

# The Role of Body Image Dissatisfaction and Depression on HAART Adherence in HIV Positive Men: Tests of Mediation Models

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**Abstract** The current study examined the role of body image dissatisfaction and depression on HAART adherence in a sample of HIV positive men. Participants were 124 HIV positive gay and bisexual men, who responded to an online survey. Results from moderated mediation models revealed that depression mediated the relationship between body dissatisfaction and HAART non-adherence for men who possessed elevated levels of body dissatisfaction, but not for those men who reported moderate or low levels. Additionally, depression was found to mediate the relationship between body dissatisfaction and HAART non-adherence for men with a self-reported AIDS diagnosis. Results suggest the importance of addressing both body dissatisfaction and depression in men who are living with HIV/AIDS.

**Keywords** HIV/AIDS · Body image dissatisfaction · Depression · HAART adherence · Lipodystrophy

## Introduction

Among men with HIV/AIDS, body image disturbances are not uncommon. For example, Sharma et al. reported that 31% of HIV positive men report body dissatisfaction [1]. Body image is defined as an individual's attitudes and perceptions regarding the physical self [2], and includes

cognitions, affect, and behaviors [3]. There are several possible explanations for these rates of body dissatisfaction in HIV positive men. Namely, the impact of lipodystrophy has been found to significantly impact men's views of their bodies [4–7]. Lipodystrophy is loosely defined as a set of symptoms associated with continued use of Highly Active Retroviral Therapy (HAART), chiefly, fat atrophy of the arms, legs, face, and buttocks, and hypertrophy of fat in the abdomen and neck [4]. Additionally, lipodystrophy has a particularly important role in HAART adherence, as several, although not all reports [8], have identified self-perceived changes in body fat to be related to HAART non-adherence [5, 6, 9, 10]. This potential for non-adherence has striking influences on HIV/AIDS patients, as even occasional non-adherence to treatment is related to deleterious outcomes [11–13].

Other possible sources of increased body dissatisfaction in HIV populations include a high proportion of HIV positive men reporting a gay or MSM orientation [14] and the impact of AIDS wasting syndrome. Regarding sexual orientation, it is possible that men living with HIV/AIDS report high levels of body dissatisfaction due to higher rates of body dissatisfaction found in gay versus heterosexual populations [15]. Additionally, although perhaps less common since the advent of HAART, wasting of muscle mass via complications from progression to AIDS can also have a significant negative impact on individuals' body image, quality of life, and mood [16].

Regarding mood, depression is often associated with body dissatisfaction in men [17, 18]. Some theorists [19] have argued that body dissatisfaction predicts depression, as perceived failure to obtain a muscular and thin ideal (i.e., the current "ideal" male body) is likely to lead to increases in negative appraisals of the self. Perhaps body dissatisfaction may contribute toward a negative view of

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the self via both appraisal of one’s appearance and physical capabilities, as well as through decreased social attraction or stigma to the extent that changes in physical characteristics are noticeable. Indeed, Guaraldi reported that in HIV positive men, body dissatisfaction may lead to depression through stigma, decreases in self-esteem, and perceptions of loss of desirability [4].

Depression is commonly reported among HIV positive individuals [20]. For instance, Bing et al. found that 36% of their nationally representative HIV positive sample reported symptoms of major depressive disorder [21]. Furthermore, individuals living with HIV who endorsed greater levels of depressive symptoms have been found to progress to AIDS status faster than those with a lower endorsement of depressive symptoms [22]. Depression has also been found to directly predict HAART non-adherence in HIV positive samples [23–25]. Clearly, these findings illuminate the nefarious role depression plays in the lives of individuals living with HIV.

