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Running Head: TESTOSTERONE AND CHEST SURGERY IN FTMs

Effects of Testosterone Treatment and Chest Reconstruction Surgery on Mental Health and
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Sexuality in Female-To-Male Transgender People

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KEY WORDS: Transgender, Female-to-Male, FTM, Transsexual, Genderqueer, Testosterone, Mental Health, Chest Reconstruction Surgery, Body Satisfaction, Anxiety, Depression, Anger, Sexuality, Sexual Attraction, Sexual Identity

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ABSTRACT

This study examined the effects of testosterone treatment with or without chest reconstruction surgery (CRS) on mental health in female-to-male transgender people (FTMs). Over 200 FTMs completed a written survey including quantitative scales to measure symptoms of anxiety and depression, feelings of anger, and body dissatisfaction, as well as qualitative questions assessing shifts in sexuality after the initiation of testosterone. Fifty-seven percent of participants were taking testosterone and 40% had undergone CRS. Cross-sectional analysis using a between-subjects MANOVA showed that participants who were receiving testosterone endorsed fewer symptoms of anxiety and depression as well as less anger than the untreated group. Participants who had CRS in addition to testosterone reported less body dissatisfaction than either the testosterone only or the untreated groups. Furthermore, participants who were injecting testosterone on a weekly basis showed significantly less anger than those injecting every other week. In qualitative reports, over 50% of participants described increased sexual attraction to non-transgender males after taking testosterone. This study represents the first to our knowledge

to identify the effects of CRS in addition to testosterone on mental health in FTMs. These results may be of particular value to medical and mental health practitioners serving this community.

KEY WORDS: Transgender, Female-to-Male, FTM, Genderqueer, Testosterone, Chest Reconstruction Surgery, Mental Health, Body Satisfaction, Sexuality, Sexual Attraction, Sexual Identity, Depression, Anxiety, Anger

INTRODUCTION

Although testosterone has been used to treat female-to-male transgender people (FTMs) since the 1930's (Meyerowitz, 2002) and chest reconstruction surgery has been performed on FTMs since the 1940's (Kennedy, 2007), little research has been conducted to examine the effects of these treatments on mental health and body satisfaction (Meier, Fitzgerald, Pardo, & Babcock, 2011). The term "transgender" includes several related but diverse gender identities, including genderqueer, gender-variant, and anyone who does not identify with the sex they were assigned at birth. Many FTMs experience gender dysphoria, a strong desire to change the gendered presentation of their body, and some choose to undergo medical gender transition through taking testosterone and/or having chest reconstruction surgery (CRS) (Lev, 2004). Few FTMs in the United States undergo genital surgery for a variety of reasons (Meier et al., 2011; Rachlin, 1999). The decision process is very individual and based on a variety of factors including one's self-identified gender and associated experiences of body dissatisfaction and psychological discomfort.

Access to medical transition involves consultation with both mental health and medical providers, and current recommendations specify that these providers be informed concerning gender expression, identity, and treatment (APA, 2009; WPATH, 2011). The majority of counseling and medical school training programs do not adequately prepare practitioners to be competent allies to serve the needs of transgender clients (Carroll, 2010; Obedin-Maliver et al., 2011), and even well-trained providers are hampered by the paucity of available information on the effects of testosterone and CRS on mental health and sexuality in FTMs (Ettner, 1999; Lev, 2004).

Physical effects of testosterone treatment on FTMs include increased muscle mass, voice deepening, growth of facial and body hair, weight gain, cessation of menses, and clitoral enlargement (Israel & Tarver, 1997; Moore, Wisniewski, & Dobs, 2003), and emotional effects include increased energy, sex drive, and appetite (Boverman & Loomis, 2000; Hembree et al., 2009). Once a beard is grown and voice deepens, FTMs are seen as male by others, that is, are able to “pass” in society as male (Lev, 2004). The effects of varying dosage regimens of testosterone remain unknown (Klein & Gorzalka, 2009). While commonly prescribed for hypogonadal males, testosterone treatment for FTMs is still considered to be an “off-label” use by the FDA (FDA, 2012). Studies of hypogonadal males taking testosterone have identified psychological effects including improved mood, increased energy, reduced depression, and greater sexual satisfaction (Dunning & Ward, 2004; Perry et al., 2002; Wang et al., 1996).

Studies of FTMs have documented high levels of depressive and anxious symptomatology which have been linked to frequent experiences of discrimination in employment and housing, violence, physical and verbal abuse, societal harassment related to

gender presentation, and perceived need to keep one's transgender identity a secret (Burgess, Lee, Tran, & Van Ryn, 2008; Clements-Nolle, Marx, Guzman, & Katz, 2001; Clements-Nolle, Marx, & Katz, 2006; Nuttbrock, Rosenblum, & Blumenstein, 2002). Anxiety and discomfort with one's gender are identified in the psychiatric and sociological literature as core features of FTM identity, which lead many to seek medical gender transition (APA, 2000; Devor, 2004). Mental health-related quality of life has been found to be higher in FTMs who received testosterone treatment compared with FTMs who have not (Newfield, Hart, Dibble, & Kohler, 2006). Three other studies to date have found that testosterone use in FTMs is related to fewer symptoms of anxiety and depression (Davis, 2006; Gomez-Gil et al., 2012; Meier et al., 2011).

