Personal network structure and substance use in women by 12 months post treatment intake

Elizabeth M. Tracy, Ph.D[1,*], **Meeyoung O. Min, Ph.D.**[1], **Hyunyong Park, MSSW**[1], **MinKyoung Jun, Ph.D.**[2], **Suzanne Brown, Ph.D.**[3], and **Meredith W. Francis, MSW**[1]

[1]Jack, Joseph and Morton Mandel School of Applied Social Sciences, Case Western Reserve University, 11235 Bellflower Road, Cleveland, Ohio 44106-7164

[2]Gyeonggido Family and Women's Research Institute, Gyeonggi-do, Suwon, Republic of Korea

[3]Wayne State University, School of Social Work, Detroit Michigan

Abstract

Introduction—Women with substance use disorders enter treatment with limited personal network resources and reduced recovery support. This study examined the impact of personal networks on substance use by 12 months post treatment intake.

Methods—Data were collected from 284 women who received substance abuse treatment. At six month follow up, composition, support availability and structure of personal networks were examined. Substance use was measured by women's report of any use of alcohol or drugs. Hierarchical multivariate logistic regression was conducted to examine the contribution of personal network characteristics on substance use by 12 months post treatment intake.

Results—Higher numbers of substance using alters (network members) and more densely connected networks at six month follow-up were associated with an increased likelihood of substance use by 12 months post treatment intake. A greater number of isolates in women's networks was associated with decreased odds of substance use. Women who did not use substances by 12 months post treatment intake had more non-users among their isolates at six months compared to those who used substances. No association was found between support availability and likelihood of substance use.

Conclusions—Both network composition and structure could be relevant foci for network interventions e.g. helping women change network composition by reducing substance users as well as increasing network connections. Isolates who are not substance users may be a particular strength to help women cultivate within their network to promote sustained sobriety post treatment.

*Corresponding Author: ext@case.edu, 216 368-6294.

Keywords

personal networks; post treatment substance use; women with substance use disorders

1. Introduction

A personal network analysis approach is helpful in understanding the social context of substance use. Such an approach examines the set of relationships surrounding a focal person, the characteristics (e.g. presence of substance users) of those people, how network members (alters) are related to the focal person, and the way in which the network is organized and structured (e.g. highly centralized around one person or highly interconnected) (Marsella & Snyder, 1981; Wasserman & Faust, 1994). The types of social support exchanged within the network can also be examined in network analysis, including the availability of supportive behaviors such as tangible aid, emotional support, advice and information (Cohen, Underwood, & Gottlieb, 2000). Within a stress-coping framework (Lazarus & Folkman, 1984), personal networks can be viewed as a coping resource (Thoits, 1995). In this paper, a personal network analysis approach is used to examine the relationship between women's personal networks and maintenance of abstinence from substance use after intake into addiction treatment services.

Support from social network members may be a critical part of recovery from substance use disorders. Peer support within the treatment setting and social support outside of treatment appear to be significant factors influencing substance abuse treatment progress and outcome (Joe, Broome, Rowan-Szal & Simpson, 2002). Those entering treatment with highly supportive personal networks tend to have better retention in treatment (Dobkin, De Civita, Paraherakis & Gill, 2002), and having an abstinence and recovery-oriented network post-treatment is related to improved treatment outcomes over time (Broome, Simpson, & Joe, 2002). However, women tend to enter treatment with less supportive personal networks as compared with men (Mendelson, Dariotis, & Agus, 2013) and are often embedded in complex substance using networks which are simultaneously sources of stress but also sources of potential or actual support (Falkin & Strauss, 2003). Therefore, case planning to help women create recovery-oriented networks post treatment is often a priority for treatment providers.

