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WHICH CRIMINOGENIC NEED CHANGES ARE MOST IMPORTANT IN PROMOTING DESISTANCE FROM CRIME AND SUBSTANCE USE?

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Abstract

Andrews and Bonta identified the following criminogenic needs as important to reducing offending: substance use, antisocial cognition, antisocial associates, family and marital relations, employment, and leisure and recreational activities. This study examines dynamic criminogenic need changes across a 12-month period and identifies which need changes are the best predictors of criminal offending and illicit drug use among a sample of drug-involved probationers who participated in an intervention ($N = 251$). Probationers had significant changes in several need areas, and treatment participation moderated some changes. Probationers who had reductions in criminally involved family members they associate with, improved work performance, and decreased alcohol use had the greatest reductions in offending. Those who increased time spent engaged in leisure and recreational activities were less likely to self-report subsequent drug use. These findings suggest that certain dynamic need changes may be more important than others, and designing interventions to impact these needs might improve outcomes.

Keywords

risk–needs–responsivity (RNR); criminogenic needs; offender rehabilitation; probation; substance use

INTRODUCTION

The risk–need–responsivity (RNR) model is based on the premise that tailoring treatment and controls for offenders should be based on criminal justice risk and criminogenic need factors that are related to offending behaviors. Assigning the appropriate dosage, type of controls, and correctional programming will facilitate reductions in criminal offending. The underlying theory is that offending is a product of the history of criminal justice involvement and specific criminogenic needs. By attending to dynamic criminogenic needs through proper treatment and control programming, one can affect offending behavior. Empirical support exists for the conceptual model, including studies that document differential recidivism rates by (a) risk level (Andrews & Bonta, 2010; Hanson & Morton-

Bourgon, 2009; Lowenkamp, Latessa, & Holsinger, 2006; Thanner & Taxman, 2003) and severity of criminogenic needs (Vieira, Skilling, & Peterson-Badali, 2009), (b) assignment of high- and moderate-risk offenders to different treatment programs (Latessa & Lowenkamp, 2006; Marlowe, Festinger, Lee, Dugosh, & Benasutti, 2006; Taxman & Thanner, 2006; Thanner & Taxman, 2003), (c) number of criminogenic needs targeted by an intervention program (Dowden & Andrews, 1999; Gendreau, Little, & Goggin, 1996), and (d) differential correctional programming that targets criminogenic need areas (Dowden & Andrews, 1999; McGuire, 2004).

While most criminogenic needs are identified by aggregate (group) change, Farrington (2007) argues that research should identify causes of desistance through analyses of within-individual changes. As such, individual-level analyses are needed to accurately estimate the effect of change on offending patterns. Despite calls for longitudinal studies, research in the area of offender change tends to be cross-sectional or derived from program evaluations with limited observational points. The relatively weak literature base leaves many questions unanswered, such as in what need areas *can* people change and during what time frame?

With nearly 4 million people under probation in the United States (Maruschak & Parks, 2012), it is important to explore how offenders' needs change within their first year of supervision, when recidivism risk—and the expectation for the offender to succeed—is the highest (Byrne, 2009; Langan & Levin, 2002). An understanding of how likely it is that needs can change, and the impact on criminal involvement, is critical to guiding the development of effective supervision and the growing literature base on effective correctional practices. In addition, such an understanding could address the unanswered questions about realistic expectations for how long it takes probationers to change in key areas.

This article is devoted to exploring changes in criminogenic needs in the areas of substance use, antisocial cognition, antisocial associates, family and marital relations, employment, and leisure and recreational activities during probation, and its impact on offending and drug use among drug-involved probationers. The data for the present study come from a multisite trial for substance abusing offenders. This research uses panel data observed at four time points in 12 months to assess which criminogenic needs are amenable to change and the impact of need changes on recidivism and illicit drug use within in a 6-month window. The implications from this study for designing interventions and future research are discussed.

WHAT DO WE KNOW ABOUT CRIMINOGENIC NEEDS?

Andrews and Bonta (2010) contend that, “[d]ynamic predictors (dynamic risk factors) are ones on which assessed change is associated with subsequent criminal behavior” (p. 27). Cross-sectional studies generally report that criminogenic needs are related to recidivism. Overall, a limited literature base exists on how offenders change over time, and how these changes affect recidivism.¹ One study conducted by Schlager and Pacheco (2011) examined

¹Arnold (2007) examined the technical violation rate for a cohort of probationers using total Level of Service Inventory–Revised (LSI-R) score, but the findings are difficult to interpret. The study did not control for time between observation points, which ranged from a few days to several years, with a mode of 6 months.

changes within criminogenic needs at two data points: baseline (entering a community-based corrections program) and then 6 months later, using the Level of Service Inventory–Revised (LSI-R) instrument for a sample of parolees. The study found that parolees changed significantly over this short time period in six criminogenic need areas measured by the LSI-R; the only areas where change did not occur were substance use and emotional well-being. Schlager and Pacheco, however, did not examine how these changes affected post-supervision outcome behaviors, such as recidivism, drug use, stable employment, or technical violations, limiting the ability to understand which of these individual-level changes affect outcome behaviors of concern.

Raynor (2007) examined the effect of need changes on subsequent offending by assessing changes in the cumulative LSI-R score (not individual subscales associated with specific criminogenic needs) and reconviction for a new crime in 360 probationers. This study found that those who increased in total LSI-R score were more likely to be reconvicted of an offense (67% of those who had score increases) than those who decreased in their total LSI-R scores (42% of those who had score decreases) during a 24-month period. While this study found that changes in the total LSI-R score can occur over time, the study did not specify the particular need areas that contributed to better or poorer outcomes. The question of which dynamic criminogenic needs are important to fostering positive outcomes remains unanswered. In the following section, we briefly overview the available research on each area of criminogenic need and on the types of interventions that facilitate offender change. While a meta-analytical review of this material might be desirable, it is outside the scope of this study where the emphasis is on trying to provide a foundation for the research questions regarding short-term need changes that affect criminal offending and drug use.

ANTISOCIAL COGNITIONS

Antisocial cognitions, or antisocial thought patterns, that reinforce participation in criminal activity (Walters, 1990) is a well-recognized criminogenic need. Antisocial cognitions, such as justification and rationalization, have shown to be associated with criminal history (Healy & O'Donnell, 2006; Palmer & Hollin, 2004). Walters (1995, 2003) and Henning and Frueh (1996) offer that cognitive thinking errors reinforce criminal lifestyles through self-interest, minimization of prosocial activities, denial of responsibility for behavior, and pleasurable or deviant thoughts about criminal activity.

Recent strategies to improve our understanding of criminal thinking patterns have focused on instruments to measure thinking errors, such as the Psychological Inventory of Criminal Thinking Styles (PICTS; Walters, 1995), Criminal Thinking Scale (CTS; K. Knight, Garner, Simpson, Morey, & Flynn, 2006), Criminal Delinquency Scale (CDS; Le Blanc et al., 1996), and Criminal Cognition Scale (CCS; Tangney et al., 2012). Some analyses of the PICTS illustrate that a score can change over time, but there is not a clear indication of whether this is a result of treatment or maturation. For instance, Walters (2003) found an increase in PICTS scores among incarcerated offenders who have a minimal criminal history, which may derive from a prisonization effect or the negative psychological effects of imprisonment. Taxman, Rhodes, and Dumenci's (2011) report found that an abbreviated PICTS scale, the CTS, is highly correlated to self-efficacy instead of criminal cognitions. As

few predictive validity studies have been conducted in the area of criminal thinking, and given the dearth of studies with more than two observation points, the relationship between criminal cognitions and recidivism has not been clearly demonstrated.

