement in vitality over time. There was not a significant association for individuals with average BMI ($b = .61, p = .13$) or lower BMI ($b = -.25, p = .54$). See Appendix Q for significant fixed effects and covariances and Appendix R for a graph of the interaction effect. No effect of time by baseline BMI was observed for depressive symptoms ($-.05 (SE = .04, p = .17)$), chest-related state anxiety ($-.13 (SE = .10, p = .22)$), general trait anxiety ($-.07 (SE = .06, p = .30)$), drive for thinness ($+.02 (SE = .04, p = .50)$), bulimia symptoms ($+.00 (SE = .02, p = .98)$), self-esteem ($+.04 (SE = .03, p = .16)$), appearance evaluation ($+.00 (SE = .01, p = .87)$), chest satisfaction ($+.01 (SE = .01, p = .29)$), health-related quality of life ($+.06 (SE = .11, p = .61)$), bodily pain ($-.05 (SE = .18, p = .80)$), general health ($-.09 (SE = .14, p = .54)$), social functioning ($-.14 (SE = .19, p = .46)$), role emotional ($+.28 (SE = .20, p = .18)$), and mental health ($+.06 (SE = .15, p = .70)$). Taken together, these findings indicate that changes over time for chest-specific indices of body image and general social functioning are not moderated by baseline BMI. However, there was a moderator effect of baseline BMI on changes in vitality over time, such that only individuals with higher baseline BMI saw significant improvement in vitality.

**Aim 2**

Based on Bartlett’s test of sphericity ($\chi^2 = 1579.94, df = 28, p < .001; \chi^2 = 1233.87, df = 28, p < .001$) and the Kaiser-Meyer-Olkin value (.93 and .91) for all men and women
respectively, the CSQ items were deemed appropriate for factor analysis. The eigenvalues, scree plot, and parallel analysis using 1000 samples suggested a 1 factor solution for both men and women. The scale contained eight items that strongly loaded (e.g., .40 or higher) on the one factor for both men and women (see Appendix S for pattern coefficients). Additionally, Tucker’s coefficient of congruence (1.00) suggested an identical factor structure of the CSQ for both men and women.

Results from the independent samples t-tests showed significant differences between men and women on a number of variables: age ($t(242.16) = 8.22, p < .001, g = .85$), BMI ($t(486) = 3.47, p < .01, g = .32$), chest satisfaction ($t(348.81) = -7.73, p < .001, g = .73$), appearance evaluation ($t(470) = -2.03, p < .05, g = .18$), drive for thinness ($t(470) = -3.85, p < .001, g = .36$), trait anxiety, ($t(443) = -2.35, p < .05, g = .23$), self-esteem ($t(401.36) = 2.73, p < .01, g = .26$), and general health ($t(450) = 2.79, p < .01, g = .27$). The following variables were not significantly different between men and women: bulimia ($t(467) = -1.63, p = .10, g = .15$), chest-related state anxiety ($t(341.45) = -.45, p = .65, g = .05$), depressive symptoms ($t(458) = -.32, p = .75, g = .03$), health-related quality of life ($t(421) = 1.40, p = .16, g = .14$), bodily pain ($t(483) = .71, p = .48, g = .06$), vitality ($t(465) = 1.86, p = .06, g = .17$), social functioning ($t(475) = .39, p = .70, g = .04$), role emotional ($t(480) = -1.21, p = .23, g = .11$), and mental health ($t(474) = .44, p = .66, g = .04$). For means, standard deviations, and effect sizes for the two groups, see Appendix T.

Lastly, a correlation matrix was created for men with gynecomastia, men without gynecomastia, and women that included BMI, chest satisfaction, appearance evaluation, eating pathology, chest-related state anxiety, trait anxiety, self-esteem, depressive symptoms, and various facets of health-related quality of life. Positive correlations between chest satisfaction
and measures of overall appearance evaluation and self-esteem and negative correlations between chest satisfaction and measures of eating pathology and appearance anxiety provide convergent validity. See Appendices U, V, and W for individual correlation matrices for men with gynecomastia, men without gynecomastia, and women respectively.
CHAPTER FIVE: DISCUSSION

Gynecomastia affects a sizeable portion of men and is a condition in which breast tissue develops beyond average size. While the area of male body image is fairly new and the amount of research focused on gynecomastia is sparse, past studies have identified that gynecomastia is often accompanied by chest dissatisfaction (Ordaz & Thompson, 2015). This can also be evidenced by the growing number of men electing to receive cosmetic surgery aimed at reducing breast size (American Society of Plastic Surgeons, 2017). Additional studies suggest that individuals with gynecomastia may utilize alternative strategies that mirror traditional eating pathology in attempt to reduce breast size (Fisher & Fornari, 1990; Nuzzi et al., 2013). It is clear that many men with gynecomastia experience distress by the appearance of their chest, but what remains unclear is the extent to which surgical management of the condition is effective in reducing this distress. The current study addressed this gap in the literature by examining psychosocial functioning before and after gynecomastia surgery and generally found significant improvement in chest-specific indices of mental health and social functioning, whereas other indices of mental health remained unchanged. Additionally, there is a general lack of body image measurement in the gynecomastia literature. The current study addressed this gap by assessing both chest-specific and global body image in a treatment-seeking population and examining the psychometrics of a chest-specific body image measure that can be used with both men and women.
Aim 1

In the current study, 25 men underwent breast reduction surgery and were assessed before surgery and through 1 year after surgery with the aim of identifying potential psychosocial benefits from breast reduction surgery. Prior to discussing the results from this study, the overall symptom profile of the sample should be noted. First, chest-specific indices of mental health were most severe, with chest satisfaction being significantly lower than both men with gynecomastia in general and men without gynecomastia. Additionally, the average for chest-related state anxiety was in the 92nd percentile when compared to population norms for adult males in a similar age range (Spielberger, 1983). Second, overall appearance evaluation was significantly lower than that of men without gynecomastia. Third, many areas of mental health were comparable to that of men without gynecomastia or mild severity. For example, eating pathology, general trait anxiety, self-esteem, depressive symptoms, and all areas of health-related quality of life were similar to those of men without gynecomastia, suggesting a potentially reduced symptom profile for the current sample and limiting potential for change. Taken together, these characteristics suggest a sample that is highly concerned with the appearance of their chest that may not be experiencing as much distress or impairment outside of body image factors. Additionally, examination of the individual trajectories of participants suggests a fairly variable sample in both baseline scores and trajectories for most measures outside of chest satisfaction. This may indicate the potential for moderators of symptom presentation and outcomes that aren’t currently accounted for. Moreover, many variables may not change linearly, which may limit results from mixed effects models.
Chest Satisfaction and Overall Appearance Evaluation