1.1 Personal Networks Influence on Maintenance of Sobriety

Network composition, as reflected in the characteristics and types of network relationships, can influence sobriety during recovery. The presence of substance use by network members in key relationships has been shown to be associated with abstinence or substance use post treatment (Day, et al., 2013, Manuel, McCrady, Epstein, Cook, & Tonigan, 2007). A personal network in which there are fewer alters (people in the network) involved in drinking or drug use contributes to decreasing substance use over time for people in recovery, whereas having more substance users in the network increases risk of substance use (Bond, Kaskutas and Weisner, 2003; Walton, Blow, Bingham, & Chermack, 2003; Weisner, Delucchi, Matzger, & Schmidt, 2003). For example, McDonald, Griffing, Kolodziej, Fitzmaurice, and Weiss (2011) found that having more than two drug using

network members increased the likelihood of more drug using days as compared with personal networks which did not have any, or had just one drug user. Davey-Rothwell, Chander, Hester, and Latkin (2011) also reported that having a greater number of network members who drank was linked to heavy episodic drinking of women; in their study large personal networks were predictive of better treatment outcomes, but only when these network members were non-drinkers. The presence of substance using friends (characterized as high relapse risk) in the personal networks of young adults was found to be predictive of substance use 12 months post residential treatment; the change in network composition, from substance using friends to non-using friends more aligned with abstinence predicted more positive substance use outcomes (Kelly, Stout, Greene, & Slaymaker, 2014).

However, the influence that a network relationship has on a person's substance use or abstinence depends also on the type of the relationship, e.g. family member, relative, partner, or friends (Kim, Davis, Jason, & Ferrari, 2006). For women, some relationships, such as with their children, may serve as a motivation to reach or maintain sobriety (McCrady, 2004; Tracy & Martin, 2007). Partner relationships, on the other hand, may complicate the recovery process. Living with a partner who continues to use substances is highly predictive of post treatment relapse among women (Grella, 2008) and is associated with poor physical and psychological health (Dawson, Grant, Chou & Stinson, 2007). In contrast, less substance use among spouses or significant others has been linked to reduced likelihood of relapse (Ellis, Bernichon, Yu, Roberts, & Herrell, 2004).

In addition to network composition, the degree to which network members support abstinence is very important for maintaining sobriety, and has been related to reduced drinking post treatment (Bond, Kaskutas and Weisner 2003), more commitment to abstinence at treatment end (Laudet & Stanick, 2010), and longer length of abstinence (Dobkin et al, 2002). Having higher levels of social support have also been linked to reduced heroin and cocaine use and improved mental health outcomes for people with dual disorders (Warren, Stein, & Grella, 2007), and increased likelihood of maintaining abstinence for people receiving opiate substitution treatment (Day et al., 2013) Soyez, DeLeon, Broekaert, and Rosseel (2006) found in their examination of predictors of treatment success that women with more social support from network members were more likely to succeed in substance abuse treatment.

The source of support is also important. Family members are one of the most important sources of support for women in substance abuse treatment and provide both emotional and tangible support (Savage & Russell, 2005). El-Bassel, Chen, and Cooper (1998), found that kin network members provided more sobriety support to stop using drugs than sex partners and nonkin network members. Treatment professionals, including peers in treatment and 12 step programs, can be a significant source of support. In one examination of the influence of formal versus informal support, concrete support from treatment-related alters was a significant predictor of treatment discharge disposition, while concrete support from family members was not significant (Jun, Tracy, Min, & Park, 2014).

Few studies have examined the ways in which network structure, or how the network is organized, is associated with treatment outcomes and it is this gap in the literature that is

addressed in this paper. Network structural variables describe the way in which the network is arranged around a focal person (McCarty, 2002). Density refers to the number of ties present out of all possible ties, with increased density indicating a highly connected cohesive network. Components reflect the number of groups of people connected to each other directly or indirectly. The presence of isolates within a network indicates people who are not connected to anyone else in the network. Frequency of daily contact within the network, as might be expected in a densely connected network, has been shown to predict less alcohol use post treatment (Bond, Kastutas & Weisner, 2003; Zywiak, Longabaugh, & Wirtz, 2002) as well as reduction of drug using behavior (Zywiak et al., 2009). Tucker, Wenzel, Golinelli, Zhou, and Green (2011) found that network density predicted access to treatment services for homeless women; however, the influence of network density on treatment outcomes was not examined in their study. A highly connected network may be useful in initiating a coordinated response, such as access to treatment services, but such a network may not always be helpful in supporting sobriety. It is important to note that personal networks can be sources of stress as well as support (Lincoln, 2000). Interpersonal problems within a connected network may trigger substance use relapse, as Sun (2007) demonstrated among women's relationships with intimate partners.