The focus on measuring criminal thinking and its impact on changes in offender outcomes is different from the concerns raised about offenders improving their thinking patterns to disrupt or avoid criminal behavior. Interventions designed to restructure cognitions (such as problem-solving skills and cognitive patterns) typically focus on examining and then changing thought patterns. A quasi-experimental study of the *Thinking for a Change* curriculum, a well-known intervention to facilitate such cognitive changes, found that offenders exposed to this curriculum were less likely to be rearrested than others (Lowenkamp, Hubbard, Makarios, & Latessa, 2009). The study did not directly measure criminal thinking, antisocial cognitions, character patterns of offending behaviors, or motivation to change. It is unclear whether the key mechanism of antisocial cognition is altered by participation in this or other cognitive behavior interventions focused on criminal thinking.

ANTISOCIAL ASSOCIATES

A well-known criminological theory is differential association, whereby offenders associate with those who engage in criminal behavior. Time spent with deviant peers increases offending behaviors by providing the techniques, motives, and reinforcement for committing crime (Sutherland, 1947). Studies continue to find that a close relation with deviant peers and isolation from prosocial peers affect drug use and criminal involvement (Haynie, 2003; Oxford & Lee, 2011; Simons & Robertson, 1989). Studies on social networks have found that peer affiliations and friendship networks can change over time (Giordano, Cernkovich, & Holland, 2003; Hawkins & Fraser, 1987; Warr, 1998; Wright & Cullen, 2004). Certain life events can facilitate such changes in networks, such as drug treatment (Gottfredson, Najaka, & Kearley, 2003; Wilson, Mitchell, & MacKenzie, 2006), employment (Kazemian, Farrington, & Le Blanc, 2009), and marriage (Laub, Nagin, & Sampson, 1998; Sampson, Laub, & Wimer, 2006).

With few exceptions, research on antisocial peers generally occurs in studies of adolescents that continue to find that delinquent peers associate with other delinquent peers (Fergusson, Swain-Campbell, & Horwood, 2002; Giordano et al., 2003; Monahan, Steinberg, & Cauffman, 2009; Warr, 1998; Wright & Cullen, 2004). Fergusson and colleagues (2002), using data on a birth cohort of 1,265 New Zealand youth followed from 14 to 21 years old, found that increases in deviant peer relations were significantly associated with increasing rates of crime and drug use. Similarly, Wright and Cullen (2004) found that deviant peers were the strongest predictor of criminal conduct as compared with employment or friendship networks. As youth age, it appears that pathways such as marriage, employment, and other maturation events diminish the effect of antisocial peers for some offenders (Warr, 1998; Wright & Cullen, 2004). A literature search did not yield any intervention studies that directly examined how changes in social networks affect offender outcomes among adults.

FAMILY AND MARITAL RELATIONS

Strong family relations are important to reducing offending behavior (Berg & Huebner, 2011; Petersilia, 2003; Visher & Travis, 2003) and substance use (Havassy, Wasserman, & Hall, 1995; D. K. Knight & Simpson, 1996). Family ties are believed to reduce offending by serving as a protective factor to insulate from criminal influences, as well as provide emotional support and facilitate the change process. D. K. Knight and Simpson (1996) found, in a sample of 439 heroin users, that a decline in family conflict occurred simultaneously with reductions in illicit substance use, injection drug use, and criminal behavior. Cobbin, Huebner, and Berg (2012) found that strong, prosocial family ties were associated with a decline in criminal behavior among men and women with more prior convictions.

Less consistent empirical evidence exists for the relationship between residing with a significant other and desistance. Residing with a spouse has been shown to decrease the likelihood of crime among a sample of probationers (Li & MacKenzie, 2003; Li, Priu, & MacKenzie, 2000; MacKenzie & Li, 2002). Horney, Osgood, and Marshall (1995) examined how monthly changes in local life circumstance affect offending behavior and found that residing with a girlfriend significantly increased the likelihood of criminal involvement, but residing with a wife decreased the probability of committing an assault. Li and colleagues (2000) found that residing with a significant other was associated with a decrease in violent offenses, but was unrelated to property crime. In a study of women offenders, Griffin and Armstrong (2003) found that residing with a partner decreased the odds of involvement in nondrug crimes but increased drug-dealing behaviors. Some residential patterns of offenders may decrease some crimes, but increase other criminal behaviors. Studies on participation in drug treatment or criminal thinking interventions have not shown any direct effect on family relations, or how family relations moderate offending behaviors.

WORK AND SCHOOL

The relationship of work and education to offending behavior is unclear. Recent studies have found that employment is unrelated to subsequent offending behaviors, even in transitional employment programs designed to assist offenders obtain a job (see Bushway & Apel, 2012; Hepburn & Griffin, 2004). While employment is considered a pathway to desistance (Sampson & Laub, 1993; Tripodi, Kim, & Bender, 2010), empirical studies examining the effects of employment on recidivism are contradictory. Li and MacKenzie (2003) found that attending school or having a job increased criminal involvement among female probationers, but decreased offending among males. A meta-analysis conducted by Wilson, Gallagher, and MacKenzie (2000) found that prisoners who participate in prison-based education or vocation prison programs have higher employment rates and are less likely to recidivate upon release than nonparticipants.

Longitudinal studies have found more positive outcomes when employment is stable, which differs from studies that examine employment status (such as employed/not). Kazemian and colleagues (2009), using data from the Cambridge Study in Development (a longitudinal study of British working-class males) and the Montreal Two Samples Longitudinal Study (French-Canadian adjudicated males), found that employment instability was a predictor of

criminal involvement in adulthood in Cambridge data, but it was not so for the males in the Montreal data. Piquero, MacDonald, and Parker (2002) analyzed data on parolees from the California Youth Authority over 7 years post-release and found that employment overall had no impact on offender outcomes and within-individual changes in employment (employed full-time vs. not employed full-time) were unrelated to arrests.

LEISURE ACTIVITIES

“Idle times make idle hands” is an old adage that Andrews and Bonta (2010) report is related to criminal behavior. Involvement in prosocial activities reduces delinquency in youth (Agnew & Petersen, 1989; Mahoney & Stattin, 2000; Yin, Katims, & Zapata, 1999), but it is unclear whether this pattern holds for adults. Most of our knowledge about leisure and recreational activities and offending in adult populations derives from validation studies of the LSI-R, an instrument that contains a subscale on leisure and recreational activities. This scale measures participation in organized, prosocial activities and the client belief that his free time could be better spent. Former inmates and probationers who self-report fewer recent leisure and recreational activities on the LSI-R are more likely to recidivate than those who report more frequent engagement in these activities (Girard & Wormith, 2004; Palmer & Hollin, 2007). Another study found no differences in LSI-R leisure and recreational activities scores between those who committed parole technical violations and those who did not (Simourd, 2006). No known intervention studies have examined the effect of change in leisure and recreational activities on crime-related outcomes.