In support of one hypothesis, mixed-effects models showed significant improvement in chest satisfaction from pre to one-year post surgery among men receiving surgery for gynecomastia. Additionally, a paired samples t-test supported this result with a large effect size. This is in line with previous research that suggests high satisfaction rates with gynecomastia surgery (e.g., Barone et al., 2017). As men’s breast reduction surgery aims to eliminate or reduce incongruent sex characteristics, it makes sense that the procedure would increase chest satisfaction, especially since that dissatisfaction is often tied concerns of a feminine appearance (Schonfeld, 1962; Wassersug & Oliffe, 2009). While the CSQ is newer and without clinical cutoffs, mean levels were significantly lower than both the larger sample of men with gynecomastia and men without gynecomastia and were brought up to levels that appear similar to those of men without gynecomastia by the 12-month follow-up. Clinically, this suggests that surgery may have the ability to bring chest satisfaction up to more normal levels.

Chest satisfaction significantly improved over time even after controlling for baseline BMI, and baseline BMI had no significant effect on the magnitude of improvement. It is not uncommon for a patient’s weight to be a factor in determining eligibility for gynecomastia surgery, as individuals who are of normal weight are less likely to experience complications or dissatisfaction with surgery (American Society for Plastic Surgeons, 2019). While this may still hold true for reducing surgical complications, the current study suggests that individuals may feel better about the appearance of their chest after surgery regardless of their pre-operation BMI. This is in line with previous retrospective research that has shown high satisfaction rates and reductions in psychological distress after gynecomastia surgery, regardless of BMI (Rosen et al., 2010). However, individuals who received gynecomastia surgery in the current study had an
average baseline BMI of 25.75, which is just outside of normal range, and no one in the sample was classified as obese based on their BMI, making the sample fairly limited in BMI range. As complication rates tend to be higher with individuals with obesity (American Society for Plastic Surgeons, 2019), BMI may serve as a moderator of psychological surgery outcomes, such that individuals with greater BMI may report less improvement in chest satisfaction. Future research should include both a broader range of BMIs and assess complication rates to see how outcomes differ based on these factors.

Alternatively, it may be that BMI is not strongly associated with psychological outcomes of gynecomastia surgery. BMI is often noted as a poor estimate of body fat for individuals with a significant amount of lean mass, as it does not differentiate between fat and fat free mass (Garn, Leonard, & Hawthorne, 1986). It is not uncommon for bodybuilders, a particularly muscular population, to struggle with gynecomastia and seek treatment (Blau & Hazani, 2015). Future research that includes this population may benefit from using fat free mass index, an indicator of health similar to BMI that includes an assessment of fat mass, as it may be a more accurate indicator of health for this significant subpopulation.

While improvements in chest satisfaction were evident over time, overall appearance evaluation did not significantly change following gynecomastia surgery. Appearance evaluation can be thought of as a broader index of how one view’s their body (e.g., is my body sexually appealing) rather than a chest-specific measure. These findings indicate that while surgery may affect local body image (e.g., for the chest), it may be less effective for changing one’s overall body image. There is consistent previous research indicating chest satisfaction is associated with overall body image for men (Tantleff-Dunn & Thompson, 2000), and correlations within the current study show a high correlation between chest satisfaction and overall appearance.
evaluation in men without gynecomastia. The same correlation is smaller, though still high, when using a sample of men with gynecomastia. This may suggest that for men with gynecomastia, there are other factors that play into overall appearance concerns and improved chest satisfaction via surgical removal of gynecomastia may not be enough to change this. In contrast, the paired samples t-test showed a significant large effect size for appearance evaluation. When coupled with the fact that the effect of time on appearance evaluation was approaching significance ($p = .07$), this may suggest alternative explanations. One possibility might be that change is nonlinear for appearance evaluation. It may be that changes occur more rapidly the farther out from surgery when recovery is further along, and until then, it is harder for individuals to feel strongly about their body. These findings may also be due to random error. Future research should continue to examine more global aspects of body image within the context of treatment for this population.

**Chest-related State Anxiety and General Trait Anxiety**

One exploratory aim of the current study was to examine other factors that might be influenced by surgical management of gynecomastia. Previous literature has shown that individuals with gynecomastia experience anxiety about how their chest appears (Kinsella et al., 2012), yet no study to date has examined this within the context of treatment. Similar to chest satisfaction, mixed effects models showed significant reductions in chest-related state anxiety from pre to one-year post surgery. That is, as time passed after surgery, men reported feeling less nervous when their chest was exposed (e.g., wearing a thin shirt, a tight shirt, or no shirt at all). Moreover, these effects remained significant even after controlling for BMI, and BMI had no significant moderating effect of symptom reduction following surgery. This may suggest that there is something unique about the presentation of breast tissue that produces anxiety regardless
of fat mass. Additionally, chest-related state anxiety on average was in the 92\textsuperscript{nd} percentile compared to population norms for adult males between the ages of 19 and 39 (Spielberger, 1983) and dropped to the 78\textsuperscript{th} percentile by 12 month follow up. While no norms exist for the gynecomastia population, this is a group of individuals similar in age and gender, and this jump in percentile rank might suggest clinically significant change. In contrast however, there was no significant change when looking at t-tests. It’s unclear why this was the case, but one possibility might be attributable to random error. This is heightened by the fact that many of the paired samples t-tests had very small sample sizes due to missing data.

