

BRIEF REPORTS

Distress Tolerance as a Predictor of Early Treatment Dropout in a Residential Substance Abuse Treatment Facility

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A large percentage of individuals who enter residential substance abuse treatment drop out before completing treatment. Given that early treatment dropout places individuals at an increased risk for relapse, identifying the mechanisms underlying treatment dropout would have several important theoretical and clinical implications. In the current study, the authors examined levels of psychological and physical distress tolerance as a predictor of early treatment dropout in a residential substance abuse treatment facility. In a sample of 122 individuals entering a residential substance abuse treatment facility, level of psychological distress tolerance was predictive of early treatment dropout above and beyond relevant self-report variables. There was no relationship between physical distress tolerance and early treatment dropout. Implications for future studies and treatment development or modification are discussed.

Keywords: distress tolerance, substance use, treatment, residential, dropout

A large percentage of individuals entering treatment for drug- and alcohol-related problems drop out of treatment early (e.g., Crits-Christoph & Siqueland, 1996), and the lowest rates of completion occur in long-term residential programs (Substance Abuse and Mental Health Services Administration, 2002). This low completion rate is alarming, given that treatment length appears to be one of the single most consistent predictors of successful outcomes across a number of studies (e.g., Simpson, Joe, & Brown, 1997). Despite the importance of understanding the mechanisms that may underlie treatment dropout, few conclusions can be drawn from available research (e.g., Claus, Kindleberger, & Dugan, 2002; Lang & Belenko, 2000; Maglione, Chao, & Anglin, 2000).

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Distress tolerance, defined as an individual's behavioral persistence in the face of emotional and/or physical distress, may be one potential mechanism underlying treatment dropout. Baker, Piper, McCarthy, Majeskie, and Fiore (2004) have suggested that escape or avoidance of negative affect is the principal motive for the use and consequent dependence on psychoactive substances, supporting the notion that an individual's inability to persist through the early stages of a quit attempt may be a result of the desire to avoid intense negative affective states. Furthermore, Daughters, Lejuez, Kahler, Strong, and Brown (2005) investigated the relationship between persistence on a psychological stressor and duration of most recent drug and alcohol abstinence attempt. Results indicated a positive relationship between duration of an individual's most recent abstinence attempt and persistence on the psychological stressor. Finally, an emerging body of research with smokers has identified that persistence across a number of behavioral measures is related to length of abstinence from cigarette smoking (Brandon et al., 2003; Brown, Lejuez, Kahler, & Strong, 2002).

Given the importance of treatment length for long-term abstinence, the goal of the present study was to examine the mechanisms involved in the ability to persist through the early stages of residential drug use treatment. Distress tolerance measures are predictive of success in the early stages of an abstinence attempt among smokers and drug and alcohol abusers. It is hypothesized that similar processes are occurring in the early stages of residential treatment. Specifically, it is hypothesized that lower levels of distress tolerance are associated with an increased risk for early treatment dropout, because the early stage of treatment is theorized

to be the time during which patients are required to make the most adjustments in their lifestyle and behavior. Further, given the findings from previous studies examining predictors of dropout from residential substance use treatment, we also included demographics variables, mood variables, psychopathology, substance use severity, treatment readiness, and social support to determine the unique predictive utility of behavioral measures of distress tolerance.

Method

Participants

Participants for this study included 122 individuals who entered the Salvation Army Harbor Light residential substance abuse treatment facility in Northeast Washington, DC. The mean age of the sample was 40.3 years; 70.5% were men, and 95.1% were African American. In terms of highest education level attained, 27.0% reported having less than a high school education, 43.4% reported having a high school degree or GED, 20.5% reported attending college or technical school for a period of time, and 9.1% reported holding either a college, graduate, or professional degree. Substances used on a weekly basis in the past year included crack/cocaine (60.7%), alcohol (41.0%), heroin (27.9%), and cannabis (27.0%). On entering the facility, patients signed a contract with the intent to complete 30 days (45.1% of participants), 60 days (6.6%), 90 days (23.0%), or 180 days (25.4%) of treatment.

