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The Effects of Hormonal Gender Affirmation Treatment on Mental Health in Female-to-Male Transsexuals

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Hormonal interventions are an often-sought option for transgender individuals seeking to medically transition to an authentic gender. Current literature stresses that the effects and associated risks of hormone regimens should be monitored and well understood by health care providers (Feldman & Bockting, 2003). However, the positive psychological effects following hormone replacement therapy as a gender affirming treatment have not been adequately researched. This study examined the relationship of hormone replacement therapy, specifically testosterone, with various mental health outcomes in an Internet sample of more than 400 self-identified female-to-male transsexuals. Results of the study indicate that female-to-male transsexuals who receive testosterone have lower levels of depression, anxiety, and stress, and higher levels of social support and health related quality of life. Testosterone use was not related to problems with drugs, alcohol, or suicidality. Overall findings provide clear evidence that HRT is associated with improved mental health outcomes in female-to-male transsexuals.

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In the United States, health care is an enormous industry, affecting a great many people. Current estimates suggest that health care expenditures in the United States reached \$2.2 trillion in 2007, 46% derived from public funds (Centers for Disease Control, 2010). However, research has indicated that there are large discrepancies in access to health care across a number of variables, including ethnicity, sexual identity, and gender identity (Shipherd, Green, & Abramovitz, 2010).

Because of difficulties with inconsistent definitions and the potential “invisibility” of transgender people, data about access to and utilization of health care by this population are often not available (Hussey, 2006). Current research is extremely variable in determining prevalence of the transgender population. One frequently cited study estimates that the lower bound for prevalence is at least one in 500 (Olyslager & Conway, 2007). Prevalence estimates of FTMs have been found to range from 1 in 833 to 1 in 542,500 and MTFs from 1 in 555 to 1 in 549,000 (St. Amand & Labuski, in press). The inconsistency in prevalence data highlights the dearth of information concerning transgender individuals in general.

The race to improve such information concerning the female-to-male transsexual (FTM) population is plagued by a number of issues as well. The vast majority of research has been conducted with male-to-female transsexuals (MTFs) (Green, 2004; Meyerowitz, 2004). Conversely, less research has focused on FTMs, or those individuals who were assigned female at birth but identify as male but have not yet physically or socially transitioned to live as male (Devor, 1997). Of the research that examines both FTMs and MTFs, important differences emerge that indicate that FTMs may experience less discrimination and be more satisfied with medical treatment that aids in their transition (Kuiper & Cohen-Kettenis, 1988; Schilt & Wiswall, 2008). These findings highlight the importance of separate analysis and research specific to the FTM population and further contribute to a dearth of adequate research.

With respect to health care, there is likewise a lack of information concerning transgender access and utilization of health care services. In the existing literature, country-wide data for these figures largely do not exist. Within the United States, these data have been collected and compiled inconsistently across states, resulting in just a few sources of information. One such document suggests that while over half of transgender individuals in Virginia had access to a primary care doctor, about half of these primary care doctors were not thought to be knowledgeable about transgender health issues (Xavier, Honnold, & Bradford, 2007). This resulted in a similar percentage of transgender individuals having to educate their doctors themselves. In addition, more than one-third of these individuals had experienced a degree

of discomfort in discussing their transgender status or needs to their primary care doctors. Level of discomfort was considerably higher when considering a nonprimary-care doctor in half of the participants, with reasons for discomfort including fear of insensitivity, of being denied treatment, and of ridicule or hostility. While little is known about access and utilization of health care, or even specific health care needs of transgender individuals, it is evident that this is not a negligible group of individuals and that much more needs to be known and effectively communicated to health care providers.

Due to the paucity of research specific to the transgender population, clinical care for trans persons may not be evidence based but rather anecdotal or based on nonrepresentative narratives. For example, Shipherd, Green, and Abramovitz (2010) report that differential access to health care exists across many minority populations, including the transgender population. Utilization of health care services is reduced in this population, with perceived barriers including cost, fear of mental health services in general, and perceived stigma associated with mental health services. These findings underscore the need for increased education and outreach to the transgender community about the nature of the services in general.

