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Using the Personality Assessment Inventory to Predict Male Offenders' Conduct During and Progression Through Substance Abuse Treatment

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Prior research has supported the utility of the Personality Assessment Inventory (PAI; Morey, 1991, 2007) to predict various negative outcomes among offender samples, yet few studies have specifically examined its association with behavior in treatment. In this study, the PAI was administered to 331 male offenders court ordered into substance abuse treatment. Several theoretically relevant PAI scales (e.g., Antisocial Features, Borderline Features) predicted various forms of problematic conduct (e.g., disruptive behavior, aggression) and subjective and objective ratings of treatment progress. Although there was relatively limited evidence for the superiority of any one predictor over the others, the Aggression (AGG) scale demonstrated incremental validity above and beyond other indicators for general noncompliance and aggressive behavior. Interpersonal scales also predicted select treatment behavior while sharing relatively little common variance with AGG. These findings highlight the importance of distinguishing lower order and higher order dimensions on the PAI and other measures.

Keywords: Personality Assessment Inventory, substance abuse, aggression, interpersonal style, treatment outcome

Accurate assessment of the risks and needs of substance-abusing offenders is a critical component of the rehabilitation process (for recent overviews, see Andrews & Bonta, 2010; Flynn & Brown, 2008; Simpson & Flynn, 2007). Psychological assessment tools may be useful for assessing various constructs relevant to offender management and treatment (e.g., antisocial traits, aggressive tendencies, motivation for change). For example, several multiscale, self-report inventories such as the Minnesota Multiphasic Personality Inventory—2 and the Millon Clinical Multiaxial Inventory—III are used widely to assess individuals who are involved in the

criminal justice system (e.g., Craig, 2006; Megargee, 2006), in large part because they are an expedient means of tapping a wide array of symptoms that may be relevant to rehabilitation and supervision.

The Personality Assessment Inventory (PAI; Morey, 1991, 2007) is a multiscale, self-administered questionnaire that may serve as an informative assessment tool among substance-abusing offenders, given that it taps various psychological and personality constructs that are potentially relevant to predicting treatment behavior and outcomes. For example, the PAI includes two indices

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developed explicitly to assess treatment process issues: the Treatment Rejection (RXR) scale and the Treatment Process Index (TPI). The rationale for including such measures stems from extant theory and research highlighting the potential importance of motivation for change in the therapeutic process (e.g., Prochaska & DiClemente, 2005).

Additionally, several other PAI scales, such as Antisocial Features (ANT), Borderline Features (BOR), Aggression (AGG), and Drug Problems (DRG), assess domains of psychopathology and behavior problems that might disrupt the course and ultimate outcome of treatment for substance abusing offenders. For example, various models of criminality (e.g., Andrews & Bonta, 2010) highlight the importance of antisocial attitudes, and a wealth of research indicates that such attitudes predict a host of negative consequences in the criminal justice literature (e.g., Bonta, Law, & Hanson, 1998; French & Gendreau, 2006). Similarly, one would predict on the basis of extant theory and research that borderline traits would have a detrimental impact on the treatment process, particularly among offender samples (Blackburn, 1995; Edens, Cruise, & Buffington-Vollum, 2001), and research clearly indicates that borderline characteristics in general are associated with a host of negative life outcomes (e.g., Bagge et al., 2004; Bagge, Stepp, & Trull, 2005), including an increased likelihood of substance abuse (Trull, Waudby, & Sher, 2004).

In addition to assessing fairly narrow areas of psychopathology by means of individual scales, recent research (e.g., Blonigen et al., 2010; Ruiz & Edens, 2008) suggests that many of the individual, lower order scales can be aggregated to assess two broad, higher order dimensions of psychopathology: externalizing (EXT) and internalizing (INT). The spectrum of externalizing psychopathology encompasses behaviors and personality traits such as substance abuse, aggression, antisociality, and impulsivity (Krueger et al., 2002). In contrast, internalizing psychopathology reflects a tendency to express pathology inward (see, e.g., Watson et al., 1995), as evidenced by symptoms such as depression or somatization. Given the nature of externalizing psychopathology, its assessment may be particularly relevant to rehabilitation attempts with substance abusers, although internalizing symptoms may play an important role in this process as well (Gray & Saum, 2005). As Weiss, Süsser, and Catron (1998) noted, distinguishing among narrowband (lower order) and broadband (higher order) dimensions of psychopathology is crucial, as each level of explanation may afford distinctive information about risk (see also Lilienfeld, 2003). One of our goals in the current research, then, was to evaluate the independent and incremental utility of both broadband and narrowband levels of focus in terms of predicting treatment indices.