Anger appears to increase in some FTMs taking testosterone but to decrease in others (Gorton et al., 2005). Hypogonadal men experience reductions in anger and tension when treated with testosterone (O'Connor, Archer, Hair, & Wu, 2002; Wang et al., 1996), and Davis (2006) has also found testosterone treatment in FTMs to be related to less anger. While non-transgender men with testosterone levels elevated to *above* the normal male range experience increased anger, (Pope, Kouri, & Hudson, 2000), the dosage prescribed to both hypogonadal males and FTMs is targeted to place their testosterone level *within* the normal male range. It is thought that the effects of testosterone on anger in FTMs will be similar to those on hypogonadal males.

Chest reconstruction surgery (CRS) may be sought before or after initiating testosterone therapy or may be sought without testosterone therapy (WPATH, 2011). Breasts are viewed as the most significant source of body dysphoria in FTMs, as they present the most visible conflict with a male gender expression (Cromwell, 1999; Dutton, Koenig & Fennie, 2008). Yet for many FTMs, access to CRS or any other gender-affirming surgery is limited due to high cost and lack

of insurance coverage (Horton, 2008). Many FTMs bind their breasts with tight elastic fabric or tape in order to reduce the visibility of their chest prior to CRS. The binder, especially when worn tightly, may cause potentially harmful breathing restrictions (Papp, unpublished data), but for many FTMs is still preferable to the body dysphoria and reduced ability to pass as male in society that they experience without it. No known studies have investigated the effects of CRS in addition to testosterone on specific aspects of mental health or body satisfaction in FTMs.

Body dissatisfaction among FTMs refers to a sense of body-mind dissonance, including experiences of shame or intense emotional discomfort associated with their gendered body parts (Devor, 1997; Morgan & Stevens, 2008). Body dissatisfaction is extremely common among transgender people and is well known to be highly destructive to mental health functioning in this population (Lev, 2004). Research has demonstrated that most transgender individuals report reductions in gender dyphoria, body dissatisfaction, and psychological discomfort following sexual reassignment surgery (Smith, van Goozen, Kuiper, & Cohen-Kettenis, 2005). Interviews with FTMs (Devor, 1997) highlight a common goal of matching one's physical body to one's internal sense of gender identity, and a simultaneous process of either incorporating or rejecting social norms for maleness and the male body. Qualitative research and several personal narratives suggest that testosterone and/or CRS improves self-esteem and lessens body dissatisfaction (Devor, 1997; Green, 2004; Rubin, 2003).

Studies examining the sexual orientation of FTMs provide mixed results, with some reporting that FTMs are typically exclusively attracted to women (Lawrence, 2010), others reporting that male-attracted FTMs are more common than previously thought (Bockting, Benner,

& Coleman, 2009), and still others finding that most FTMs are attracted to both males and females (Meier et al., 2011). To further complicate the matter, sexual attraction in FTMs may change (Dickey, Burnes, & Singh, 2012; Daskalos, 1998; Schleifer, 2006), which may be related to testosterone use (Meier, Pardo, Labuski, & Babcock, 2013). Recent research on the direction of shifting sexual attractions suggests a tendency toward attraction to males (Meier et al., 2013), however, it remains unclear whether this shift is toward transgender and/or non-transgender men. The current study aims to provide insight into the multiplicity of possible changes in orientation and attraction toward individuals of either transgender or non-transgender status.

The primary objective of this study was to examine how testosterone treatment with or without CRS affects specific mental health symptoms of anxiety and depression, level of anger, and extent of body dissatisfaction in FTMs. A second objective was to evaluate whether regimen of testosterone administration affected these same mental health variables. In terms of sexuality, an additional objective was to explore how testosterone treatment in FTMs affects sexual attractions and sexual orientation identity.

Specific Hypotheses

The present cross-sectional study examined the group differences among FTMs who have not received any gender-related medical interventions, those who have had testosterone only, and those who have had testosterone and CRS. Following previous research (Davis, 2006; Gomez-Gil et al., 2012; Meier et al., 2011; Newfield et al., 2006), we hypothesize that FTMs who receive medical interventions will report indications of better mental health and greater comfort with their bodies. Specifically, we hypothesize that FTMs receiving testosterone only (T) and both testosterone and CRS (T+CRS) will report fewer symptoms of anxiety and depression and less

anger than those who have not received any treatment (Nt). Second, the T and the T+CRS groups will report less body dissatisfaction than the Nt group. Third, the T+CRS group will report fewer symptoms of anxiety and depression, less anger, and greater satisfaction with their bodies compared to the T only group. In terms of sexuality, FTMs who have initiated testosterone treatment are anticipated to report increased sex drive and changes in sexual attractions. As this last objective was addressed through an exploratory approach, the direction of shifts in sexual attraction was not hypothesized.

METHOD

Participants

The sample consisted of 208 self-identified FTMs and gender-variant people, all assigned female at birth but no longer fully identified as female. Because “transgender” is an umbrella term including diverse gender identities, the sample included genderqueer, gender-fluid, FTM, and other masculine-identified transgender people. Five intersex participants were included because they fit criteria of being assigned female at birth but no longer identifying as female.

Procedure

This study utilized a cross-sectional survey design, in which a purposive sample of participants completed a written questionnaire including a battery of quantitative clinical scales as well as open-ended qualitative questions. The study was approved by the Human Subjects Institutional Review Board of San Francisco State University. A draft questionnaire was pilot-tested with a group of 20 participants between May-September of 2004 (Punch, 2003) and

participants' feedback was used to optimize the wording of questions for clarity and rates of completion.