Previous research has shown that individuals with gynecomastia often go at great lengths to hide the appearance of their chest via means of using duct tape, extra layers of clothing, or social withdrawal (Kinsella et al., 2012; Rosen et al., 2010; Schonfeld, 1962). These camouflaging and avoidance behaviors may be anxiety driven and may be similar to those exhibited by individuals with body dysmorphic disorder (BDD) in attempt to escape judgment from others (Oakes, Collison, & Milne-Home, 2017). If breast reduction surgery is able to reduce appearance anxiety relevant to chest exposure, it may also be able to reduce the frequency of camouflaging and avoidance behaviors associated with gynecomastia. These findings highlight the potential for surgery to reduce hiding behaviors associated with gynecomastia; however, future research is needed to clarify the extent to which breast reduction is able to change behavioral responses to appearance anxiety relevant to gynecomastia. Additional research may also benefit from examining rates of BDD in this population and trying to distinguish between body image-related distress associated with gynecomastia and BDD (e.g., will some individuals still report dissatisfaction with their chest following surgery, and is this indicative of BDD?).
While chest-related state anxiety significantly decreased over time, general trait anxiety remained stable both in the mixed effects models and paired t-test. These findings make sense for a number of reasons. Trait anxiety is a much broader construct revolving around emotional responses and physiological sensations associated with anxiety not specific to the appearance of the chest. It is unlikely that surgical intervention for gynecomastia will change how individuals interact with the world more broadly. Second, mean levels of trait anxiety in the current sample ($M = 41.68$) are fairly close to population norms for working adult men between the ages of 19 and 39 ($M = 35.55$), a similar population (Spielberger, 1983). This may indicate fairly normal levels of trait anxiety in men with gynecomastia, reducing potential for change. This is also consistent with the overall findings from this study that suggest broader constructs remain unchanged following gynecomastia surgery.

**Depression, Self-esteem, and Eating Pathology**

Depressive symptoms and low self-esteem are commonly reported problems associated with gynecomastia (e.g., Ordaz & Thompson, 2015). Past research is unclear as to whether or not self-esteem improves following gynecomastia surgery, and no research has yet to examine change in depressive symptoms within the context of treatment for gynecomastia. Given this information, mixed effects models for depressive symptoms and self-esteem following gynecomastia surgery were exploratory in nature. Results from the mixed effects models and paired t-tests showed that depressive symptoms and self-esteem did not significantly change over time. At baseline, the sample endorsed mild depressive symptoms based on common cutoff scores (Kroenke, Spitzer, & Williams, 2001) and self-esteem was within the 41st percentile for population norms in the United States (Sinclair et al., 2010). When combined with the fact that the current sample’s scores did not significantly differ from those of men without gynecomastia,
one explanation is that depression and self-esteem might not have much potential to change. Additionally, depression and self-esteem are broad constructs that can be affected by a number of factors (e.g., appearance, life events, achievements, relationships, etc.). It may be that chest satisfaction only partially contributes to depressive symptoms or makes up a small portion of one’s self-esteem, even for individuals with gynecomastia who are actively seeking treatment in hopes of improving their appearance. This possibility aligns with the general findings from this study that suggests that broader constructs remain relatively unchanged compared to chest-specific constructs (e.g., chest satisfaction and chest-related anxiety). The current study adds to the small handful of studies that have used a validated measure to examine changes in self-esteem for this population (e.g., Barone et al., 2017). Previous research that has examined self-esteem following gynecomastia surgery has used proxy measures (e.g., questions that may not directly assess self-esteem) or unvalidated measures (Fricke et al., 2017; Kasielska & Antoszewski, 2011), which contribute to the mixed findings in this area. It is important for future research to consider this limitation and use a validated measure of self-esteem or more specific aspects of self-esteem related to appearance.

A number of studies have shown that men with gynecomastia exhibit eating pathology, often as a means to try and self-treat the condition (e.g., Ordaz & Thompson, 2015). As a result, it was expected that men presenting for treatment in this study might endorse high levels of eating pathology, but this was not the case. Mean bulimia scores were minimal and drive for thinness was only slightly more elevated. Additionally, changes in drive for thinness were better accounted for by BMI and did not significantly change over time. While the current sample may not have endorsed significant levels of eating pathology, future research is warranted. Eating disorders often center around body image concerns, and previous research has highlighted eating
concerns for this population (e.g., Ordaz & Thompson, 2015). It may be that specific sub-populations exist that are more prone to develop eating pathology in response to gynecomastia (e.g., athletic populations or younger populations trying to self-treat), and perhaps findings with those population may be different. It may also be that traditional eating pathology measures do not adequately capture disordered eating or body-related behaviors for this population, and qualitative research might be able to shed light on this area. Moreover, it may be more appropriate to assess BDD and its associated behaviors (e.g., camouflaging, avoidance) in this population.

**Health-related Quality of Life**

Past research has shown improvements in several facets of health-related quality of life following gynecomastia surgery (Davanco et al., 2009), and based on this information, it was hypothesized that participants would endorse significant improvements in health-related quality of life. In partial support of this hypothesis, mixed-effects models showed significant improvements in the social functioning domain of quality of life. Moreover, this improvement appears to be clinically significant based on the minimally important differences suggested by the measure’s manual (e.g., 3 point change; Maurish, 2011). Based on the fixed effect of time, this would suggest that individuals were seeing clinically significant change in social functioning by month three. One caveat however is that these minimally important differences are based on lower mean scores, and research with other medical conditions have cited much larger scores being needed to be clinically significant (Wyrwich, Tierney, Babu, Kroenke, & Wolinsky, 2005). These results when coupled with the significant change in chest-related state anxiety may suggest clinically significant change however.
Social withdrawal is one of the more commonly cited coping mechanisms for individuals with gynecomastia (e.g., Ordaz & Thompson, 2015), as these individuals often fear judgment from others based on their appearance. These findings suggest that surgical correction of gynecomastia has the potential to increase social behaviors over time. One plausible explanation of these findings may be linked to how men compare themselves to others, as it is not uncommon for men to compare their appearance to that of other men. Previous research highlights that social comparisons are associated with body dissatisfaction (e.g., Myers & Crowther, 2009) and that body image concerns are indicative of social withdrawal, especially in the gynecomastia population (e.g., Ordaz & Thompson, 2015). Drawing from social comparison theory, which posits that individuals may make evaluations about their own self or social worth from comparisons with others (Festinger, 1954), it may be that men evaluate their own chest more favorably following surgery, reducing distress associated with social interactions. This makes sense in the current sample given the increases in chest satisfaction and corresponds well with previous research that highlights body image improvements leading to greater social functioning in women with macromastia following surgery (Perez-Panzano et al., 2017). It is also possible that drops in chest-related anxiety are driving the increased social behavior, as individuals may be less worried about how others view their chest. Future research on the role that social comparisons and appearance anxiety play in social adjustment and body image in this population is warranted however, as this goes beyond the scope of the current study.