In addition to treatment motivation indices and narrow- and broadband measures of psychopathology, the PAI includes scales intended to measure more basic features of interpersonal style (i.e., Dominance [DOM] and Warmth [WRM] scales). Over the years, there has been considerable theoretical interest in interpersonal theory (Wiggins, 1982) as it relates to models of psychopathology, particularly personality disorders (Monsen, Hagtvet, Havik, & Eilertsen, 2006; Pincus & Gurtman, 2006), as well as more recent theorizing about the role of interpersonal style in conceptualizing antisocial and criminal behavior (Blackburn, Logan, Renwick, & Donnelly, 2005). For example, extant research suggests that offenders as a group tend to present as more interpersonally domi-

nant than the general population (Blackburn, 1998). Additionally, although relatively independent of Axis I psychopathology per se, interpersonal characteristics may be relevant to various treatment-related issues. For example, a domineering approach to interpersonal relationships might interfere with the ability to develop a close working alliance with treatment providers, particularly in correctional settings in which patients may be expected to assume a somewhat more deferential role than in other contexts (see, e.g., Edens, 2009; Vittengl, Jarrett, & Clark, 2003). Despite these hypotheses, relatively little empirical research has focused on interpersonal features and treatment response specifically among justice-involved individuals.

Most published research to date on the PAI in forensic and correctional settings has focused on its utility in predicting outcome variables, such as institutional misconduct, violent behavior, and suicidal ideation (e.g., Edens & Ruiz, 2005, 2009; Walters, Duncan, & Geyer, 2003; Wang et al., 1997). In terms of misconduct and violence, studies typically have examined the relative utility of ANT, AGG, and, to a lesser extent, BOR (Edens & Ruiz, 2005). Although ANT has demonstrated incremental validity over other PAI scales and indicators in multivariate analyses (e.g., Caperton, Edens, & Johnson, 2004), AGG and BOR have also often been significant predictors at the bivariate level in the prediction of these criteria (Caperton et al., 2004; Edens & Ruiz, 2005; Walters et al., 2003). Additionally, some evidence suggests that interpersonal features may predict institutional adjustment problems among prisoners (Edens, 2009) and that the variance explained may be partially independent of measures of psychopathology.

Although there is an extensive amount of research on the PAI among offender populations, only a few studies have investigated its utility specifically in predicting treatment response or outcome among individuals involved with the criminal justice system (Caperton et al., 2004; Edens, 2009; Hopwood, Baker, & Morey, 2008). Caperton et al. (2004) reported that the RXR scale was weakly but significantly correlated ($r = .14$) with treatment non-compliance among sexual offenders ($n = 137$) participating in a mandatory treatment program. In a study of an inpatient substance abuse sample ($n = 753$) conducted by Hopwood et al. (2008), however, the RXR scale did not significantly differentiate treatment completers from noncompleters—although TPI scores did predict treatment completion. In this study, ANT scores were related to misconduct during treatment (i.e., rule-breaking behavior) and AGG scores predicted a history of assaultive behavior, but neither scale predicted treatment completion. Additionally, Edens (2009) found that although ANT was unrelated to staff ratings of treatment noncompliance or failure among male prison inmates, DOM scores did predict this outcome fairly robustly (area under the curve = .69). Also, DOM and WRM scores interacted statistically to predict aggressive behavior, with a dominant and cold interpersonal style indicating those at greatest risk for misconduct.

The purpose of the current study was to expand on the nascent body of PAI research examining the role of motivation (i.e., RXR, TPI), psychopathology (i.e., ANT, AGG, BOR, DRG), and interpersonal style (i.e., DOM, WRM) in predicting treatment-related behavior and treatment outcomes with substance abusers. In particular, we were interested in ascertaining the *incremental* validity (Sechrest, 1963) of these narrowband indicator variables above and beyond one another, given that little is known about the unique

contribution they might make in identifying substance abusers at higher risk for poor treatment response. We were also interested in evaluating the incremental validity of these narrowband variables above and beyond broadband dimensions (see below) given that the former variables possess unique variance above and beyond the latter (Weiss et al., 1998). We hypothesized that at the bivariate level, these various scales would predict a host of treatment-related criterion measures, including staff reports of several types of problematic treatment behavior, suspected drug use, and both objective and subjective ratings of treatment outcome (described in greater detail below). In terms of incremental validity, we tentatively hypothesized that ANT might explain more variance in problematic in-treatment behavior than other PAI indicators, given prior findings suggesting that it accounts for unique variance in predicting institutional adjustment problems among offender samples more generally (e.g., Edens & Ruiz, 2005).

Beyond comparing the performance of individual PAI scales and indices with each other, we also examined the basic and incremental validity of the broadband EXT and INT scales to identify indicators of counterproductive treatment-related behaviors. Given that no other studies have examined the predictive validity of EXT and INT relative to individual PAI scales, we had no strong a priori expectations about the likely pattern of findings in terms of incremental validity beyond individual-level scales such as ANT and AGG. Finally, we also expected that interpersonal scales might demonstrate incremental validity beyond other PAI measures in relation to predicting treatment outcome ratings specifically, given prior evidence suggesting that they may be uniquely related to outcome ratings in other offender samples (Edens, 2009).

Method

Sample

Participants comprised a subsample of individuals who took part in a larger study of antisocial personality disorder and psychopathy that involved recruitment of male offenders who either had been court-ordered to residential drug treatment programs or who were serving prison sentences (for a description of the full study and sample, see Poythress et al., 2010). The present research focused on the subsample of 331 male offenders who were beginning mandated residential drug treatment at sites in Florida ($n = 152$), Nevada ($n = 24$), Oregon ($n = 73$), Texas ($n = 53$), and Utah ($n = 29$). The participants ranged in age from 18 to 46 years ($M = 30.16$ years, $SD = 6.39$). The ethnic composition of the sample was diverse (Caucasian, 58.6%; African American, 26.7%; Hispanic, 14.5%). Only 43% ($n = 143$) of the sample had graduated from high school or obtained a general equivalency diploma, and an additional 26% ($n = 85$) had completed at least one year of college; 31% ($n = 102$) had less than a high school education.

