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**Title:** Relations between Distress Tolerance and Psychosocial Variables in Adults Experiencing Homelessness

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**Word Count:**

**Abstract**

**Background:** Recent research suggests that a small set of transdiagnostic vulnerability factors may underlie causes of many psychological symptoms and disorders, as well as comorbid behavioral health problems. Compared with domiciled adults, adults experiencing homelessness are more likely to suffer from anxiety, depression, chronic stress, and drug use. Distress Tolerance (DT) is a transdiagnostic factor that may be particularly relevant to mental and physical health problems among individuals experiencing homelessness.

**Methods:** This study used baseline data from a randomized controlled trial that tested a novel smartphone-based intervention for recently incarcerated adults experiencing homelessness. A series of linear regressions were conducted to examine relationships between DT subscales (i.e., tolerance, appraisal, regulation, and absorption) and psychosocial variables (e.g., depression, aggression, hostility, anxiety, urban life stress). The subscales measured the participant’s ability to tolerate negative emotional states (tolerance), the participant’s own assessment of distress (appraisal), mechanisms used to cope with distress (regulation), and the level of attention consumed by distress (absorption). All models were adjusted for age, sex, race/ethnicity, education, and duration of homelessness.

**Results:** Participants (n = 244) were predominantly Black/African American (60.7%) and male (86.5%) with a mean age of 40.6 years (SD = 11.0). Lower DT Appraisal was significantly associated with higher depression symptoms, anxiety, hostility, and stress. Lower DT Absorption was significantly associated with higher aggression, anxiety, and stress. Similarly, lower DT Tolerance was significantly associated with greater levels of hostility. All but one of the results were consistent with hypotheses (all p < .05).

**Conclusion:** This research extends previous work and indicates that lower DT, particularly the Appraisal and Absorption subscales, was associated with more depression symptoms, anxiety, hostility, and stress among adults experiencing homelessness. Future research should assess the feasibility of interventions that enhance DT Appraisal and Absorption coping with individuals experiencing homelessness.

**Introduction**

The number of adults experiencing homelessness in the United States (US) remains high [1]. In 2019, an estimated 568,000 people experienced homelessness on any given night in the US [2]. Adults experiencing homelessness are more likely to suffer from anxiety, depression, chronic stress, and drug and alcohol abuse compared with domiciled adults [1, 3]. Additionally, compared to domiciled adults, adults experiencing homelessness have a shorter life expectancy due to difficulties accessing health care, medication non-adherence, and compromised immune systems, as well as non-emergency medical issues that go untreated [4-6].

Recent work in psychopathology research posits that the underlying cause of many forms of emotional symptoms and disorders, as well as their comorbidity with behavioral health problems, may be underpinned by a smaller set of transdiagnostic vulnerability processes [7]. Distress Tolerance (DT) is a transdiagnostic factor that may be particularly relevant to adverse emotional and physical health problems among persons experiencing homelessness [8]. DT is defined as one’s perceived or behavioral capacity to withstand distress related to affective, cognitive, and/or physical states [8, 9]. Lower DT has been found to be associated with increased mental health problems, addictive behaviors, and physical health problems [10-12].

Much of the available research on DT has been conducted among domiciled populations.11 This work has firmly established DT as a risk factor for greater mood symptom severity and dysregulation [13, 14]. Based upon these and related findings, subsequent work has sought to increase DT to improve psychosocial and behavioral health functioning [15-17]. Evidence from such studies suggest improving DT is related to less mood severity and less life impairment [18, 19]. DT is particularly relevant for adults experiencing homelessness, who endure high levels of stress due to housing instability [6], food insecurity [20], sleep problems [21], and other stressors [3, 6] that result in worse health outcomes in the context of lower DT. In fact, lower DT has partially explained the relation between urban stress and poor mental health outcomes, including depressive and Post Traumatic Stress Disorder symptoms among adults experiencing homelessness [6]. There is a general lack of research on DT among homeless populations despite the importance of this construct among this group, including the extent to which this construct relates to other aspects of psychological functioning (e.g., depression, aggression, hostility, and anxiety).