An additional barrier to health care access exists in that transsexual-specific medical care is rarely covered by insurance in the United States (Bockting, Robinson, Benner, & Scheltema, 2004; Schneider, Bockting, Ehrbar, Lawrence, Rachlin, & Zucker, 2008). This represents a systemic difference, which cannot be ameliorated via increased information. Furthermore, differential access to services can occur because health care professionals often question their own cultural competence working with this group. However, many of the presenting mental health concerns for this population are common among the general population. As the presenting problems may oftentimes be the same, concerns about competency on the part of the providers are likely unfounded. Thus, for diagnostic accuracy and improved long-term outcomes, it is crucial that health care providers become better informed to help overcome barriers to treatment and to more effectively treat FTMs (Shipherd et al., 2010).

A common reason FTMs seek medical attention related specifically to transsexual status is to receive gender affirmation treatment (GAT). Medical gender affirmation treatments are those that align physical sex with transgender individuals' identities and can take the form of surgical interventions and/or hormonal regimens (Gorton, Buth, & Spade, 2005).

Surgical interventions are those designed to physically change gender-determined body parts from that of one gender to another in an irreversible manner. While the specific procedures involved herein are beyond the scope of this paper, Feldman and Goldberg (2006) and Ettner, Monstrey, and Eyler (2007) provide a comprehensive review of the current surgical procedures.

GAT surgical interventions are available in a number of societies, and they are sometimes covered under national healthcare schemes; this is not the case in every country. As previously mentioned, in the United States,

transgender-specific health care needs are rarely, if ever, covered by insurance (Bockting, Robinson, Forbeg, & Scheltema, 2005), and these interventions can be quite costly, particularly surgical intervention. Surgical procedures sought as a part of GAT can range from around \$6,000 for breast reduction and chest reconstruction in FTMs to more than \$75,000 for genital reconstruction surgery. Despite the fact that many similar procedures are covered by insurance for nontransgender individuals in the event of illness or injury, they are rarely covered by insurance for transgender individuals (Horton, 2008).

Due to this lack of insurance coverage, coupled with the often exorbitant costs of such surgical interventions, hormone replacement therapy (HRT) is a more commonly accessible intervention. In the United States, as in many other industrialized nations, most individuals who desire to make a gender transition select hormonal regimens solely or as an initial step (Rachlin, Green, & Lombardi, 2008). HRT is thought to function through activating effects, which influence the circulation of cross-sex steroid hormone blood levels (Slabbekoorn, van Goozen, Megens, Gooren, & Cohen-Kettenis, 1999). The aim of HRT for transgender persons is to diminish the secondary sex characteristics of the original sex (e.g., fat distribution) and to engender and/or enhance the secondary sex characteristics (e.g., hair growth, muscle) of the sex with which the individual currently identifies (Gooren, 2005). For FTMs undergoing HRT, the agent of choice is usually an injectable testosterone, such as cypionate, administered through intramuscular injection, which serves to enhance the development of facial and body-hair growth, deepening of the voice to a male range, increased muscle development, and cessation of menses (Gorton et al., 2005). Through these mechanisms of change, HRT is often the first step towards self-authentication via medical gender transition. The cost of such hormonal treatments tends to be much lower than surgical interventions, making these hormonal interventions far more accessible to trans individuals.

Research on GAT to date has focused on a number of areas, including cognitive, physical, and psychological changes. This research is important in informing the transgender community of the effects of various HRT procedures. Also, it is an important step in increasing information available to doctors, such that treatments may be demystified to patients and their health care providers. However, despite the limited accessibility of surgical interventions, the bulk of the previous research on the effects of GAT has focused on surgical treatment, with unfortunately few studies to date having examined psychological changes associated with administration of the much more accessible HRT.