Eligibility criteria for the larger study included the ability to speak English and an estimated IQ of 70 or more based on a screening assessment (QuickTest; Ammons & Ammons, 1962) administered at the time of enrollment. Additionally, any individuals currently taking psychotropic medications for active symptoms of psychosis were excluded from the study. All participants completed the PAI as part of a more extensive research protocol on entry into the study, which typically occurred within the first

month of entry into treatment (average elapsed time ranged from 2.23 to 5.65 weeks across sites; these periods of time were not significantly different from one another). Treatment duration across all sites was approximately six months.

Measures

PAI. The PAI (Morey, 2007) is a 344-item, multiscale, self-administered inventory of adult personality and psychopathology. Although not developed specifically for use with offender populations, its low required reading level (i.e., fourth grade) and relatively brief protocol length make this instrument appealing for use with this group (Edens & Ruiz, 2005). The PAI consists of 22 nonoverlapping scales measuring various constructs of interest in clinical settings. In addition to the basic scales, various configural and composite indicators have been developed over the years (Morey, 2007). The specific scales and indicators of interest in this study are described below (see Table 1 for descriptive statistics for this sample).

Treatment motivation. As noted earlier, two PAI indicators were designed explicitly to provide information concerning treatment issues. The RXR scale was intended to assess motivation for major life changes. Morey (1991) recommended that a cutoff score of $RXR < 43T$ typically suggests the "acknowledgment of personal difficulties" (p. 20). Therefore, lower scores on this scale suggest that an individual is more motivated to change, that is, endorses such characteristics as psychological mindedness and willingness to participate actively. In terms of construct validity, various correlational studies have found that RXR is inversely related to measures of distress and treatment interest and commitment (Baity, 2004; Blais et al., 2002).

The TPI is a composite measure linked theoretically to treatment amenability, with lower scores reflecting psychological assets ostensibly tied to successful treatment outcome (Morey, 1991, 2007). Although the validity evidence for this scale is limited, studies such as that reported in Baity (2004) provide some indication that the TPI measures relevant treatment process variables, such as poorly articulated views of goals and tasks.

Psychopathology and behavior problems: Individual scales. Noted earlier, BOR, ANT, AGG, and DRG were the clinical and treatment consideration scales thought to be most directly relevant to predicting treatment behavior and outcome among substance abusers.

The BOR scale assesses various elements of borderline personality disorder pathology, such as affective instability, impulsivity, potential self-destructive behaviors, and disrupted interpersonal relationships (Morey, 2007). Evidence supporting the construct validity of this scale has been demonstrated across numerous studies (Bagge, Stepp, & Trull, 2005; Bell-Pringle, Pate, & Brown, 1997; Kurtz & Morey, 2001; Trull, Widiger, Lynam, & Costa, 2003). For example, the BOR scale correlates with various indicators of borderline personality disorder, such as symptom counts on the Structured Interview for *DSM-IV* Personality Disorders (Bagge et al., 2004) and the borderline personality composite score theoretically derived from the NEO Personality Inventory—Revised (Trull et al., 2003).

The ANT scale was designed to assess key features of antisocial personality disorder and psychopathy, such as callousness, lack of empathy, and stimulus seeking. Moderate to strong correlations

Table 1
Descriptive Statistics for Personality Assessment Inventory Scales/Indicators and Criterion Measures

Scale or measure	α	T score		Base rate
		<i>M</i>	<i>SD</i>	
Antisocial Features	.84	73.61	11.58	
Borderline Features	.88	69.76	11.69	
Drug Problems	.80	91.97	13.77	
Aggression	.92	63.40	14.36	
Dominance	.79	53.51	10.87	
Warmth	.79	46.58	11.03	
Treatment Rejection	.62	34.10	7.94	
Treatment Process Index		1.55	1.93	
General acts of noncompliance				49%
Disruptive or countertherapeutic behavior				26%
Aggressive misbehavior				17%
Objective treatment progress				63%
Subjective treatment progress				55%
Using or suspected of using illicit drugs				19%

have been demonstrated between the ANT scale and both self-report and interview-based assessments of antisocial personality disorder and psychopathy (Benning, Patrick, Salekin, & Leistico, 2005; Douglas, Hart, & Kropp, 2001; Edens, Hart, Johnson, Johnson, & Olver, 2000; Guy, Poythress, Douglas, Skeem, & Edens, 2008; Hicklin & Widiger, 2005). Additionally, as previously discussed, the predictive validity of the ANT scale for such criteria as behavioral problems (Buffington-Vollum, Edens, Johnson, & Johnson, 2002; Caperton et al., 2004) and recidivism (Salekin, Rogers, Ustad, & Sewell, 1998) has been demonstrated.