Simons and Gaher developed the Distress Tolerance Scale (DTS) [9], a self-report measure of the perceived capacity to tolerate distress that isolates four unique facets of distress tolerance: (1) *tolerance*, which represents the perceived inability to tolerate unpleasant or distressing emotional states; (2) *appraisal*, which represents one’s cognitive assessment of their ability to cope with distress; (3) *regulation,* which is characterized by the mechanism by which individuals cope with the aversive states—avoiding negative emotions and alleviating them through rapid means; and (4) *absorptio*n, which identifies the level of attention consumed by distressing emotions and the disruption of functioning during the experience of an aversive state [9]. Individuals with low DT have more difficulty coping with feelings of distress, accepting distress, utilizing avoidance tactics to ignore feelings of distress and tend to give more attention to feelings of distress [9]. Exploratory and confirmatory factor analytic studies of the DTS support the hierarchical multidimensional model with a single second-order factor, global DT, and four first-order factors [9, 22]. Numerous studies suggest the DTS global factors and subdimensions demonstrate excellent construct validity and internal consistency, hence, the DTS may be a promising tool for potentially isolating the subfacets of DT that are uniquely associated with psychological distress among adults experiencing homelessness [22].

The present study examined cross-sectional relationships between dimensions of DT and multiple psychosocial variables (e.g., depression, aggression, hostility, anxiety, urban life stress)among adults experiencing homelessness. We extend prior work by investigating whether relations between DT and psychosocial functioning: (1) are specific to DT subscales; (2) generalize across domains of psychosocial variables, including depression, aggression, hostility, anxiety, and urban life stress; and (3) determine whether these associations were incremental to age, sex, race/ethnicity, education levels, and current length of homelessness. Given that past work has shown that the regulation and appraisal DT subscales were unique predictors of behavioral health functioning, we expect these subscales to be consistently and robustly related to our criterion variables [22].

**Methods**

The current study is a cross-sectional examination of 244 participants from an ongoing three-arm randomized controlled trial (Link2Care; R01MD010733). Link2Care assesses the efficacy of a smartphone app for case management and treatment service utilization to effectively increase case management contact time and reduce homeless nights and re-arrest. Participants (n=244) were recruited from a large homeless shelter in Dallas, Texas, beginning in the spring of 2018. Participants were eligible to participate if they were released from the Dallas County jail in the past 60 days, planned to reside in the Dallas area for the next year, were enrolled in the shelter’s homeless recovery program, and were able to complete five scheduled study sessions (i.e., baseline, randomization, and 1-,3-, and 6-month post-randomization follow-up assessments). Additionally, participants were required to score ≥ four on the Rapid Estimate of Adult Literacy in Medicine (REALM) test indicating >= 6th-grade literacy and score >=24 on the Mini-Mental health exam [23-25]. The current study utilizes data collected during the baseline and randomization visits. A more detailed description of the protocol has been described previously [26].

**Measures**

*Sociodemographics.* All participants completed assessments of demographic characteristics, including age, sex, ethnicity/race, and years of education (dichotomized as less than a high school and equal to or greater than high school). Additionally, participants answered questions about the length of current homelessness period (in months), age when they first experienced homelessness, and lifetime periods of homelessness.

*Distress Tolerance.* Distress tolerance was measured using the Distress Tolerance Scale (DTS), a 16-item self-report measure [9]. Each question is rated on a 5-point scale ranging from 1=Strongly disagree to 5=Strongly agree. Sample questions include: Feeling distressed or upset is unbearable to me,” “My feelings of distress are so intense that they completely take over,” and “When I feel distressed or upset, I cannot help but concentrate on how bad the distress actually is.” Higher DTS scores indicate lower levels of DT.

*Depressive Symptoms*. Current depression symptoms were assessed using the Patient Health Questionnaire-8 (PHQ-8) [27].Each question is rated on a 4-point scale, ranging from 0=Not at all to 3=Nearly every day. Sample items included, "Over the last two weeks, how often have you been bothered by little interest or pleasure in doing things?" and "Over the last two weeks, how often have you been bothered by feeling tired or having little energy?". Those who scored 10 or higher (score range=0-24) were categorized as having symptoms indicative of clinically significant depression.