1.2 Clinical Characteristics' Influence on Maintenance of Sobriety

A number of clinical and demographic characteristics also influence treatment outcome. Among adults with substance use disorders, co-occurrence of either a single affective disorder or three or more mental health disorders is common (Morisano, Babor, & Robaina, 2014; SAMHSA, 2013). Having symptoms of a mental illness co-occur with a substance use disorder (dual disorders) is associated with poorer treatment outcomes, shorter retention in substance abuse treatment, and decreased abstinence self-efficacy (Conners, Grant, Crone, & Whiteside-Mansell, 2006; Greenfield, Venner, Kelly, Slaymaker, & Bryan, 2012). In addition, women with dual disorders have more difficulty accessing and using social support (Tracy & Biegel, 2006), and experience less reciprocity within their network relationships (Tracy & Johnson, 2007) than women with a substance use disorder alone, making it difficult for them to realize the benefits that may derive from a supportive network. The high number of trauma symptoms among women with dual disorders (Najavits, Weiss, & Shaw, 1997) both impacts their ability to form positive close social attachments (Bollerud, 1990; Min, Tracy & Park, 2014) and their quality of life post treatment (Brown, Jun, Min & Tracy, 2013).

A person's sense of abstinence self-efficacy also affects whether they return to substance use after treatment. Greater social support for abstinence and higher levels of abstinence self-efficacy may increase commitment for abstinence at the end of treatment (Laudet & Stanick, 2010). Kelly, Hoeppner, Stout, and Pagano (2011) found that people who had higher self-efficacy in social situations and fewer network members who were pro-drinking had a higher percentage of days abstinent and fewer drinks per drinking day when they did drink.

1.3 Limitations of Previous Studies

Many of the previous studies that have examined the role of personal social networks in recovery from substance use disorders use samples that are primarily white males with

higher socioeconomic status (Bond, J., Kaskutas, L. A., & Weisner, C., 2003; Broome, K. M., Simpson, D. D., & Joe, G. W., 2002; Kelly, J. F., Stout, R. L., Greene, M. C., & Slaymaker, V., 2014; McDonald, L. J., Griffin, M. L., Kolodziej, M. E., Fitzmaurice, G. M., & Weiss, R. D., 2011; Soyez, V., De Leon, G., Broekaert, E., & Rosseel, Y., 2006; Zywiak, W. H., Longabaugh, R., & Wirtz, P. W., 2002), or were completed in private treatment centers (Manuel, J. J., McCrady, B. S., Epstein, E. E., Cook, S., & Tonigan, J. S., 2007; Stone, A., Jason, L. A., Stevens, E., & Light, J. M., 2014). This present study examines the personal social network characteristics of urban, racially-diverse, low-socioeconomic status women seeking substance use treatment in publicly-funded treatment centers. In this, it is similar to other studies that have focused exclusively on women's social networks in recovery. However, the focus and eligibility criteria for this study are much broader than in other studies, which tended to focus on very specific areas of interest such as methadone maintenance (El-Bassel, N., Chen, D., & Cooper, D., 1998), HIV prevention (Davey-Rothwell, M., Chander, G., Hester, L., & Latkin, C., 2011), or women with co-occurring disorders and a history of victimization (Savage, A., & Russell, L. A., 2005). This study also uniquely examines the influence of network structure in addition to the more commonly studied concepts of network composition and social support from network members.

1.3 Aims of this study

Our study examined the relationship between personal network characteristics and women's substance use by 12 months post treatment intake. Controlling for other clinical and demographic factors that might influence treatment outcomes, three aspects of personal networks were included in the analysis: 1) the composition of personal networks, that is, the types and characteristics of relationships of network members to the woman; 2) social support perceived to be available from the network; and 3) the structure of the personal network, as indicated by the components, density, and isolates. The following research question was examined: To what extent are compositional, social support and structural characteristics of personal networks of women predictive of substance use by 12 months post treatment intake for women with substance use dependence? The inclusion of network structural variables provides a more complete analysis of network influence beyond network composition and social support.