The AGG scale assesses temperamental anger and hostility, along with behavioral expressions of aggression (i.e., physical and verbal). This scale has consistently been shown to be associated with various indicators of aggression and anger, such as the Buss-Perry Aggression Questionnaire (Diamond & Magaletta, 2006) and the State-Trait Anger Expression Inventory (Morey, 1991). It has also demonstrated significant, albeit modest, relationships with staff ratings of aggression in correctional settings (e.g., Wang et al., 1997).

The DRG scale was developed to assess "behaviors and consequences related to drug use, abuse, and dependence" (Morey, 1996, p. 79). In comparison with community norms, Morey (1991) suggested that individuals enrolled in substance abuse treatment typically have markedly elevated DRG scores (i.e., range: 75T–90T). This assertion has been supported through such studies as Alterman et al. (1995), whose treatment-seeking substance-abusing sample obtained elevated DRG scores ($M = 83.96$), similar to the results for the inpatient substance abuse treatment sample ($M = 82.46$) described by Hopwood et al. (2008). The DRG scale has been shown to be moderately to highly correlated with the Drug Abuse Screening Test (Morey, 1991) and the Addiction Severity Index (Kellogg et al., 2002; Parker, Daleiden, & Simpson, 1999).

Broadband internalizing and externalizing psychopathology. These two basic dimensions of psychopathology were operationalized on the PAI by aggregating individual scales into composite indicator variables as outlined by Blonigen et al. (2010). The EXT scale was calculated by taking the mean value of the AGG,

Alcohol Problems, ANT, and DRG scales. Similarly, the INT scale encompassed the mean value of the Anxiety, Depression, and Anxiety-Related Disorders scales.

We should note that broader and more comprehensive models have been proposed for operationalizing EXT and INT on the PAI (Ruiz, 2009; Ruiz & Edens, 2008). For example, using factor analysis, Ruiz and Edens (2008) identified an internalizing dimension that comprised the Anxiety, Depression, Anxiety-Related Disorders, Somatic Complaints, Suicide, and Schizophrenia scales, whereas the externalizing dimension comprised ANT, AGG, BOR, DRG, Mania, Paranoia, and Alcohol Problems scales. In the present study, however, we used the simpler conceptualizations of the externalizing and internalizing dimensions proposed by Blonigen et al. (2010) but also investigated the performance of more comprehensive INT/EXT models in supplementary analyses.

Interpersonal style. The DOM scale of the PAI assesses level of control and independence in interpersonal relationships, with low scores indicative of submissiveness. Convergent validity has been demonstrated in theoretically expected directions with the Interpersonal Adjective Scales—Revised (Rothweiler, 2004) and interpersonal features of psychopathy (Douglas, Guy, Edens, Boer, & Hamilton, 2007). The WRM scale assesses "the extent to which a person is interested in supportive and empathic personal relationships" (Morey, 2007, p. 3). Support for the validity of WRM is evident in its high level of associations with other measures of love and nurturance (e.g., Rothweiler, 2004) and negative associations with avoidant and schizoid personality features (see Morey, 2007).

Criterion measures. Prospective data regarding treatment-related behavior and treatment progress were obtained through both a standardized review of institutional records and postdischarge interviews with participants' primary therapists. A standardized form for recording therapists' judgments about treatment outcomes and responses was used by research assistants across all sites, providing a quantitative rating scale (e.g., 1–4) for each question. Therapists' ratings of success or failure were coded at the end of treatment. All criterion measures reflect behavior or outcomes that occurred subsequent to the completion of the PAI (e.g.,

only aggressive incidents that occurred after completion of the PAI were included in analyses).

In terms of *general acts of noncompliance*, any incident listed in either the treatment agency's incident report log or participants' progress notes, inclusive of both aggressive and nonaggressive acts (e.g., gambling, lying to a staff member, stealing), was subsumed under this dichotomous criterion measure (0 = no infractions/incidents; 1 = one or more incidents; see Table 1 for base rates of the criterion measures). The outcome measure, *aggressive misbehavior*, was operationalized by the presence or absence of incidents reflecting either verbal (e.g., oral threats to staff or other inmates) or physical (e.g., assaulting a staff member, fighting an offender with a weapon) aggression. Verbal and physical acts were combined to form one category because very few individuals engaged in physically aggressive acts ($n = 8$).

In regard to treatment-related behavior, *disruptive or counter-therapeutic behavior* was operationalized by means of a rating from each participant's therapist regarding the frequency of necessary confrontations or removals from group or other therapeutic activities with the following response options: *never*, *rarely*, *occasionally*, or *often*. Given the low base rate of frequent disruptive behavior (4%), these four response options were collapsed into two groups, that is, *never/rarely* and *occasionally/often*.

Counselors also completed ratings as to whether the patient was *using or suspected of using illicit drugs* during the course of treatment, using a 3-point scale (1 = *no suspected or confirmed drug use*, 2 = *suspected drug use but not confirmed via tests/screens*, 3 = *confirmed drug use [e.g., failed urine analysis]*). (All residents at these facilities were routinely tested for drug use.) The second response option (i.e., *suspected drug use*) might have been selected if, for example, the clinical staff noted behavior suggestive of drug-induced effects (e.g., slurred speech, dilated eyes, unstable gait) but not in conjunction with an immediately available objective drug test or screen result. Given the low base rates of suspected and confirmed drug use (7.9% and 8.2%, respectively), these two groups were collapsed into one category.