Procedures

Residents were approached for participation within 1 week of their arrival at the treatment center. Of 144 individuals approached, 16 refused to participate. On the basis of the results of the Structured Clinical Interview for DSM-IV (SCID-IV; First, Spitzer, Gibbon, & Williams, 1997), an additional 6 were excluded because of psychosis. The average length of time between arrival to the facility and participation in the study was 2.6 days ($SD = 1.8$). For entry into the treatment center (independent of the current study), individuals were required to evidence abstinence from all drug use and to have completed a detoxification program if needed. As a result, acute drug effects likely did not affect the participants' scores on the testing battery.

In addition to the SCID-IV, the protocol consisted of a battery of seven self-report questionnaires and four distress tolerance challenge tasks. The order of completion of the challenge tasks was counterbalanced across participants. Participants were reminded before each task that their performance would affect the amount of money they would earn during the session, with the total possible amount ranging between \$5 and \$15.

The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) was used to assess for confounding differences in current positive and negative moods at the beginning of each assessment session (i.e., challenge tasks). Reliability of this scale in the current study was high ($\alpha = .89$). The Center for Epidemiological Studies–Depression Scale (CES-D; Radloff, 1977) was used to assess depressive symptoms participants had experienced during the past week. Reliability of this scale in the current study was acceptable ($\alpha = .76$). The Multidimensional Personality Questionnaire–Stress Reaction Subscale (MPQ-SR; Tellegen, 1982) was used to index nervousness, proneness to worry, irritability, and labile affect. Reliability of this scale in the current study was good ($\alpha = .84$). The Eysenck Impulsiveness Scale (Eysenck, Pearson, Easting, & Allsopp, 1985) was used to assess traitlike levels of impulsive behavior across cognitive and behavioral domains. Reliability of this scale in the current study was acceptable ($\alpha = .76$). A polydrug use questionnaire was used to assess use of the 10 drug categories derived by Kirisci, Vanyukov, Dunn, and Tarter (2002) to control for the effects of drug type and use level. Substance use frequency was calculated by adding the frequency of sub-

stance use across drug classes on a weekly basis in the past year. The Interpersonal Support Evaluation List (ISEL; Cohen, Mermelstein, Kamarck, & Hoberman, 1985) was used to assess participants' perception of functional support. Reliability of this scale in the current study was acceptable ($\alpha = .74$). The Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES; Miller & Tonigan, 1996) was used to assess three continua of readiness to change; *ambivalence*, *recognition*, and *taking steps*. Reliability of each scale in the current study was acceptable ($\alpha = .69, .85$, and $.90$, respectively).

Distress Tolerance Tasks

Psychological Stressor 1: Paced auditory serial addition task (PASAT; Lejuez, Kahler, & Brown, 2003). For this task, numbers were sequentially flashed on a computer screen, and participants were asked to add the presented number to the previously presented number before the subsequent number appeared on the screen. The task consisted of three levels, with decreasing latencies between number presentations. Participants were informed that once the final level had begun, they could terminate exposure to the task at any time by informing the experimenter; however, the amount of money they would make at the end of the session would depend on their performance on the task. The participants were not told that the task was scheduled to end after 7 min. Psychological distress tolerance was indexed as latency in seconds to task termination. In line with the methods of Brown et al. (2002) and Daughters, Lejuez, Kahler, et al. (2005), dysphoria was measured using a four-item scale consisting of self-reported anxiety, difficulty concentrating, irritability, and frustration. Reliability of this dysphoria scale was acceptable ($\alpha = .69$). A baseline administration of the scale occurred at the start of the session, and an experimental administration occurred after the second level of the PASAT to determine whether the task increased psychological stress. This second administration occurred at the end of second level of the PASAT as opposed to the end of the task to prevent confounds associated with termination latency.

Psychological Stressor 2: The computerized mirror-tracing persistence task (MTPT-C; Strong et al., 2003). We used a computerized version of the mirror-tracing persistence task (MTPT; Quinn, Brandon, & Copeland, 1996). Participants traced a red dot along a star using the computer mouse, which had been programmed to move the red dot in the reverse direction. If a participant moved the red dot outside the star or if a participant stalled for more than 2 s, a loud buzzer would sound, and the red dot would return to the starting position. Participants were told that they could end the task at any time by pressing any key on the computer but also that how well they did on the task would affect how much money they made. The participants were not told that the task was scheduled to end after 5 min. Psychological distress tolerance was measured as latency in seconds to task termination. Additionally, the number of errors per second (i.e., the number of times the participant had to return to the starting position during the task divided by the task time) was recorded to control for the effects of skill on persistence. Because the MTPT only included a single level, dysphoria could not be assessed without confounding termination latency.