SUBSTANCE USE

The prevalence of alcohol and drug use is 4 times higher among offenders than in the general population (National Institute of Justice, 2010; Substance Abuse and Mental Health Services Administration, 2011). Even though there is little knowledge about the drug-crime nexus (White & Gorman, 2000), research suggests that drug use affects recidivism. A meta-analysis found that the odds of criminal involvement are nearly 3 times higher for active users and that the likelihood of offending may be mediated by the type of drug used (Bennett, Holloway, & Farrington, 2008). Evaluations of substance abuse treatment programs have generally established treatment as an effective tool at reducing drug use and crime (Prendergast, Podus, Chang, & Urada, 2002; Wilson et al., 2006).

Longitudinal studies on changes in drug use and crime seem to suggest that the two behaviors are mutually reinforcing. Welte, Barnes, Hoffman, Wieczorek, and Zhang (2005) found that men aged 16 to 19 years old who consumed alcohol more frequently have higher rates of criminal behavior, but current drug use was unassociated with criminal involvement. More alcohol use and substance involvement at later follow-up periods continued to have a significant, positive effect on offending trajectory. Other longitudinal studies on drug use over time found that those with drug involvement are more likely to be arrested (Uggen & Kruttschnitt, 1998) and have illegal earnings (Uggen & Thompson, 2003). Drug use may also increase the likelihood of certain types of crimes over others (Li et al., 2000).

LIMITATIONS OF PRIOR LITERATURE AND THE PRESENT STUDY

The criminogenic needs literature identifies several changeable factors that are predictive of offending behaviors. While studies have suggested that short-term need changes may occur in less than 12 months (for instance, Jensenius, 2008; D. K. Knight & Simpson, 1996; Walters, 2003), extant studies have only reviewed a few of the criminogenic needs that are theoretically important to reducing criminal involvement. As discussed hereinbefore, these studies have not adequately linked these changes with reductions in offending and drug use. The available literature is less clear as to which changes in needs produce the greatest declines in offending, and how fast dynamic risk factors may change. The purpose of the present study is to identify which dynamic need changes account for reductions in drug use and criminal offending among drug-involved probationers during a 12-month period.

The present study builds on prior literature in several ways. First, this study examines the effect of changes across several criminogenic factors on two outcomes: criminal and substance use behaviors. Most studies tend to examine each factor individually. A review of the literature yielded 12 studies that examined more than two criminogenic needs areas at once,² with 7 studies derived from three data sets. Three studies examined four criminogenic needs in concert (Kazemian et al., 2009; Uggen & Kruttschnitt, 1998; Uggen & Thompson, 2003). The multivariate models are limited, given that they do not include other criminogenic needs as either control or independent variables, which may result in biased parameter estimates (Weisburd, 2001). For example, in Sampson and Laub's (1993) longitudinal study of 1,000 men, they found that a strong attachment to a spouse discourages criminal behavior. Warr (1998) tested a rival explanation by examining how two factors—association with deviant peers and marriage—affect criminal behavior. Warr found that marriage was a predictor of desistance from crime, but when delinquent peers were included in the model, marriage was no longer a significant factor. Even though this study's sample and measurement of desistance differed from Sampson and Laub (1993), Warr demonstrated that the transition of marriage was accompanied by a considerable decline in time spent with delinquent peers, and that this relation largely explained the relation between marriage and criminal behavior. Similarly, Maume, Ousey, and Beaver (2005) found that marital attachment did not predict desistance from marijuana use after controlling for time spent with deviant peers. It is likely that some criminogenic needs serve to mediate the relationship between other dynamic needs and criminal behavior.

Second, most research on dynamic criminogenic need changes draws from the life-course literature (Blokland & Nieuwebeerta, 2005; Sampson & Laub, 1993; Sampson et al., 2006), which tends to use longer observation periods (several years or decades) instead of short time frames. The use of short time intervals, such as a 12-month period in the present study, allows for the ability to identify more abrupt changes on these key factors and the influence of fast-changing needs on outcomes. In addition, the value of multiple data points is highlighted by Kazemian and colleagues (2009), "[b]ecause only two data points were used

²See Capaldi, Kim, and Owen (2008); Griffin and Armstrong (2003); Horney, Osgood, and Marshall (1995); Li and MacKenzie (2003); Li, Priu, and MacKenzie (2000); Kazemian, Farrington, and Le Blanc (2009); MacKenzie and Li (2002); Piquero, MacDonald, and Parker (2002); Uggen and Kruttschnitt (1998); Uggen and Thompson (2003); Warr (1998); and Wright and Cullen (2004).

... it was not possible to determine whether changes occurring in offending habits were gradual or abrupt” (p. 397). Horney, Osgood, and Marshall (1995) suggested that the fundamental processes that produce short-term changes may be the same processes that govern changes over the life course. More studies are needed to better understand how short- and long-term processes affect desistance.

Third, while studies tend to assess the degree to which criminogenic needs affect the desistance process, they often fail to explicitly discuss or measure the effect of *change* among criminogenic needs on outcomes. For instance, Griffin and Armstrong (2003) measured change in circumstances using the rate of months employed, but this measure does not distinguish the direction of change and its relation to offender outcomes. As summarized by Farrington (2007),

it is more relevant to demonstrate that offending decreases within individuals after getting married, getting a job, or moving house (Farrington, 1988) than to demonstrate lower offending rates of married compared with unmarried people, employed versus unemployed people, and so on. (p. 126)

The present study is designed to answer this call to assess individual-level changes in criminogenic needs on offending and substance abuse. By controlling for variables that may otherwise confound the findings of prior studies, the present study determines which criminogenic need changes are responsible for the greatest reduction in offending and substance use, as well as how treatment participation influences these changes. And most important, this research differentiates between the existence of dynamic criminogenic needs and changes in such needs on offending and drug use behaviors.

METHOD

SAMPLE

This research relies on data from a randomized clinical trial that was conducted at three probation offices in Maryland to compare a seamless probation-treatment process and traditional probation referral with community-based treatment services. Those probationers randomized to the seamless system group received on-site assessment of treatment needs, 18 sessions of intensive cognitive-behavioral therapy, goal-setting sessions (i.e., identified desirable goals) administered by their probation officer and treatment counselor, weekly drug testing, and interaction with the probation officers. The on-site treatment counselors used a manualized protocol shown to implement a level of care shown to generate better outcomes among probationers and the quality of treatment was improved through fidelity assessments during the pilot study (Thanner & Taxman, 2003). The control group received on-site treatment assessment and traditional supervision including a referral to treatment services in the community. As the control group was referred to an array of available community treatment services, the fidelity of the services were not assessed. Participants had to attend a treatment facility that was licensed by the State of Maryland to deliver a sanctioned treatment model (services were provided by a certified counselor). The experiment used criminal justice risk as a blocking factor. To be considered for participation in the study, the individual had to be on probation with substance abuse treatment as a

condition of their sentence for at least 6 months. Participants were excluded from the study if they were on parole or on a specialized caseload (e.g., sexual and violent offenders). The study sample consisted of 251 participants, as described in Table 1.

