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ORIGINAL ARTICLE

Distress Tolerance, Emotion Dysregulation, and Anxiety and Depressive Symptoms Among HIV+ Individuals

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Abstract The current study examined the mediational effects of emotion dysregulation in terms of the relation between perceived distress tolerance and anxiety and depressive symptoms among HIV+ individuals. Participants included 176 HIV+ adults (21.6 % female, $M_{age} = 48.40$ years, SD = 8.66). Results indicated that distress tolerance was significantly related to greater depressive and anxiety symptoms. Results also indicated that emotion dysregulation mediated this association. The observed findings were evident above and beyond the variance accounted for by CD4 T-cell count, ethnicity, gender, education level, and cannabis use status. The results are discussed in terms of the potential explanatory utility of perceived distress tolerance and emotion dysregulation in terms of psychological well-being among HIV+ individuals.

Keywords Emotion dysregulation · Distress tolerance · HIV · AIDS · Anxiety · Depression

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Introduction

The empirical literature documents statistically and clinically significant relations between HIV/AIDS and anxiety and depressive symptoms and disorders (Bing et al. 2001; Campos et al. 2010; Olley et al. 2005). Rates of anxiety disorders among HIV+ individuals have been estimated as high as 43 % (Chandra et al. 1998; Perretta et al. 1996). Likewise, depressive symptoms and disorders commonly co-occur with HIV/AIDS, with some studies finding over a 50 % base rate of clinical depression among adults with HIV/AIDS (Williams et al. 2005). Although the underlying directionality between anxiety and depressive symptoms and disorders and HIV/AIDS is presently unclear, research has nonetheless found that these negative emotional states tend to contribute to non-adherence to HIV medications (Antoni 2003; DiMatteo et al. 2000; Schönnesson et al. 2006; van Servellen et al. 2002), lesser quality of life (Sewell et al. 2000), greater health-care utilization (Joyce et al. 2005; O'Cleirigh et al. 2009), and greater risky sexual behaviors (Hart et al. 2008; Hatzenbuehler et al. 2011).

Scholars have begun to focus greater energy on identifying the explanatory processes that may underlie such anxiety/depression-HIV/AIDS associations. The most well-developed aspect of this literature has been focused on coping with the HIV/AIDS illness and other life stressors (e.g., Commerford et al. 1994; Perez et al. 2009; Vosvick et al. 2010). Yet, there has been little investigation of other cognitive-affective factors related to these negative emotional states. One potentially promising construct in this context is distress tolerance. Distress tolerance reflects the perceived or behavioral capacity to withstand exposure to aversive experiential states (e.g., negative emotions, uncomfortable physical sensations; Zvolensky et al. 2011). Specifically, distress tolerance has been conceptualized as:

(a) the perceived capacity to withstand aversive emotional or physical states [assessed via self-report measures; e.g., Distress Tolerance Scale (DTS; Simons and Gaher 2005)], and (b) the ability to behaviorally withstand distressing internal states elicited by some type of stressor [typically assessed via the latency to discontinue distressing tasks; e.g., breath-holding task (Asmundson and Stein 1994)]. The study of this construct may be important in the HIV+ population because it could potentially amplify affective states and lead to more maladaptive coping behaviors (e.g. substance use; Abrantes et al. 2008; Brown et al. 2005; Bornovalova et al. 2012; Perkins et al. 2010).

To date, only one study has explicitly tested the effects of distress tolerance among an HIV+ population (O'Cleirigh et al. 2007). In this investigation, poorer levels of perceived distress tolerance (as indexed by the DTS), under conditions of high degrees of self-rated life stress, were related to significantly greater endorsement of depressive symptoms, use of substances in a coping-oriented manner, as well as alcohol and cocaine use in the past month, and number of reported reasons for missing medication dosages (O'Cleirigh et al. 2007). The results of this initial study highlight that there is indeed potential merit in further exploring the role of perceived distress tolerance among persons with HIV.

Despite the observed association between perceived distress tolerance and some psychosocial factors among persons with HIV/AIDS reported by O'Cleirigh et al. (2007), there is as of yet little understanding of possible factors that may explain the association (i.e., mediators) between this construct and anxiety/depressive symptoms. This is an important next step in the scientific process, as it is necessary to tease apart the specific mechanisms linking HIV and anxiety/depressive symptoms. Indeed, the identification of potential mediating variables is notable for at least two key reasons. First, by developing an understanding of mediating processes, we can gain a clearer understanding of the pathway(s) through which distress tolerance may affect anxiety/depressive symptoms. Second, explicating these explanatory mechanisms is essential to translating basic research knowledge about distress tolerance and HIV/AIDS to advances in specialized behavioral and pharmacologic interventions for persons suffering from anxiety and mood-related disturbances.