While there has been some work investigating HRT-related cognitive changes (van Goozen, Cohen-Kettenis, Gooren, Frijda, & van de Poll, 1995; Slabbekoorn et al., 1999; van Goozen, Slabbekoorn, Gooren, Sanders, & Cohen-Kettenis, 2002) and physical modifications associated with cross-

sex HRT have been well-documented (Meyer, Webb, Stuart, Finkelstein, Lawrence, & Walker, 1986; Gorton et al., 2005), these findings are beyond the scope of this paper. Unfortunately, few research studies have investigated psychological effects (Slabbekoorn, van Goozen, Megens, Gooren, & Cohen-Kettenis, 2001). Despite the relative paucity of research, the overarching conclusion seems to be that cross-sex HRT has an effect on the psychological and emotional functioning of transsexuals.

Prior research on surgical and hormonal treatment among transgender women (MTFs) found effects on mood and cognitive function. Kuiper and Cohen-Kettenis (1988) found that MTFs who had undergone HRT and genital reconstruction for a neo-vagina reported increased well-being. Leavitt and colleagues found that MTFs who were taking estrogen showed decreased depression and anxiety (Leavitt, Berger, Hoepfner, & Northrop, 1980). Furthermore, research has been conducted on the effects of hormones in non-transgender individuals on psychological functioning, with Buchanan, Eccles, and Becker (1992) finding a consistent moderate estrogen level associated with feelings of satisfaction. Similarly, HRT with estrogen has been associated with increased emotional stability in MTFs (Leavitt et al., 1980). Van Goozen and colleagues (1995) found differential effects associated with cross-gender HRT in MTFs and FTMs. MTFs showed decreases in irritable mood and sexual arousal, whereas FTMs showed increased proneness to anger and aggression, as well as sexual arousal.

Slabbekoorn and colleagues (2001) investigated the psychological and emotional results of HRT in both FTMs and MTFs. This study found that, in general, as well as relative to their own expectations, MTFs experienced more negative emotions regardless of HRT status and experienced more positive emotions and anger readiness associated with hormones. Conversely, FTMs experienced more aggressive and sexual feelings but less affect intensity. While this study provides an important source of evidence as to the changes in transsexuals associated with HRT, the lack of use of standardized measures of the psychological variables lessens the generalizability of the results. Furthermore, the effects of HRT noted above only scratch the surface of potential clinically relevant effects, such as those that share a more direct relationship with health and mental health.

Notwithstanding this sampling of findings, the paucity of research on the effects of HRT, compounded with the relative lack of research on FTM as compared to MTF transsexuals, has resulted in very little research on the effects of testosterone on FTMs (Newfield, Hart, Dibble, & Kohler, 2006). The impact of ignorance about the effects of testosterone is exacerbated by the current manner in which individuals can gain access to gender affirming medical treatments.

Health care providers working with transgender individuals are faced with determining the most effective way to manage transgender-specific medical concerns when comorbid psychological complaints exist, such as

depression and anxiety. The World Professional Association for Transgender Health's (WPATH) Standards of Care document provides eligibility and readiness requirements for gender affirming medical interventions (Meyer et al., 2001). Among the readiness requirements is the subjective assessment by a health care provider that mental health would improve if the person's gender identity and physical body were aligned and consistent over time. While this document states that individuals with severe psychiatric conditions that affect reality testing need to be treated for those conditions prior to considering any gender affirming medical interventions, it also states that this decision ultimately rests with the health care provider. Standard practice has been to treat nearly any comorbid psychological conditions, including depression and anxiety, prior to considering any of the medical steps involved in gender reassignment (Hale, 2007). The notion herein is that gender reassignment constitutes a psychologically taxing process. However, this notion has not been thoroughly investigated to date. While the seventh edition of this document is scheduled to be released preceding the publication of the *Diagnostic and Statistical Manual of Mental Disorders—Fifth Edition (DSM-5)*, the importance of educating health care professionals as to the effects and implications of GAT treatments remains of paramount significance.

In addition to gaining familiarity with treatment-related effects of HRT and other gender affirming treatments that are specific to transgender individuals, it is also crucial that physical health care professionals gain an understanding of additional medically relevant factors commonly experienced by FTMs. Research indicates that depression is common in as much as 60% of transgender youth (Clements-Nolle, Marx, & Katz, 2006). Similar to the well-established role of incidence of victimization and discrimination in depression in the gay, lesbian, and bisexual (GLB) population (Clements-Nolle et al., 2006), these factors are thought to play an analogous role in the high levels of depression in the transgender population.