*Aggression*. Levels of physical and verbal aggression were assessed using the 12-item Aggression Questionnaire [28]. Each question is rated on a 5-point scale, ranging from 1=Extremely uncharacteristic of me to 5= Extremely characteristic of me. Sample items included “Given enough provocation, I may hit another person,” “My friends say that I am somewhat argumentative,” and “Sometimes I fly off the handle for no good reason.” Scores range from 12 to 60, with higher scores indicating greater aggression.

*Hostility*. Hostility was assessed via the CJ Client Evaluation of Self and Treatment (TCU CJ CEST). Hostility is a subscale of the social functioning scales and includes eight items. Each question is rated on a 5-point scale, ranging from 1=Disagree strongly to 5=Agree strongly Sample items include "you have carried weapons, like knives or guns,” “you feel a lot of anger inside you,” and “you like others to feel afraid of you.” Scores range from 10 to 50, with higher scores indicating higher hostility levels [29].

*Anxiety*. Current anxiety symptoms were assessed using the GAD-7, a self-administered, diagnostic instrument [30]. Sample items included “Over the last 2 weeks, how often have you been bothered by feeling nervous, anxious, or on edge?” and “Over the last 2 weeks, how often have you been bothered by having trouble relaxing?”. Each question is rated on a 3-point scale, ranging from 1=Not at all to 3=Nearly every day. Those that scored 15 points or higher (score range=0-21) were categorized as having symptoms indicative of severe anxiety.

*Stressors.*The Urban Life Stress Scale is a 21-item self-report checklist that assesses unique stressors that may be experienced by individuals living in medium to large cities [31]. Questions are rated on a 5-point scale, from 1=no stress to 5=extremely stressful-more than I can handle. Sample questions include "In your day-to-day life, how much stress do you generally experience related to money or finances?”, “In your day-to-day life, how much stress do you generally experience related to using public services?”, and “In your day to day life, how much stress do you generally experience related to crime and violence?”. Scores range from 21 to 105, with higher scores indicating more significant stress.

**Statistical Analyses**

Summary statistics were used to report mean with standard deviation for continuous variables and frequency with percentage for categorical variables. A multiple linear regression analysis was conducted to predict five key variables associated with DTS (Model 1, depressive symptoms; Model 2, aggression; Model 3, hostility; Model 4, anxiety; Model 5, urban life stress). All models included the four DTS subscales as predictors simultaneously, and all models were adjusted for age, sex, race/ethnicity, education, and length of current homelessness. Both the unadjusted and adjusted regression coefficients for each DTS subscale are reported. As all analyses were exploratory, models were not corrected for multiple comparison testing.

All analyses were conducted using base R software.

**Results**

Participants (n=244; *Mage* = 40.6 years old, *SD* = XX) predominantly identified as Black/African American (60.7%) and male (86.5%). Most participants reported having earned a high school diploma or more education (66.1%), and reported the current period of homeless as 33.3 (28.7–32.0) months on average. The total time spent homeless across the lifetime was 47.5 months on average (39.0-56.0). See Table 1.

*Model 1: Depressive Symptoms and DTS subscales.* The model explained 10.9% of the variance in depressive symptoms, *F*(9, 218) = 4.09, *p* < .001. In the unadjusted model, no DTS subscale predicted depressive symptoms. In the adjusted model, participants who reported lower DTS appraisal were significantly more likely to report higher depressive symptoms (*b* = -.051, *p* = .047) (Table 2).

*Model 2: Aggression and DTS subscales.* The model explained 12.4% of the variance in aggression, *F*(9, 218) = 4.56, *p* < .001. In both the unadjusted (*b* = -2.473, *p* = .008) and adjusted models (*b* = -2.369, *p* = .013), lower DTS absorption was significantly associated with higher levels of aggression (Table 3).

*Model 3: Hostility and DTS subscales.* The model explained 26.1% of the variance in hostility, *F*(9, 218) = 9.91, *p* < .001. In both the unadjusted (*b* = -2.312, *p* = .01) and adjusted models (*b* = -2.417, *p* = .008), lower DTS appraisal was significantly associated with higher levels of hostility. In the adjusted model, lower DTS tolerance was significantly associated with greater levels of hostility *b* = -1.636, *p* = .031; Table 4).