Emotion dysregulation represents one promising, integrative construct of increasing scholarly interest in psychopathology and health comorbidity research (Agar-Wilson and Jackson 2012; Mennin and Fresco 2010). Emotion dysregulation is posited to be an integrative construct, reflecting difficulties in the self-regulation of affective states and in self-control over affect-driven behaviors (Carver et al. 1996). Gratz and Roemer (2004) developed a self-report scale, entitled the Difficulties in Emotion Regulation Scale (DERS), which measures emotion dysregulation as a higher-order construct involving multiple, internally consistent, lower-order dimensions. Emotion dysregulation (higher-order factor), as measured by the DERS, is related to increased levels of negative emotional symptoms (Anestis et al. 2011; Gratz and Roemer 2004; Kashdan et al. 2008; Tull et al. 2008, 2009; Vujanovic et al. 2008), coping-oriented substance use (Bonn-Miller et al. 2008; Johnson et al. 2012), self-harm (Gratz and Tull 2010), and sexual difficulties (Rellini et al. 2010, 2012, in press) among non-HIV/AIDS samples. Thus, emotion regulation is a construct that reflects responding to emotional states through the identification, interpretation, and management of these states. Although poor emotion regulation (emotion dysregulation) is similar to purported emotional amplification variables such as distress tolerance, it differs in its broader focus on both implicit and explicit processes to alter affective states and has been empirically shown to be distinct from distress tolerance (McHugh et al., in press). For example, Brandt et al. (2012) found that emotional dysregulation and an index of distress tolerance shared only 3 % of variance with one another.

One recent study found that emotion dysregulation, as measured by the DERS total score, was significantly related to anxiety and depressive symptoms, pain-related anxiety, and HIV-symptom distress among adults with HIV ($n = 164$; Brandt et al. in press). Moreover, the observed emotion dysregulation effects were evident above and beyond the variance accounted for by demographic and HIV-specific characteristics (e.g., length of time with HIV), as well as perceived distress tolerance (Brandt et al. in press). Yet, this investigation did not examine whether emotion dysregulation may mediate the relation between distress tolerance and anxiety or depressive symptoms. As informed by integrative theoretical models of HIV/AIDS-psychopathology comorbidity (Gonzalez et al. 2010; Johnson et al. 1995; Tsao et al. 2004), individuals who are less tolerant of anxiety/depressive symptoms may be more likely to respond to such sensations with greater degrees of emotion dysregulation. For example, perceived distress tolerance may contribute to a failure to identify or implement emotion regulatory strategies in an effective manner. Thus, from this perspective, a formative next research step is to evaluate whether emotion dysregulation mediates (explains) the association between distress tolerance and anxiety and depressive symptoms among persons with HIV/AIDS.

Together, the present study tested the hypothesis that, among individuals with HIV/AIDS, lower perceived distress tolerance (as measured by the DTS) would significantly predict greater anxiety (as indexed by panic and social anxiety symptoms), and depressive symptoms. It

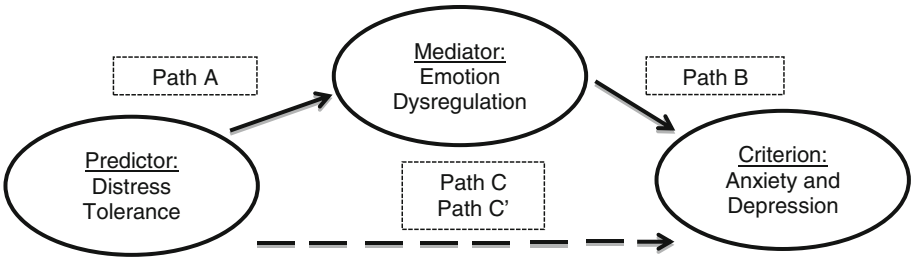

Fig. 1 The proposed model; emotion dysregulation as a mediator of the association between distress tolerance and IDAS-General Depression. IDAS-Panic, and IDAS-Social Anxiety