MEASURES

Participants completed several standardized instruments to gather demographics, psychological indicators, and offending behaviors. All participants were assessed at baseline before treatment began (referred to as Time 1), and at 3 months (Time 2), 6 months (Time 3), and 12 months (Time 4) post-randomization. The study had a high retention rate throughout the follow-up time points (Time 2 = 97%, Time 3 = 95%, Time 4 = 90%), and each participant contributed data at four time intervals, for a total of 1,004 observations.³ Criminogenic needs were measured in six areas: antisocial cognition, antisocial associates, family and marital, employment, leisure and recreational time, and substance abuse. The following section provides a description of how each variable was operationalized, and the analytical plan section details how the measures were transformed to investigate our research questions.

DEPENDENT VARIABLES

Frequency of drug use and criminal offending—Probationers completed life history event calendars to collect data on social bonds, risky behaviors, criminal offending, treatment experiences, and periods of incarceration, where the interviewer asked the client to retrospectively identify on a calendar when this activity occurred over the prior 90 days (Sobell & Sobell, 1992). This instrument was administered during a structured interview that facilitated the accurate recall of life events, using the validated event calendar approach (Horney & Marshall, 1991; Sobell & Sobell, 1992).

The present study used this instrument to obtain the number of days of drug use and criminal offending at each wave. A drug use day is considered any day the client self-reports illicit substance use. Similarly, all self-reported criminal activities were used to measure the number of criminal offending days, excluding illicit substance use, possession of drug paraphernalia, and technical violations of their probation sentence. The number of days the client reported engaging in drug use and criminal offending were adjusted for time spent incarcerated or hospitalized, and then standardized due to varied reporting times so the maximum possible days of drug use and criminal offending for each wave was 90 days (see also Chaiken & Chaiken, 1982; Horney & Marshall, 1991). The number of self-reported drug use and crime days for each wave was calculated as follows: number of days of drug use or criminal behavior/(number of days the client is reporting on – number of days incarcerated or hospitalized) × 90. A client who is asked to self-report on activity over a 100-day period, of which 35 days were spent using illicit drugs and 15 days incarcerated, would have a frequency of drug use calculated as follows:

³While the experiment had low attrition, a mean imputation was used to impute missing values by wave, which allowed us to retain the baseline sample size through all time points analyzed.

$$\begin{aligned}\text{Drug use days} &= 35 / (100 - 15) \times 90 \\ &= (.41) \times 90 \\ &= 37\end{aligned}$$

The total number of drug use and criminal offending days were calculated for each respondent by wave.

CONTROL VARIABLES

To ensure the model was correctly specified, the following relevant control measures were included in the subsequent multivariate analyses.

Study condition—A control variable for the study condition of the participant will be included in the models. A total of 128 clients (49%) were randomized into the control group and 123 clients (51%) into the seamless system group, respectfully coded as 0 and 1.

Static risk at baseline—This study used a static criminal history measure comprised of six items shown to be predictive of future offending (i.e., number of prior arrests, number of probation violations number of incarcerations, and other prior involvement in the justice system; Austin, 2006). This measure is being controlled for because it was a blocking variable in the randomized experiment. High-risk offenders were coded as 1 and low-risk offenders were coded as 0.

Frequency of drug treatment—The life event calendar, discussed hereinbefore, was used to calculate the number of days participating in drug treatment for each wave by treatment type: self-help (e.g., alcoholics and narcotics anonymous meetings), outpatient (e.g., individual or group therapy), or inpatient (e.g., detox and residential treatment). These variables are controlled because it is expected that differences in participation may affect the amount of change that might occur.

Drug dependence at baseline—The severity of drug use was assessed by the Texas Christian University (TCU) Drug Screen, an instrument that is valid and reliable for measuring drug use dependence among correctional-based populations (D. K. Knight, Simpson, & Hiller, 2002). The instrument has nine binary questions that are tallied to determine the TCU Drug Score, where a score of 3 or greater meets diagnostic criteria for drug dependence (D. K. Knight, Simpson, & Morey, 2002).

INDEPENDENT VARIABLES

Antisocial cognition—The CTS was administered to measure criminal thinking in six areas: entitlement, justification, power orientation, cold heartedness, criminal rationalization, and personal irresponsibility (K. Knight et al., 2006). The CTS has shown to have good psychometric properties and have good test–retest reliability among drug-involved offenders (K. Knight et al., 2006). A composite measure of criminal thinking was created for the six months measured by adding individual criminal thinking constructs together ($\alpha > .769$). Participants with higher scores indicate higher levels of criminal thinking.

Antisocial associates—The Orientation of Social Support (OSS) instrument was used to obtain the number of family members and friends within the participant's social network with whom they commit crimes and use drugs (Alemi et al., 2003).

Family and marital relations—The OSS was also used to measure family who were caring and provided emotional support to the participant. In this scale, offenders indicated the number of family members who accept them as they are and the number who provide help. These two items were added together and were averaged to create an indicator of familial support.

Employment—At each assessment, the clients were asked to self-report their total income obtained from employment in the prior 30 days. This measure precluded money received during illegal activities. Income is a more sensitive measure of employment than other measures (see Piquero et al., 2002). No probationers reported being students during this study.

Leisure and recreation time—The Community Assessment Inventory (CAI) was used to measure leisure and recreational time (Brown, O'Grady, Battjes, & Katz, 2004) by totaling the amount of hours spent each week in the following areas: passive activities, social and recreational areas, self-help and productive activities, and family time. This measure excluded time spent using drugs and engaging in criminal activity. It captures aspects of leisure and recreational activities found to be related to criminal involvement among adult populations (Andrews & Bonta, 2010; Palmer & Hollin, 2007; Simourd, 2004).

Substance use—The life history event calendar was also used to obtain two measures of substance use. First, the frequency of alcohol use for each wave was calculated while adjusting for days incarcerated or hospitalized, as discussed hereinbefore. Second, the frequency of illicit drug use for each wave was calculated with the same equation. These two were measured separately.

ANALYTIC PLAN

Identifying changes in needs—To determine if the group-mean criminogenic need levels of the sample significantly change across the 12-month study (four time points), the present study used a one-way repeated-measures ANOVA. As the study relies on data from a randomized controlled trial, criminogenic need changes are examined separately by experimental condition. Measures of criminogenic needs at each of the four time points were used to estimate the ANOVAs. Using the within-individual effects and Bonferroni multiple comparison test to examine the nature of change, the study explored how change occurred. The *F* ratio from the within-subject effects test was used to determine if significant change occurred for the sample over time. If the assumption of Mauchley's test of Sphericity was not met, statistical significance was assessed using the most conservative Epsilon correction, either Greenhouse–Geisser or Huynh–Feldt (Girden, 1992). The post hoc Bonferroni multiple comparison tests were used to determine whether there was a significant difference between time intervals and the direction of change across three time intervals: baseline to 3 months, 3 to 6 months, and 6 to 12 months. The Bonferroni test, which is more conservative

than other post hoc tests and powerful when making a small number of comparisons, was conducted only on variables where the ANOVA repeated measures test was statistically significant.