Transgender individuals are also at risk for elevated anxiety, especially during the coming out process. Anxiety related to coming out has been well documented in the GLBT community in general (Safren & Rogers, 2001). No research to date has measured anxiety levels in FTMs; instead, studies usually have used a more general measure of psychological functioning (Smith, van Goozen, Kuiper, & Cohen-Kettenis, 2005). However, anxiety is viewed as so integral to the transsexual identity formation process that it is considered the first stage in Devor's (2004) model of transsexual identity formation. This stage, abiding anxiety, is characterized by discomfort surrounding one's gender. The societal expectations for what it means to be a certain gender, in addition to social consequences (actual and perceived) of being "different," are theorized to contribute to this sense of anxiety.

Furthermore, rates of attempted suicide and problematic substance use are high among transsexuals. For example, suicide prevalence in transgender

adults is reportedly as high as 32% (Clements-Nolle et al., 2006). Similarly, transgender youth reported high rates of self-harm behaviors, with suicide attempts being reported in 26% of these individuals (Grossman & D'Augelli, 2007). Rates of substance use have also been found to be particularly high in the transgender population, with some researchers suggesting a vulnerability to substance abuse in this population (Clements, Wilkinson, Kitano, & Marx, 1999; Cole, O'Boyle, Emory, & Meyer, 1997). More specifically, rates of heavy alcohol use have ranged from 8–31%, with illicit drug use ranging from 3–71% (Bocking et al., 2005; Garofalo, Deleon, Osmer, Doll, & Harper, 2006; Ramirez-Valles, Garcia, Campbell, Diaz, & Heckathorn, 2008).

The role of social support as a potential buffer to the aforementioned negative psychological symptoms has been well borne out in the literature (Cobb, 1976; Cohen & Wills, 1985; Pinto, Rogério, Melendez, & Spector, 2008). To date, no empirical studies have examined social support in the FTM community. Support from family has been shown to have a protective effect against negative mental health outcomes for gender-variant children (Ryan, Huebner, Diaz, & Sanchez, 2009). Gauthier and Chaudoir (2004) discuss the importance of the internet as a potential source of social support for FTMs and posit that FTMs can find understanding and acceptance in cyberspace that may not exist in their day-to-day life.

Preliminary assessment of quality of life in FTMs indicates testosterone treatment may improve their quality of life (Newfield et al., 2006). Overall quality of life has been found to be lower in FTMs who have not begun HRT, when compared to both male and female nontransgender individuals (Newfield et al., 2006). No empirical studies to date have examined change in quality of life following testosterone administration on FTMs.

Support for the notion that mental health will improve with HRT comes from numerous studies suggesting affective distress and associated behaviors can be related to issues involving discrimination, abuse, and decreased body image (Clements-Nolle et al., 2006; Grossman et al., 2007). Similarly, Safren and Heimberg (1999) found that when controlling for psychosocial predictors of current distress, the differences between heterosexual and sexual minority youths in levels of depression, hopelessness, and past and present suicidality were nullified. It would follow that as sources of distress, including feelings of discomfort with physical sex characteristics, are alleviated by HRT, levels of associated affective distress should decrease.

Based on the general dearth of information on the FTM population in general, specifically concerning the effects of testosterone use, the most accessible form of GAT, the aim of the current study is to determine the psychological variables associated with receiving HRT. Due to the increases in depression and anxiety, as well as reduced quality of life in FTMs not on HRT, it is hypothesized that (1) FTMs who are currently taking testosterone (+HRT) will report lower levels of depression, anxiety, and stress than those

who are not (–HRT) and (2) FTMs who are currently taking testosterone (+HRT) will report higher levels of social support and quality of life than those who are not (–HRT).

An additional aim of this study was to conduct a preliminary investigation of associated psychological factors, such as suicidality and problematic alcohol and substance use, in their relationship to HRT status.