also was hypothesized that emotion dysregulation would mediate (explain) this association (see Fig. 1). For the current investigation we chose these particular criterion variables because (1) there are elevated rates of anxiety and depression among people living with HIV/AIDS (Chandra et al. 1998; Johnson et al. 1995), and (2) empirical work suggests that anxiety and depression are each associated with poor HIV management (Antoni 2003; Leserman et al. 2005) and risky sexual behaviors among people living with HIV/AIDS (Lawal 2011; Turner et al. 2011). We chose panic and social anxiety, specifically, as indices of anxiety because of their direct relevance to the HIV+ population. For example, symptoms stemming from HIV infection and side effects of antiretroviral medications are similar to panic attack symptoms (Lorenz et al. 2006; Tsao et al. 2004) and social concerns often accompany infection (e.g. disease stigma, disease disclosure; Bunn et al. 2007; Chandra et al. 2003). Additionally, we expected that the hypothesized associations would be significant above and beyond the variance accounted for by CD4 T-cell count, ethnicity, gender, and education level factors. Specifically, CD4 T-cell count was chosen to control for disease stage, while ethnicity, gender, and education were included to adjust for common demographic factors that covary with psychopathology among this population (Tsao et al. 2004). Cannabis use was added as a covariate to control for overarching study design (see "Procedure" section; Bonn-Miller et al., in press).

Method

Participants

Participants were 176 HIV positive individuals (38 female; $M_{age} = 48.40$ years, SD = 8.66). In terms of ethnicity, 38.6 % of participants identified as Black/Non-Hispanic, 29 % as White/Caucasian, 13.6 % as Black/Hispanic, 11.9 % as Hispanic, 1.1 % as Asian, and 5.7 % as "Other". Please see Table 1 for current and lifetime psychiatric diagnoses in this sample.

For inclusion in the study, participants had to be (1) HIV positive, (2) currently prescribed at least one antiretroviral medication, and (3) undergoing treatment at an outpatient HIV treatment clinic. In addition, approximately one-third of the sample ($n = 56$) met DSM-IV criteria for current cannabis dependence,[1] approximately one-third ($n = 61$) were non-dependent cannabis users (use in the past 30 days), and approximately one-third ($n = 59$) reported no cannabis use within the past 6 months.

Measures

Structured Clinical Interview-Non-patient Version for DSM-IV (SCID-N/P; First et al. 2004)

Diagnostic assessments were conducted using the SCID-I-NP (Non-Patient Version; First et al. 2004). The SCID-I-N/P was administered by trained research assistants, interviews were audio-recorded, and diagnoses were confirmed by the last author following a review of recorded interviews. The SCID-N/P was employed to document psychopathology in the sample.

Distress Tolerance Scale (DTS; Simons and Gaher 2005)

The DTS is a 15-item self-report measure on which respondents indicate, using a 5-point Likert-type scale (1 = *strongly agree* to 5 = *strongly disagree*), the extent to which they perceive that they can experience and withstand distressing emotional states (Simons and Gaher 2005). The DTS has evidenced convergent validity with measures assessing emotion regulatory processes (Cougle et al., in press; Simons and Gaher 2005). In the current investigation, the DTS-total score was used as a global index of individual ability to tolerate emotional distress, as has been done in the previous study employing this construct among an HIV sample (O'Cleirigh et al. 2007). As in past work (e.g., Anestis et al. 2007), the total DTS-total score evidenced good internal consistency in the present sample (Cronbach $\alpha = .88$).

[1] Cannabis dependence was defined with the experience of withdrawal symptom criterion, which is consistent with DSM-5 criteria for dependence (Budney and Wiley 2001).