Transgender individuals constitute a "hidden population" (Rosser, Oakes, Bockting, & Miner, 2007), meaning a subgroup of the general population which is difficult to discern without self-disclosure. The recruitment of participants was conducted by an FTM genderqueer researcher. Because many transgender individuals keep their identities private, purposive sampling including internet recruitment methods (Duncan, While, & Nicholson, 2003; Meier et al., 2011; Newfield et al., 2006) and chain-referral (Penrod, Preston, Cain, & Starks, 2003) were utilized to ensure greater representation and increased sample size.

From May 2005 to February 2006, a total of 210 participants were recruited at San Francisco Bay Area transgender community events, as well as outreach through transgender-focused email listservs and websites advertising the study. Two participants were excluded due to self-identifying their gender as female on the survey questionnaire. Informed Consent was obtained from all participants. No identifying participant information was attached, and respondent anonymity was stringently maintained throughout the study. The 98-question written survey questionnaire took participants approximately 20-35 minutes to complete. Some participants completed the questionnaire with pen and paper at community events, while others completed the survey on their computers and sent their responses by postal mail or email to the principal investigator.

Measures

Demographics. Demographic characteristics assessed in the survey questionnaire included age, ethnicity, employment and/or student status, and housing stability. Participants

self-identified their gender, sexual orientation, primary sexual attraction(s), and whether they felt they passed as male to others. Participants reported any testosterone use, type, length of time since they began taking testosterone, method of administration, dosage, and regimen of use. Participants also listed any gender-related surgeries they had undergone including chest reconstruction.

Anxiety. The Beck Anxiety Index (BAI; Beck & Steer, 1993) is a 21-item self-reported questionnaire measuring symptoms of anxiety. Participants rate how bothered they feel by a list of common symptoms of anxiety including “scared,” “unable to relax,” and “dizzy or lightheaded” from 0 (Not At All) to 3 (Severely). Internal reliability of the BAI has been found to be .92 (Beck, Epstein, Brown, Steer & Robert, 1988). Pilot testing demonstrated that certain questions of the BAI were not understood by FTM participants or overlapped with effects related to testosterone use (e.g., “Sweating” and “Feeling hot”) and were removed. A total of 15 out of 21 items were used and internal reliability was found to be excellent ($\alpha = .92$).

Depression. The Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996) is a 21-item self-reported questionnaire assessing symptoms of depression. Participants rate how much they are bothered by depressive feelings on a 4-point Likert scale; sample items include “Sadness” with 0 (I do not feel sad) to 3 (I am so sad or unhappy that I can’t stand it). In use with the general population, the BDI-II has excellent reliability ($\alpha = .91$; Beck, Steer, Ball, & Ranieri, 1996). Because testosterone treatment has been shown to cause changes in weight, muscle mass, appetite, and libido (Moore et al, 2003; Futterweit, 1998), items that relied on changes in the physical body, eating, weight, and libido were eliminated (e.g., “Changes in

Appetite” and “Loss of interest in sex”). In total, 17 of the 21 items were used and the internal reliability was found to be excellent ($\alpha = .92$).

Anger. The Snell Clinical Anger Scale (CAS) is a 21-item self-reported questionnaire measuring feelings of anger (Snell, Gum, Shuck, Mosley, & Hite, 1995) where items consist of four statements ranked 0-3. For example, 0 (I do not feel angry), 1 (I feel angry), 2 (I am angry most of the time now), 3 (I am so angry and hostile all the time that I can’t stand it). Internal reliability of the CAS has been reported to be excellent ($\alpha = .94$; Snell et al., 1995). Items related to sexual interest, appetite, and other testosterone-linked physical changes were removed, as were several repetitive questions shown through pilot testing to decrease rates of survey completion. In total, 12 of 21 questions were used and internal reliability for this modified scale was found to be good ($\alpha = .87$).

Body Dissatisfaction. Body dissatisfaction was conceptualized as not being satisfied with one’s body, particularly in relation to gendered physical characteristics (e.g., “I like my chest” and “I like my musculature”). For purposes of the current study, a 10-question Likert scale was developed to assess body dissatisfaction in FTMs (see Appendix). For the purposes of this study, the items were reverse scored. The internal reliability of this novel body dissatisfaction scale was good ($\alpha = .86$).

Mood and Sexuality. Several qualitative questions were included in the survey questionnaire to allow participants who had initiated testosterone to describe any changes they noticed in their mood and sexuality in their own words. Specifically, participants were asked: *Do you think your mood changed when you started hormones? If yes, please explain what changes you felt in your mood. Did these changes last or were they temporary fluctuations?* Second,

participants were asked: *Did your sexual interests, orientation, or attractions change when you started T? Please explain.*

Data Analysis

The data were analyzed using PASW 18.0 (PASW Inc., Chicago, IL). Independent samples chi-square analyses and ANOVAs were conducted to determine significant differences in demographics between treatment groups. Bivariate correlations were conducted to determine if there was a relationship between length of time on testosterone and the dependent variables of anxiety, depression, anger, and body dissatisfaction. A *t*-test was conducted to determine the effect of regimen of testosterone injection on these dependent variables. After ensuring that dependent variables met test assumptions, a between subjects MANOVA was conducted to test for differences in symptoms of anxiety and depression, and in levels of anger and body dissatisfaction between the 3 groups: FTMs who were receiving T and had CRS (T+CRS), those who were receiving T without CRS (T), and those who had no treatment (Nt).