METHOD

Participants and Procedures

FTM participants were recruited in spring 2008 to participate in an online survey that took 10–25 minutes to complete. The anonymous online survey was hosted on a secure server. The Committee for the Protection of Human Subjects at the University of Houston approved subject recruitment. Study advertisements were posted on online groups and discussion forums that were dedicated to FTM members. Participants also may have learned of the study through local FTM support groups, and all interested participants were given the URL to a secure website. Data were collected over a period of three months.

Participants read a consent form prior to study participation, and the investigator's contact information was provided in case participants had questions at any time before, during, or after study participation. In order to maintain anonymity, names and contact information of the participants were not collected. Agreement to participate in the study was provided by clicking an "I consent" button on the consent page. To prevent duplicate responses, only one survey was permitted from each unique IP address, though these were kept anonymous.

Respondents provided demographic information and then completed questionnaires assessing clinical symptoms of depression, anxiety, and stress; current perceived social support; and health-related quality of life. Upon survey completion, participants were entered into a lottery drawing for cash prizes. Funds for this research were provided by a graduate student research award from the Texas Psychological Foundation.

Data from 448 FTMs were collected for this study. Sixty-two participants were dropped from the analyses because of incomplete surveys, and 17 participants were dropped for failure to meet the minimum age requirement of 18. Thus, $n = 369$ participants were included in the present analyses. The mean age of the current sample was 28 years (range 18–68). The majority of the sample was White (76.7%) and reported at least some college level of education (88%). The majority of the sample reported working full- or part-time jobs (51.6%), and 30.2% indicated they were students. Most participants reported living in the United States (85%). Sixty-five percent reported a gross annual income of \$25,000 or less. Sixty-six percent of the sample reported taking testosterone at the time of the survey. Half of the sample (50%)

reported attractions towards both men and women. Forty-one percent of the sample reported having had chest reconstruction surgery, and 6% reported having genital surgery. All of the participants who had genital reconstruction reported being on HRT and having had chest surgery. Although most of the participants who reported having had chest surgery without genital surgery were on HRT, a small number were not ($n = 7$).

Measures

DEMOGRAPHICS

Participants reported information on their age, ethnicity, education, work status, income, HRT status, surgical status (chest and genital surgeries), history of suicide attempts, and history of alcohol and substance problems. See Table 1 for a summary of the demographics of the present sample.

Questions assessing HRT status, and history of suicide, alcohol, and drug use were: "Are you currently using hormones?" "Have you ever attempted suicide?" "Have you or anyone else felt that you have had a problem with alcohol?" "Have you or anyone else felt that you have had a problem with a substance (other than alcohol)?" Respondents chose "Yes" or "No" for each item.

DEPRESSION, ANXIETY, AND STRESS

The Depression, Anxiety, and Stress Scale (DASS) is a 42-item measure of depression, anxiety, and stress experienced over the previous week (Lovibond & Lovibond, 1995). The DASS utilizes a four-point Likert response scale, wherein participants decided whether the item applied to them from 0 (Did not apply to me at all) to 3 (Applied to me very much, or most of the time) over the past week. Prior research confirms concurrent and construct validity in the acceptable to excellent range (Antony, Bieling, Cox, Enns, & Swinson, 1998). Consistent with recent research (Crawford & Henry, 2003), reliability for the total scale was excellent ($\alpha = .96$). The Cronbach's reliability coefficients for the subscales were .95 (depression), .86 (anxiety), and .92 (stress), suggesting good to excellent internal consistency. Higher scores on each scale indicate more depression, more anxiety, and more stress. Refer to Table 2 for the normative scores for each subscale.