Physical Stressor 1: Breath holding (BH). Because maximum BH duration has been previously shown to be predictive of the duration of cessation attempts in cigarette smokers (Hajek, Belcher, & Stapleton, 1987; Brown et al., 2002), we used BH as one physical challenge procedure. Specifically, an experimenter instructed the participants to begin holding their breath for as long as possible; the experimenter then began timing the length of BH with a stop watch. Persistence was measured as latency in seconds to taking a breath.

Physical Stressor 2: Cold pressor task (CPT). The CPT was used as an additional physical challenge procedure. As used by Willoughby and Edens (1996), the procedure involves immersion of the nondominant hand and forearm in a container of ice water (33° Fahrenheit; $SD = \pm 1^{\circ}$) up to a specified point marked by the experimenter. Participants were told to keep their hand in the water for as long as they could and that they could remove their hand at any time. The participants were not told that the task was

scheduled to end after 5 min. Persistence was measured as latency in seconds to removing the hand from the water.

Results

Group Status

Individuals were grouped on the basis of whether they completed at least 30 days of treatment. All individuals were included regardless of their contracted length of stay. Early dropouts ($n = 20$) were defined as those individuals who either left the facility voluntarily against treatment advice ($n = 8$), or were removed because of substance use ($n = 12$).¹ Completers were those individuals who finished at least 30 days of treatment ($n = 102$).

Relationships Among Distress Tolerance Measures

Psychological distress tolerance. Individuals persisted on the PASAT for an average of 208.7 s ($SD = 165.2$). Paired t tests indicated a significant increase in dysphoria during the PASAT, $t(122) = 5.94$, $p < .001$, suggesting that the task was psychologically stressful. Skill on the PASAT was indexed by the number of correct responses during the first two levels. There was no relationship between number of correct responses and PASAT duration ($p > .05$). Due to technical difficulties with the computer program, MTPT data were missing for the first 11 participants. On the MTPT, individuals persisted an average of 197.1 s ($SD = 95.9$). Skill on the MTPT was indexed by the number of errors per second, calculated by dividing total MTPT time by the number of errors. There was a significant relationship between MTPT time and errors; individuals with fewer errors per second persisted longer on the MTPT, $r(111) = -.20$, $p < .05$, suggesting that individuals who had a more difficult time with the task tended to quit sooner. As we hypothesized, the correlation between the PASAT and MTPT measures of psychological distress tolerance was significant, $r(111) = .38$, $p < .001$. This correlation remained significant after controlling for errors per second, $r(108) = .34$, $p < .001$.

Physical distress tolerance. Two participants refused to complete both the CPT and BH task, and one person refused to complete the BH task. The mean BH time was 30.12 s ($SD = 13.8$), and the mean CPT time was 99.97 s ($SD = 104.6$). As we hypothesized, the correlation between the CPT and BH measures of physical distress tolerance was significant, $r(119) = .27$, $p < .01$.

Relationships Among Self-Report Measures and Distress Tolerance Measures

Participants who were younger, $r = -.31$, $p < .01$, and male, $t(117) = 6.35$, $p < .05$, persisted significantly longer on the CPT. Additionally, BH duration was negatively correlated with impulsivity ($r = -.20$, $p < .05$) and MTPT was negatively correlated with negative affect (PANAS, $r = -.20$, $p < .05$). However, because of the large number of correlations tested, the somewhat small magnitude of these relationships, and inconsistencies across multiple measures of negative affect, these correlations may be significant by chance and should be interpreted with caution. There were no other significant relationships between the distress tolerance and self-report measures.

Mean Differences Between Early Dropouts and 30-Day Completers

Demographics. No significant differences were found between early dropouts and 30-day completers on any demographic variables ($ps > .05$). Furthermore, no differences were found between early dropouts and 30-day completers on legal status, defined as whether they were ordered by the court to attend treatment. Specifically, 77.4% of the 30-day completers and 60% of the early dropouts had been court-ordered to treatment, $\chi^2(1, N = 122) = 2.69$, $p > .10$.