Table 1 Rates of current axis I anxiety, mood, and substance use diagnoses

Diagnosis	Current axis I diagnoses, number (%)	Lifetime axis I diagnoses, number (%)
Anxiety disorders (≥1 dx)	63 (36 %)	76 (43 %)
Panic without agoraphobia	4 (2 %)	6 (3 %)
Panic with agoraphobia	8 (5 %)	10 (6 %)
Agoraphobia without panic	3 (2 %)	5 (3 %)
Specific phobia	14 (8 %)	15 (9 %)
Social phobia	7 (4 %)	7 (4 %)
OCD	11 (6 %)	12 (7 %)
PTSD	35 (20 %)	41 (23 %)
GAD	11 (6 %)	15 (9 %)
Anxiety disorder NOS	1 (1 %)	1 (1 %)
Mood disorders (≥1 dx)	32 (18 %)	33 (19 %)
MDD	16 (9 %)	17 (10 %)
Dysthymic disorder	16 (9 %)	18 (10 %)
Bipolar	1 (1 %)	1 (1 %)
Substance use disorders (≥1 dx)	99 (56 %)	147 (84 %)
Alcohol	74 (42 %)	110 (63 %)
Amphetamines	46 (26 %)	66 (38 %)
Cannabis	75 (43 %)	93 (53 %)
Cocaine	70 (40 %)	105 (60 %)
Hallucinogens	22 (13 %)	31 (18 %)
Inhalant	4 (2 %)	5 (3 %)
Opioid	26 (15 %)	41 (23 %)
Sedative	15 (10 %)	21 (12 %)

Total percentages by disorder type (e.g., anxiety, mood, substance) were recorded as the presence of one or more disorders to account for comorbidity

Difficulties in Emotion Regulation Scale (DERS; Gratz and Roemer 2004)

The DERS was used to assess emotion dysregulation. The DERS is multidimensional, consisting of 36 items, which comprise six subscales. Items are rated on a 5-point Likert-type scale ranging from 1 ("*almost never*") to 5 ("*almost always*"). In the current investigation, we used the DERS total score to indicate a global composite index of emotion dysregulation (Gratz and Roemer 2004). Consistent with past work (Gratz and Roemer 2004), the DERS-total score demonstrated good internal consistency in the current sample (Cronbach $\alpha = 90$).

Inventory of Depression and Anxiety Symptoms (IDAS; Watson et al. 2007)

The IDAS is a 64-item questionnaire that assesses dimensions of major depression and anxiety disorders (Watson et al. 2007). The IDAS contains 12 subscales indexing criteria related to DSM-IV-TR (APA 2000) anxiety and depression disorders. In the current study three of the subscales were examined to gauge indices of anxiety and depression. The Panic (8 items; e.g. "I was trembling or shaking"), and Social Concerns (5 items; "I was worried about embarrassing myself socially") subscales served as indicators of anxiety. The General Depression subscale (20 items; e.g. "I felt depressed") contains items regarding dysphoria, suicidality, lassitude, insomnia, appetite loss, and well-being, thereby serving as an overall index of depressive symptoms (Watson et al. 2007). The three IDAS subscales showed good reliability (range of Cronbach α's = .77–.89) in the current sample.

Procedure

The data for the current study were taken from a larger study examining the effects of cannabis use on antiretroviral medication adherence in the HIV population (Bonn-Miller et al., in press). The present data have not been reported previously. Interested persons, responding to flyers posted throughout a VA Medical Center, as well as in a number of community outpatient HIV clinics in the San Francisco Bay area, contacted the research team and were provided with a detailed description of the study via phone. Participants were then initially screened for eligibility and, if eligible, scheduled for an appointment. Upon arrival to the laboratory, each participant provided written consent to participate in the research study. Next, participants were administered the SCID I-N/P by trained interviewers and then completed a battery of self-report measures. At the conclusion of this appointment, participants were compensated $50 for their efforts. Following the appointment, medical records for each participant were accessed to obtain most recent CD4 T-cell counts. All study procedures were approved by the Stanford University and Mills-Peninsula Institutional Review Boards (IRB).

Data Analytic Plan

First, a series of zero-order correlations were conducted to examine associations between study variables. Second, to test the association between perceived distress tolerance (as measured by the DTS total score) and each criterion individually, as well as the mediational effects of emotion dysregulation (as measured by DERS total score) on this relation, Baron and Kenny's (1986) recommended test of mediation was employed. Specifically, the test requires a series of hierarchical multiple regressions including: (1) the predictor variable (DTS total score) must significantly predict the criterion variables (Path C); (2) the predictor variable must significantly predict the mediator (DERS

Table 2 Descriptive data and zero-order relations among study variables

	1	2	3	4	5	6	Mean (SD) or %	Observed range
1. Cannabis use status[a]	–	−.08	.19*	.19**	.09	.14	33.5 % (no use)	–
2. DTS-total[b]		–	−.58**	−.37**	−.34**	−.34**	3.00 (.89)	1.17–5
3. DERS-total[c]			–	.62**	.44**	.55**	82.59 (22.47)	42–146
4. IDAS-depression[d]				–	.61**	.63**	43.05 (13.92)	22–86
5. IDAS-panic[d]					–	.72**	11.73 (4.62)	4–27
6. IDAS-social[d]						–	8.10 (4.32)	1–25