Finally, therapists rated each individual's *subjective treatment progress*, which was coded as 0 = failed treatment or made minimal gains or 1 = achieved substantial gains or succeeded in treatment. Additionally, *objective treatment progress* was determined through the examination of agency records. Given that each treatment program used a standardized multitiered system that tracked how each client progressed over the course of treatment, this rating was completed on the basis of whether an individual successfully progressed to the highest level of the program at the time of discharge. Data were missing for 21 and eight participants for objective and subjective treatment outcome, respectively. Those missing subjective data had slightly higher RXR scores than did those with treatment data. Otherwise, there were no appreciable group differences on the remaining PAI scales of interest.

Procedure

Individuals were recruited at each site from lists of potential participants who met basic inclusion criteria (i.e., age, race, English fluency). Informed consent and data collection procedures were approved by university institutional review boards and relevant agency review boards. All participants completed the PAI as part of the research protocol for the larger study. The PAI was

administered as a paper-and-pencil measure by the research assistant individually in a quiet, private, interviewing room provided by the agency where the data were collected. Given the potential for random or careless responding on self-report measures, all PAI profiles with Infrequency and/or Inconsistency scores above suggested cutoffs for offenders (i.e., $\geq 80T$; Edens & Ruiz, 2005) were excluded from the analyses. Of the initial group of individuals who met basic inclusion criteria, only a few ($n = 5$) profiles were excluded because of suspected random or careless responding, resulting in the final sample of 331 participants noted above.

Results

Bivariate Analyses

We first computed logistic regressions to examine the bivariate associations between individual PAI scales and dichotomous criterion variables (see Table 2). Because there were differences in PAI characteristics and outcomes across sites, potential site effects were controlled on the first step and the PAI scale of interest was entered on the second step. As can be discerned from Table 2, AGG and ANT most consistently predicted our outcome measures. Results for RXR for both treatment variables were in the expected direction but only approached statistical significance (for objective progress, $p = .09$; for subjective progress, $p = .06$).¹ None of the examined individual PAI indicators were associated with suspected or confirmed drug use.

Next, we examined the extent to which the broadband EXT and INT scales related to the criterion measures (see Table 2).² Similar to the performance of the individual PAI indicators, EXT predicted general acts of noncompliance, disruptive behavior, aggressive acts, and subjective ratings of treatment progress. The magnitude of these effects was generally similar to those for the AGG scale in isolation. However, EXT did not significantly predict objective ratings of treatment progress. At the bivariate level, INT was predictive only of subjective treatment outcome ratings.³

¹ Given the interaction between RXR and TPI scores reported by Hopwood et al. (2008), we also conducted regression analyses examining potential moderator effects between these two scales in our data. The interaction term, however, was not significant in the prediction of either objective or subjective ratings of treatment progress.

² We examined results for all three externalizing and internalizing models noted earlier (i.e., Blonigen et al., 2010; Ruiz, 2009; Ruiz & Edens, 2008). With a few exceptions, the pattern of results was generally similar across all models. Therefore, only results for the Blonigen et al. (2010) INT/EXT model are reported here. Additional information concerning the other findings is available from John F. Edens upon request.

³ Given that participants differed somewhat in the length of time spent in treatment prior to being recruited for this study, we reran all of our primary analyses controlling for days in treatment prior to recruitment on the first step of the regression analyses. Results were virtually identical to those reported above, except that the marginally significant effect for RXR and subjective treatment outcome ($p = .06$) was significant ($p = .045$) after controlling for days in treatment on the first step. Additionally, the number of days in treatment was not significantly correlated with any of the predictor or criterion measures examined in this study.

Table 2
Regression Models Predicting Outcome Variables for
Personality Assessment Inventory Scales

Outcome type	Wald(1)	OR	95% CI
General acts of noncompliance			
AGG	7.85**	1.03	[1.01, 1.04]
ANT	5.81*	1.03	[1.01, 1.05]
EXT	4.05*	1.03	[1.00, 1.05]
Disruptive behavior			
AGG	13.92**	1.04	[1.02, 1.06]
ANT	12.88**	1.04	[1.02, 1.07]
BOR	8.77**	1.04	[1.01, 1.06]
TPI	7.52*	1.20	[1.05, 1.36]
WRM	4.02*	0.98	[0.95, 0.99]
EXT	7.28**	1.04	[1.01, 1.07]
Aggressive acts			
AGG	18.45**	1.05	[1.03, 1.07]
ANT	11.33**	1.05	[1.02, 1.07]
BOR	6.05*	1.03	[1.01, 1.06]
EXT	9.54**	1.05	[1.02, 1.08]
Subjective treatment ratings			
AGG	7.96**	1.02	[1.01, 1.04]
ANT	6.63*	1.03	[1.01, 1.05]
BOR	6.02*	1.03	[1.01, 1.05]
EXT	8.22**	1.04	[1.01, 1.06]
INT	5.32*	1.03	[1.00, 1.05]
Objective treatment ratings			
AGG	4.58*	1.02	[1.00, 1.04]
BOR	3.80*	1.02	[1.00, 1.05]

Note. AGG = Aggression scale; ANT = Antisocial Features scale; BOR = Borderline Features scale; EXT = Externalizing scale; INT = Internalizing scale; TPI = Treatment Process Index; WRM = Warmth scale; OR = odds ratio (the OR in logistic regression pertains to each step increase on the predictor); CI = confidence interval.