The Current Study

Although body image has been explored before in relation to HAART non-adherence in HIV positive samples, no studies have actually measured dissatisfaction with one’s body, per se; rather, body image has been assessed via self-perceptions of body fat changes [5, 6, 9, 10]. While the perception of body fat change is an important component of body image, perhaps emphasis on dissatisfaction should also be explored, as the affective and cognitive aspects of body dissatisfaction tend to be more predictive of distress than perceptual assessment of one’s body [26]. Additionally, the aforementioned studies measured perceptions of body fat changes with instruments that have yet to be empirically validated; thus, questioning the reliability and validity of their results.

Thus, the purpose of the current study is to evaluate the mediational impact of depression on the relationship between body dissatisfaction and HAART non-adherence. However, this mediation model may not hold under all circumstances. One consideration is the level of body dissatisfaction. Perhaps depression will only serve as a mediator when men possess elevated levels of body dissatisfaction. Another possibility is that this model may vary as a function of AIDS status. Given that progression to AIDS status may be associated with additional body changes (e.g., wasting syndrome) [16], and that perceived body changes are positively correlated with time since diagnosis and length of HAART use [1], it seems possible that men with AIDS may have added concerns regarding their bodies compared to men without an AIDS diagnosis. Therefore, the following models are proposed, in which mediation (i.e., depression) and moderators variables (i.e., AIDS status, level of body dissatisfaction) will be tested [27]:

Model 1: the relationship between body dissatisfaction and HAART non-adherence will be mediated by depression (Fig. 1).

Model 2: the relationship between body dissatisfaction and HAART non-adherence will be mediated by depression only for those HIV positive men who possess elevated levels of body dissatisfaction (Fig. 2).

Model 3: the relationship between body dissatisfaction and HAART non-adherence will be mediated by

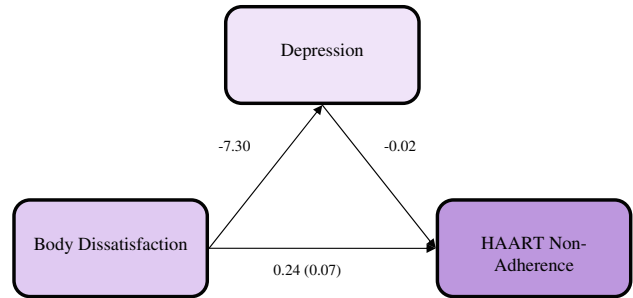


Fig. 1 Unstandardized coefficients for simple mediation of depression in the relationship between body dissatisfaction and HAART non-adherence. Note: the direct effect (controlling for depression) coefficient is located parenthetically in the figure

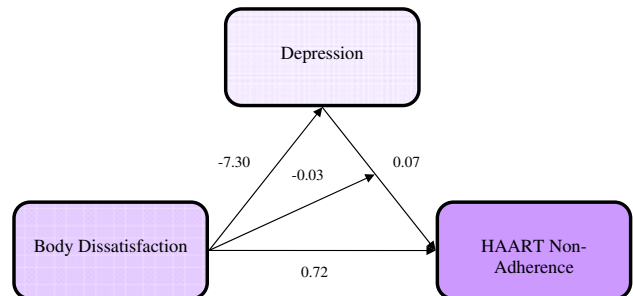


Fig. 2 Unstandardized coefficients for depression as a mediator in the relationship between body dissatisfaction and HAART non-adherence moderated by body dissatisfaction