*Model 4: Anxiety and DTS subscales.* The model explained 18.4% of the variance in anxiety, *F*(9, 218) = 16.18, *p* < .001. In both the unadjusted (*b* = -1.229, *p* = .013) and adjusted models (*b* = -1.363, *p* = .007), lower DTS absorption was significantly associated with higher levels of anxiety. In both the unadjusted (*b* = -1.582, *p* = .005) and adjusted models (*b* = -1.616, *p* = .005), lower DTS appraisal was significantly associated with greater levels of anxiety (Table 5).

*Model 5: Urban Life Stress and DTS subscales.* The model explained 31% of the variance in urban life stress, *F*(9, 218) = 12.34, *p* < .001. In both the unadjusted (*b* = -4.291, *p* < .001) and adjusted models (*b* = -5.561, *p* < .001), lower DTS absorption was significantly associated with higher urban life stress. In both the unadjusted (*b* = -6.378, *p* < .001) and adjusted models (*b* = -5.445, *p* < .001), lower DTS appraisal was significantly associated with higher urban life stress. However, in both the unadjusted (*b* = 3.584, *p* = .005) and adjusted models (*b* = 3.258, *p* = .005), higher DTS regulation was significantly associated with higher levels of urban life stress (Table 6).

**Discussion:**

The primary purpose of the present study was to examine cross-sectional relationships between dimensions of DT and multiple psychosocial variables among adults experiencing homelessness. We hypothesized that lower DT subscale scores would be significantly related to greater depressive symptoms, aggression, hostility, anxiety, and urban life stress. All but one of the significant relations between DT and criterion variables were in the hypothesized direction (i.e., lower DT subscale scores were related to greater symptoms of depression, aggression, hostility, anxiety, urban life stress). Below we discuss…

Consistent with our hypotheses and past research on predictors of behavioral health functioning, we found that the appraisal subscale was significantly related to four out of five included criterion variables [22]. However, regulation, which we hypothesized would be consistently associated with DT subscales, was only significantly associated with urban life stress, and in the opposite direction as what we hypothesized.

To the best of the authors’ knowledge, this study is the one of the first to expand the DTS literature beyond domiciled populations [22]. Findings further underline the importance of examining how DT subscales relate to ?? variables. Notably, while the direction of association was mostly consistent, there were differential strengths of relationship among DT subscales across domains of psychosocial functioning and suggests that a global DT measure is insufficient. Third, we were able to determine that these associations were incremental, even after adjusting for age, sex, race/ethnicity, education levels and current length of homelessness.

While this study has many strengths, there were several limitations. First, this study was cross-sectional. While the cross-sectional design allowed us to identify relationships between variables, no claims of causal relationships can be made. Future research should collect longitudinal data to overcome limitations of causal inference, as well as understand whether these associations change over time. Second, the study took place in one shelter in a Southwestern city. This may limit the generalizability of study findings. Third, this study used a convenience sample, which could have resulted in underrepresentation from some groups of adults experiencing homelessness. For instance, homeless adults who avoid or do not obtain services from homeless shelters.

Conclusion.

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| **Table 1.** Descriptive statistics at baseline. |  | |
| Variable | | Mean (SD) | |
| Age (years) | | 40.6 (39.2 – 42.0) | |
| MMSE Total Score | | 27.5 (27.3 – 27.8) | |
| Gender  Male  Female  Other | | 211 (86.5)  29 (11.9)  4 (1.6) | |
| Race  More than one race/multi-racial  White  Black or African American  Other | | 26 (10.7)  55 (22.5)  148 (60.7)  15 (6.1) | |
| Hispanic/Latino (yes) | |  | |
| Completed less than high school education | | 63 (27.7) | |
| Currently receiving treatment for mental health problems (yes) | | 142 (58.2) | |
| PHQ-8 Score greater than 10 (yes) | | 72 (29.5) | |
| Current total time homeless (months) | | 33.3 (25.1 – 41.5) | |
| PHQ-8 score | | 8.3 (7.4 – 9.1) | |
| GAD-7 total score | | 7.7 (7.0 – 8.5) | |
| Aggression questionnaire total score | | 29.1 (27.8 – 30.5) | |
| Urban Life Stress Scale total score | | 55.0 (52.8 – 57.1) | |
| Distress Tolerance Scale total score  Tolerance  Appraisal  Regulation  Absorption | | 3.1 (3.0 – 3.2) | |

Mini-Mental state exam (MMSE). The Patient Health Questionnaire (PHQ) and Generalized Anxiety Disorder scale (GAD-7). The Aggression Questionnaire (AQ-12).