Participants' written responses to open-ended qualitative questions on mood and sexuality were evaluated by hand via content analysis at the level of specific words and phrases relevant to the study aims. Manifest content was then grouped by a single coder into categories of similar meaning, ie. "happier/less depressed" or "more assertive/more confident". Response coding was repeated three times to maximize reliability. The frequency of each recurring theme was tabulated, entered into PASW 18.0 (PASW Inc., Chicago, IL), and then quantified as a percentage of the total number of responses received. (Rubin & Babbie, 1989).

RESULTS

Participant Demographics

Demographics are presented by treatment status in Table 1. The sample was predominately Caucasian (79.3%). The average age of the sample was 31.5 years (SD = 9.26, range 18 to 64). Most reported working full or part-time jobs (81.3%) and 37.5% indicated that they were students. Nearly all participants (94.2%) had stable housing. Participants used a variety of words to describe their gender and sexual orientation identity, with the most common being male (33.2%) and queer (37.5%), respectively. The majority of the sample (58.2%) reported passing as male.

Fifty-seven percent of participants ($n = 118$) were receiving testosterone at the time of the study. Forty percent of the sample ($n = 84$) indicated having undergone CRS prior to the survey, and the majority of those were also using testosterone ($n = 72$). Thirty-eight percent of participants ($n = 78$) were not receiving testosterone and had not undergone CRS. Twenty-one of the participants who were currently receiving testosterone reported a history of temporarily stopping testosterone. Eleven participants who were not receiving testosterone at the time of the survey reported a history of past testosterone use. Participants who had had CRS, but were not receiving testosterone ($n = 12$) were excluded from the multivariate analyses due to small sample size, yet their demographic data is presented in Table 1.

The majority of participants who reported using testosterone administered it by intramuscular (IM) injection (89%), with only 11% of participants using other formulations such as Androgel (8.5%) or a transdermal patch (1.7%). One participant reported taking non-prescribed androgen pills. Of the participants receiving IM injections, the majority were using Testosterone Cypionate (75.2%; $n = 79$), with fewer using Testosterone Enanthate (19.1%; $n =$

20), or Sustanon (5.7%; $n = 6$). A total of 78 participants (74.3%) received IM injections once every 2 weeks, of varying dosages, while 27 participants (25.7%) received weekly IM injections. See Table 2 for a summary of dosage and injection schedules.

Univariate Analyses

Participants in the three groups did not differ by employment status, student status, or race (Refer to Table 1 for statistics). The groups did, however, differ on age, with participants who had not received any treatment being significantly younger than those who had received any treatment, $F(2, 193) = 24.5, p < .0001$. As such, age was used as a covariate in the multivariate analysis. The more medical interventions participants had, the more likely they were to report passing or being perceived as male by strangers, $\chi^2(4) = 64.05, p < .0001$. Participants in the T+CRS and T groups were more likely to self-identify their gender as male, while those not receiving treatment were most likely to identify as genderqueer, $\chi^2(6) = 58.73, p < .0001$. While the most common sexual identity label endorsed by participants was “queer” ($n = 78$), those in the T+CRS group were most likely to self-identify as gay male, and those who were using testosterone (T+CRS and T only) were more likely to identify as either bisexual or heterosexual than were those in the no treatment group, $\chi^2(16) = 43.08, p < .0001$.

Approximately half of participants (50.4%, $n = 105$) completed pen and paper surveys, and 49.5% ($n = 103$) returned questionnaires via email. A series of t -tests were conducted with type of questionnaire (email or pen and paper) as the independent grouping variable and mental health and treatment status as dependent variables. Type of questionnaire was related to body dissatisfaction, with those returning questionnaires via email reporting more body dissatisfaction, $t(203) = -2.36, p < .05$, and were more likely to be on T, $\chi^2(1) = 8.75, p < .01$, than those who

completed pen and paper questionnaires. No other differences were found between these two groups.

Among participants using testosterone, the average length of time receiving testosterone treatment was 3.62 years, with a range of 1 week to 35 years. A series of regression analyses were conducted in order to determine if length of time on testosterone predicted mental health. Length of time on testosterone was not found to be related to anxiety, $r(118) = -.063, p > .05$, depression, $r(118) = .017, p > .05$, anger, $r(117) = .005, p > .05$, or body dissatisfaction, $r(116) = -.121, p > .05$.

A *t*-test comparing participants on T who were injecting 100 mg testosterone on a weekly basis with those who were injecting 200 mg every other week found that those injecting weekly reported significantly less anger, $t(53) = 6.49, p < .05$, than those injecting every other week. A trend was found for symptoms of depression, $t(53) = 1.97, p = .05$, with those injecting weekly reporting fewer symptoms.

Of those who had undergone CRS ($N = 84$), the majority had double mastectomies with double incision technique ($n = 66$), while sixteen underwent a peri-aerolar technique and two participants reported having breast reduction surgery.

As expected, anxiety, depression, anger, and body dissatisfaction were each moderately positively correlated (See Table 3). These moderate correlations provide evidence for discriminant validity and evidence that the scales measure related yet distinct constructs.

Multivariate Analyses

Although data from 208 participants was collected, 185 surveys were included in the multivariate analysis. Fourteen subjects were excluded due to incomplete questionnaires.