* $p < .05$; ** $p < .01$

[a] Cannabis use status coded as 1 = non-use, 2 = non-dependent use, 3 = dependent use

[b] Distress Tolerance Scale (Simons and Gaher 2005)

[c] Difficulties in Emotion Regulation Scale (Gratz and Roemer 2004)

[d] Inventory of depression and anxiety symptoms (Watson et al. 2007)

total score; Path A); (3) the mediator must significantly predict the criterion variables (Path B); and (4) when the predictor and mediator are entered simultaneously into a multiple regression, the mediator must significantly predict the criterion variables, with the relation between the predictor and criterion variable significantly reducing or becoming non-significant (Path C′).

Separate regression analyses were conducted to examine the mediational effects of DERS-total score on the relation between DTS-total score and each of the three examined subscales of the IDAS. In each regression analysis, CD4 T-cell count, ethnicity, gender, education level, and cannabis use status (i.e., non-use, non-dependent use, dependent use) were entered in Step 1 as covariates.[2]

As the mediational analyses were conducted among cross-sectional data, an additional analysis was conducted for each significant mediational model, where the proposed mediator and criterion variable were reversed (Preacher and Hayes 2004; Sheets and Braver 1999; Shrout and Bolger 2002). Specifically, for each significant mediational analysis, we also evaluated whether each respective IDAS subscale mediated the relation between DTS total score and DERS total score. This additional test helps improve confidence in the directionality of the observed relations (Preacher and Hayes 2004; Sheets and Braver 1999; Shrout and Bolger 2002). Finally, both bootstrapping and Sobel tests (see Preacher and Hayes 2004; Sobel 1982) were used to confirm findings from the Baron and Kenny (1986) mediational tests.

[2] Analyses were repeated with negative affectivity, as measured by the PANAS (Watson et al. 1998), included as an additional covariate at Level 1. All results remained statistically significant with the inclusion of negative affectivity as an additional covariate. These results can be obtained by contacting the first author.

Results

See Table 2 for descriptive statistics and zero-order correlations among study variables. Distress tolerance was significantly negatively related to all outcome variables as well as DERS total score. Furthermore, DERS total score was significantly positively related to all outcome variables.

See Table 3 for an overview of mediational analyses. As Path A for each of the 3 mediational analyses was the same (i.e., DTS total score predicting DERS total score), only one regression was conducted for this path. Analyses revealed that, after accounting for the covariates at Step 1, DTS total score was a significant predictor of DERS total score ($\beta = -.56$, $p < .001$).

Regarding IDAS-General Depression, the covariates entered at Step 1 of each regression accounted for 7.9 % of the variance in the model with cannabis use status and gender being significant predictors. In terms of Paths C and B, DTS total score was significantly negatively, and DERS total score was significantly positively, related to IDAS-General Depression. When both the predictor and mediator were entered simultaneously (Path C′), DERS total score remained a significant predictor of IDAS-General Depression, while DTS total score did not; with the beta being reduced from −.35 to .01 when the DERS total score was introduced. The bootstrapped 95 % confidence interval with 5,000 iterations was .28–.50 (Preacher and Hayes 2004). The Sobel test (Sobel 1982) also confirmed the reduction in the relation between DTS and IDAS-General Depression when DERS was introduced into the model ($Z = -6.67$, $p < .001$).

Regarding IDAS-panic, the covariates entered at Step 1 of each regression accounted for 6.3 % of the variance in the model with no significant predictors. In terms of Paths C and B, DTS total score was significantly negatively, and