Diagnostic status. Because of sample size constraints, we restricted analyses to disorders with at least a 10% prevalence rate in the sample. No significant group differences were found in the rates of current or past major depressive disorder, borderline personality disorder, antisocial personality disorder, or substance dependence other than alcohol. It is of note that there was a trend for early dropouts to be more likely than 30-day completers to meet criteria for alcohol dependence, $\chi^2(1, N = 122) = 3.42$, $p = .06$. Rates of comorbidity did not differ between early dropouts and 30-day completers.

Self-report measures. There were no group differences on self-reported depressive symptoms, negative or positive affect, impulsivity, stress reaction, social support, or stage of change between early dropouts and 30-day completers ($ps > .20$). Of note was the trend for early dropouts to report a higher frequency of substance use, $t(120) = -1.90$, $p = .06$. Additionally, a chi-square analysis was used to determine differences in drug type between early dropouts and 30-day completers. Participants were categorized as either a primary cocaine ($n = 53$), primary heroin ($n = 19$), both primary cocaine and heroin ($n = 16$), or other drug user ($n = 31$). There were no group differences in drug type, $\chi^2(3, N = 122) = 0.767$, $p > .85$.

Distress tolerance measures. Group differences on the distress tolerance measures are presented in Figure 1. No significant differences were found in persistence between early dropouts and 30-day completers on either of the physical distress tolerance measures (BH and CPT; $ps > .05$). With regard to psychological distress tolerance, early dropouts were significantly less persistent than completers on the PASAT ($p < .01$) and MTPT ($p < .01$). The group difference on MTPT remained after controlling for errors on the task ($p < .01$).

Predictors of Treatment Dropout

We ran discrete-time survival analyses to predict days until dropout during the first 30 days of treatment using Cox proportional hazards regression. Three separate models were tested to examine the unique contribution of each of the psychological distress tolerance tasks. In the first step of each analysis, only the self-report variables that demonstrated a trend toward significant group differences were included as covariates, namely alcohol dependence and substance use frequency. Because there were no

¹ Our sample size did not permit differentiation of early dropouts who left voluntarily from those who were removed due to substance use in the final analysis. However, it is of note that there were no differences on any of the distress tolerance measures among these two groups of early dropouts, $ps > .17$; $ds < .47$.

