Semantic networks, schema change, and reincarceration outcomes of therapeutic community graduates

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ABSTRACT

Background: Therapeutic community (TC) clinical theory assumes that peer interaction forms a framework for social learning that will displace ingrained cognitive schema that underlie substance abuse. There has been no direct test of this hypothesis.
Methods: We analyzed the content of a large corpus of written affirmations (pushups) and corrections (pull-ups) exchanged between 2342 male TC graduates. We encoded the content of the written communications as semantic networks of words, in which words that appear in the same brief document are connected and are referred to as word combinations. Loss of combinations and gain of combinations each measured an aspect of change in word combination patterns across time. These measures were used in a multivariable Cox model to predict the hazard of reincarceration for residents while controlling for race, age, score on the Level of Service Inventory-Revised and the total number of pushups and pull-ups sent to peers.
Results: Residents' reincarceration risk varied significantly with changes in word combinations used over the course of treatment. The implications of the model were visualized to reveal the complicated nature of the interaction terms included in the model. The visuals suggested that residents who changed their expression patterns the least – lost and gained few word combinations – had the highest reincarceration risk after graduation.
Conclusions: The results suggest that TC success, in terms of increasing time to reincarceration, depends on how residents change their interaction patterns through the treatment process. Merely interacting with others does not explain success; but whether those interactions change does explain outcomes, which may imply that more fundamental changes are occurring.

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1. Introduction

Therapeutic community (TC) clinical theory sees addiction as a disorder of the entire human being (Broekaert, 2001; De Leon, 2000; Perfas, 2012). TC residents often arrive with serious social deficits traceable to their years of substance abuse, including unrealistic thinking and dysfunctional interpersonal interactions (Broekaert, 2001; De Leon, 2000). While these deficits may stem from substance abuse, they also serve to maintain it (De Leon, 2000). Treatment is unlikely to succeed unless it displaces these deeply ingrained anti-social approaches to living (De Leon, 1995). This view extends naturally to criminogenic traits (Day & Doyle, 2010; Stevens, 2013), and randomized studies, systematic reviews and meta-analyses demonstrate that TCs can be effective in treating both substance abuse and criminal behavior (Lees, Manning, & Rawlings, 2004; Mitchell, Wilson, & MacKenzie, 2007; Pearson & Lipton, 1999; Sacks, Sacks, McKendrick, Banks, & Stommel, 2004; Shuker, 2013; Vanderplasschen et al., 2013; Wexler, De Leon, Thomas, Kressel, & Peters, 1999). Though the evidence of TC effectiveness

includes numerous studies, the effect size is moderate[1] and there is evidence of variability in the existing set of outcome studies (Mitchell et al., 2007). Much work has yet to be done to explain the variability through examination of the mechanisms of treatment (Kazdin & Nock, 2003), which could lead to improvements in program outcomes by way of identifying key ingredients. This study takes a step in the explanatory direction by examining changes in resident expressions throughout TC treatment and their relationship with reincarceration.

The TC tool for achieving the changes that have been attributed to TCs is the community of residents and staff as a whole (De Leon, 2000). Community is so central to TCs that the physical facilities are constructed in such a way as to foster prosocial interactions. For instance, recreation rooms are small and lack hidden corners and furniture is placed such that individuals will be in close proximity and face one another (De Leon, 2000; Hawkins & Wacker, 1986). Constant

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[1] A 2007 meta-analysis of 30 evaluations gleaned from the literature suggests a combined odds ratio of 1.38, or a 38 percent higher odds of avoiding reincarceration for TC participants (graduates and non-completers) within one year of leaving a TC. This amounts to an approximate 8 percentage point reduction in the probability of one-year reincarceration assuming a control group with a 50 percent reincarceration probability.

interaction with peers is also necessary since residents must maintain the community, they do so in teams, and they do so according to a rigorous schedule (Debaere, Vanheule, & Inslegers, 2014).

TC clinical theorists argue that the structured TC community influences residents through social learning (De Leon, 1990; Miller, Sees, & Brown, 2006). De Leon (2000), states that, "Learning, both formal and informal, is a central value in the TC… All experiences in recovery can and should be used to advance personal growth…" (pg. 79). Peer feedback is continuous throughout the day, and is formalized in peer to peer interventions known as pull-ups and pushups (De Leon, 2000). A pull-up is a peer correction for norm violating behavior, while a pushup is an affirmation, in which a resident identifies a peer who has shown personal growth or benefitted others (De Leon, 2000; Doogan, Warren, Hiance, & Linley, 2010; Hawkins & Wacker, 1986; Miller et al., 2006; Patenaude, 2005; Warren, Doogan, et al., 2013; Warren, Hiance, Doogan, De Leon, & Phillips, 2013). Simpson's TCU treatment process model (Simpson, 2004) sees this and other peer interactions as a part of program participation that leads to a therapeutic relationship with the community, which can result in psychosocial and behavioral changes.