Mixed-effects models also revealed a moderating effect of baseline BMI on changes in vitality over time, such that vitality significantly improved for individuals with higher baseline BMI but not for those with average or lower levels. Vitality is a measure of energy levels, and findings from the current study are consistent with previous research that has examined health-
related quality of life following gynecomastia surgery (Davanco et al., 2009). Vitality in the current study however did not significantly improve until baseline BMI was entered into the model as a potential moderator, suggesting that these effects may be dependent on BMI. For example, it may be that individuals with higher BMI feel more energized following surgery for a variety of reasons, whereas those with lower BMI may not see those benefits. BMI did not significantly decrease following surgery, suggesting changes in weight are not accounting for changes in vitality and that perhaps other factors might be responsible. Increased energy is consistent with increased social functioning also exhibited by the current sample; however, it is unclear the relationship between these two variables. For example, it may be that individuals with higher BMI feel more able to engage in social behaviors due to increased energy, or it could be that by engaging in more social behaviors, these individuals feel more energized. It could also be that individuals with higher BMI may have more depressive symptoms and lower energy, producing more potential for change. Additionally, anxiety can be mentally taxing, and chest-related anxiety was heightened in this sample. Reductions in chest-related anxiety might also be freeing up energy and mental resources for these individuals, leading individuals with higher BMI, whose weight might also impact energy levels, to feel greater effects from these changes. Future research should further examine the interplay between energy levels and other variables within this population.

All other facets of health-related quality of life remained unchanged in the current study, which is inconsistent with previous research that showed many physical and mental facets of this construct changing over time (Davanco et al., 2009; Kasielska-Trojan & Antoszewski, 2017; Nuzzi et al., 2018). Differences in statistical tests used and age may be accounting for these differences. For example, Wilcoxon’s nonparametric test was used to assess change in previous
research which is a less stringent statistical test involving fewer time points (Davanco et al., 2009; Kasielska-Trojan & Antoszewski, 2017). Additionally, younger age has been more indicative of quality of life improvement for individuals with gynecomastia, and mean age of the current sample (e.g., 32.04) is substantially older compared to previous research in this area (e.g., 17.0; Nuzzi et al., 2018). Most notably, mental health aspects of health-related quality of life remained unchanged following surgery. While one might expect this to be impacted by surgery, it is again a very broad measure of mental health, and broader constructs in the current sample remained relatively stable before and after surgery. Previous research that has seen significant change in broader constructs has asked participants to consider how those constructs changed relative to their gynecomastia (Kasielska & Antoszewski, 2011), whereas the current sample did not. It may be that asking participants to consider problems as they relate to their gynecomastia may influence outcomes, and this could be something to consider for future research. Moreover, at baseline, most aspects of quality of life in the current sample were noticeably higher than general population norms for the United States (Maglinte, Hays, & Kaplan, 2012), which may again suggest a lower severity symptom profile for the current sample.

Overall Findings

The current study highlights a number of novel findings regarding psychosocial functioning following gynecomastia surgery. First, there was a general trend toward significant change in chest-specific indices of mental health (e.g., chest satisfaction and chest-related anxiety) following surgery whereas broader constructs generally remained the same (e.g., trait anxiety, depressive symptoms, self-esteem, eating pathology, and health-related quality of life). These findings may be in part due to the specificity of gynecomastia surgery, or the generally low level of symptom severity for broader constructs in the current clinical sample. Additionally,
social functioning significantly improved following surgery, which makes sense given that social withdrawal is a commonly noted maladaptive coping mechanism for individuals with gynecomastia (e.g., Ordaz & Thompson, 2015). This indicates that chest-related facets of mental health may be more impacted by surgery versus broader constructs. While many outcome measures do not have clinical cutoffs, a few factors show potentially clinically significant improvement. This potential can be seen in chest satisfaction that closely mirrors that of men without gynecomastia, chest-related anxiety percentile ranking changes, and social functioning changes meeting less conservative estimates of minimally important differences.

Aim 2

Given the high rates of gynecomastia surgery and the specific goal of improving chest appearance through gynecomastia surgery, a psychometrically strong chest-specific body image measure is warranted. The CSQ is an eight-item measure of chest satisfaction that is not specific to musculature or fat, but instead focuses on the general appearance of the chest, with questions addressing things like shape, symmetry, or appearance based on clothing worn. Factor analysis of this measure showed a one-factor solution with all items strongly loading onto the one factor. Internal consistency for the CSQ was excellent in a large sample of men with gynecomastia; however, it was just under acceptable when used with the smaller sample of men with gynecomastia presenting for surgical treatment. There may be variability among individuals presenting for treatment that reduces reliability in this case. For example, there may be unaccounted for factors that led individuals to respond differently. Future research examining the psychometrics of the measure within a treatment seeking context with more demographic information is warranted. The CSQ was positively associated with overall appearance evaluation and self-esteem and negatively associated with drive for thinness, chest-related state anxiety, and
depressive symptoms, providing convergent validity for the measure. These results show preliminary support for the psychometrics of the CSQ and suggest that it could be used for the gynecomastia population to assess change in body image over time. For example, some research has examined satisfaction rates with gynecomastia surgery (Fricke et al., 2017; Kasielska-Trojan & Antoszewski, 2017), which can be seen as a proxy for chest satisfaction, but no other studies to date have examined specific body image variables following surgery for this population.

Macromastia, a similar condition in which women develop excess breast tissue, has garnered more emphasis on body image research than its male counterpart. This research has shown similar psychosocial correlates to that of gynecomastia, such as depressive symptoms, anxiety symptoms, and reduced self-esteem (Cerrato et al., 2012; Iwuagwu et al., 2006), and treatment research with this population has shown body image improvements following surgery (Borkenhagen et al., 2007; Glatt et al., 1999; Perez-Panzano et al., 2017). Body image in this population has generally been assessed either through silhouette or digital figural ratings or more globally, and the CSQ may be a suitable attitudinal measure for use within this population to assess chest satisfaction following macromastia surgery. Results from the EFA show preliminary support for this, showing an identical factor structure in a sample of women when compared to men. Additionally, the measure has excellent reliability when used with women, and it is positively associated with overall appearance evaluation and self-esteem and negatively associated with drive for thinness, chest-related state anxiety, and depressive symptoms, again providing convergent validity for the measure. As anticipated, chest satisfaction was generally positively correlated with overall appearance evaluation and self-esteem and negatively correlated with depressive symptoms, drive for thinness, chest-related anxiety, and trait anxiety in all three samples. Of note, BMI was only correlated with chest satisfaction for men without
This makes sense, given that body image concerns in gynecomastia population is more about the presence of breast tissue, whereas body image concerns for men often revolve around muscularity and leanness, aspects of appearance that consider fat mass.