Moderation-effect of treatment participation on need changes—To examine how treatment participation among probationers moderated group-level changes in criminogenic needs, a series of one-way repeated-measures ANOVA models were used for each criminogenic need with study condition and self-reported treatment days added as between-subject factors. This statistical procedure explores whether probationers change differently by the assigned study condition and the number of treatment sessions attended since randomization (referred to as an interaction effect). For these analyses, the self-reported treatment participation variable, described hereinbefore, was transformed into an ordinal variable based on the 18 treatment sessions that clients were expected to attend over the 12-month study period per the intervention protocol (between the baseline and 12-month interview)⁴: no treatment participation, attended treatment but not fully compliant (fewer than 18 sessions), and fully compliant (at least 18 sessions).

Effect of need changes on outcomes—To determine whether criminogenic need changes predict criminal activity and substance use, the study used conditional change regression models using the generalized estimating equation (GEE) method (Zeger & Liang, 1986). Change in criminogenic needs in 6 months was used to examine the impact on crime and drug use days:

$$\text{Log}(E(Y_{i4} | \mathbf{X}_{i1}, \mathbf{X}_{i3}, \mathbf{Z}_{i3})) = \beta_0 + \beta_1 \mathbf{X}_{i1} + \beta_2 (\mathbf{X}_{i3} - \mathbf{X}_{i1}) + \gamma \mathbf{Z}_{i3} + \varepsilon_{i4},$$

where Y_{i4} is the observed dependent variable of subject i ($i = 1, \dots, 251$) at 12-month ($j = 4$), \mathbf{X}_{i1} is a vector of aforementioned independent variables of subject i at baseline ($j = 1$), \mathbf{X}_{i3} is a vector of aforementioned independent variables of subject i at 6-month ($j = 3$), \mathbf{Z}_{ij} is a vector of aforementioned control variables of subject i at 6-month including the observed dependent variable of subject i at 6-month, and ε_{i4} is a random error. While the repeated ANOVA model focuses on the comparison of the group means, the GEE uses individual-level change. As such, the regression models are able to assess the effect of within-individual-level need changes in 6 months even if the group mean does not demonstrate change. Similar to a regular regression model, GEE uses independent variables at the individual level and provides valid inference on how these independent variables predict to the response variables. In this model, β_0 is an intercept, β_1 is a vector of regression parameters modeling how the independent variables at baseline are related to the dependent variable, the parameter vector β_2 models how changes in independent variables from baseline are related to the dependent variable, and the vector γ is used to model the effects of control variables on the dependent variable. The process of controlling for the 6-month independent variable when estimating the effects of the dependent variable at 12-month follow-up may be interpreted as estimating change in the dependent variable from the 6- to

⁴A separate treatment participation measure was computed to examine the effect of treatment participation on leisure and recreational activities in the ANOVA analyses (treatment variable recalculated to exclude self-help group participation).

12-month interview (Cohen, Cohen, West, & Aiken, 2002; Werts & Linn, 1970). The amount of change in the dependent variable is conditional to the dependent variable at 6 months. Conditional change regression models assess the effect of need changes on the dependent variable at a later time point (12 months) to establish the temporal sequence of events (see Lounds, Seltzer, Greenberg, Shattuck, & MacLean, 2007); if need changes affect crime or drug use, the needs changes must occur prior to the effects on crime and drug use.

As the dependent variables in the present study are count data, a negative binomial distribution was used to model the dependent variables in the GEE model (Gardner, Mulvey, & Shaw, 1995). Although a Poisson distribution can also be used for count data, it requires that the conditional mean be equal to the conditional variance, and such a requirement is not satisfied in our data set. The working independence matrix was used in our analysis as Zeger and Liang (1986) proved that the estimated are unbiased regardless of the choice of working correlation matrix. The GEE model was used instead of the random-effects model because the random-effect model requires appropriate distribution assumptions for the random components. These assumptions are difficult to verify. Under incorrect distribution assumptions, the regression coefficient estimates may be biased and inference on regression coefficients is erroneous (Hubbard et al., 2010).

The changes in each dynamic need measure, which served as covariates in the GEE model, were calculated by using a difference-to-difference score between baseline and 6-month measures to assess change relative to the magnitude of need at baseline. For instance, a client with a criminal thinking measure of 35 at baseline and 45 six months later would have a change score of +10, which signifies an increase in 6 months. Some change scores were reverse coded so negative measures reflect a decrease in dynamic needs. The participant's needs scores at baseline will be added as covariates in the GEE models, because it is necessary to control for baselines when using change scores (Diggle, Heagerty, Liang, & Zeger, 2002).

The distributions of the static and dynamic continuous variables that will be included in the multivariate analyses are provided in Table 2. The table also presents the percent of clients who experienced changes in status between time points for each dynamic measure (e.g., a change in status would be deemed a client whose criminally involved friends changed from five peers at baseline to two peers at 6 months). Multicollinearity was assessed using Pearson and Spearman rank correlation coefficients; there is no evidence of collinearity that would pose an issue in the proceeding analyses.⁵

FINDINGS

CHANGES IN CRIMINOGENIC NEEDS

The repeated-measures ANOVAs presented in Table 3 suggest that probationers are capable of changing their criminogenic needs in a 6-month window. Probationers had significant changes in five of the eight variables examined (three need areas): criminal network of family ($F = 5.3, p < .001$; $F = 7.7, p < .01$) and friends ($F = 8.6, p < .01$; $F = 9.9, p < .001$),

⁵Multicollinearity diagnostics are available by request from Dr. Faye Taxman.

time spent engaging in prosocial activities ($F = 3.4, p < .01$), and alcohol use days ($F = 6.1, p < .05; F = 8.4, p < .001$) and drug use days ($F = 13.7, p < .001; F = 10.2, p < .001$). The Bonferroni post hoc tests suggest probationers had significant need changes in several areas, with change most likely to occur between 6 and 12 months. Clients experience a significant increase in the number of alcohol use days between baseline and 3 months in the control group ($p < .05$). A significant decrease occurs in drug use days between 6 and 12 months for the treatment ($p < .05$) and control ($p < .001$) groups.

TREATMENT PARTICIPATION AS A MODERATOR OF CRIMINOGENIC NEED CHANGES

Table 4 presents the ANOVA results of the interaction effect of study condition and treatment participation on change in criminogenic needs over time. There are significant differences in the rate of change in weekly hours spent engaging in leisure and recreational activities by treatment participation over time ($F = 4.55, p < .01$). Probationers who actively participate in treatment are considerably more likely to spend time engaged in leisure and recreational activities (see Figure 1). While the weekly hours spent engaging in leisure and recreational activities declined for the entire sample over time, probationers who were fully compliant with the intervention's treatment protocol had slight increases in their engagement (and had the highest number of hours spent engaged in activities at the 12-month assessment), unlike those who were treatment noncompliant. The significant treatment \times main effect interaction for drug use days suggests that probationers changed differently in drug use days by level of treatment participation across time ($F = 7.42, p < .001$). Probationers who self-reported more treatment participation days had significantly greater declines in illicit drug use over time, with the participants who attended at least 18 treatment sessions having the most dramatic declines in drug use over the course of the study (see Figure 2). No other interaction affects were statistically significant.