Participants who had had CRS, but were not receiving testosterone ($n = 12$) were also excluded from the multivariate analyses due to inadequate sample size. However, means from these participants (CRS only) are included in Table 4.

To determine whether treatment status was associated with mental health, a between-subjects MANOVA was conducted with treatment status (3 levels: Nt, T, and T+CRS) on anxiety, depression, anger, and body dissatisfaction with age as a covariate. As predicted, an overall multivariate effect of treatment status was found in which FTMs differed on these outcomes based on treatment status, $F(4, 182) = 5.21, p < .001$, but not on age, $F(4, 182) = 1.98, p = .10$.

Main effects of anxiety, $F(2, 185) = 11.24, p < .001$, depression, $F(2, 185) = 12.09, p < .001$, anger, $F(2, 185) = 7.15, p < .01$, and body dissatisfaction, $F(2, 185) = 13.07, p < .001$, were found. Specifically, FTMs who had had CRS in addition to testosterone (T+CRS) endorsed fewer symptoms of anxiety, $t(142) = 7.46, p < .001$, and depression, $t(142) = 7.09, p < .001$, less anger, $t(142) = 3.09, p < .001$, and experienced less body dissatisfaction, $t(142) = 6.73, p < .001$, than those who were not receiving either treatment (Nt). FTMs who were receiving testosterone (T) endorsed fewer symptoms of anxiety, $t(117) = 4.78, p < .01$, and depression, $t(117) = 4.64, p < .01$, as well as less anger, $t(117) = 1.76, p < .05$, than those who were not receiving treatment (Nt). However, the Nt and T groups did not differ on body dissatisfaction, $t(117) = .81, p > .05$. The T and T+CRS groups were not found to differ on symptoms of anxiety, $t(113) = 2.77, p > .05$, depression, $t(113) = 2.45, p > .05$, or anger, $t(113) = 1.32, p > .05$. However, they did differ on body dissatisfaction, with the T+CRS group reporting less body dissatisfaction, $t(113) = 5.92, p < .001$, than the T only group. See Table 4 for a summary of the multivariate results.

Self-Reported Mood

Of the participants who had initiated testosterone treatment ($n = 129$), 109 respondents (84.5%) reported noticing mood changes. Thematic analysis identified several common response categories among these participants. The largest group (43%, $n = 47$) stated they felt happier/less depressed since beginning testosterone treatment. About one-third of participants (31%, $n = 34$) stated that they were feeling more assertive/more confident. Another 30% ($n = 33$) stated they felt calmer/more relaxed/less anxious, and 31 participants (28%) described feeling less emotional/more balanced/more stable/less mood swings. An example quote from one participant reads, "I feel much more well-balanced and happier—more self-confident than I used to. I haven't had any negative mood changes." Seventeen percent of participants ($n = 18$) also noted that they cried less frequently on testosterone.

Nearly one-third of participants (31%) described temporary mood effects lasting between 6-24 months from the start of their testosterone use. Twenty-six percent of participants ($n = 30$) stated that they were angrier/more irritable/quicker to get angry. Of these, 18 (60%) further explained that the increase in anger was a temporary effect, which later subsided. Eighteen participants (17%) described experiencing temporary mood swings, which disappeared either after their dose of testosterone was raised, or after they switched from every other week to weekly injections. For example, one respondent wrote, "Anger peaked in first few months, then diminished." Another explained, "Many hormonal changes, up and down in the beginning until my body was able to adjust. Once I found a dose (every week vs every 2 wks), it helped things level off and feel more comfortable."

Self-Reported Sexuality

Of the participants who initiated testosterone treatment, 95 respondents (73.6%) reported noticing changes in their sexuality after starting testosterone. Participants approached the question about changes in their sexual interests, orientation, or activities in different ways. Some described how they felt their orientation or attractions to different genders of people had shifted, others wrote about changes in their own sexual identity, and still others described how their sex drive changed. Fifty-four percent of these respondents ($n = 51$) described feeling an increased level of attraction to what many described as “biological men”, also known as cisgender or non-transgender males, whether in place of or in addition to the types of genders they had felt attracted to prior to starting T, (e.g., “I was more willing/interested in sex with biological males”). Fifty participants (53%) described noticing that their sex drive had increased, (e.g., “My sex drive increased greatly!”). Twenty percent of participants reported they found themselves attracted to a wider variety of different genders of people, for example, “I became willing to explore all avenues of gender and preference”.

Additionally, 15 participants (16%) stated that their self-identified sexual identity had changed to gay male. For some respondents, that change in identity accompanied a change in sexual attraction, (e.g., “I went from a lesbian to a gay male.”) Other respondents started out with an internal sense of themselves as gay men, and found that taking T and passing as male allowed them access to the gay male community, (e.g., “I have always been attracted to male-bodied men, but now I have more success among people I am interested in (men interested in other men).”)

DISCUSSION

Consistent with our overall hypothesis, the results provide clear evidence that testosterone and CRS are associated with indicators of more positive mental health (fewer symptoms of anxiety and depression, and less anger) and with greater body satisfaction in FTMs. While both T alone and T+CRS were related to fewer symptoms of anxiety and depression and less anger compared to neither treatment, contrary to our hypothesis, the T only and the T+CRS groups did not differ on these three variables. As hypothesized, T+CRS participants did demonstrate less body dissatisfaction than those who were taking T only and those with neither treatment. However, participants taking T alone did not differ from the no treatment group on body dissatisfaction. Taken together, these results indicate that testosterone treatment is associated with a positive effect on mental health, while CRS seems to be more important for the alleviation of body dissatisfaction in FTMs.