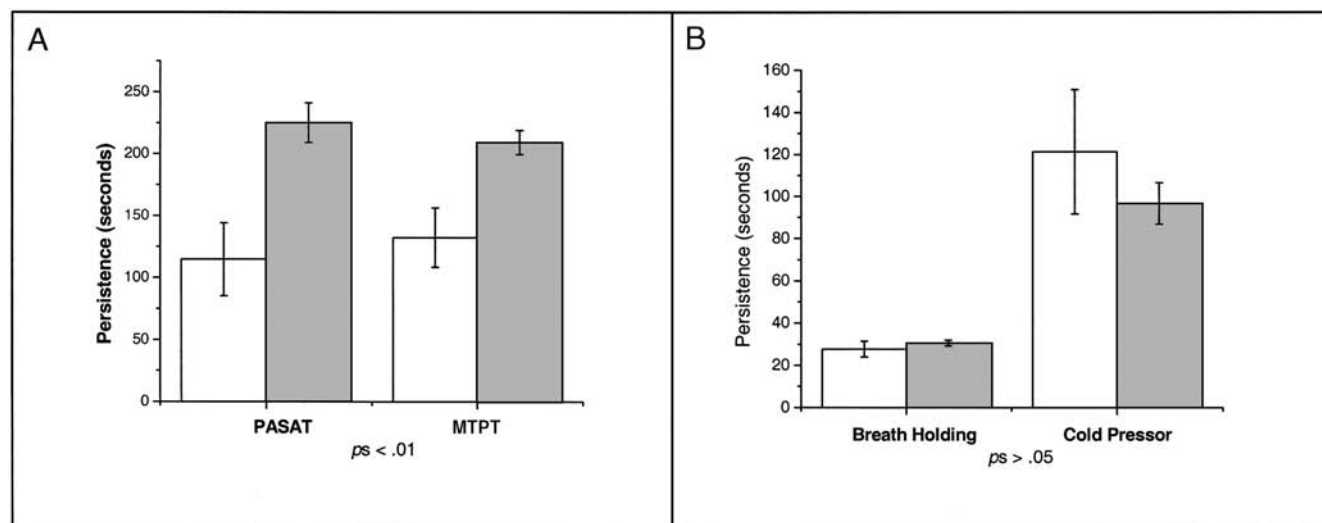


Figure 1. Mean difference in persistence as measured in seconds spent on psychological (paced auditory serial addition task [PASAT] and mirror-tracing persistence task [MTPT]; panel A) and physical (breath holding and cold pressor task; panel B) distress tolerance tasks between study participants who dropped out early from a substance use treatment program and participants who completed 30 days of treatment. Early dropouts are represented by white bars, and 30-day completers are represented by gray bars. The error bars reflect the standard error of the mean.

group differences for the physical distress tolerance tasks, these variables were not entered into the equation. Continuous independent variables were standardized using *z* scores to facilitate interpretation. In Equation 1, MTPT was entered as a second step, and the final model was significant, $\chi^2(3, N = 111) = 12.19, p < .01$, with MTPT significantly related to early treatment dropout, $B = -.72, SE = .27$, hazard ratio (HR) = .49, $p < .01$, indicating that shorter MTPT times were associated with an increased risk of early treatment dropout. In Equation 2, the PASAT, but not MTPT, was entered as a second step, and the final model was significant, $\chi^2(3, N = 122) = 8.58, p < .05$, with shorter PASAT duration associated with an increased risk of early treatment dropout, $B = -.57, SE = .27$, HR = .56, $p < .05$. In Equation 3, both MTPT and PASAT were entered together in the second step, and the final model was significant, $\chi^2(4, N = 111) = 13.03, p < .05$, but with only shorter MTPT duration significantly related to an increased risk for early treatment dropout, $B = -.62, SE = .29$, HR = .54, $p < .05$.

We also ran a Cox proportional hazards model predicting risk of dropout over the maximum possible treatment duration of 180 days. In these analyses, subjects' data were censored at the point at which they successfully completed their treatment contracts. Therefore, more sparse data were available for risk of dropout at the later time points. In this analysis, the effect of MTPT when analyzed without PASAT in the model was reduced and was below traditional significance levels, $B = -.29, SE = .17$, HR = .75, $p = .08$. A test of the interaction of Time $\times$ MTPT indicated that the effect of MTPT on dropout risk became weaker over time, but this effect did not reach significance, $B = .0070, SE = .0061, p = .25$. For the PASAT, the main effect was far weaker in the 180-day model, essentially equal to 0, $B = .01, SE = .16$, HR = 1.02, $p = .93$. The test of the Time $\times$ PASAT interaction was significant, $B = .014, SE = .007, p < .05$, and the effect of PASAT when the

interaction with Time was included was in the expected negative direction, $B = -.60, SE = .33$, HR = .55, $p = .07$. Calculations based on these model coefficients indicated that higher scores on the PASAT in this sample were related to lower risk of dropout over the first 41 days of treatment but to higher risk of dropout after that time.

Discussion

In the current study, predictors of treatment dropout in a residential substance use treatment center were examined. Early dropouts were significantly less likely to persist on the psychological stressors than 30-day completers, above and beyond characteristics previously reported to predict treatment dropout. Conversely, there were no differences in persistence between early dropouts and 30-day completers on the physical stressors. Further analyses indicated that lower levels of psychological distress tolerance were predictive of dropping out of treatment within the first 30 days, yet the link between the two dissipated after the initial 30-day period, which suggests a particular relevance to the initial stages of treatment.