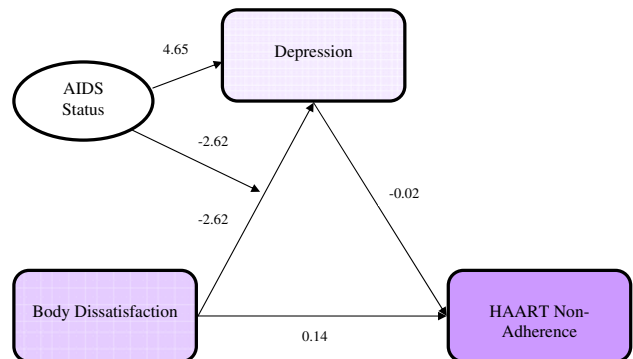
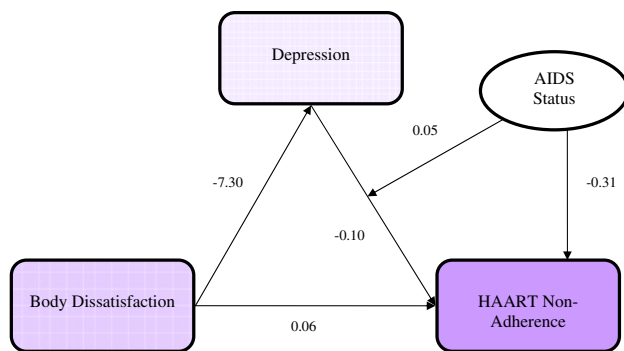


Fig. 3 Unstandardized coefficients for depression as a mediator in the relationship between body dissatisfaction and HAART non-adherence moderated by AIDS status (path a)



**Fig. 4** Unstandardized coefficients for depression as a mediator in the relationship between body dissatisfaction and HAART non-adherence moderated by AIDS status (path b)

depression only for men who have also been diagnosed with AIDS (this model specifies the path from body dissatisfaction to depression is moderated by AIDS status; Fig. 3).

Model 4: the relationship between body dissatisfaction and HAART non-adherence will be mediated by depression only for men who have also been diagnosed with AIDS (this model specifies the path from depression to HAART non-adherence is moderated by AIDS status; Fig. 4).

## Methods

### Participants and Procedure

Participants were 124 HIV positive gay and bisexual men who were recruited through descriptions of the study that were posted on various HIV/AIDS related Internet-based discussion boards and listservs. The description of the study outlined the main goals, such as examining body image and health in men. Furthermore, potential participants were informed that upon completing the survey, a participant could select one of several charitable organizations to which the researchers would donate \$1 per completed survey. After reading the recruitment statement, potential participants advanced to the online survey if they wished to participate. The authors' Institutional Review Board approved this study.

### Measures

#### Body Dissatisfaction

Each participant completed the 7-item Appearance Evaluation subscale from the Multidimensional Body-Self Relations Questionnaire (MBSRQ) [28]. On this measure, participants rated their agreement with items on a 5-point

scale, with responses ranging from 1 “*Definitely Disagree*” to 5 “*Definitely Agree*.” The Appearance Evaluation subscale measures global satisfaction or dissatisfaction with one’s looks [29]. Higher scores denote more positive feelings regarding one’s body. Cronbach’s alpha has been reported at 0.88, whereas 1-month test–retest reliability is 0.81 [29]. For the current study,  $\alpha = 0.91$ .

#### Depression

Each participant completed The Center for Epidemiological Study - Depression Scale (CESD) [30], a 20-item measure of depressed mood. Responses are coded on a 4-point scale ranging from 1 “*Rarely or none of the time*” to 4 “*Most or all of the time*” over the previous 2 weeks. In the general population, the CESD has good internal consistency ( $\alpha = 0.90$ ). For the current sample,  $\alpha = 0.93$ .

#### HAART Non-Adherence

Each participant completed a modified version of the Simplified Medication Adherence Questionnaire (SMAQ) [31]. The SMAQ was developed as a brief instrument to assess HAART non-adherence in HIV-infected patients. Knobel et al. demonstrated that the SMAQ has 72% sensitivity and 91% specificity to detect non-adherent patients and a Cronbach’s alpha level of 0.75 [31]. For the current sample,  $\alpha = 0.78$ . The SMAQ consists of six items, five of which are dichotomously scored. The one item which is continuous: “Thinking about the last week, how often have you not taken your medicine?” is responded to via a 5-point scale (“Never”, “1–2 times”, “3–5 times”, “6–10 times”, or “>10 times”). Although participants responded to this item with the 5-point scale, responses were later dichotomized into 1 “*2 to 10 times*” and 2 “*1 to Never*” for data analysis. Another modification that was made to the SMAQ was the wording of the item “Did you not take any of your medicine over the past weekend?” This item was changed to: “Did you fail to take any of your medicine over the past weekend?” The rationale behind this change was due to beliefs that the former version of the item was confusing; thus, the modification was made in aims of improving comprehension of the instrument. A total score from the SMAQ was computed by summing the responses from the six items. Lower scores denote less HAART adherence.