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

Incremental Validity Analyses: Psychopathology Measures

In sum, ANT, AGG, and BOR explained relatively similar amounts of variance across several of the criterion measures. This finding, however, does not necessarily mean that these indicators accounted for unique variance in these variables, particularly given that these scales are relatively strongly intercorrelated: ANT/AGG $r = .64$, ANT/BOR $r = .58$, AGG/BOR $r = .56$, all $ps < .001$. Given that we were interested in unique predictive variance, we conducted incremental validity analyses alternating the order of predictors to determine whether any of the PAI indicators contributed incremental variance above and beyond the variance due to the other significant predictors of outcome performance.⁴ Similar to the bivariate analyses, site differences were controlled in the first step, whereas the PAI scales that were significant predictors at the bivariate level were controlled on the second step. The independent contribution of a particular scale of interest was then examined in the third step.

The results of these analyses indicated that no unique variance was explained by any of the examined scales in the prediction of disruptive behavior or subjective or objective ratings of treatment progress. The AGG scale, however, did uniquely predict general acts of noncompliance (odds ratio [OR] = 1.02, Wald = 4.21, $p < .05$), and aggressive acts (OR = 1.05, Wald = 8.17, $p < .01$), even after controlling for the variance attributable to ANT and BOR.

Given that AGG and the broader EXT scale explained comparable amounts of variance in some of the criterion measures, we next conducted incremental validity analyses to determine whether AGG could explain any unique variance in outcome measures beyond EXT, and vice versa. (For the purposes of these analyses, the externalizing dimension was recalculated excluding the AGG scale.) Objective ratings of treatment progress and suspected drug use were not included in these analyses because EXT was not associated with these outcome variables at the bivariate level.

After controlling for variance explained by EXT, AGG continued to be a significant predictor of general acts of noncompliance (OR = 1.02, Wald = 6.30, $p < .05$), disruptive behavior (OR = 1.04, Wald = 11.19, $p < .01$), aggressive acts (OR = 1.05, Wald = 15.14, $p < .01$), and subjective treatment progress (OR = 1.02, Wald = 4.13, $p < .05$). However, EXT did not account for variance above and beyond that already explained by the AGG scale on any of the examined criterion variables.

In terms of global performance, dimensional analyses of the theoretically relevant PAI scales are informative in terms of whether scores are meaningfully related to relevant criteria. However, given that clinical decision making in many instances may be categorical (e.g., whether someone is referred for an anger management intervention or not), it is also useful to consider the utility of specific cut scores in relation to criterion measures. Therefore, we replicated the preceding analyses with suggested AGG, ANT, BOR, EXT, and TPI cut scores (T score ≥ 70) for those outcome variables that they significantly predicted at the bivariate level (see Table 3). Morey (1991) suggested that a T score of 70 or more can be a useful indicator of the presence of a clinically significant problem, given its departure from the average T score (i.e., 50) in the PAI community normative sample. As can be seen in Table 3, most of the odds ratios for these analyses were in the 1.50–2.50 range.

Interpersonal Style: Interactive Effects

Although few significant bivariate effects were noted for DOM and WRM, prior research (Doyle & Dolan, 2006; Edens, 2009) and theory (e.g., Wiggins, 1982) suggest potential interactive effects between these dimensions and various behavioral indicators. For example, the conjunction of high dominance with low warmth tends to be especially prevalent among offenders who are at greater risk for institutional misconduct. As such, we conducted logistic regressions in which we entered both scales on the second step (after site on the first step) and then their interaction (multiplicative) term on a third step. The interaction term on the last step was a significant predictor of the following criterion measures: general noncompliance (Wald = 6.23, $p < .05$), aggressive acts (Wald = 7.23, $p < .01$), and objective treatment progress ratings (Wald = 5.11, $p < .05$); there was a nonsignificant trend for the interaction to predict subjective treatment ratings as well (Wald = 3.29, $p = .07$).

Next, we examined group-level DOM/WRM classifications examined in prior investigations (e.g., Edens, 2009; Edens & Ruiz, 2005) of the PAI's interpersonal style scales (i.e., DOM $\geq 55T$

⁴ Examination of multicollinearity statistics demonstrated that all intercorrelations among scales were within an acceptable range.