Several explanations are possible regarding differences in predictive utility across physical and psychological distress tolerance tasks. While in treatment, psychological distress is likely the combined result of abstinence, increased structure and loss of freedom, separation from friends and family, active engagement in challenging group treatments, and ambivalence regarding the future benefits of a drug-free lifestyle. Physical distress, on the other hand, is likely to result from withdrawal symptoms and cravings. Therefore, the active participation required by the psychological distress tolerance challenge procedures may have been more closely analogous to active treatment participation. The physical distress tolerance tasks, on the other hand, reflected passive en-

duration tests and thus may have been more closely analogous to the process of detoxification. Individuals entering the treatment center were required to have been abstinent for 72 hr or to have entered detoxification and thus had already evidenced an ability to tolerate the physical effects of withdrawal, if present. Consequently, our recruitment procedure may have resulted in the exclusion of individuals with the greatest deficits in physical distress tolerance, specifically those who may have not persisted through detoxification or abstinence before entering the center.

Previous studies have indicated that distress tolerance is significantly related to depressive symptoms (Daughters, Lejuez, Strong, Breen, & Lesieur, in press), negative affect (Brown et al., 2002), and stress reaction (Brown et al., 2002; Daughters, Lejuez, Kahler, et al., 2005). However, these findings did not replicate in the current study. Although negative affective states clearly play a contextual role in distress tolerance, it should be emphasized that our focus is on individuals' reaction or ability to persist despite increased levels of negative affect. The results of this current study support this focus; there were no differences between length of persistence and changes in dysphoria during the PASAT, suggesting that it may not be one's level of distress but one's willingness to experience distress that drives the decision to terminate the tasks and treatment.

Strengths of the current study include a prospective design and the use of multiple, theory-driven potential predictors of treatment dropout across self-report and behavioral domains. Although the self-report measures evidenced acceptable reliability, characteristics of this sample (e.g., comprehension issues due to limited education and neurological effects of chronic drug use) suggest the importance of behavioral measures to complement the use of self-report measures. Further, these findings are in line with previous work reporting that persistence on a psychological stressor is significantly related to abstinence duration in smokers, gamblers, and drug and alcohol abusers (Brandon et al., 2003; Brown et al., 2002; Daughters, Lejuez, Kahler, et al., 2005; Daughters, Lejuez, Strong, et al., in press), and suggest that similar processes are occurring across addictions with regard to the relationship between psychological distress tolerance and successful abstinence.

In addition to identifying the processes by which distress tolerance relates to treatment dropout, future studies should begin to recruit larger, more diverse samples to allow a more comprehensive examination of the moderating effect of variables such as demographics, drug type, and legal status (court referred vs. voluntary admission to the center). For example, although legal status was not related to dropout status in the current study, previous findings indicating that court-referred individuals are more likely to stay in treatment to avoid legal circumstances (Maglione, Chao, & Anglin, 2000), suggesting that this variable may moderate the relationship between distress tolerance and treatment dropout with a larger sample. In this way, collecting information on reasons for leaving also might help clarify these underlying processes. A similar future direction is examination of the predictive utility of distress tolerance in actual relapse for treatment completers. The dissipation in the relationship between distress tolerance and dropout after 30 days argues against a relationship with relapse for completers after persisting through the initial period of abstinence in the treatment center; however, it is unclear to what extent distress tolerance may again play an important role in staying

abstinent in the face of additional psychological stressors experienced after leaving residential treatment.

Although several questions remain, the current results do suggest the importance of distress tolerance in persisting through the most difficult early stages of treatment. This is of great public health importance, given the clear relationship between remaining in treatment and long-term abstinence. Clinically, these results suggest the potential value of targeting individuals with low levels of psychological distress tolerance to receive treatment modules addressing this deficit, such as those emphasizing effective emotion-regulation skills. As treatment progresses, changes in distress tolerance can be measured by exposing individuals to psychologically distressing situations and measuring their persistence.