To the best of our knowledge, this was the first research study to examine the specific mental health effects of the combination of testosterone and CRS in this population. It was also the first to find a positive relationship between CRS and body satisfaction. The findings have particular relevance for medical providers, therapists, and FTMs and gender-variant people considering using medical treatments to physically transition.

Our results regarding the beneficial effects of testosterone on mental health are in line with previous findings in recent studies of FTMs (Davis, 2006; Gomez-Gil et al., 2012; Meier et al., 2011; Newfield et al., 2006), and hypogonadal males (AACE, 2002; Dunning & Ward, 2004; Wang et al., 1996). Because length of time on T was not related to mental health (Gomez-Gil et al., 2012), it is possible that the positive effects of testosterone occur relatively quickly in FTMs.

The findings from the current study add to a growing evidence base that testosterone treatment is associated with fewer symptoms of anxiety and depression in FTMs (Davis, 2006; Gomez-Gil et al., 2012; Meier et al., 2011). The qualitative descriptions of mood changes following testosterone treatment in our sample were also positive, with the exception of a notable temporary increase in irritability. After starting testosterone, participants listed experiences of reduced depression, increased confidence, decreased anxiety, and improved emotional stability.

This study provided quantitative evidence that testosterone is related to less anger in FTMs, a finding that is consistent with its effect on hypogonadal males (O'Connor et al., 2002). Unlike non-transgender males using testosterone at supraphysiologic levels, many of our study participants treated with testosterone in the normal male range reported feeling calmer and more emotionally stable. Just over one-fifth of participants receiving testosterone reported experiencing temporary mood swings including increased anger, which in most cases later subsided. This temporary increase in anger may be similar to what pubertal natal males experience when they first experience testosterone in their system (Buchanan, Eccles, & Becker, 1992).

Along these same lines, fluctuations in mood were found to be related to testosterone injection schedules. A weekly injection regimen was related to less anger and a trend for fewer depressive symptoms than a regimen of every other week injections. Because weekly doses are known to produce a more steady level of T in the body (Gorton et al., 2005), it is thought that fluctuations in hormone level may contribute to mood instability. This appears to be similar to mood fluctuations found in non-transgender individuals undergoing puberty, menopause, or other hormonal changes (Buchanan et al., 1992; Short, 2003). This is an important consideration

for medical providers, especially if the patient has a history of mood instability, bipolar disorder, or difficulty managing their anger, as these patients may benefit from weekly injections.

As hypothesized, FTMs who had CRS reported the lowest levels of body dissatisfaction. Despite the substantial physical changes induced by testosterone in FTMs, testosterone alone was not related to a sense of greater satisfaction with their bodies. This finding is at odds with anecdotal reports that testosterone's masculinizing effects generate improved body comfort in FTMs (Cromwell, 1999; Devor, 1997; Green, 2004; Rubin, 2003). Our finding that CRS was related to less body dissatisfaction is thought to reflect a reduction in gender dysphoria associated with removing the physical attribute considered most in conflict with an FTM or a male gender identity (Cromwell, 1999; Dutton et al., 2008). It may also indicate a sense of physical freedom and improved breathing ability associated with no longer needing to bind their breasts in order to pass as male.

Qualitative results of this research identified a shift in sexual attraction after starting testosterone, as hypothesized. Of those participants who reported such a shift, over half described an increase in attraction toward non-transgender males. This finding is in line with a recent study of FTMs demonstrating an increase in sexual attraction toward males after taking testosterone (Meier et al., 2013), and clarifies that this attraction is not limited to other transgender males. It is unclear whether this finding represents a byproduct of the overall increase in sex drive produced by testosterone treatment, and/or a byproduct of the generalized increase in attraction toward a wider range of gender possibilities, two effects that participants of the current study also reiterated. Recent research (Bockting et al., 2009) has found a much higher prevalence of gay and bisexual FTMs than was previously thought. It is possible that entrenched homophobia in the past

may have prevented many FTMs from disclosing non-heterosexual orientation in order to pass medical gatekeepers limiting their access to hormones or CRS (Lev, 2004; Meyerowitz, 2002). Within the city of San Francisco, participants of the current study may have experienced more sexual opportunities and easier access to non-transgender gay men.

Some participants noted changes in their self-defined sexual identity after starting testosterone. Several participants described how these changes in sexual identity followed not only the initiation of testosterone treatment but also a new ability to pass as male in society and an associated acceptance within gay male spaces. These simultaneous changes in FTMs' physical gendered appearance and their social acceptance as a male may be difficult to separate as contributing factors to the development of a changed sexual identity label during the process of medical gender transition. dickey et al. (2012) describe the interplay between changing gender identity and changing sexual orientation in FTMs, and discuss implications for researchers and counselors working with this group as they self-define and redefine their sexual orientation during transition. Changes in sexual attractions or shifts in sexual orientation may be unexpected and confusing to some FTMs already experiencing changes in their self-identified gender. Counselors and health providers are well positioned so as to inform FTMs and their partners of the potential for these changes.

Several important limitations to this study should be noted. Due to the convenience sampling used in this study, conclusions are not generalizable to the FTM population. This is particularly true for people of color, who are underrepresented in this study. Because half of the surveys were collected at transgender community events in San Francisco, results and demographics of study participants may reflect local cultural patterns. As this was a cross-

sectional study, it is not clear if there are innate differences between the treatment groups that allow some FTMs easier access to medical interventions. In addition, while the body dissatisfaction survey questionnaire was reviewed and demonstrated good internal reliability, it is a novel instrument. As several scales used in this study were modified from their original form, results should be interpreted with caution.