#### Demographics

Participants completed a brief demographic form on which they indicated their sex, ethnicity, age, height, weight, AIDS status (i.e., “Have you been diagnosed with AIDS?”), length of HIV diagnosis, HAART status, and length of taking HAART. Additionally, participants indicated their sexual

orientation by responding to an adaptation of the Klein Sexual Orientation Grid (KSOG) [32]. For the purpose of this study, only the variable of Present Self-Identification was used. Participants rated their present self-identification (with respect to sexual orientation) on a 7-point scale, ranging from 1 “heterosexual only” to 7 “homosexual only.”

## Analyses

Descriptive statistics were calculated to describe the study sample and are presented in Table 1. To determine if demographic variables were significantly associated with study outcomes, correlational analyses were conducted. Correlations among study measures are also presented in Table 1. To test model 1, simple mediation was conducted according to the bootstrapping strategy recommended by Preacher and Hayes [33]. To examine if this simple mediation model held given the level of body dissatisfaction, or AIDS status, the remaining models (i.e., models 2–4) were assessed via moderated mediation [27]. Moderated mediation allows researchers to assess both how and when an indirect effect occurs. In other words, moderated mediation exists when the presence of a mediating variable in the relationship between a predictor and outcome is contingent on a level of a moderating variable. There are several forms in which a moderated mediation can occur, and Preacher et al. outlined five of these possibilities [27]. For the purposes of the current study, three of these models were tested: (a) the independent variable serves as a moderator in the path between the mediator and the outcome variable, (b) a fourth (moderator) variable affects the path between the independent variable and the mediator, and (c) a fourth (moderator) variable affects the path between the mediator and outcome variable.

Analogous to testing interaction effects in regression, when moderated mediation exists, the researcher must identify specific values of the moderator by which to test the conditional indirect effects [27]. One approach to then test the conditional indirect effects is through the use of nonparametric bootstrapping. Bootstrapping is a statistical approach in which cases from the original dataset are randomly re-sampled with replacement, to re-estimate the sampling distribution [34]. From this new sampling distribution, confidence intervals (CIs) are then constructed. A conditional indirect effect is considered “significant” if zero is not contained within the upper and lower CIs. Bootstrapping is generally preferred over traditional methods of studying mediation [34], as it does not require the assumption of a normal distribution to be met—an assumption that is rarely reached in small to moderate samples [33]. Thus, bootstrapping procedures should be given preference when testing mediation when samples sizes are small to moderate.

**Table 1** Descriptive statistics and intercorrelations of study variables

Variable	Mean (median)	SD (IQR)
Body dissatisfaction	3.19	0.89
Depression	19.60	13.48
HAART non-adherence <sup>a</sup>	10.57 (11.00)	1.72 (2)
Sexual orientation <sup>a</sup>	6.87 (7.00)	0.47 (0)
Age	47.94	9.51
BMI	25.60	5.00
n (%)		
Race/ethnicity		
Caucasian	106 (85.5%)	
Hispanic/Latino	9 (7.3%)	
Black/African-American	6 (4.8%)	
Multiethnic	1 (0.8%)	
Asian	1 (0.8%)	
Native-American	1 (0.8%)	
Length of HIV diagnosis (years)		
<1	2 (1.6%)	
1–2	5 (4.0%)	
2–4	13 (10.5%)	
4–6	11 (8.9%)	
6–8	14 (11.3%)	
8–10	6 (4.8%)	
>10	73 (58.9%)	
Length on HAART (years)		
<1	8 (6.5%)	
1–2	12 (9.7%)	
2–4	12 (9.7%)	
4–6	8 (6.5%)	
6–8	9 (7.3%)	
8–10	16 (12.9%)	
>10	59 (47.6%)	
AIDS diagnosis		
Yes	44 (35.5%)	
No	80 (64.5%)	