2. Method

2. 1. Sample and research design

The sample of the present study was women who received treatment from three county-funded, women-only substance abuse treatment programs (1 residential and 2 intensive outpatient) in Cleveland, Ohio. Women were eligible to be included in the study if they were 18 years of age or older, had been in treatment for at least one continuous week, and had a diagnosis of substance dependence defined as a DSM-IV diagnosed substance dependence within the past 12 months of entry into the study for at least one substance, including alcohol. Participants who were diagnosed with schizophrenia or taking medication prescribed for a psychotic disorder were excluded from the sample

Computer-assisted face-to-face interviews were utilized to collect respondents' information at four times over the course of a year: at one week post treatment intake, and at 1, 6, and 12 months post-intake. Participants received a $35 gift card at each interview, plus travel expense reimbursement. The Case Western Reserve University Institutional Review Board approved the study protocol, which included signed written, informed consent at each follow up interview. A Certificate of Confidentiality was obtained from the Department of Health and Human Services. A total of 377 women were enrolled in the study and 372 were eligible for follow up (5 were deceased, too ill or withdrew). The present analysis includes 284 women, 76% of those eligible for follow ups, who provided substance use data at 6 and 12 months. Those not reported in this analysis were more likely to be White, have higher education levels, have higher levels of trauma symptoms, and to have been in residential treatment; no other demographic or clinical differences were found.

2.2. Measures

2.2.1. Substance use by 12 months post treatment intake—The dependent variable was a dichotomous variable (yes/no) indicating any substance use by 12 months post treatment intake. Using wording from the Individual Assessment Profile (Flynn et al, 1995), respondents were asked at the 6 or 12 month interview, whether they had used any of 12 substances (e.g., alcohol, marijuana/hash, heroin, opiates, depressant, cocaine/crack) to get high or to feel better since the previous interview. Any self-reported substance use at six and/or 12 months post treatment intake was operationalized as substance use by 12 months post treatment intake (0 = *No*, 1 = *Yes*).

2.2.2. Personal network characteristics at six months post treatment intake—

Personal network characteristics that were collected at six months post treatment intake are the independent variables for the current study, as our previous study on this cohort demonstrated changes in network characteristics during and post treatment (Min et al., 2013). EgoNet software (available from sourceforge.net/projects/egonet; McCarty, 2002; McCarty, Molina, Aguilar, & Rota, 2007), a social network software program, was used to assess the personal network characteristics of respondents such as network composition (e.g., relationship with respondents), network support (e.g., the number of people providing concrete/sobriety support, number of negative people), and network structure (e.g., how the network members were arranged around the respondents). Each respondent reported 25 people with whom they had had any type of contact in the previous six months.

Network composition was measured by the number of treatment related network members and the number of substance using network members. Network support was assessed using the number of network members providing concrete support and the number of network members providing sobriety support. The following three variables were used to assess respondents' network structure: density, the ratio of the number of present ties divided by the all possible ties among network members (the extent of cohesiveness), with higher scores indicating more densely connected network among network member (range from 0 to 100); component, the number of groups of at least three alters who are connected directly or indirectly; and isolates, the number of network members who were not connected to anyone else in the network.

2.2.3. Covariates collected at one week post treatment intake—The Computerized Diagnostic Interview Schedule IV (CDIS-IV; Helzer et al., 1985; Robins, Helzer, Croughan, & Ratcliff, 1981), a structured interview based on the criteria in the DSM-IV, was used to assess the presence of co-occurring mental and substance use disorders at treatment program intake. Respondents were coded either having substance use disorders only (0) or having co-occurring mental and substance use disorders (1). Abstinence self-efficacy was measured by the 20-item abstinence self-efficacy scale (DiClemente, Carbonari, Montgomery, & Hughes, 1994). Using a 5-point Likert scale (range 20–100), higher scores indicate greater confidence to abstain from alcohol and drug across 20 different high-risk situations (e.g., drug sick, felt depressed/lonely, craving, being offered drug in social situation). The total scores were used in the study with internal consistency (α) = .97. Childhood or adulthood traumatic events were assessed by Trauma Symptom Checklisk-40 (Elliott & Briere, 1992; Zlotnick et al., 1996), a 40-item self-report instrument assessing trauma-related symptomatology (anxiety, depression, dissociation, sexual abuse trauma, sexual problems, and sleep disturbance) in adults resulting from childhood and/or adult traumatic experiences. The total scores were used with a range from 0 to 120, with higher scores indicating greater trauma symptoms (α = .93). The respondents' previous substance abuse treatment history, coded as a dichotomous variable ((0 = *No*, 1 = *Yes*) as well as respondents' demographic characteristics (age, race/ethnicity, education, and marital status) were used.