Directions for future research

Continued research in this area is needed, given the importance of understanding the mental health effects of medical treatments in order to provide informed, effective treatment and sensitive care for this underserved population. Until recently, FTMs have relied on shared anecdotal reports from individuals receiving T and/or CRS to ascertain the possible effects of these treatments on mental health, body satisfaction, and sexuality. As no clinical trials examining testosterone treatment or CRS have been conducted on FTMs, FDA approval is lacking and medical coverage for these treatments is limited (FDA, 2012; WPATH, 2011).

At least three separate areas warrant further investigation. First, research with a larger sample of participants who have had CRS without testosterone treatment will be valuable to determine the impact of CRS alone on aspects of mental health and body satisfaction. Next, researchers should examine the psychological impacts of dosage and regimen of testosterone (especially those other than IM injection) as well as the impact of discontinuing hormone treatment. Third, future studies with FTMs could measure whether improvements in mental health are related to passing as male in society, and could also examine how mental health is influenced by the degree of the match between participants' physical body and internal gender identity.

As the present study was correlational, no definitive conclusions can be drawn about the cause of the lower prevalence of symptoms of anxiety and depression and less anger, found to be related to treatment status (testosterone with or without CRS). Some possible explanations include: 1) a direct pharmacological effect of testosterone treatment, 2) a psychological consequence of gender-affirming, testosterone-induced changes in their physical body, 3) a psychosocial effect of passing as male and being treated as such in society, or 4) some combination of these factors. While it is difficult to separate these simultaneous aspects of the experience of testosterone treatment, future longitudinal studies could survey FTMs at different time points throughout their physical transition in order to examine these changes more closely. Longitudinal studies could elucidate the amount of time it takes for positive mental health effects to occur, as well as examine any mediators and moderators to treatment outcome such as amount of gender dysphoria, length of time waiting for treatment, presence of medical or mental health disorders, and self-acceptance (Gomez-Gil et al., 2012; Meier et al., 2011). Our finding that length of time on testosterone was not correlated with improvements in mental health suggests that testosterone may have a rapid, direct pharmacological impact on mood even before physical changes in the body occur or the individual begins to pass as male. Future longitudinal studies could test this hypothesis, measuring levels of testosterone in the bloodstream, evaluating FTMs' sense of body satisfaction, and eliciting their experiences as they begin to pass as male, in order to parse apart the impact of each variable on mental health.

Implications for behavioral health

This study adds to the growing body of empirical evidence demonstrating the positive mental health effects of testosterone use on symptoms of anxiety and depression and level of

anger in FTMs. In particular, the current study provides some of the first evidence of the lower prevalence of symptoms of anxiety and depression and less anger associated with the combination of testosterone and CRS in FTMs, as well as the greater body satisfaction associated with CRS. Medical providers may also note that a weekly regimen of testosterone injections rather than every other week could reduce mood instability associated with hormone fluctuations. Behavioral clinicians, counselors, and FTM/gender-variant community members need to be informed of the beneficial mental health and body satisfaction effects associated with testosterone and CRS, as well as the potential for shifts in sexual attraction after taking testosterone. As counselors and health providers limit the accessibility of these treatments, it is imperative that they take these ameliorative effects into account when assisting FTMs in the decision making process associated with a medical gender transition.

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Appendix. Body Dissatisfaction Questionnaire

The following questions address issues of body image. Please read each statement carefully and keep in mind that your answers will be kept confidential.

Using the response categories below, please circle the number that corresponds to how closely you agree with the following statements.

Response categories: 1 = STRONGLY AGREE
 2 = AGREE
 3 = NEUTRAL
 4 = DISAGREE
 5 = STRONGLY DISAGREE

- | | | | | | |
|--|---|---|---|---|---|
| 1. When clothed, I like my body as a whole. | 1 | 2 | 3 | 4 | 5 |
| 2. When naked, I like my body as a whole. | 1 | 2 | 3 | 4 | 5 |
| 3. I find my physical appearance attractive. | 1 | 2 | 3 | 4 | 5 |
| 4. I like my chest. | 1 | 2 | 3 | 4 | 5 |
| 5. I like my musculature. | 1 | 2 | 3 | 4 | 5 |

- | | | | | | |
|---|---|---|---|---|---|
| 6. I like my genitalia. | 1 | 2 | 3 | 4 | 5 |
| 7. I like my face. | 1 | 2 | 3 | 4 | 5 |
| 8. I feel a sense of shame about my body. | 1 | 2 | 3 | 4 | 5 |
| 9. I think other people will like my body. | 1 | 2 | 3 | 4 | 5 |
| 10. I feel a need to hide parts of my body from others. | 1 | 2 | 3 | 4 | 5 |