The following Pearson correlations among IVs and the DV were obtained: HAART non-adherence, depression ( $r = -0.191$ ,  $P = 0.03$ ); HAART non-adherence, body dissatisfaction ( $r = 0.122$ ,  $P = 0.177$ ); body dissatisfaction, depression ( $r = -0.482$ ,  $P = 0.0001$ )

<sup>a</sup> These variables were non-normally distributed, thus, the median and IQR are reported in addition to the mean and SD

## Results

### Preliminary Analyses

Demographic variables were assessed to determine if they significantly covaried with the outcome measure. These correlational findings revealed that none of the

demographic variables (i.e., age, sexuality, BMI, ethnicity, length of HIV diagnosis, or length of HIV HAART use) were significantly related to the outcome variable (HAART non-adherence). Thus, none of these variables were included as covariates in the primary analyses.

#### Simple Mediation (Model 1)

Model 1 hypothesized that depression would mediate the relationship between body dissatisfaction and HAART non-adherence. To test this hypothesis, bias corrected (BC) confidence intervals (CI's, 95%) were generated [33], as they have been shown to produce better type I error rates and power, compared to conventional CIs. Results of the indirect effect, based on a bootstrapped sample of  $n = 5,000$ , revealed that zero was contained within the lower and upper limits (BC lower =  $-0.05$ , BC

upper =  $0.38$ ), thus indicating that depression did not mediate the relationship between body dissatisfaction and HAART non-adherence (Table 2).

#### Moderated Mediation (Model 2)

Model 2 posited that the mediational influence of depression on the relationship between body dissatisfaction and HAART non-adherence would be moderated by body dissatisfaction, in that depression would only serve as a mediator for men who possess elevated levels of body dissatisfaction. Regression analyses were initially conducted with body dissatisfaction predicting depression, revealing that lower scores on body satisfaction (i.e., greater body dissatisfaction) predicted higher scores on depression ( $B = -7.30$ ,  $t = -6.1$ ,  $P < 0.00001$ ). Next, the interaction term of body dissatisfaction X depression in the

**Table 2** Coefficients and confidence intervals for the 4 mediation models

Path	<i>B</i>	SE	<i>t</i>	<i>P</i>
<b>Model 1</b>				
BD to DEP	-7.30	1.20	-6.10	0.00001
DEP to HAART	-0.01	0.01	-1.70	0.09
BD to HAART	0.24	0.17	1.40	0.17
BD to HAART (controlling for DEP)	0.07	0.20	0.40	0.70
Indirect effect BC CI {-0.05, 0.38}				
<b>Model 2</b>				
BD to DEP	-7.30	1.20	-6.10	0.00001
DEP to HAART	0.07	0.04	1.76	0.08
BD to HAART	0.72	0.33	2.20	0.03
BD × DEP to HAART	-0.03	0.01	-2.40	0.02
Conditional indirect effect for BD (3.5) <sup>a</sup> BC CI {0.05, 0.49}				
<b>Model 3</b>				
BD to DEP	-2.62	4.35	-0.60	0.54
AIDS to DEP	4.65	8.16	0.57	0.57
BD × AIDS to DEP	-2.62	2.54	-1.03	0.30
DEP to HAART	-0.02	0.01	-1.37	0.17
BD to HAART	0.14	0.62	0.23	0.82
Conditional indirect effect for AIDS (Yes) BC CI {-0.04, 0.30}				
Conditional indirect effect for AIDS (No) BC CI {-0.07, 0.37}				
<b>Model 4</b>				
BD to DEP	-7.30	1.20	-6.10	0.00001
DEP to HAART	-0.10	0.04	-2.52	0.01
AIDS to HAART	-0.31	0.60	-0.51	0.60
DEP × AIDS to HAART	0.05	0.02	2.20	0.03
BD to HAART	0.06	0.20	0.30	0.76
Conditional indirect effect for AIDS (yes) BC CI {0.06, 0.75}				
Conditional indirect effect for AIDS (no) BC CI {-0.23, 0.18}				