References

- Baker, T. B., Piper, M. E., McCarthy, D. E., Majeskie, M. R., & Fiore, M. C. (2004). Addiction motivation reformulated: An affective processing model of negative reinforcement. *Psychological Review*, 111, 33–51.
- Brandon, T. H., Herzog, T. A., Juliano, L. M., Irvin, J. E., Lazev, A. B., & Simmons, V. N. (2003). Pretreatment task-persistence predicts smoking cessation outcome. *Journal of Abnormal Psychology*, 112, 448–456.
- Brown, R. A., Lejuez, C. W., Kahler, C. W., & Strong, D. R. (2002). Distress tolerance and duration of past smoking cessation attempts. *Journal of Abnormal Psychology*, 111, 180–185.
- Claus, R. E., Kindleberger, L. R., & Dugan, M. C. (2002). Predictors of attrition in a longitudinal study of substance abusers. *Journal of Psychoactive Drugs*, 34, 69–74.
- Cohen, S., Mermelstein, R., Kamarck, T., & Hoberman, H. (1985). Measuring the functional components of social support. In I. Sarason & B. Sarason (Eds.), *Social support: Theory, research, and applications* (pp. 73–94). Dordrecht, The Netherlands: Martinus Nijhoff.
- Crits-Christoph, P., & Siqueland, L. (1996). Psychosocial treatment for drug abuse: Selected review and recommendations for national health care. *Archives of General Psychiatry*, 53, 749–756.
- Daughters, S. B., Lejuez, C. W., Kahler, C., Strong, D., & Brown, R. (2005). Psychological distress tolerance and duration of most recent abstinence attempt among residential treatment seeking substance abusers. *Psychology of Addictive Behaviors*, 19, 208–211.
- Daughters, S. B., Lejuez, C. W., Strong, D., Breen, R., & Lesieur, H. R. (in press). The relationship among negative affect, distress tolerance, and latency to gambling treatment failure. *Journal of Gambling Studies*.
- Eysenck, S. B., Pearson, P. R., Easting, G., & Allsopp, J. F. (1985). Age norms for impulsiveness, venturesomeness, and empathy in adults. *Personality & Individual Differences*, 6, 613–619.
- First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. (1997). *Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), Clinician Version*. Arlington, VA: American Psychiatric Press.
- Hajek, P., Belcher, M., & Stapleton, J. (1987). Breath-holding endurance as a predictor of success in smoking cessation. *Addictive Behaviors*, 12, 285–288.
- Kirisci, L., Vanyukov, M., Dunn, M., & Tarter, R. (2002). Item response theory modeling of substance use: An index based on 10 drug categories. *Psychology of Addictive Behaviors*, 16, 290–298.
- Lang, M. A., & Belenko, S. (2000). Predicting retention in a residential drug treatment alternative to prison program. *Journal of Substance Abuse Treatment*, 19, 145–160.
- Lejuez, C. W., Kahler, C. W., & Brown, R. A. (2003). A modified computer version of the Paced Auditory Serial Addition Task (PASAT) as a laboratory-based stressor. *Behavior Therapist*, 26, 290–293.
- Maglione, M., Chao, B., & Anglin, D. (2000). Residential treatment of methamphetamine users: Correlates of drop-out from the California

- Alcohol and Drug Data System (CADDs), 1994–1997. *Addiction Research*, 8, 65–79.
- Miller, W. R., & Tonigan, J. S. (1996). Assessing drinkers' motivations for change: The Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES). *Psychology of Addictive Behaviors*, 10, 81–89.
- Quinn, E. P., Brandon, T. H., & Copeland, A. L. (1996). Is task persistence related to smoking and substance abuse? The application of learned industriousness theory to addictive behaviors. *Experimental and Clinical Psychopharmacology*, 4, 186–190.
- Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1, 385–401.
- Simpson, D. D., Joe, G. W., & Brown, B. S. (1997). Treatment retention and follow-up outcomes in the drug abuse treatment outcome study (DATOS). *Psychology of Addictive Behaviors*, 11, 294–307.
- Strong, D. R., Lejuez, C. W., Daughters, S., Marinello, M., Kahler, C. W., & Brown, R. A. (2003). *The computerized mirror tracing task, version 1*. Unpublished manual.
- Substance Abuse and Mental Health Services Administration. (2002). *Results from the 2001 National Household Survey on Drug Abuse: Volume I. Summary of national findings* (Office of Applied Studies, National Household Survey on Drug Abuse Series H-17, Department of Health and Human Services Publication No. SMA 02–3758). Rockville, MD: Author.
- Tellegen, A. (1982). *Brief manual for the Multidimensional Personality Questionnaire*. Unpublished manuscript, University of Minnesota, Minneapolis.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54, 1063–1070.
- Willoughby, F. W., & Edens, J. F. (1996). Construct validity and predictive utility of the Stages of Change Scale for alcoholics. *Journal of Substance Abuse*, 8, 275–291.

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