MULTIVARIATE MODELS EXAMINING CHANGES IN CRIME AND DRUG USE

GEE models were conducted to determine if reductions in criminogenic need during the first 6 months of the study predicted declines in later criminal offending and substance use among drug-involved probationers, while controlling for experimental condition and other theoretically relevant covariates. The first model presented in Table 5 explores the influence of criminogenic need changes from baseline to 6 months on change in crime days between 6 and 12 months. The only baseline criminogenic needs measure that was associated with changes in criminal activity was drug use days, with those self-reporting fewer illicit substance use days being significantly more likely to engage in criminal behavior. Changes in criminogenic needs were better able to explain crime-related outcomes than initial need levels at the initiation of the study. Those who experienced decreases in criminogenic needs levels in familial criminal networks, income, and alcohol use from baseline to 6 months were significantly more likely to have a decline in crime days during the later 6 to 12 months. Probationers with more severe drug addictions and those who attended self-help and inpatient treatment sessions were also more likely to experience a decline in crime days reported between 6 and 12 months.

The second model presented in Table 5 explores the influence of criminogenic need changes over the initial 6-month window on change in illicit substance use days reported between 6

and 12 months. It appears that criminogenic need levels and changes in these needs were poorer predictors of drug use outcomes than criminal activity. Among the criminogenic need measures, only changes in leisure and recreational activities for the initial 6 months were significantly associated with substance use changes between months 6 and 12. Probationers who increased time spent engaging in leisure and recreational activities in the first 6 months had declines in illicit substance use later on (the last 6 months).

DISCUSSION AND CONCLUSION

Although previous research demonstrates that offender change can occur (and that treatment is effective), a gap occurs in the research about the areas in which individual-level change in criminogenic needs can facilitate reductions in recidivism. The lack of cross-sectional studies and dearth of longitudinal studies in this area limits the development of evidence-based rehabilitative programming. The present study uses panel data on a sample of drug-involved probationers, analyzed at the group (ANOVA analysis) and individual (GEE analysis) levels, to inform the change literature in three significant ways. First, this research determined that significant changes in criminogenic needs can occur over a 12-month period, with more change occurring in the 6- to 12-month period. But, reductions in drug use days and alcohol use days, along with reductions in family criminal networks and increases in licit income, during a 6-month period are more likely to accelerate recidivism reductions. Second, the study examined whether treatment participation and study intervention moderated criminogenic need changes. Third, the study explored whether within-individual-level changes in needs are linked to changes in offending and substance use. It appears that *changes* in criminogenic needs from baseline measures are more predictive of change than the initial needs presented at baseline.

Findings from this research contribute to the knowledge about offender change. Offenders as a whole are capable of change across varied criminogenic need domains during a 12-month time frame in several theoretically relevant areas. During this period, drug-involved probationers experienced the most substantial changes in substance use patterns and affiliation with antisocial family members. This finding reinforces the importance of drug-involved probationers to be involved in treatment programs because it is likely that participation in treatment can facilitate these changes, which have a collateral impact on reductions in offending.

Perhaps this finding suggests that some need areas are more difficult to change than others, or that the treatment programs did not adequately target the associated behaviors to facilitate change in the other need areas. As shown in the ANOVA models, meaningful changes in many of the criminogenic needs are unlikely to occur in a 6-month window, but appear to be obtainable within 12-months in the present study. Some need changes may occur at later points or they could be a function of other changes that create opportunity structures for change. It is likely that some changes occur in clusters or that some changes may trigger other needs that are then more susceptible to change. Future studies should further develop our understanding of time-dependent need changes, and identify individual-level factors that accelerate change. Empirical research to this end may also assist correctional agencies in delineating reasonable expectations for probationers over short durations. An explanation for

why offenders did not change in all need areas should also be further explored as it has implications for the development of RNR theory and theoretically relevant interventions.

The study also provided a preliminary inquiry into how the correctional intervention differentially affected need changes. This question is important given the myriad explanations for offender changes (such as maturation or the suppression effect that may occur with probation). The results of this study provide evidence to suggest that factors other than treatment are driving need changes. Participation in treatment accounts for significant change across a few need areas, but there is much room for future research to provide a more nuanced understanding of how aspects of interventions facilitate change. For example, the present study was unable to explore how need changes are affected by the quality and dosage of treatment. Mediator analysis could help identify the direct effect of a single study intervention on need changes. Such a study would be vital to furthering the RNR theory and development of correctional programming as it allows researchers to pinpoint with greater certainty the aspects of interventions that effect change.

The present study provides partial support for the RNR framework, but raises some important questions and considerations for the development of this theory. Some variables (i.e., criminal thinking, antisocial peers) did not perform as hypothesized, which could be a function of the construct or of the measurement of the construct. For instance, ANOVA analysis results indicate that probationers, as a group, do not change significantly in antisocial cognitions. As noted, this may be because it takes people longer to change in this area or that certain criminogenic need areas are more amenable to change at specific times than others. More work is needed to understand the patterns of change in cognitions. Another explanation may be that the selected criminal thinking instrument is not sensitive enough to measure incremental changes in antisocial cognitions or that the instrument may not adequately measure or predict criminal thinking among all types of offenders, such as drug-involved populations (Taxman et al., 2011).

The relative importance of criminogenic needs was found to be dependent on the type of behavior being changed, either offending or substance abuse. This finding is surprising because the RNR model is supposed to be a general theory of criminal conduct, which is intended to explain crime across different types of offenders and demographics. The generalizability of the theory to different types of offenders, particularly substance abusers, should be further explored as it has implications for research and practice. For instance, it may suggest that correctional programming should differentially be targeting criminogenic needs by type of offense the individual committed (e.g., drug use vs. personal crimes).

The RNR model is based on using individual-level factors to assign offenders to the appropriate programming. Criminogenic need change should be assessed and then reassessed to determine the degree of short-term changes that can occur. This information will aid in the development of treatment programs by allowing researchers to (a) develop ways to facilitate long-term change among offenders, and (b) understand how certain types of offenders may change differently. This may be aided by the development of more sensitive risk and need assessment tools. Petersilia (1999) noted that sizable reductions in recidivism will be unobtainable in community supervision programs without a rehabilitative

component. To further this end, rehabilitative programs must also target need areas that empirical research links to desirable outcomes. The RNR theory identifies several criminogenic risk areas, but contends that four static and dynamic needs are the most strongly associated with crime (antisocial attitudes, criminally involved associates, history of antisocial behavior, and criminal thinking; Andrews & Bonta, 2010). This argument was only partially substantiated by the present study as the findings suggest that the type of needs most influential to effecting change may be dependent on the behavior tried to be changed. Future research should use panel data to further explore the influence of each dynamic need area on various offending behaviors to determine if other studies find similar results. This study examined the effect of all dynamic needs in concert because prior research suggests that these factors may be analogous. Understanding how criminogenic needs are interrelated, and to what extent, is beyond the scope of the present study, but is a valuable avenue for research.