BD body dissatisfaction, DEP depression; HAART HAART non-adherence, AIDS AIDS Status (Yes, No), BCCI Bias corrected confidence intervals

<sup>a</sup> The conditional indirect effect when BD was set at 0.35 SD above the mean

prediction of HAART non-adherence was assessed, indicating that the interaction of body dissatisfaction and depression predicted HAART non-adherence over and above the main effects of body dissatisfaction and depression independently, ( $B = -0.03$ ,  $t = -2.4$ ,  $P = 0.02$ ). Body dissatisfaction was then set at  $\pm 1$  SD below, at, and above the mean (low = 2.3, medium = 3.2, high = 4.1) to test for the conditional indirect effects at specific values of the moderator. Results indicated that only at high levels of body dissatisfaction ( $z = 2.3$ ,  $P = 0.03$ ) did depression mediate the relationship between body dissatisfaction and HAART non-adherence. However, because this value was based on the assumption of a normal distribution, it should be interpreted with caution. As an alternative, the conditional indirect effect was run using bootstrapping ( $n = 5000$ ), by setting the moderator (body dissatisfaction) level at 3.5 (this level was chosen after inspecting the Johnson–Neyman Significance Regions, and is roughly 0.35 SD above the mean). Results revealed that zero was not contained within the lower and upper limits (BC lower = 0.05, BC upper = 0.49), thus indicating that depression mediated the relationship between body dissatisfaction and HAART non-adherence only for men who possessed elevated (i.e., 0.35 SD above the mean) levels of body dissatisfaction.

#### Moderated Mediation (Model 3)

Model 3 posited that the mediational influence of depression on the relationship between body dissatisfaction and HAART non-adherence would be moderated by AIDS status (moderation within the path from body dissatisfaction to depression), in that depression would serve as a mediator in the relationship only for men who have been diagnosed with AIDS. Initially, regression analyses were conducted with body dissatisfaction, AIDS status, and their interaction term predicting depression. These analyses revealed non-significant findings. Thus, the lack of significant moderation within the path of body dissatisfaction to depression would preclude the possibility of a significant conditional indirect effect. In sum, the mediational influence of depression in the relationship between body dissatisfaction and HAART non-adherence was not found to be moderated by AIDS status (in the path from body dissatisfaction to depression).

#### Moderated Mediation (Model 4)

Model 4 posited that the mediational influence of depression on the relationship between body dissatisfaction and HAART non-adherence would be moderated by AIDS status (moderation within the path from depression to HAART non-adherence), in that depression would serve as a mediator in the relationship only for men who have been

diagnosed with AIDS. Initially, regression analyses were conducted, with body dissatisfaction predicting depression ( $B = -7.30$ ,  $t = -6.1$ ,  $P < 0.00001$ ), indicating that lower scores on body satisfaction (i.e., greater body dissatisfaction) predicted higher levels of depression. Next, the interaction term, depression X AIDS status, in the prediction of HAART adherence was assessed, indicating that the interaction of depression and AIDS status significantly predicted HAART non-adherence over and above the main effects of depression and AIDS status, independently ( $B = 0.05$ ,  $t = 2.2$ ,  $P = 0.03$ ). AIDS status was then assessed at both levels (yes, no) to test the conditional indirect effect at each level of the moderator. As in the previous models, 95% BC CIs were generated (via bootstrapping,  $n = 5000$ ) for both levels of AIDS status. Findings revealed the following results for men who had been diagnosed with AIDS: BC lower = 0.06, BC upper = 0.75. When generating BC CIs for HIV positive men without an AIDS diagnosis the following results were found: BC lower =  $-0.23$ , BC upper = 0.18. Because zero was not contained within the BC CIs for men with AIDS (whereas it was for men without AIDS), the results indicate that depression served as a mediator in the relationship between body dissatisfaction and HAART non-adherence only for men who have been diagnosed with AIDS.