This is the first study to evaluate body image in the context of gynecomastia treatment through psychometrically tested measurement. Previous research has identified body image problems in this population through qualitative case reports or proxy measures (e.g., satisfaction with surgical procedures). While these methods were important first steps, the current study provides a chest satisfaction measure, the CSQ, with a clean factor structure and appropriate convergent validity that could be used to increase consistency between studies. The CSQ could provide a solution to the lack of body image measures for the gynecomastia population and could be used to assess chest satisfaction before and after surgery. Additionally, the current study provides strong statistical support for using this measure more broadly, including with men without gynecomastia as well as with women. Future research should test the psychometric properties of this measure in the macromastia population. Moreover, the current study highlights a need to use validated and psychometrically sound measures more generally with this population, especially when assessing body image, as many previous studies have used variable measurements (e.g., 1-item measures, proxy-measures, etc.). The inconsistency across the few treatment studies that currently exist may be in part due to this variability in measurement. While the CSQ has clinical utility in that it can be used for outcomes assessment in the context of cosmetic surgery, the psychometrics of the measure should continue to be examined, with a confirmatory factor analysis being an appropriate next step.
CHAPTER SIX: CONCLUSION

While psychosocial treatment research for the gynecomastia population is still growing, there are a broad array of inconsistencies between studies. Some factors that may be contributing to inconsistencies in the treatment literature include age, statistical methods used, and specification of outcomes related to gynecomastia. Moreover, the gynecomastia treatment literature is often in opposition with similar research in the macromastia population that shows improvement to broader indices of mental health following surgery (Iwuagwu et al., 2006; Pérez-Panzano, et al., 2017). It is unclear why similar physical conditions associated with similar psychosocial consequences would respond differently to surgical treatment and needs further attention. One hypothesis is that perhaps individuals seeking gynecomastia versus macromastia surgery have different motivations. For example, men seeking gynecomastia treatment almost always seek breast reduction for purely cosmetic reasons. Though mental health and body image certainly play a role, there usually are not physical health factors associated with gynecomastia, which is underscored by low insurance coverage rates for the procedure (Nuzzi et al., 2013). Alternatively, macromastia is often accompanied by pain (Mian, Dyson, & Ulbricht, 2019), perhaps leading to both appearance and health motivations. These dual motivations may result in greater improvement following surgery. Future research might benefit from also comparing psychosocial outcomes from gynecomastia surgery to breast augmentation, as both are likely primarily motivated by appearance concerns.

The current study is not without limitations. First, the current study is a case series study, which is a common limitation in both the macromastia and gynecomastia literature. This lack of
experimental nature makes it impossible to determine causal relationships. Second, the current study lacks a comparison group. While surgery is the most common form of active treatment for gynecomastia, previous research suggests a potential need for psychological intervention (Schonfeld, 1962). Future experimental research that compares the effectiveness of surgery to other treatments (e.g., psychotherapy) or lack of treatment is warranted. Third, BMI is commonly associated with outcomes in the gynecomastia literature (e.g., Ordaz & Thompson, 2015), and the current study exhibited a restricted range in BMI. The average BMI for individuals in the treatment-receiving group was just outside the healthy weight range with little variability across participants. This restricted range in BMI may have influenced results, especially when considering BMI as a potential moderator of outcomes. Additionally, there may be other moderators of outcomes that this study failed to capture. Lastly, the small sample size limiting available statistical procedures (e.g., follow-up reliability and p value adjustments) and substantial missing data potentially biasing results are notable limitations tied to the difficulty in recruiting a clinical sample and collecting follow-up data in a fast-paced medical environment.

In conclusion, the current study adds to the gynecomastia treatment literature by examining longitudinal change in body image-related variables before and after surgery. Additionally, the current study provides a psychometrically valid measure of chest satisfaction that can be used for not only the gynecomastia population but other populations as well (e.g., men without gynecomastia and women). Results from the current study suggest that surgery has the potential to improve chest satisfaction and psychological functioning, especially in chest-specific measures and social functioning but that broader constructs may require additional intervention. Future research is needed to examine causal effects of surgery for gynecomastia on psychosocial functioning and to examine other types of intervention such as psychotherapy.
REFERENCES


APPENDIX A:
TIMELINE OF STUDY TIME POINTS

Time 1
1 Week Pre-Op

Time 2
1 Month Post-Op

Time 3
3 Months Post-Op

Time 4
6 Months Post-Op

Time 5
12 Months Post-Op

Surgery
APPENDIX B:

GYNECOMASTIA.ORG FORUM POST

Hello,

My name is Daniel Luis Ordaz, and I am principal investigator in a research study titled: Psychological Correlates of Gynecomastia (Pro_16403). This study is being conducted through the University of South Florida, under the supervision of Dr. Kevin Thompson. The purpose of this study is to examine psychological and social factors related to gynecomastia, as very little research has been conducted in this area despite some evidence suggesting the psychological impact of gynecomastia. This study will hopefully shed some light on the effects of gynecomastia as well as inform future treatment of gynecomastia.

This study is being conducted solely online and consists of several questionnaires that take about 20 minutes to complete. All information is strictly confidential, and participation is completely voluntary. Please do not feel that you have to participate in this study because you have read this or are a member of this forum. However, if you are a male with gynecomastia aged 18 years or older, and are interested in participating in this study, please follow the link below to participate in the study.

Study Link: https://www.surveymonkey.com/s/ZL5ZZ27

Thanks,

Daniel Luis Ordaz, B.A.
Clinical Psychology Doctoral Student
University of South Florida
Body Image Research Group
APPENDIX C:

CHEST SATISFACTION QUESTIONNAIRE (CSQ)

Instructions: Using the scale below, please circle the number that best matches your agreement with the following statements.