SOCIAL SUPPORT

The Multidimensional Scale of Perceived Social Support (MSPSS) is a 12-item scale developed to assess social support from friends, family, and a significant other (MSPSS; Zimet, Dahler, Zimet, & Farley, 1988). However, for the purposes of this study, the total score was used. Responses are based on a 7-point Likert scale, ranging from 1 (Very strongly disagree) to 4

TABLE 1 Summary of Demographic Information

Variable	%
Age	Sample (n = 369) <i>M</i> = 28.5, Range 18–68
Ethnicity	
Caucasian	76.7
Latino/Hispanic	2.7
African American	3.5
Asian American	0.8
Pacific Islander	0.5
Native American/Alaskan Native	0.3
Biracial	13
Other	2.4
Education	
HS diploma/GED or less	10
Some college	40.9
Associate's degree	3.8
Technical/Trade School	0.8
Bachelor's degree	22.8
Postgraduate	21.7
Work Status	
Full time	37.7
Part time	14.6
Temporary/seasonal	1.4
Unemployed	11.9
Disability	4.1
Retired	0.3
Student	29.3
Gross Annual Income	
none	10.8
Less than \$5,000	16.3
\$5,000–14,999	22
\$15,000–24,999	13.6
\$25,000–29,999	6.2
\$30,000–39,999	11.4
\$40,000–49,999	5.4
\$50,000–74,999	8.1
\$75,000–99,999	3.5
\$100,000–over	2.7
Testosterone Therapy	
+ HRT	66
– HRT	34

(Neutral) to 7 (Very strongly agree). The Cronbach's reliability for the total support subscale was good ($\alpha = .89$), and higher scores indicate higher levels of perceived social support.

QUALITY OF LIFE

The Short Form 36-item Questionnaire version 2 (SF-36v2; Ware, Kosinski, & Dewey, 2000) is a reliable quality of life measure and has been validated

TABLE 2 Multivariate Results including Normative Data

Outcome Variable	+ HRT	– HRT	TOTAL	NORMS [†]
Mean				
Depression***	6.5	13.7	9	0–9
Anxiety***	4.4	8.0	5.6	0–7
Stress***	9	15.1	11.1	0–14
Quality of life***	65.2	53.7	61.3	50 (10)
Perceived social support***	5.3	4.8	5.1	5.8 (.86)
Suicide attempts (ever)#	42%	46%	43%	32%
Alcohol problems	27%	19%	24%	8–31%
Substance use problems	19%	19%	19%	3–71%

*** $p < .001$, # based on $n = 367$.

[†]Norms for depression, anxiety, stress, social support, quality of life, are based on the general population norms, whereas norms for suicide attempts and substance problems are based on research from the transgender population.

MANOVA: Overall significant main effect of HRT on mental health, $F(5, 363) = 12.89$, $p < .001$.

with online FTM samples (Newfield et al., 2006). It yields eight subscales with reliabilities ranging from .93 to .95 (Ware, 2003). The current study uses the general health subscale, which demonstrated good reliability ($\alpha = .85$). Higher scores indicate higher levels of quality of life.

Analyses

The distributions for depression, anxiety, and stress were positively skewed and the distributions for social support and quality of life were negatively skewed, so the data were log transformed. The table presents untransformed data. See Table 2 for a display of the untransformed means for the groups.

To test the hypotheses (that FTMs differed on clinical variables based on HRT status), a two-way multivariate analysis of variance (MANOVA) was conducted with HRT status (+ or –) as the qualitative between-subjects factor and depression, anxiety, stress, social support, and quality of life as quantitative dependent variables.

RESULTS

As expected, depression, anxiety, and stress were positively correlated; social support and quality of life were also positively correlated; and depression, anxiety, and stress scores were each negatively correlated with social support and quality of life (see Table 3). The significant correlations provide evidence for good discriminant validity, and the small to moderate correlations indicate that the scales measure related, yet distinct, constructs. Thus, the dependent variables are appropriate for use in a MANOVA.

TABLE 3 Correlation Matrix

	Depression	Anxiety	Stress	Social Support
Depression				
Anxiety	.63***			
Stress	.65***	.73***		
Social support	−0.38***	−.24***	−.24***	
Quality of life	−.35***	−.37***	−.33***	.25***

*** $p < .001$.

The means of the dependent variables for the two groups are presented in Table 2. Mean scores for almost all variables in each group fall within the normal range for depressive symptoms, anxiety symptoms, and stress. The means of depression and stress of FTMs who were not on testosterone fell just outside of normal, in the mild range. Both groups reported lower than average levels of social support. Overall, FTMs reported relatively high levels of quality of life. Almost half of the sample reported a history of at least one suicide attempt, which was higher than expected. Overall rates of problematic alcohol and substance use were within the expected ranges (see Table 2).