## Discussion

The aim of the current study was to investigate the role of body dissatisfaction and depression on HAART non-adherence in a sample of HIV positive men. Although aspects of body image (i.e., perceptions of body fat changes) have been found to be related to HAART non-adherence in HIV positive populations [5, 6, 9, 10], these studies have assessed only one component of body image, while failing to address dissatisfaction with one's body. Further, the aforementioned studies failed to utilize empirically-based measures of body image, or to test more nuanced models for understanding how and when body image may negatively impact HAART non-adherence. The current study improved on these areas by including a well-established, validated measure of body dissatisfaction, as well as testing for possible mediators and moderators in the relationship between body dissatisfaction and HAART non-adherence.

Specifically, the novel statistical techniques of bootstrapped simple and moderated mediation were employed to test four competing models. Model 1 suggested that depression would serve as a mediator in the relationship between body dissatisfaction and HAART non-adherence. Model 2 proposed that this relationship would only be significant for men who possess elevated levels of body

dissatisfaction (Fig. 2). Model 3 hypothesized that the relationship between body dissatisfaction and HAART non-adherence would be mediated by depression, only for men who have been diagnosed with AIDS (moderation occurring in the path from body dissatisfaction to depression; Fig. 3). Finally, model 4 posited that the relationship between body dissatisfaction and HAART non-adherence would be mediated by depression, only for men who have been diagnosed with AIDS (moderation occurring in the path from depression to HAART non-adherence; Fig. 4). Results from these analyses supported models 2 and 4.

The findings from the current study did not support model 1. These results suggest that depression does not serve as mediator in the relationship between body dissatisfaction and HAART non-adherence. However, due to the possibility that these relationships might hold under certain circumstances, alternative moderated mediation models were tested. Indeed, the results from model 2 suggested that depression does serve as a mediator between body dissatisfaction and HAART non-adherence for men with elevated levels of body dissatisfaction.

It should be noted that when testing this model, “elevated” was defined as 0.35 SD above the mean. This suggests that only slight increases above the average level of body dissatisfaction triggered the significant mediation. Perhaps these findings suggest that extremely high levels of body dissatisfaction are not needed to produce a deleterious impact on HAART adherence in HIV positive men.

Model 3 was not supported in the current study. However, model 4, which is a slight variation of model 3 was found to be significant. These two models differ in the path in which AIDS status serves as a moderator. In model 3, AIDS status interacts with body dissatisfaction in predicting depression, whereas in model 4, AIDS status interacts with depression in predicting HAART adherence. These discrepant findings suggest that depression serves as a mediator in the relationship between body dissatisfaction and HAART non-adherence only for men who have been diagnosed with AIDS. In other words, AIDS status does not appear to interact with body dissatisfaction to predict depression; however, AIDS status does interact with depression to predict HAART non-adherence, with high levels of depression and being diagnosed with AIDS serving as the significant predictors.

A question that remains to be answered is whether the body dissatisfaction that men were reporting was a result of lipodystrophy, or rather due alternative hypotheses. Because lipodystrophy symptoms were not explicitly assessed for (i.e., changes in fat composition at discrete areas of the body), in addition to the cross-sectional design, it cannot be stated that men’s body dissatisfaction was a function of experiencing symptoms of lipodystrophy. Perhaps, given that the men in the sample identified as being gay or bisexual,

the body dissatisfaction reported was a result of the pressure gay men often feel to obtain a muscular and thin body [35]. In order to address this question, future research could compare HIV positive and negative gay men on various measures of body image to determine if differences exist. Such studies may help address the question of why the men in the current study possessed body dissatisfaction.