Table 3
Regression Models Predicting Outcome Variables Using Suggested Cut Scores for Personality Assessment Inventory Scales

Outcome type	Wald(1)	OR	95% CI
General acts of noncompliance			
AGG \geq 70	8.21	2.07**	[1.26, 3.40]
ANT \geq 70	3.07	1.55	[0.95, 2.53]
Disruptive behavior			
AGG \geq 70	10.01	2.32**	[1.38, 3.92]
ANT \geq 70	7.22	2.29**	[1.25, 4.20]
BOR \geq 70	5.54	1.89*	[1.11, 3.21]
TPI \geq 4 (65T)	3.94	1.88*	[1.01, 3.49]
EXT \geq 70	5.38	2.12*	[1.12, 4.00]
Aggressive acts			
AGG \geq 70	11.61	2.80**	[1.55, 5.05]
ANT \geq 70	8.02	2.79**	[1.37, 5.69]
BOR \geq 70	4.20	1.86*	[1.03, 3.37]
EXT \geq 70	5.08	2.42*	[1.12, 5.23]
Subjective treatment ratings			
AGG \geq 70	6.87	1.94**	[1.18, 3.18]
ANT \geq 70	3.00	1.55	[0.94, 2.55]
BOR \geq 70	2.10	1.42	[0.88, 2.27]
EXT \geq 70	4.90	1.83*	[1.07, 3.12]
Objective treatment ratings			
AGG \geq 70	9.17	2.32**	[1.35, 3.99]
BOR \geq 70	1.38	1.37	[0.81, 2.29]

Note. AGG = Aggression scale; ANT = Antisocial Features scale; BOR = Borderline Features scale; EXT = Externalizing scale; TPI = Treatment Process Index; OR = odds ratio; CI = confidence interval.
 * $p < .05$. ** $p < .01$.

indicating a relatively more forceful and controlling style and $WRM \leq 45T$ indicating a relatively colder and more distant approach to relationships; see Morey, 2007, for further justification of these particular cut scores).⁵ In terms of general acts of noncompliance, WRM moderated the relation between DOM and this outcome, in that those who scored higher on DOM and lower on WRM were disproportionately at risk (60%), whereas those who scored high on DOM but also high WRM were at lower risk (39%) for general noncompliance. Generally similar effects were noted for aggression, with these group classifications identifying a subgroup of high-DOM-score individuals who were disproportionately likely to commit aggressive acts (31%)—but only among those with low WRM scores. Those with higher WRM scores in conjunction with higher DOM scores had a lower rate of aggressive acts (16%) that were comparable to the rates of the remaining two groups with lower DOM scores (low DOM with low WRM [15%] and low DOM with high WRM [14%]). The group-level results for objective treatment progress indicated that high DOM/low WRM individuals were at greater risk for not completing the highest program level before terminating treatment (48%) relative to those who were high DOM/high WRM (31%) and low DOM/high WRM (26%), although, somewhat surprisingly, those who were low DOM/low WRM were also at relatively high risk for not progressing to the highest level of treatment (53%).

Supplementary Analyses

A final series of regression analyses compared the incremental validity of the interpersonal scales and AGG in relation to the

prediction of general noncompliance, aggressive acts, and objective treatment progress. To briefly summarize, when AGG was entered into the regression on a preceding step, in each instance, the $DOM \times WRM$ interaction term continued to be a significant subsequent predictor ($p < .05$), with the amount of variance explained being somewhat attenuated relative to the regression model not including AGG on the preceding step. When the order of entry was reversed (DOM, WRM, and their interaction term entered preceding AGG), AGG continued to be a significant predictor of general noncompliance, aggressive acts, and treatment progress (objective), with relatively minimal decreases in the amount of variance explained compared with when AGG had been entered alone.

Discussion

Our aim in this study was to examine the basic and incremental validity of select PAI indicators of treatment motivation, psychopathology, and interpersonal style to predict treatment-related behavior and progress among substance abusers. In particular, we wished to ascertain the extent to which narrowband dimensions of psychopathology derived from the PAI, such as the AGG scale, might afford additional predictive validity for treatment-related variables, above and beyond broadband dimensions of psychopathology, such as a generalized externalizing dimension (see Weiss et al., 1998).

Certain key findings were generally encouraging, particularly for the AGG scale and the interpersonal style scales ($DOM \times WRM$), in relation to problematic treatment behavior and outcome. The bivariate performance of AGG in this study was for the most part consistent with earlier research suggesting that it operationalizes a construct relevant to future aggression among those involved with the criminal justice system (e.g., Edens & Ruiz, 2005, 2009; Wang et al., 1997), although this is one of the first studies to demonstrate incremental predictive validity relative to ANT in relation to these types of criterion measures (cf. Walters et al., 2003).⁶ This finding suggests that treatment decisions that incorporate PAI data may not benefit from considering the additive effects of ANT and BOR above and beyond AGG, although, again, other studies have suggested that ANT displays incremental utility beyond AGG in relation to aggressive conduct and rule-breaking behavior (Hopwood et al., 2008).

In terms of the performance of the broadband internalizing and externalizing scales, the pattern of results for EXT at the bivariate level was for the most part similar to those of the lower order PAI scales, particularly AGG. After controlling for variance explained by AGG in the multivariate models, EXT was not uniquely related

⁵ Analysis of the significant interaction between DOM and WRM continuous scale scores via methods outlined by Aiken and West (1991) yielded a pattern of results consistent with the findings detailed above concerning specific cut scores examined in prior research.