Multivariate Analyses

To test whether FTMs differed on clinical variables based on HRT status, a between-subjects MANOVA was run with HRT status (2 levels: +HRT and −HRT) on depression, anxiety, stress, social support, and quality of life. As predicted, an overall multivariate effect of HRT status was found in which FTMs differed on mental health measures based on HRT status ($F(5, 363) = 12.89, p < .001$). Specifically, FTMs who were on testosterone reported lower levels of depression, anxiety, and stress and higher levels of social support and health-related quality of life than those who were not on testosterone.

A main effect of depression was found $F(1, 367) = 57.34, p < .001$, where FTMs who were on testosterone reported significantly lower levels of depression than those who were not on testosterone. Main effects of anxiety and stress were found were in the same direction (anxiety: $F(1, 367) = 37.71, p < .001$; stress $F(1, 367) = 38.14, p < .001$).

Social support was found to differ significantly between groups, with FTMs on testosterone reporting higher levels of perceived social support than those not on testosterone ($F(1, 367) = 13.03, p < .001$). A main effect of health-related quality of life was found wherein FTMs who were on testosterone reported higher quality of life scores than those who were not on testosterone, ($F(1, 367) = 17.95, p < .001$).

Chi-square tests were used to determine whether or not there was a significant difference in reported history of one or more suicide attempts between FTMs who were on HRT and those who were not. Forty-two percent

of + HRT FTMs reported a history of a suicide attempt, and 46% of -HRT FTMs reported the same. The difference was not statistically significant, $\chi^2(1, 367) = .53, p > .05$.

A similar set of analyses was conducted to determine whether or not FTMs who were on HRT and those who were not differed on reported history of problems with alcohol or other substance use. Histories of alcohol problems were reported by 27% of +HRT FTMs and 19% of -HRT FTMs. This difference was not found to be statistically significant, $\chi^2(1, 369) = 2.3, p > .05$. Nineteen percent of both groups reported having a history of substance use problems, $\chi^2(1, 369) = .002, p > .05$.

DISCUSSION

All hypotheses in the current study received strong empirical support. FTMs who were on HRT with testosterone had significantly lower reported levels of depression, anxiety, and stress than their FTM counterparts not taking testosterone. FTMs on testosterone had generally a higher reported quality of life and higher levels of perceived social support compared with their FTM counterparts not currently taking testosterone. Thus, for FTMs, HRT in the form of testosterone is associated with fewer negative psychological symptoms, and in addition is related to greater levels of protective factors and sources of resiliency, such as perceived social support and a higher quality of life.

It is noteworthy that the levels of negative psychological symptoms were atypical in this particular sample, as they were lower than those reported in previous internet studies of FTMs (Clements-Nolle et al., 2006; Newfield et al., 2006). For example, Clements-Nolle and colleagues (2006) found the incidence of clinical depression in their sample of 500 transgender individuals to be as high as 60%. While that sample included MTFs, the incidence of depression remains well above that reported in the current study. Newfield and colleagues (2006) reported lower overall quality of life in a sample of FTMs. This may be because the current study reported on one aspect of quality of life only, while Newfield and colleagues discussed overall quality of life. While the sample endorsed fewer negative symptoms overall, levels of these composite domains still varied significantly between groups.

Despite differences found in the levels of psychological variables, no significant group differences were found in suicidality or problematic substance use. That is, FTMs taking testosterone did not differ from their FTM counterparts not taking testosterone in number of past suicide attempts or in problematic substance use. The lack of significant findings with respect to suicidality may be in part due to the manner in which this was assessed. For the purposes of this study, suicidality was queried only in terms of past attempts. Because a previous suicide attempt is a single event in the past, it

is not something that can be affected by current use of HRT. More research is needed in this area to elucidate levels of suicidal ideation and potential changes therein, as well as changes in number of attempts following treatment with HRT.