Table 3 Summary of hierarchical regression analyses

	ΔR^2	*t* (Each predictor)	β	sr^2	*p*
Criterion variable: IDAS-general depression					
Criterion variables	7.9				
Gender		2.17	.17	.03	<.05
Ethnicity		−.24	−.02	.00	ns
Education level		−.89	−.07	.00	ns
CD4 T-cell count		−.71	−.05	.00	ns
Cannabis use status		2.40	.18	.03	<.05
Individual predictors					
DTS-total	11.0	−4.73	−.35	.11	<.001
DERS-total	33.4	9.73	.62	.33	<.001
Mediation	33.5				
DTS-total		.07	.01	.00	ns
DERS-total		7.95	.63	.23	<.001
Criterion variable: IDAS-panic					
Criterion variables		6.3			
Gender		1.84	.15	.02	ns
Ethnicity		−1.86	−.14	.02	ns
Education level		.00	.00	.00	ns
CD4 T-cell count		1.32	.10	.01	ns
Cannabis use status		1.61	.12	.01	ns
Individual predictors					
DTS-total	8.9	−4.13	−.31	.09	<.001
DERS-total	17.0	6.05	.44	.17	<.01
Mediation	17.6				
DTS-total		−1.12	−.10	.01	ns
DERS-total		4.32	.39 .09	<.001	
Criterion variable: IDAS-social					
Criterion variables	5.4				
Gender		−.31	−.02	.00	ns
Ethnicity		−1.21	−.09	.01	ns
Education level		−1.94	−.15	.02	ns
CD4 T-cell count		.89	.07	.00	ns
Cannabis use status		1.66	.13	.02	ns
Individual predictors					
DTS-total	10.8	−4.59	−.34	.11	<.001
DERS-total	26.4	7.99	.55	.26	<.001
Mediation	26.4				
DTS-total		−.59	−.05	.00	ns
DERS-total		6.14	.52	.16	<.001

In total there are three regression analyses for each criterion variable. Each variable under "individual predictor" constitutes a separate regression analysis. The "mediation" section indicates simultaneous entry of indicated variables

DERS total score was significantly positively, related to IDAS-panic. When both the predictor and mediator were entered simultaneously (Path C′), DERS total score remained a significant predictor while DTS total score did not; the beta reduced from −.31 to −.10 when the DERS total score was introduced, indicating mediation. The bootstrapped 95 % confidence interval with 5,000 iterations was .05–.11 (Preacher and Hayes 2004). Additionally, the Sobel test (Sobel 1982) confirmed the reduction in the relation between DTS and IDAS-panic when DERS was introduced into the model ($Z = -5.04$, $p < .001$).

Regarding IDAS-social, the covariates entered at Step 1 of each regression accounted for 5.4 % of the variance in the model with no significant predictors. In terms of Paths C and B, DTS total score was significantly negatively, and DERS total score was significantly positively, related to IDAS-social. When both the predictor and mediator were entered simultaneously (Path C′), DERS total score remained a significant predictor while DTS total score did not. The beta reduced from −.34 to −.05 when the DERS total score was introduced. The bootstrapped 95 % confidence interval with 5,000 iterations was .07–.14 (Preacher and Hayes 2004). The Sobel test (Sobel 1982) confirmed the reduction in the relation between DTS and IDAS-social when DERS was introduced into the model ($Z = -6.07$, $p < .001$).

Importantly, when the mediator and criterion variables were reversed in each of these analyses, we found that DTS total score remained a significant predictor of DERS total score after controlling for IDAS-general depression ($t = -7.28$, $\beta = -.41$, $sr^2 = .13$, $p < .001$), IDAS-panic ($t = -7.52$, $\beta = -.47$, $sr^2 = .18$, $p < .00$), and IDAS-social concerns ($t = -7.41$, $\beta = -.44$, $sr^2 = .16$, $p < .001$). These results suggest that these variables were not simply interrelated, but that the DERS total score provided a distinct mediational relation between the DTS total score and criterion variables.

Discussion

The present study examined the association between perceived distress tolerance and anxiety and depressive symptoms among adults with HIV. As hypothesized, there was consistent evidence that perceived distress tolerance, as measured by the DTS, was significantly and uniquely associated with anxiety and depressive symptoms. The observed effects were moderate in size, ranging from −.31 to −.35 (see Table 3), with lower levels of perceived distress tolerance being incrementally associated with greater endorsement of the studied criterion variables. Importantly, the effects for perceived distress tolerance were apparent over and above the significant variance accounted for by CD4 T-cell count, ethnicity, gender, education level, and cannabis use status. Thus, the results cannot be attributed to these factors (see also footnote #2). These findings replicate and uniquely extend those reported by O'Cleirigh

et al. (2007) on the role of perceived distress tolerance among individuals with HIV in terms of a variety of negative health behaviors (e.g., coping-oriented substance use).