<table>
<thead>
<tr>
<th>Definitely Disagree</th>
<th>Mostly Disagree</th>
<th>Neither agree nor disagree</th>
<th>Mostly agree</th>
<th>Definitely agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

1. I am comfortable with the shape of my chest. 1 2 3 4 5
2. I am comfortable with the size of my chest. 1 2 3 4 5
3. I am comfortable with the symmetry of my chest. 1 2 3 4 5
4. My chest is unattractive.* 1 2 3 4 5
5. My chest looks good in motion. 1 2 3 4 5
6. I am satisfied with the appearance of my chest. 1 2 3 4 5
7. I like the way my chest looks with a shirt on. 1 2 3 4 5
8. I like the way my chest looks without a shirt on. 1 2 3 4 5
APPENDIX D:
AIM 1 DESCRIPTIVES

Descriptives for Aim 1 Presented in Mean (SD) with Post-hoc Differences and Effect Sizes

<table>
<thead>
<tr>
<th>Variable</th>
<th>Primary Surgery Group N = 18</th>
<th>Men with Gynecomastia N = 65</th>
<th>Men without Gynecomastia N = 75</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>32.04 (10.72)a</td>
<td>35.03 (13.32)a</td>
<td>20.59 (3.81)b</td>
<td>.34</td>
</tr>
<tr>
<td>BMI</td>
<td>25.75 (2.59)ab</td>
<td>27.23 (6.14)a</td>
<td>24.82 (4.76)b</td>
<td>.05</td>
</tr>
<tr>
<td>Chest Satisfaction</td>
<td>1.81 (.56)c</td>
<td>2.23 (1.04)b</td>
<td>3.56 (.89)a</td>
<td>.38</td>
</tr>
<tr>
<td>Appearance Evaluation</td>
<td>2.82 (.63)b</td>
<td>2.68 (.91)b</td>
<td>3.53 (.88)a</td>
<td>.18</td>
</tr>
<tr>
<td>Drive for Thinness</td>
<td>20.88 (8.36)ab</td>
<td>22.79 (8.40)a</td>
<td>17.37 (8.36)b</td>
<td>.09</td>
</tr>
<tr>
<td>Bulimia Symptoms</td>
<td>11.96 (4.53)ab</td>
<td>14.73 (8.67)</td>
<td>12.53 (5.61)</td>
<td>.03</td>
</tr>
<tr>
<td>Chest-related State Anxiety</td>
<td>52.83 (14.32)a</td>
<td>50.22 (16.52)a</td>
<td>38.14 (13.17)b</td>
<td>.16</td>
</tr>
<tr>
<td>Trait Anxiety</td>
<td>41.68 (10.39)ab</td>
<td>44.75 (14.58)a</td>
<td>39.60 (12.37)b</td>
<td>.03</td>
</tr>
<tr>
<td>Self-esteem</td>
<td>21.48 (4.72)ab</td>
<td>19.11 (6.92)b</td>
<td>22.06 (6.25)a</td>
<td>.05</td>
</tr>
<tr>
<td>Depressive Symptoms</td>
<td>5.00 (3.73)b</td>
<td>7.48 (5.96)a</td>
<td>5.85 (5.52)ab</td>
<td>.03</td>
</tr>
<tr>
<td>Health-related Quality of Life</td>
<td>70.25 (15.44)</td>
<td>63.09 (17.41)</td>
<td>66.93 (13.76)</td>
<td>.02</td>
</tr>
<tr>
<td>Bodily Pain</td>
<td>89.38 (14.66)ab</td>
<td>77.08 (23.95)b</td>
<td>82.14 (17.47)ab</td>
<td>.05</td>
</tr>
<tr>
<td>General Health</td>
<td>75.68 (14.74)</td>
<td>69.18 (20.63)</td>
<td>69.80 (17.19)</td>
<td>.01</td>
</tr>
<tr>
<td>Vitality</td>
<td>56.75 (16.13)</td>
<td>50.41 (19.07)</td>
<td>52.27 (17.39)</td>
<td>.01</td>
</tr>
<tr>
<td>Social Functioning</td>
<td>69.50 (31.89)ab</td>
<td>61.96 (31.11)b</td>
<td>76.62 (22.16)a</td>
<td>.06</td>
</tr>
<tr>
<td>Role Emotional</td>
<td>71.00 (24.78)</td>
<td>62.46 (25.03)</td>
<td>66.44 (24.59)</td>
<td>.01</td>
</tr>
<tr>
<td>Mental Health</td>
<td>67.00 (16.89)</td>
<td>60.33 (22.35)</td>
<td>66.28 (18.30)</td>
<td>.01</td>
</tr>
</tbody>
</table>

Note. Surgery group measures are from baseline. The sample of men with gynecomastia includes the surgery group of men. Superscript letters indicate significant differences based on post-hoc tests. Age, BMI, chest satisfaction, bulimia, depressive symptoms, bodily pain, and social functioning used Games-Howell post-hoc. All others used Tukey HSD. Significance values based on p < .05. η² = eta-squared effect size.
## APPENDIX E:

### AIM 1 PAIRED T-TESTS

**Paired Samples t-Test Means, Standard Deviations, and Effect Sizes for the Surgery Group**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Baseline</th>
<th>12 MFU</th>
<th>(d)</th>
<th>(n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>24.57 (2.61)</td>
<td>24.89 (2.85)</td>
<td>.31</td>
<td>10</td>
</tr>
<tr>
<td>Chest Satisfaction***</td>
<td>1.77 (.77)</td>
<td>3.27 (.88)</td>
<td>1.69</td>
<td>10</td>
</tr>
<tr>
<td>Appearance Evaluation**</td>
<td>2.40 (.41)</td>
<td>3.02 (.42)</td>
<td>1.65</td>
<td>9</td>
</tr>
<tr>
<td>Drive for Thinness</td>
<td>20.89 (8.55)</td>
<td>18.56 (6.62)</td>
<td>.13</td>
<td>9</td>
</tr>
<tr>
<td>Bulimia Symptoms</td>
<td>11.67 (3.67)</td>
<td>11.33 (4.61)</td>
<td>.07</td>
<td>9</td>
</tr>
<tr>
<td>Chest-related State Anxiety</td>
<td>43.00 (14.32)</td>
<td>50.43 (14.62)</td>
<td>.67</td>
<td>7</td>
</tr>
<tr>
<td>Trait Anxiety</td>
<td>38.56 (11.24)</td>
<td>42.56 (13.56)</td>
<td>.24</td>
<td>9</td>
</tr>
<tr>
<td>Self-esteem</td>
<td>20.57 (4.79)</td>
<td>22.57 (4.43)</td>
<td>.34</td>
<td>7</td>
</tr>
<tr>
<td>Depressive Symptoms</td>
<td>5.63 (4.98)</td>
<td>6.88 (6.37)</td>
<td>.14</td>
<td>8</td>
</tr>
<tr>
<td>Health-related Quality of Life</td>
<td>71.99 (17.53)</td>
<td>69.49 (18.17)</td>
<td>.20</td>
<td>8</td>
</tr>
<tr>
<td>Bodily Pain</td>
<td>93.06 (11.84)</td>
<td>88.89 (22.50)</td>
<td>.21</td>
<td>9</td>
</tr>
<tr>
<td>General Health</td>
<td>80.63 (10.84)</td>
<td>73.75 (21.17)</td>
<td>.38</td>
<td>8</td>
</tr>
<tr>
<td>Vitality</td>
<td>54.17 (21.65)</td>
<td>52.08 (20.73)</td>
<td>.13</td>
<td>9</td>
</tr>
<tr>
<td>Social Functioning</td>
<td>70.83 (36.98)</td>
<td>81.94 (23.48)</td>
<td>.40</td>
<td>9</td>
</tr>
<tr>
<td>Role Emotional</td>
<td>71.30 (27.36)</td>
<td>67.59 (32.39)</td>
<td>.13</td>
<td>9</td>
</tr>
<tr>
<td>Mental Health</td>
<td>64.44 (18.28)</td>
<td>62.78 (18.05)</td>
<td>.12</td>
<td>9</td>
</tr>
</tbody>
</table>

*Note.* 12 MFU = 12-month follow up. Scores presented as M (SD). \(d\) = Cohen’s \(d\). **\(p < .01\), ***\(p < .001\).
APPENDIX F:

MEAN CHEST SATISFACTION AND APPEARANCE EVALUATION SCORES OVER TIME

Note. This graph shows mean scores for the above variables at each time point. The scale for each measure ranges from 1 to 5, with higher scores indicating greater body image. # MFU = respective month follow up.
APPENDIX G:

MEAN STATE AND TRAIT ANXIETY SCORES OVER TIME

Note. This graph shows mean scores for the above variables at each time point. The scale for each measure ranges from 20 to 80, with higher scores indicating greater anxiety. # MFU = respective month follow up.
APPENDIX H:

MEAN DRIVE FOR THINNESS AND BULIMIA SCORES OVER TIME

Note. This graph shows mean scores for the above variables at each time point. The scale for each measure ranges from 7 to 42, with higher scores indicating greater eating pathology. # MFU = respective month follow up.
APPENDIX I:

MEAN DEPRESSION AND SELF-ESTEEM SCORES OVER TIME

Note. This graph shows mean scores for the above variables at each time point. The scale for the self-esteem measure ranges from 0 to 30, with higher scores indicating greater self-esteem. The scale for the depression measure ranges from 0 to 27, with higher scores indicating more depressive symptoms. # MFU = respective month follow up.
APPENDIX J:

MEAN HEALTH-RELATED QUALITY OF LIFE SCORES OVER TIME

Note. This graph shows mean scores for the above variables at each time point. The scale for each measure ranges from 0 to 100, with higher scores indicating greater quality of life in each domain. # MFU = respective month follow up, QoL = quality of life.
APPENDIX K:

INDIVIDUAL TRAJECTORIES FOR THE CSQ, MBSRQ-AE, EDI-DT, AND EDI-B

Note. Plots show individual data points over time for chest satisfaction (top left), appearance evaluation (top right), drive for thinness (bottom left), and bulimia (bottom right). Missing data was interpolated when possible.
APPENDIX L:

INDIVIDUAL TRAJECTORIES FOR THE RSES, PHQ-9, STAI-S, AND STAI-T

Note. Plots show individual data points over time for self-esteem (top left), depression (top right), chest-related state anxiety (bottom left), and general trait anxiety (bottom right). Missing data was interpolated when possible.
APPENDIX M:

INDIVIDUAL TRAJECTORIES FOR THE SF-36 V2 AND BP, GH, AND VT SUBSCALES

Note. Plots show individual data points over time for overall health-related quality of life (top left), bodily pain (top right), general health (bottom left), and vitality (bottom right). Missing data was interpolated when possible.
APPENDIX N:

INDIVIDUAL TRAJECTORIES FOR THE SF-36 V2 SUBSCALES OF SF, RE, AND MH

Note. Plots show individual data points over time for social functioning (top left), role emotional (top right), and mental health (bottom left). Missing data was interpolated when possible.
APPENDIX O:

MODEL 1 FIXED EFFECTS

Significant Fixed Effects and Variance/Covariances for Model 1

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Chest Satisfaction</th>
<th>Chest-related State Anxiety</th>
<th>Social Functioning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Est</td>
<td>SE</td>
<td>p</td>
</tr>
<tr>
<td>Intercept</td>
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<td>.17</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Months</td>
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<td>.03</td>
<td>&lt;.001</td>
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Variance/Covariances

<table>
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<tr>
<td>AR1 rho</td>
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Note. All other measures were non-significant.
**APPENDIX P:**

**MODEL 2 FIXED EFFECTS**

*Significant Fixed Effects and Variance/Covariances for Model 2*

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<tr>
<th>Fixed Effects</th>
<th>Chest Satisfaction</th>
<th>Chest-related State Anxiety</th>
<th>Social Functioning</th>
<th>Drive for Thinness</th>
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<tbody>
<tr>
<td></td>
<td>Est</td>
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<td>p</td>
<td>Est</td>
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<td>.05</td>
<td>.61</td>
<td>-.22</td>
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</tbody>
</table>

| Variance/Covariances | | | | | | | | | | | | |
|-----------------------| | | | | | | | | | | | |
| Intercept             | .03  | .36  | .93  | 97.85  | 38.87 | <.05 | 472.25 | 169.43 | <.01 | 51.18  | 15.43 | <.01 |
| AR1 diagonal          | .95  | .42  | <.05 | 119.02 | 29.47 | <.001| 216.78 | 46.66  | <.001 | 9.18   | 1.85  | <.001|
| AR1 rho               | .36  | .36  | .29  | -.65   | .13   | <.001| -.10   | .24   | .66  | -.27   | .26   | .30  |