Similarly, the lack of significant findings with respect to problematic substance use between groups is likely due to the manner in which this was assessed. Substance use and abuse is often a long-standing pattern, the underpinnings of which are both psychological and physiological, adding a layer of complexity to the potential effect of testosterone on this domain. Also, time since beginning testosterone was not recorded, and as such it was impossible to determine whether or not respondents were more likely to reduce problematic substance use at any point following use of testosterone. Further research would be necessary to fully investigate this relationship.

The significance of the findings from the current study can be best understood in light of prior research. Despite an established greater propensity towards negative psychological symptoms in FTMs regardless of GAT status, the etiology of this relationship is not well understood and is often overlooked. For example, it is unclear if negative psychological symptoms are in part due to the perceived mismatch between body and gender, or if directionality extends in the other direction. Consequently, something that is not commonly emphasized is an understanding of the potential positive psychological effects that hormone regimens may be associated with in addition to their effects on secondary sex characteristics.

One possible explanation for the main effect of testosterone in the study is related to gender dysphoria, or the notion that transgender individuals may experience negative psychological symptoms related to the fact that they do not identify with their present gender (Sember, 2000). From this line of reasoning, FTMs may experience fewer negative psychological symptoms when receiving HRT because it serves to lessen the incongruence between external sex characteristics and internal gender identity. This, in turn, may lessen the negative psychological symptoms associated with gender dysphoria. That is, lesser degree of incongruence may be linked directly or via other mediating factors, such as self-worth, self-acceptance, perceived social acceptance, and so forth, to psychological sequelae such as anxiety, depression, and stress. Much more research would be needed to elucidate the verity of gender dysphoria as a mediating factor in this relationship.

An alternative explanation for these results may be linked to the system involving the requirements for the prescription of HRT to FTMs. If a prerequisite for prescribing HRT is a certain degree of psychological health and/or an absence of certain comorbid psychological conditions, it is possible that those individuals with a lesser predisposition to depression and anxiety are those more frequently prescribed HRT. Thus, the directionality of the association between HRT and psychological health is unknown.

It is clear that positive psychological effects were associated with HRT. This comes with a host of implications for clinical practice. The results offer strong support for the claim made by Levy, Crown, and Reid (2003) that withholding HRT agents from a transsexual can be associated with increased risk of depression and suicide. The current findings suggest prescription of HRT to FTMs may serve to alleviate some of the negative psychological symptoms associated with gender dysphoria, including depression, anxiety, and stress, as well as increasing protective factors such as social support and quality of life.

The current study provides some of the first evidence of the effects of testosterone on psychological symptoms for FTMs largely from the United States. Given the current role of health professionals in transsexuals' access to HRT in the United States, it is crucial that the positive effects of testosterone be taken into account by these individuals. As previously stated, it is often presumed, without adequate evidence base, that transitioning represents a potentially psychologically taxing process and should be limited in individuals with impaired reality testing. Depression and anxiety are not typically thought to impair reality testing, and have been shown to be improved in individuals on HRT. A clinical implication is that a diagnosis of depression and/or anxiety should not contraindicate HRT.

Furthermore, as health care professionals have been placed in a role to potentially limit access to hormone treatments, they bear the onus to become better educated regarding transsexual issues, in order to operate in the best interest of the individual. There is a lack of exposure to and information on transsexual and transgender issues among health care professionals. It is crucial that mental health professionals be well-educated in transsexual health issues and needs, so as to prevent undue suffering in the forms of discrimination, micro-aggression, or medical mismanagement among this population.

This study provides clear evidence that HRT is associated with improved mental health outcomes in FTMs. Current findings adds to the body of current literature that strongly encourages health care providers to be aware of possible hormonal and surgical interventions that may be indicated for use with transgender individuals. The effects and associated risks of these hormone regimens should well understood by health care providers (Feldman & Bockting, 2003).

While the implications for better education of health care professionals as to transsexual needs is unequivocal, generalizability of other implications of this study may be limited by the demographics of our sample (mostly U.S. residents, White, and highly educated). As such, a more representative sample in future research may serve to extend the generalizability of such findings. Future research to elucidate the many remaining questions also could be well served by investigation of the effects of testosterone on psychological symptoms and functioning in one sample over time.

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