There are several limitations of this research that must be acknowledged. First, the study examined changes in needs across only six of the eight central risk/need factors (but recidivism risk would be highly correlated with a measure of history of antisocial behavior). Second, while this research had the advantage of examining short-term change, study participants only reported on their behavior for a 1-year period. Future research would benefit from studies with a similar short time period between assessments, but follow-ups over a longer duration of time. Third, treatment experiences varied greatly across the sample, which prevented the present study from identifying aspects of the intervention that promote change or why the intervention may not have produced its intended aim.

The present study demonstrates that (a) offenders are capable of short-term change, (b) treatment participation may facilitate need changes in certain areas, and (c) need changes are associated with reductions in criminal offending and substance use. The findings from the present study provide further support for the RNR model and continuing this line of inquiry will provide a guide for theoretically relevant interventions and programs. It also suggests the drug-involved offenders may have a differential pattern of changing compared with other offenders under the RNR model.

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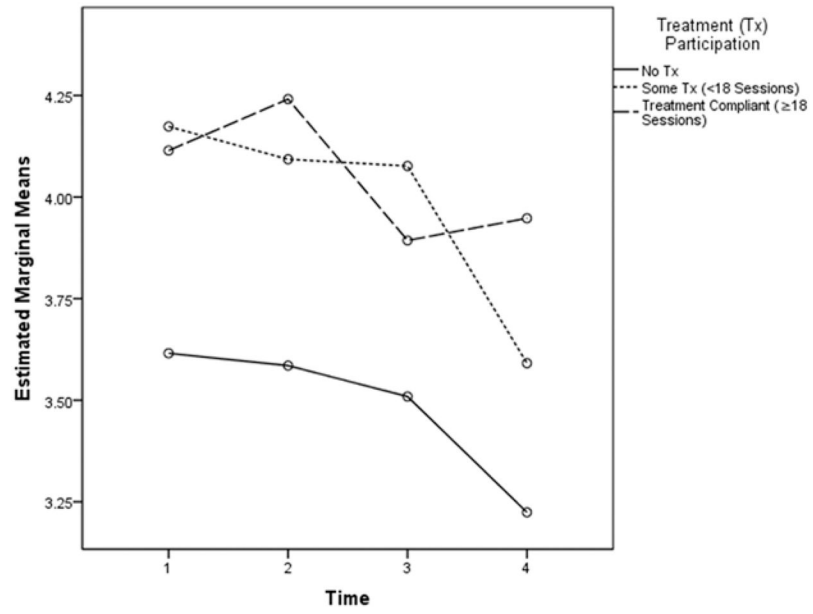


Figure 1. leisure and Recreational activities by level of Treatment Participation ($N = 251$)

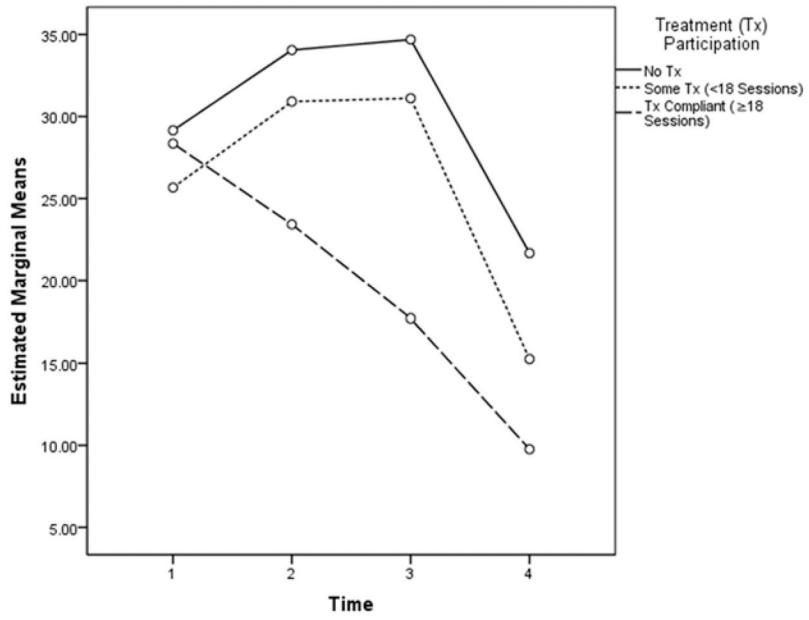


Figure 2. Drug Use Days by level of Treatment Participation ($N = 251$)

Table 1Characteristics of the Study Population at baseline ($N = 251$)

<i>Attribute</i>	<i>Total</i>	
	M	SD
Male	74.5%	
African American	66.5%	
Preferred type of drug used		
Heroin or cocaine	66.4%	
Other drug	33.6%	
Age	36.9	11.5
Years of education completed	11.3	1.7
Drug use score (out of 9)	6.3	6.0
Number of self-reported prior incarcerations	4.9	7.2
Number of self-reported prior substance abuse treatment experiences	2.1	6.2
Number of active crime days in past 90 days	3.5	15.6
Number of active drug use days in past 90 days	28.1	20.3
Number of treatment days in past 90 days	2.0	9.1
Official number of prior arrests	9.1	7.0
Type of prior arrest		
Personal offense	15.2%	
Property offense	21.2%	
Drug offense	48.7%	
Other type	15.0%	

Table 2

Characteristics of Key Continuous Variables ($N = 251$)

	Time 1		Time 2		Time 3		Time 4	
	M (SD)	% with in status from T1	M (SD)	% with in status from T2	M (SD)	% with in status from T3	M (SD)	% with in status from T4
Dependent variables								
Crime days ^a	4 (16)	3 (14)	16	1 (9)	11	2 (10)	17	
Drug use days ^b	28 (20)	26 (35)	88	23 (33)	89	13 (19)	90	
Independent variables								
Antisocial cognition								
Criminal thinking ^b	95 (20)	96 (18)	98	95 (18)	99	95 (17)	99	
Antisocial associates								
Family criminal network ^b	0.8 (2)	0.6 (1)	53	0.6 (1)	66	0.5 (1)	65	
Friend criminal network ^b	1.5 (2)	0.9 (1)	65	0.8 (1)	68	0.8 (2)	75	
Family and marital								
Supportive family ^b	2.8 (2)	2.7 (2)	84	2.8 (2)	83	2.8 (2)	62	
Work								
Income in U.S. dollars ^b	762 (1,012)	582 (757)	40	602 (873)	69	610 (862)	66	
Leisure and recreation								
Nondrug use time ^b	4.0 (2)	4.1 (2)	100	3.9 (2)	98	3.8 (2)	99	
Substance use								
Alcohol use days ^b	11 (16)	15 (27)	69	12 (24)	69	7 (15)	64	
Drug use days ^b	28 (20)	26 (35)	88	23 (33)	89	13 (19)	90	
Control variables								
Self-help sessions ^a	0.4 (5)	1.8 (8)	11	2.9 (11)	16	3.9 (13)	27	
Outpatient sessions ^a	3.4 (14)	12.6 (18)	62	12.7 (21)	62	9.3 (18)	61	
Inpatient sessions ^a	1.6 (9)	1.0 (5)	16	1.8 (11)	10	3.3 (13)	78	
Addition severity ^c	6.0 (3)	—	—	—	—	—	—	
Recidivism risk ^c	5.1 (2)	—	—	—	—	—	—	

^aIndicates a dynamic measure obtained at Times 1, 2, 3, and 4.