*Note.* BMI = baseline BMI. All other measures were non-significant.
APPENDIX Q:

MODEL 3 FIXED EFFECTS

*Significant Interaction Effects and Variance/Covariances for Model 3*

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<td>MonthsxBMI</td>
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<td>.15</td>
<td>&lt;.05</td>
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<table>
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<th>Variance/Covariances</th>
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<th></th>
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<td>.16</td>
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</table>

*Note.* BMI = baseline BMI. All other measures were non-significant.
Note. This graph shows predicted vitality scores based on the interaction effect of time by baseline BMI. Vitality scores can range from 0 to 100 with higher scores indicating greater quality of life related to vitality. Average BMI is the average baseline BMI (25.75), while high (28.34) and low BMI (23.16) are one standard deviation above and below the mean respectively.
APPENDIX S:
EFA PATTERN COEFFICIENTS, EIGENVALUES, AND PERCENT VARIANCE

Pattern Coefficients, Eigenvalues, and Percent Variance for the CSQ in Men and Women

<table>
<thead>
<tr>
<th>Items</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I am comfortable with the shape of my chest.</td>
<td>.895</td>
<td>.771</td>
</tr>
<tr>
<td>2. I am comfortable with the size of my chest.</td>
<td>.855</td>
<td>.845</td>
</tr>
<tr>
<td>3. I am comfortable with the symmetry of my chest.</td>
<td>.711</td>
<td>.624</td>
</tr>
<tr>
<td>4. My chest is unattractive.</td>
<td>.689</td>
<td>.616</td>
</tr>
<tr>
<td>5. My chest looks good in motion.</td>
<td>.795</td>
<td>.576</td>
</tr>
<tr>
<td>6. I am satisfied with the appearance of my chest.</td>
<td>.930</td>
<td>.890</td>
</tr>
<tr>
<td>7. I like the way my chest looks with a shirt on.</td>
<td>.841</td>
<td>.803</td>
</tr>
<tr>
<td>8. I like the way my chest looks without a shirt on.</td>
<td>.901</td>
<td>.773</td>
</tr>
</tbody>
</table>

| Eigenvalues | 5.53 | 4.44 |
| Percent Variance | 69.09 | 55.51 |

Note. Factor loadings and eigenvalues obtained using principal axis factoring with promax oblique rotation. All factor loadings were ≥ .40.
APPENDIX T:

AIM 2 INDEPENDENT T-TESTS

*Independent Samples t-Tests Means, Standard Deviations, and Effect Sizes for Men and Women*

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<th>Women</th>
<th>g</th>
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<tr>
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<td>Chest Satisfaction***</td>
<td>2.94 (1.17)</td>
<td>3.66 (.83)</td>
<td>.73</td>
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<tr>
<td>Appearance Evaluation*</td>
<td>3.14 (.99)</td>
<td>3.31 (.88)</td>
<td>.18</td>
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<tr>
<td>Drive for Thinness***</td>
<td>19.86 (8.78)</td>
<td>23.19 (9.59)</td>
<td>.36</td>
</tr>
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<td>Bulimia Symptoms</td>
<td>13.53 (7.23)</td>
<td>14.63 (7.11)</td>
<td>.15</td>
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<tr>
<td>Chest-related State Anxiety</td>
<td>43.53 (15.90)</td>
<td>44.17 (12.55)</td>
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<td>Trait Anxiety*</td>
<td>41.92 (13.62)</td>
<td>44.84 (12.34)</td>
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<td>Self-esteem**</td>
<td>20.69 (6.72)</td>
<td>19.06 (5.97)</td>
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<td>Depressive Symptoms</td>
<td>6.61 (5.77)</td>
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<td>Health-related Quality of Life</td>
<td>65.21 (15.57)</td>
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<td>Bodily Pain</td>
<td>79.79 (20.83)</td>
<td>78.46 (20.24)</td>
<td>.06</td>
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<td>General Health**</td>
<td>69.52 (18.79)</td>
<td>64.34 (19.87)</td>
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<td>Vitality</td>
<td>51.42 (18.15)</td>
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<td>Social Functioning</td>
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<td>Role Emotional</td>
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<td>Mental Health</td>
<td>63.58 (20.41)</td>
<td>62.77 (18.95)</td>
<td>.04</td>
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</table>

*Note.* The sample of men is a combined sample of all groups of men in the study. The assumption of equal variances was violated for age, chest satisfaction, chest-related state anxiety, and self-esteem based on Levene’s test. $g$ = Hedge’s $g$. $n$ ranged between 179 and 208 for men and 244 and 280 for women per analysis. *$p < .05$, **$p < .01$, ***$p < .001$. 

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# APPENDIX U:

## GYNECOMASTIA CORRELATION MATRIX

**Correlation Matrix for Study Variables in a Sample of Men with Gynecomastia**

<table>
<thead>
<tr>
<th></th>
<th>BMI</th>
<th>CSQ</th>
<th>MBSR</th>
<th>EDI-DT</th>
<th>EDI-B</th>
<th>STAI-S</th>
<th>STAI-T</th>
<th>RSES</th>
<th>PHQ9</th>
<th>SF36-V2</th>
<th>BP</th>
<th>GH</th>
<th>VT</th>
<th>SF</th>
<th>RE</th>
<th>MH</th>
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APPENDIX V:

HEALTHY CONTROLS CORRELATION MATRIX

Correlation Matrix for Study Variables in a Sample of Men without Gynecomastia

<table>
<thead>
<tr>
<th></th>
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<th>CSQ</th>
<th>MBSR Q-AE</th>
<th>EDI-DT</th>
<th>EDI-B</th>
<th>STAI-S</th>
<th>STAI-T</th>
<th>RSES</th>
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### APPENDIX W:

**WOMEN CORRELATION MATRIX**

**Correlation Matrix for Study Variables in a Sample of Women**

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