2.3. Data Analysis

Hierarchical logistic regression was performed to examine the unique contribution of personal network characteristics on substance use by 12 months post intake treatment after controlling for covariates. Covariates correlated with the dependent variable (substance use by 12 months post intake) at $p < .20$ were entered into the multivariate model (Mickey & Greenland, 1989). Multicollinearity was assessed by examining variance inflation factor (VIF); no multicollinearity problems were detected as evidenced by low VIF values (the highest VIF value found was 2.08). We also conducted a post hoc analysis using bivariate analysis to explore the combined effects of the characteristics of isolates (e.g., the number of substance using or non-using people among isolates) and substance use by 12 months post treatment intake.

3. Results

3.1. Sample characteristics

Table 1 shows demographic, clinical, and personal network characteristics of the sample. The majority of the women (63.7%) were African American, with a mean age of 37.0 (*SD* = 10.8). The remaining women were Euro-American (32.04%), Native American (1.06%), Latino (1.4%) or biracial (1.8%). Most (74.2%) were relying on welfare or government assistance, with 44% reporting less than high school education. Most respondents (73%) had co-occurring mental and substance use disorders. More than half of the sample (55.2%) had more than one substance use disorder, with 59% women diagnosed with cocaine dependence, followed by alcohol dependence (44.3%) and marijuana dependence (40.7%). A high proportion of respondents (72.2%) had previous substance abuse treatment history.

In terms of personal network characteristics at 6 month post treatment intake, the average number of family members, including partners, respondents had in their network was 11.1 (SD = 5.7). Respondents reported an average 7 substance using members in their networks (SD =5.7). Respondents reported that most people in their network provided sobriety support (M = 20.9, SD = 4.9). The average network density score was 35.6 (SD = 29.4). By 12 months post treatment intake, 41% (n = 116) women reported substance use, with 88 women reporting substance use at 6 months.

3.2. Impact of Personal Networks on Substance Use

Table 2 shows results of a hierarchical logistic regression ($\chi^2(15) = 71.06$, $p < .001$, Pseudo $R^2 = .22$). Compared to the model 1 with clinical characteristics only, adding personal network characteristics in the model 2 increased a predictability of substance use by 12 months post treatment intake ($\chi^2(10) = 32.9$, $p < .001$, Pseudo $R^2 = .10$).

Personal network characteristics of substance abusing women were associated with women's substance use by 12 months post treatment intake. Higher numbers of substance using alters at six months post treatment intake were associated with an increased likelihood of substance use by 12 months post treatment intake (OR = 1.08, 95% CI = 1.02, 1.14). Women with more densely connected personal networks at 6 month post intake (T3) were less likely to use substances by 12 months post treatment intake (OR = 0.98, 95% CI = 0.97, 0.998). In addition, a greater number of isolates in the women's networks was associated with decreased odds of substance use by 12 months post treatment intake (OR = 0.92, 95% CI = 0.86, 0.99). No other personal network characteristics were associated with substance use by 12 months post treatment intake.

In terms of covariates, women with co-occurring mental and substance use disorders were more likely to use substances by 12 months post treatment intake as compared to women with substance use disorder only (OR = 2.64, 95% CI = 1.28, 5.42). Women with previous substance abuse treatment history (OR = 0.43, 95 % CI = 0.23, 0.82) and with higher levels of abstinence self-efficacy (OR = 0.98, 95% CI = 0.96, 0.99) were less likely to use substances by 12 months post treatment intake.