One way to conceptualize psychological change in residents through interaction with peers and the broader social environment is that it causes a change in their cognitive structures known as schemas (Rumelhart, 1980; Simons & Burt, 2011; McVee, Dunsmore, & Gavelek, 2005), theoretical constructs that act as the building blocks for an individual's understanding of the world (Plant & Stanton, 2013; Simons & Burt, 2011). There is evidence that substance abuse is characterized by maladaptive schemas (Brotchie, Hanes, Wendon, & Waller, 2007; Shorey, Stuart, Anderson, & Strong, 2013), and that maladaptive schemas stemming from childhood stresses can result in maladaptive adult behavior, which can result in crime (Simons & Burt, 2011). There is further evidence that residential substance abuse treatment can alter schema (Roper, Dickson, Tinwell, Booth, & McGuire, 2010). To the TCU treatment process model, changes in schema are the psychosocial changes required to lead to behavioral change and to positive long term outcomes. At this point, however, no researcher has sought to link changes in an individual's schema during TC treatment with outcomes such as reincarceration after graduation.

Several methods of quantifying schemas have been proposed. The most common method in mental health and substance abuse research has been to administer the Young Schema Questionnaire (Young, 1994), which taps into specific dysfunctional schema which serve as targets of therapeutic intervention (Stopa, Thorne, Waters, & Preston, 2001). Social network researchers have taken a different approach. In a seminal article, Carley and Palmquist (1992) cited symbolic interactionists (Blumer, 1969; Stryker, 1980), social constructivists (Knorr-Cetina, 1981), and others (Goffman, 1974; Johnson-Laird, 1986) as theorists recognizing that the human brain stores information in a form that is reasonably modeled as a network of constructs. They view speech, behavior, and other expressions as manifestations stemming directly from individuals' cognitive schematic organization. Thus, speech or written text can be seen as a sample from underlying knowledge structures (Carley & Palmquist, 1992). Logically structuring written communications as word or construct networks—referred to hereafter as semantic networks—to denote the relationships among words or constructs may facilitate study of an individual's latent schematic structures. Examples of this approach can be found in Carley (1997) and Danowski (2010). We adapted these approaches for use in our study of TC residents.

Some TCs, as a normal part of their operation, collect formalized communications from individual residents to their peers. Such communications were available from the TCs we studied throughout individuals' treatment processes in the form of personal affirmative and corrective messages (pushups and pull-ups) given to peers. These communications act as the source of personal expression from which semantic networks are drawn. Importantly, while these messages include two different classifications (affirmative and corrective), we do not differentiate them in the analysis because regardless of their valence, they are still expressions of underlying knowledge or beliefs. That some residents may be prone to giving a different ratio of corrective to affirmative interactions can be controlled in a multivariable analysis.

We use well known Piagetian constructs to link theory of cognitive schemas to the methods and results of the present study. Three important terms for discussing schema change are disequilibrium, assimilation, and accommodation. The following is a simplification which can be further explored in the work of Piaget and Cook (1952). Disequilibrium is a state of mind in which observations of the world do not fit with expectations. To release the tension of disequilibrium, one must find harmony between observation and expectation. This is most easily achieved if the new observations can be made sense of given one's current schemas; this is called assimilation, the metaphorical bolting on of new internally consistent information. If the observations contradict existing schemas, the schemas need to be adapted to bring observation and expectation back into alignment; this is called accommodation, the metaphorically more intensive disassembly and restructuring of schema.

The goal of TCs is to address social deficiencies and replace existing maladaptive understandings of and approaches to successfully operating in society (De Leon, 1995). In Piagetian terms, the TC aims to facilitate accommodation of beliefs and behaviors that displace residents' incompatible and often deeply ingrained criminal value systems. On this fundamentally new structure, the TC also facilitates the assimilation of psychological and behavioral mechanisms that link the new structure to successful navigation of the complexities of social living. We argue that textual expressions from residents may contain information about these changes as they occur through treatment. Cognitive structural changes and in turn semantic network changes could vary considerably in their effect on prosocial behavior that relates to treatment outcomes. However, the lack of previous work led us to the simple approach of attempting to identify a relationship between semantic network change, broadly defined, and treatment outcomes.

In this study we drew on an archive of affirmative and corrective messages sent by TC residents to their peers. We represented an individual's given messages as networks of selected constructs that appeared together in small pieces of text. We treated these networks as though they reflected a part of residents' cognitive schemas that are relevant to community life. We referred to the networks as semantic networks, and characterized change in the semantic networks of TC residents over time in the form of simple individual level measures that captured deletions and additions of construct connections in this network. While we recognize that there could be many sources of variation in the translation from cognitive schema to construct networks, we treated these measures as though they, potentially noisily, reflected change in the underlying schemas of the residents. The measures were used as predictors of post-graduation reincarceration in a multivariable analysis (i.e., to evaluate the likelihood of a signal within the noise). We hypothesized that residents who showed more change in their semantic networks during treatment by additions and deletions would have a lower risk of reincarceration after graduation from the TC program.

2. Methods

2.1. Data

The resident data examined in the study were gathered from three minimum security facilities for felony offenders operated as TCs. Two of the TCs served predominantly rural catchment areas, while the third served a mixed urban, rural, and suburban catchment area. Among the three TCs, there were a total of four all male units. The number of beds in each unit ranged from 50 to 90. The length of the data collection periods varied by TC unit. Two of the units collected the necessary data from early 2006 until late 2008. The other two collected