⁶ Analyses for the dichotomized PAI scale scores produced odds ratios for many of the corresponding significant PAI indicators that were in a range (~ 2.0) typically considered indicative of a practically meaningful statistical effect (Fleiss, Williams, & Dubro, 1986). For example, among those individuals with scores of 70T or more on AGG, 27% engaged in aggressive behavior during treatment, whereas only 12% of those with scores below 70 engaged in such behavior.

to any of the criterion variables, whereas the AGG scale explained unique variance beyond EXT for all four examined criterion variables. From a conceptual perspective, this pattern of findings is consistent with the principle that narrowband constituent elements of overarching broadband constructs may provide information that is distinct from the broadband level of conceptualization. From a practical perspective, the failure of EXT to contribute unique variance beyond that already explained by aggressive tendencies per se offers little support for the position that it might improve on the predictive utility of lower order PAI scales (especially AGG), at least in the present sample.

The present findings do not imply that the broadband EXT dimension contains no unique information above and beyond the narrow band AGG dimension, but it does suggest that to the extent the former dimension is predictive of treatment-related variables, it may be due largely or entirely to the inclusion of content relevant to aggression proneness. These results are somewhat inconsistent with previous findings that have reported covariation between the externalization dimension and indicators of disinhibition, such as institutional misconduct (e.g., Krueger, Markon, Patrick, & Iacono, 2005; Ruiz & Edens, 2008)—although prior research has not examined unique variance in externalization separate from aggressive tendencies per se.

In terms of the interpersonal scales, our findings that high dominance and low warmth were related to noncompliance, aggressive acts, and poor treatment progress also are generally consistent with earlier studies with offender samples (Doyle & Dolan, 2006; Edens, 2009). The findings diverge somewhat from those of Edens (2009), in that treatment outcomes in that study were uniquely predicted by DOM, although the rates of failure were quite low overall and the samples examined (incarcerated sex offenders and prerelease prison inmates) differed from those in this study. It is also noteworthy that the effects we obtained were independent of the variance explained by AGG, suggesting that there may be some merit in considering both interpersonal style and aggressive tendencies (additively) when forecasting treatment-related behavior and progress.

Surprisingly, the two PAI indicators developed explicitly to provide information relevant to treatment process and outcome were not significantly predictive of either treatment progress variable. The only statistically significant association between either of these indicators and outcomes was between the TPI composite indicator and disruptive behavior. As such, our data do not suggest that RXR or TPI are likely to be especially beneficial when forecasting who is likely to have a difficult course of treatment. In addition to RXR having relatively low internal consistency in these data, both RXR and TPI were significantly positively skewed in our sample: Most participants obtained very low scores on these measures, as would be expected among most individuals in treatment. Prior research has suggested that RXR in particular seems to differentiate those seeking treatment from those not (e.g., Alterman et al., 1995), but, once they are in treatment, low scores do not seem to be especially informative about how treatment is likely to unfold—at least in relation to the criterion measures we examined.

What are the implications of our findings for clinical decision making? Our results suggest that the PAI—particularly the AGG scale—helps to identify individuals who are relatively more likely to misbehave in treatment and/or are less likely to complete treatment. Our findings also suggest that exclusive reliance on

broadband dimensions, such as EXT, may overlook important predictive outcomes when using the PAI and perhaps other omnibus measures of psychopathology. Still, individuals with high AGG scores may have been significantly less aggressive in these treatment programs than they would have been outside of them, and they also may be as likely as anyone else to benefit from treatment by showing reduced risk for reoffending. In fact, an extensive body of research suggests that high-risk offenders with dense histories of past misbehavior are precisely the ones who should be targeted for intensive correctional treatment (Andrews & Bonta, 2010; Skeem, Polaschek, & Manchak, 2009). Our results suggest that some PAI scales (e.g., AGG, high DOM and low WRM) can be used to identify individuals who may require more extensive treatment engagement efforts, substantial patience, and relatively intensive treatment.

Although we believe our results are informative, limitations should be noted. First, our results are specific to men and their generalizability to women is an open question. Prior research has suggested that the predictive utility of the PAI for justice-involved men and women is generally similar, although not identical (Skopp, Edens, & Ruiz, 2007). Second, our participants had spent varying amounts of time in the treatment program prior to being recruited into our study. Although days in treatment prior to recruitment did not strongly impact any of our findings, it would nonetheless be preferable methodologically to have the PAI administered as individuals begin treatment. Additionally, because participants were assured of confidentiality, there is some question as to whether they might have responded somewhat differently than if the PAI had been administered as part of (nonconfidential) routine clinical procedures (cf. Edens & Ruiz, 2006). Items comprising the AGG scale, for example, are highly face valid and could be easily distorted if respondents wish to deny or minimize these characteristics.

These limitations notwithstanding, the results of this research globally suggest that the PAI may provide clinically useful information concerning who is more likely to engage in problematic behavior while in treatment and less likely to successfully complete substance treatment services. The AGG scale in particular showed promise in this regard and demonstrated some evidence of unique predictive validity beyond other theoretically relevant indicators, including a broad externalizing dimension of psychopathology. Analyses of interpersonal style also suggested that the conjunction of high dominance and low warmth may be important indicators of treatment process and outcome, even beyond aggressive tendencies. Given the deleterious effects of substance abuse and dependence in society and the criminal offending that may be associated with them, we hope our findings stimulate further research into these clinically and theoretically important issues.

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