3.3. Characteristics of Isolates and Substance Use

The present study found that both higher density and more isolates in women's networks were associated with lower odds of substance use by 12 months post treatment intake. Since greater density in women's networks is associated with a smaller number of isolates (r = −.60), we explored the relationship between characteristics of isolates and substance use by 12 months post intake treatment. This post-hoc analyses indicated that women who did not use substances by 12 months post treatment intake had significantly more non-users among their isolates at six months post intake (M=3.4, SD=5.3) compared to those who used substances (M=2.0, SD=2.9), t (281.8) = 2.39, p = .02.

4. Discussion

4.1. Summary Discussion of findings

The present study examined the impact of personal networks on substance use post treatment intake among women with substance use disorders. Among the network compositional variables examined, only a greater number of substance using members at six months post treatment intake was associated with increased likelihood of substance use by 12 months post treatment intake. This finding is consistent with previous empirical literature reviewed earlier and with clinical guidelines suggesting that substance using friends and associates present high-risk social situations and social pressure to relapse (Perkinson, 2012). Of particular concern for women with substance use disorders is that it is very likely that substance users will remain in their networks post treatment, due to the fact that their networks are heavily composed of family and relatives (Ellis et al., 2004: Min et al., 2013). Stone, Jason, Stevens, and Light (2014) found that those who had completed treatment were more likely to drop drug-using alters from their network, although they tend to retain family members regardless of whether or not the family member uses substances. Managing recovery in a social context of substance users presents a distinct relapse risk for women.

However, in contrast to previous literature on social support and treatment outcomes (Laudet & Stanick, 2010; Soyez, et al., 2006), social support available from the network (e.g., the number of people providing support) was not associated with substance use post treatment intake in this sample. This could be due to differences in how social support was conceptualized and measured in different studies. In this study, perceived availability of types of support was assessed, but data on satisfaction with and quality of support provided were not collected. In addition, given the nature of women's networks, it is possible that those who provided support (e.g., child care, transportation) were also among those who used substances or with whom the women had used. This reflects the complexity of social relationships surrounding women post treatment and into recovery.

With respect to structural characteristics, higher levels of density were associated with lower likelihood of substance use by 12 months post treatment intake. This finding may indicate that more cohesive networks may allow for increased communication and provide more coordinated support systems. For example, a highly connected network may be able to better coordinate a response to signs of relapse. Interestingly, this study found that a greater number of isolates in women's personal networks was also associated with lower odds of substance use by 12 months post treatment intake. Bivariate analysis using t-test indicates that women who did not use substances post treatment had significantly more isolate abstainers at six month post treatment intake in their networks compared to those who used substances. Women who maintained abstinence from substance use by 12 months post treatment intake may have developed a coping mechanism to keep the using and non-using components of their network apart. Qualitative studies with this sample indicate that, given that many of these network ties could not be eliminated altogether from the network because they were often family members or relied upon for crucial help (e.g. child care, place to stay), women managed existing relationships by distancing some members to reduce their negative influence on recovery (Brown, Tracy, Jun, Park, & Min, 2014).

4.2 Strengths and Limitations

Study findings are best interpreted within the strengths and limitations of this study design. Study strengths include its prospective longitudinal design, highly specialized sample of women served in public treatment programs, and detailed collection of personal network data. However, the use of self-report data may under-report substance use; in addition, there are no available data on degree or severity of use during the follow up period. Characteristics of personal networks are self-reported without independent verification of the nature or provision of support reported. Some null findings could be the result of manner in which the names of network members were generated. In this study, all women were asked to identify 25 names; network members that were may have been not very close to the respondent may have been listed and perhaps these network members did not exert as much of an influence as very close network members might on the variables of interest in this study. Findings are also generalizable only to other low-income underserved groups of women served by county delivered service programs. The extent to which the women completed treatment or the amount of time spent in treatment could have potentially influenced the outcome of substance use at 12 months post treatment intake; at the same time, discharge disposition could be confounded with network variables i.e. supportive networks encouraging treatment completion. Data on discharge disposition and length of treatment was incomplete in the county administrative data set available to us and therefore we were unable to include this variable in our analysis. We did observe that even though 20% of the women were in treatment at 6 months post treatment intake, treatment status at 6 months was not statistically significantly related to our outcome variable of substance use at 12 months post treatment intake. Future research is needed to examine the unique contribution of personal network characteristics on a broader range of treatment outcomes (e.g. discharge disposition, treatment completion, employment, etc.) and over a longer time period post treatment. The nature of network change also needs examination, including which relationships tend to remain over time and which ones are replaced and by whom.