Despite the contributions of the current study, it is not without its limitations. One drawback of the study is its use of self-reported HAART adherence. However, in their review of the literature, Simoni et al. concluded that brief self-report measures of HAART adherence in HIV positive individuals can be used validly in both research and clinical practice [36]. Further, the sample composition limits the generalizability of the results to Caucasian men with Internet access. Although research on ethnic minority male body image has been limited, some evidence exists that African American men possess higher drive for muscularity than Caucasian men [37]. Moreover, because participants identified themselves as being gay or bisexual, these findings may also be limited in addressing adherence concerns in heterosexual male samples. This may be especially true given that gay men, on average, endorse higher levels of body dissatisfaction compared to heterosexual men [15, 18]. Perhaps then, future research could test these results in varied samples, including heterosexual men, women, and ethnic minorities living with HIV. Finally, because AIDS status was based on self-report, it is possible that some of the men in the current study may not have actually been diagnosed with AIDS by a physician; thus, their grouping in the AIDS diagnosis group may have been dubious. Therefore, future research on body dissatisfaction and HAART adherence should aim to collect both self-report and biological markers of AIDS status.

Another potential limitation concerns the measurement of body dissatisfaction. Although the MSBRQ is a well-validated instrument, it was not designed to assess men’s body image per se (although it has been used extensively with men). Future research may wish to investigate body image in men with a specific instrument designed for this population, such as the Male Body Attitudes Scale (MBAS) [38], which assesses muscularity, body fat, and height concerns. Recent work has found the MBAS to be a suitable instrument for measuring body image in gay men [39]. Finally, the cross-sectional design of the study precludes inferences drawn regarding causality; to assess the temporal influence of body dissatisfaction, depression, and HAART adherence, prospective studies should be conducted.

#### Clinical Implications

The findings from the current study have the potential to inform treatment with HIV positive men. For example, it

appears that body dissatisfaction is an important construct to explore with HIV/AIDS patients, as not only does it serve as a predictor of HAART non-adherence, but it also moderates the relationship between another well-established predictor of HAART non-adherence—depression. Thus, health care providers should be attentive to patients' concerns regarding the effects of HAART and the disease process on physical appearance and the potential for subsequent feelings of depression and HAART non-adherence. Consequently, clinical interventions aimed at addressing body dissatisfaction among HIV positive men may help to circumvent subsequent depression and HAART non-adherence.

Clinical interventions addressing body image in HIV positive samples should consider incorporating aspects of the patient's gender role and/or gender role conflict (GRC). Gender roles are traits, activities, occupational interests, appearance, and roles that are determined by society as typically associated with men or women [40, 41]. Gender role conflict is defined as "a psychological state in which gender roles have negative consequences or impact on the person or others" [42, p. 203]. Recent work has identified GRC as a predictor of body dissatisfaction in heterosexual [43, 44] and gay male samples [45]. Body dissatisfaction may be exacerbated in men with high levels of GRC, as they feel pressure to conform to societal norms of masculinity, which also include being muscular and looking healthy. This may be particularly true in gay men who are HIV positive, as these men may define their masculinity by feeling or looking healthy [46, 47]. Thus, body image interventions could include techniques which address beliefs about conforming or failing to conform to societal ideals of masculinity [45].

## Conclusions

In the current study, the role of body dissatisfaction and depression were examined in predicting HAART non-adherence in a sample of HIV positive men. Results from moderated mediation models indicated that depression served as a mediator in the relationship between body dissatisfaction and HAART non-adherence, but only for men who endorsed elevated levels of body dissatisfaction, or who had been diagnosed with AIDS. Thus, interventions aimed at reducing body dissatisfaction among HIV positive men are recommended.

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