Also consistent with prediction, DERS total score showed a significant mediational effect in terms of the relations between DTS total score and the studied anxiety and depression criterion variables. Although the cross-sectional nature of the research design naturally does not allow us to disentangle the causal or directional nature between the predictor and criterion variables, the present findings suggest that difficulties self-regulating certain negative affective states (e.g., anxiety, depression) may, at least partially, explain the previously observed relations between perceived distress tolerance and panic, social anxiety, and depressive symptoms. Importantly, we attempted to strengthen confidence in this observation by evaluating an alternative model, wherein each of the criterion variables mediated the relation between perceived distress tolerance and emotion dysregulation. No support was found for such a model. That is, perceived distress tolerance, emotion dysregulation, and the studied emotional symptom variables were not simply interrelated. Thus, the present findings suggest specificity in terms of the potential mediating role of emotion dysregulation. Accordingly, the current findings highlight that emotion dysregulation is an important construct to consider in the relations between perceived distress tolerance and a number of common and clinically significant anxiety and depressive symptoms among persons with HIV.

Although not the primary aim of the present investigation, at least two other observations deserve brief comment. First, the sample was characterized by high rates of current and lifetime psychopathology (see Table 1). These findings are consistent with past studies documenting that psychological disorders are highly common among the HIV population and are apt to play important roles in HIV quality of life and disease management (Chandra et al. 1998; Perretta et al. 1996). Second, perceived distress tolerance and emotion dysregulation shared approximately 33 % of variance with one another among the present sample. Thus, while these constructs are related, they do not fully overlap. This observation is in accord with past work documenting the distinct construct validities of these two cognitive-affective factors (Brandt et al. in press, 2012; McHugh et al., in press; Zvolensky et al. 2011).

There are limitations of the present study and areas for future research. First, although the sample was diverse in terms of ethnicity, it was limited to an older adult, primarily male group of individuals living with HIV/AIDS who volunteered to participate in a study for monetary reward. While men comprise a large percentage of the HIV/AIDS population (CDC 2012), future studies would benefit from examining more heterogeneous samples of persons with HIV/AIDS. Moreover, it may be advisable to offer other types of incentives instead of those that are financial in nature to ascertain whether there is any type of sampling bias. Second, the cross-sectional design of the present study does not allow for causal inferences. As such, we cannot infer the directionality between distress tolerance, emotion regulation, and anxiety and depressive symptoms. Future work should aim to test these relations prospectively to explicate their directional effects. Third, the variance shared between distress tolerance and emotion dysregulation could generally suggest some inherent interrelatedness of these constructs as opposed to mediational effects. Thus, future work could benefit from further teasing apart the purported mediational effects using alternative measurement approaches and designs for tests of these constructs.

Fourth, self-report measures were employed to assess the primary study constructs. Findings based on this type of uni-method strategy are potentially influenced by shared method variance. Future research could decrease this risk by utilizing multi-method approaches (e.g., behavioral distress tolerance tasks). Indeed, self-report and behavioral indices of distress tolerance are often not highly related (Bernstein et al. 2011; Marshall-Berenz et al. 2010; McHugh et al. 2011). Fifth, the study criterion variables were limited to anxiety/depression variables. Future work could potentially benefit by further extending the present work to other health outcome variables such as ART medication adherence and HIV symptoms among persons with HIV/AIDS. It also may be advisable to explore how distress tolerance and emotion dysregulation relate to a broader array of symptoms and disorders. Finally, the present study was a secondary analysis from a larger study exploring the role of cannabis use among an HIV/AIDS population (Bonn-Miller et al. in press). Thus, as with any secondary analysis of data, it would be important to replicate and extend the findings in the future with an a priori research investigation.

Overall, the results of the current study highlight the importance of perceived distress tolerance and emotion dysregulation in terms of elevated rates of anxiety and depression symptoms among an HIV/AIDS sample. Specifically, findings indicated that perceived distress tolerance was significantly related to greater depressive and anxiety symptoms and that emotion dysregulation mediated this association. The present findings therefore suggest that emotion dysregulation may be important in better understanding the link between distress tolerance and certain negative emotional symptoms among people living with HIV. Indeed, it is possible that targeting emotion dysregulation among HIV+ persons via strategies aimed at increasing self-efficacy over the ability to regulate affective

states and gaining further control over affect-driven behaviors could be an integral step in efforts to promote greater degrees of psychological health among HIV+ individuals.

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Conflict of interest None.

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