Table 1. Demographic Variables by Treatment Status

	Testosterone (T) and Chest Surgery (CRS)	T only	CRS only ^a	No Treatment	Statistical Analysis
	n = 72	n = 46	n = 12	n = 78	
	M (SD)	M (SD)	M (SD)	M (SD)	
Age	36.7 (10.4)	30.9 (8.2)	31.2 (6.3)	27.1 (6.4)	$F(2, 193) = 24.50$ $p < .0001$
	n (%)	n (%)	n (%)	n (%)	
Ethnicity					$\chi^2(10) = 18.17$ $p > .05$
Caucasian	59 (81.9)	35 (76.1)	10 (83.3)	61 (78.2)	
African American	6 (8.3)	4 (8.7)	1 (8.3)	4 (5.1)	
Native American	2 (2.8)	2 (4.3)	1 (8.3)	3 (3.8)	
Multiracial	1 (1.4)	-	-	6 (7.7)	
Latino	2 (2.8)	4 (8.7)	-	-	
API ^b	1 (1.4)	-	-	4 (5.1)	
Missing	1 (1.4)	1 (2.2)	-	-	
Employment					$\chi^2(4) = 9.14$ $p > .05$
Full Time	49 (68.1)	24 (52.2)	8 (66.7)	35 (44.9)	
Part Time	15 (20.8)	13 (28.3)	2 (16.7)	23 (29.5)	
Unemployed	8 (11.1)	9 (19.6)	2 (16.7)	20 (25.6)	
Student					$\chi^2(4) = 5.19$ $p > .05$
Full Time	12 (16.7)	13 (28.3)	1 (8.3)	23 (29.5)	
Part Time	11 (15.3)	6 (13)	6 (50)	6 (7.7)	
Not Student	49 (68.1)	27 (58.7)	5 (41.7)	49 (62.8)	
Housing					$\chi^2(4) = 3.36$ $p > .05$
Stable	69 (95.8)	43 (93.5)	11 (91.7)	73 (93.6)	
Unstable ^c	3 (4.2)	3 (6.5)	1 (8.3)	5 (6.4)	
Self-Identified Gender					$\chi^2(6) = 58.73$ $p < .0001$

Male	42 (58.3)	17 (37)	1 (8.3)	9 (11.5)	$\chi^2(2) = .05$ $p > .05$
FTM/Transgender	17 (23.6)	18 (39.1)	4 (33.3)	14 (17.9)	
Genderqueer ^d	8 (11.1)	6 (13)	3 (25)	35 (44.9)	
Other ^e	4 (5.6)	5 (10.9)	4 (33.3)	19 (24.4)	
Missing	1 (1.4)	-	-	1 (1.3)	
Intersex	2 (2.8)	1 (2.2)	-	2 (2.6)	
Sexual Orientation Identity					$\chi^2(16) = 43.08$ $p < .0001$
Queer	15 (22.4)	20 (44.4)	4 (5.1)	39 (50.0)	
Gay Male	15 (22.4)	5 (11.1)	1 (3.8)	5 (6.4)	
Other ^f	7 (10.4)	4 (8.9)	2 (8.3)	11 (14.1)	
Bisexual	12 (17.9)	8 (17.8)	1 (4.3)	2 (2.6)	
Heterosexual	9 (13.4)	6 (13.3)	-	3 (3.8)	
Pansexual	7 (10.4)	1 (2.2)	-	9 (11.5)	
Lesbian/Butch	-	-	1 (14.3)	6 (7.7)	
Mostly Heterosexual	2 (0.3)	1 (2.2)	-	2 (2.6)	
Pass as Male (Self-Report)					$\chi^2(4) = 64.05$ $p < .0001$
Yes	64 (88.9)	31 (67.4)	6 (50)	20 (25.6)	
No	4 (5.6)	8 (17.4)	5 (41.7)	35 (44.9)	
Not Sure	4 (5.6)	7 (15.2)	1 (8.3)	23 (29.5)	

^a This group was not included in between group analyses due to insufficient sample size

^b Asian/Pacific Islander

^c Street, Vehicle, Temporary Residential Program, Hotel, and Staying with Friends

^d Genderqueer FTM and Genderqueer/Transgender

^e Both, Neither, No Gender, and complex language indicating identifying gender outside of existing categories and labels

^f None, All, Fluid, Open, Don't Know, and complex language stating participant identifies own sexual orientation outside of existing categories and labels.

Table 2. Intramuscular Injection Schedules

Schedule	n (%)
50-100 mg/every 2 weeks *	45 (41.7)
150-275 mg/every 2 weeks *	33 (30.6)
75-100 mg/week	22 (20.4)
10-50 mg/week	5 (4.6)

*10-14 days

Table 3. Correlation Matrix (Pearson's)

	Anxiety	Depression	Anger	Body Dissatisfaction
Anxiety	-			
Depression	.65***	-		
Anger	.57***	.72 ***	-	
Body Dissatisfaction	.32***	.47***	.36***	-

*** $p < .001$

Table 4. Multivariate Results

Outcome Variable	T and CRS n = 70	T only n = 45	No Treatment n = 70	CRS only [†] n = 9
Anxiety**	7.77 ^a	10.45 ^a	15.23 ^b	12.89
Depression**	5.55 ^a	8.00 ^a	12.63 ^b	8.67
Anger*	2.85 ^a	4.18 ^a	5.94 ^b	4.22
Body Dissatisfaction**	24.66 ^a	30.57 ^b	31.38 ^b	27.67

* $p < .01$

** $p < .001$

Note. Means are presented for the dependent variables. Groups with different superscripts are significantly different from each other. Groups with the same superscript are not significantly different.

MANOVA: Overall significant main effect of medical treatment status on well being, $F(4, 182) = 5.21, p < .001$

[†]CRS only participants were not included in the MANOVA due to inadequate sample size.