^b Indicates a dynamic measure obtained at Times 1, 2, 3, and 4, and a change score was calculated for the multivariate models in Table 5.

^c Indicates a static measure obtained at Time 1.

Table 3

Summary One-Way Repeated-Measures aNOVA and bonferroni Multiple Comparison Tests of Criminogenic Needs by Risk (*N* = 251)

	T1 vs. T2			T2 vs. T3			T3 vs. T4			Total
	M (SD)	M (SD)	M difference	M (SD)	M (SD)	M difference	M (SD)	M (SD)	M difference	
Antisocial cognitions										
Criminal thinking										
Treatment group	95.5 (18)	97.6 (21)	-2.1	97.6 (21)	96.0 (17)	1.6	96.0 (17)	95.3 (17)	0.7	1.4
Control group	94.5 (20)	95.0 (16)	-0.5	95.0 (16)	94.8 (18)	0.2	94.8 (18)	94.1 (18)	0.6	0.2
Antisocial associates										
Family criminal network										
Treatment group	0.8 (1)	0.5 (1)	0.3	0.5 (1)	0.6 (1)	-0.1	0.6 (1)	0.5 (1)	0.1	5.3***
Control group	0.7 (1)	0.7 (1)	0.0	0.7 (1)	0.6 (1)	0.1	0.6 (1)	0.5 (1)	0.1	7.7**
Friend criminal network										
Treatment group	1.4 (2)	0.8 (1)	0.7	0.8 (1)	0.8 (1)	0.0	0.8 (1)	0.9 (1)	0.1	8.6**
Control group	1.8 (3)	1.1 (1)	0.7	1.1 (1)	0.9 (1)	0.2	0.9 (1)	0.8 (1)	0.1	9.9***
Family and marital										
Accepting/helpful family										
Treatment group	2.8 (1)	2.8 (2)	0.0	2.8 (2)	2.8 (2)	0.0	2.8 (2)	2.9 (2)	0.1	0.3
Control group	2.8 (2)	2.7 (2)	0.1	2.7 (2)	2.8 (2)	0.1	2.8 (2)	2.9 (2)	0.1	0.4
Work										
Income										
Treatment group	760 (1,105)	544 (717)	216	544 (717)	568 (814)	-24	568 (814)	573 (816)	-4.9	2.5 [†]
Control group	764 (920)	619 (796)	145	619 (796)	635 (927)	-16	635 (927)	647 (905)	-12	1.9
Leisure and recreation										
Nondrug use time										
Treatment group	4.2 (2)	4.1 (2)	0.1	4.1 (2)	3.9 (2)	0.2	3.9 (2)	3.8 (2)	0.1	3.4*
Control group	3.8 (2)	4.1 (2)	-0.2	4.1 (2)	3.8 (2)	0.3	3.8 (2)	3.7 (1)	0.1	2.0
Substance use										
Alcohol use days										
Treatment group	11.9 (16)	13.0 (25)	-0.9	13.0 (25)	11.1 (23)	1.8	11.1 (23)	7.4 (17)	3.8	6.1*

	T1 vs. T2			T2 vs. T3			T3 vs. T4			Total
	M (SD)	M (SD)	M difference	M (SD)	M (SD)	M difference	M (SD)	M (SD)	M difference	
Control group	9.6 (15)	15.9 (28)	-6.3*	15.9 (28)	13.5 (25)	2.4	13.5 (25)	6.6 (13)	7.0****	8.4****
Drug use days										
Treatment group	28.1 (20)	29.1 (36)	-1.0	29.1 (36)	24.3 (35)	-4.7	24.3 (35)	12.2 (18)	12.1****	13.7****
Control group	28.1 (20)	23.9 (34)	4.2	23.9 (34)	21.2 (32)	2.7	21.2 (32)	13.1 (19)	8.1*	10.2****

† *p* .10.

* *p* .05.

** *p* .01.

*** *p* .001.

Table 4

Summary One-Way Repeated-Measures aNOVa Tests of Criminogenic Needs Study Condition and Treatment Sessions attended ($N = 251$)

<i>Interaction effect</i>	<i>Study condition × Main effect</i>	<i>Treatment days × Main effect</i>	<i>Study condition × Treatment days × Main effect</i>
	F	F	F
Antisocial cognition			
Criminal thinking	0.02	0.09	1.54
Antisocial associates			
Family criminal network	0.01	0.31	0.08
Friend criminal network	0.37	0.27	0.15
Family and marital			
Accepting/helpful family	0.05	0.38	0.49
Work			
Income	1.09	0.75	1.42
Leisure and recreation			
Nondrug use time	0.02	4.55**	0.35
Substance use			
Alcohol use days	0.02	1.83	0.41
Drug use days	3.18 [†]	7.42***	1.97

[†] $p < .10$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 5

Results of Generalized estimating equations analysis examining the effect of Changes in Criminogenic Needs (Time 1–3) on Criminal Offending and Substance Use Outcomes (Time 4; $N = 251$)

	<i>Crime days</i>		<i>Drug use days</i>	
	<i>b</i>	<i>SE</i>	<i>b</i>	<i>SE</i>
Time 1				
Criminal thinking	-.005	(.011)	.010	(.005)
Familial criminal network	-.209	(.249)	-.131	(.084)
Friends criminal network	.055	(.139)	-.025	(.036)
Accepting or helpful family	.026	(.201)	.074	(.056)
Income	-.013	(.067)	-.049	(.031)
Nondrug use time	-.284	(.329)	-.062	(.054)
Alcohol use days	.015	(.014)	.000	(.006)
Drug use days	-.025*	(.011)		
Time 1 to Time 3				
Change in criminal thinking	-.063	(.037)	.037	(.026)
Change in familial criminal network	.893**	(.352)	-.030	(.115)
Change in friends criminal network	.195	(.115)	.114	(.083)
Change in accepting or helpful family	-.112	(.319)	.119	(.091)
Change in income	.262***	(.080)	.004	(.026)
Change in nondrug use time	.402	(.240)	.117*	(.053)
Change in alcohol use days	.019*	(.009)	-.002	(.003)
Change in drug use days	.003	(.006)		
Control variables				
Dependent variable at 6 months	.081***	(.010)	.015***	(.002)
Seamless system condition	-.320	(.563)	.243	(.205)
Addiction severity	.586***	(.108)	.052	(.035)
High risk	-.054	(.200)	.112	(.080)
Self-help treatment days	-.039***	(.010)	.005	(.005)
Outpatient treatment days	-.020	(.012)	-.007	(.008)
Inpatient treatment days	-.018*	(.007)	-.002	(.002)
Intercept	-1.971	(1.69)	.411	(.706)
Quasilikelihood criterion	424.9		717.5	

Note. The log transformation of income was used in the regression models. Some change scores were reverse coded so that all positive change score beta coefficients suggest that as need increases, crime or substance use increases.

† $p < .10$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.