**Table 2**. Model 1: Results of depressive symptoms regressed on the 4 DTS subscales simultaneously in unadjusted and adjusted models (adjusting for age, sex, race/ethnicity, education (<HS/HS+), and Length of current homelessness).

| Predictor | Unadjusted Coef | Unadjusted p | Adjusted Coef | Adjusted p |
| --- | --- | --- | --- | --- |
| DTS: Tolerance | -0.3143 | 0.1265 | -0.2214 | 0.2996 |
| DTS: Absorption | -0.2853 | 0.1815 | -0.3309 | 0.1349 |
| DTS: Appraisal | -0.4593 | 0.0612 | -0.5060 | 0.0470 |
| DTS: Regulation | 0.2048 | 0.2202 | 0.2773 | 0.1198 |

**Table 3.** Results of aggression regressed on the 4 DTS subscales simultaneously, adjusting for age, sex, race/ethnicity, education (<HS/HS+), and Length of current homelessness.

| Predictor | Unadjusted Coef | Unadjusted p | Adjusted Coef | Adjusted p |
| --- | --- | --- | --- | --- |
| DTS: Tolerance | -0.5720 | 0.5185 | -0.6097 | 0.5033 |
| DTS: Absorption | -2.4735 | 0.0076 | -2.3691 | 0.0126 |
| DTS: Appraisal | -0.5691 | 0.5897 | -1.0693 | 0.3242 |
| DTS: Regulation | 0.0072 | 0.9921 | 0.6844 | 0.3680 |

**Table 4**. Results of hostility regressed on the 4 DTS subscales simultaneously, adjusting for age, sex, race/ethnicity, education (<HS/HS+), and Length of current homelessness.

| Predictor | Unadjusted Coef | Unadjusted p | Adjusted Coef | Adjusted p |
| --- | --- | --- | --- | --- |
| DTS: Tolerance | -1.2474 | 0.0977 | -1.6357 | 0.0308 |
| DTS: Absorption | -1.2221 | 0.1183 | -1.0925 | 0.1621 |
| DTS: Appraisal | -2.3120 | 0.0103 | -2.4170 | 0.0075 |
| DTS: Regulation | 0.5463 | 0.3714 | 1.0629 | 0.0917 |

**Table 5**. Results of anxiety regressed on the 4 DTS subscales simultaneously, adjusting for age, sex, race/ethnicity, education (<HS/HS+), and Length of current homelessness.

| Predictor | Unadjusted Coef | Unadjusted p | Adjusted Coef | Adjusted p |
| --- | --- | --- | --- | --- |
| DTS: Tolerance | -0.2338 | 0.6193 | 0.0284 | 0.9531 |
| DTS: Absorption | -1.2290 | 0.0125 | -1.3630 | 0.0069 |
| DTS: Appraisal | -1.5818 | 0.0051 | -1.6163 | 0.0053 |
| DTS: Regulation | 0.3596 | 0.3476 | 0.5276 | 0.1913 |

**Table 6**. Results of urban life stress regressed on the 4 DTS subscales simultaneously, adjusting for age, sex, race/ethnicity, education (<HS/HS+), and Length of current homelessness.

| Predictor | Unadjusted Coef | Unadjusted p | Adjusted Coef | Adjusted p |
| --- | --- | --- | --- | --- |
| DTS: Tolerance | -0.9936 | 0.4150 | -0.2028 | 0.8730 |
| DTS: Absorption | -4.2914 | 0.0008 | -5.5618 | 0.0000 |
| DTS: Appraisal | -6.3781 | 0.0000 | -5.4458 | 0.0004 |
| DTS: Regulation | 3.5847 | 0.0004 | 3.2585 | 0.0023 |

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