4.3 Implications of the findings

Findings from this study suggest some specific goals for personal network interventions as a component of treatment and relapse prevention planning. One goal would be to help women disentangle themselves from substance users and to recognize that a management strategy vis a vis these ties may be more suitable and realistic than a strategy to eliminate such relationships. Many of these substance users may be family or partners who provide other types of support. Even though it may not be realistic to cut off a relationship, better coping strategies to manage stress in relationships could help reduce triggers for use. Skills training and role play practice may help women learn to deal with and plan for difficult interactions. Another goal for network intervention might be to help women change the structure of their network. Isolates may be a particular strength to help women cultivate within their network, as these network ties were predictive of less likelihood for use. The addition of non-using network ties is typically accomplished through participation in 12 step self-help programs as well as alumni groups. At the same time, interventions to help build connections among existing network relationships, such as family/network meetings or educational sessions, may also be helpful as higher network density was also predictive of less likelihood of use. The very act of asking about personal networks is often an intervention in and of itself, as

women have a chance to reflect and gain insight as to how people are connected to them and each other, how much support they honestly see as possible from the network, and ways in which small structural changes could hold the potential to support their treatment gains and trajectory. Overall, this study has shown the potential of a personal network approach to gather detailed information about the social networks of women in recovery, and in particular, aspects of social networks that may interfere with the recovery process.

Acknowledgments

References

Bollerud K. A model for the treatment of trauma-related syndromes among chemically dependent inpatient women. J Subs Abuse Treat. 1990; 7(2):83–87.

Bond J, Kaskutas LA, Weisner C. The persistent influence of social networks and alcoholics anonymous on abstinence. J Stud Alcohol. 2003; 64(4):579–588. [PubMed: 12921201]

Broome KM, Simpson DD, Joe GW. The role of social support following short-term inpatient treatment. Am J Addict. 2002; 11(1):57–65. [PubMed: 11876584]

Brown S, Tracy EM, Jun M, Park H, Min MO. Personal network recovery enablers and relapse risks for women with substance dependence. Qual Health Res. 2014 Advance online publication. 10.1177/1049732314551055

Brown S, Jun MK, Min MO, Tracy EM. Impact of dual disorders, trauma, and social support on quality of life among women in treatment for substance dependence. J Dual Diag. 2013; 9(1):61–71.

Cohen, S.; Underwood, L.; Gottlieb, B., editors. Social support measurement and interventions: A guide for health and social scientists. New York: Oxford; 2000.

Conners NA, Grant A, Crone CC, Whiteside-Mansell L. Substance abuse treatment for mothers: Treatment outcomes and the impact of length of stay. J Subs Abuse Treat. 2006; 31(4):447–456.10.1016/j.jsat.2006.06.001

Davey-Rothwell M, Chander G, Hester L, Latkin C. Social network characteristics and heavy episodic drinking among women at risk for HIV/Sexually transmitted infections. J Stud Alcohol Drugs. 2011; 72(6):1041–1047. [PubMed: 22051219]

Dawson DA, Grant BF, Chou SP, Stinson FS. The impact of partner alcohol problems on women's physical and mental health. J Stud Alcohol Drugs. 2007; 68(1):66–75. [PubMed: 17149519]

Day E, Copello A, Karia M, Roche J, Grewal P, George S, Chohan G. Social network support for individuals receiving opiate substitution treatment and its association with treatment progress. European Addict Res. 2013; 19(4):211–221.10.1159/000343827 [PubMed: 23391965]

DiClemente CC, Carbonari JP, Montgomery RP, Hughes SO. The alcohol abstinence self-efficacy scale. J Stud Alcohol. 1994; 55(2):141–148. [PubMed: 8189734]

Dobkin PL, De Civita M, Paraherakis A, Gill K. The role of functional social support in treatment retention and outcomes among outpatient adult substance abusers. Addiction. 2002; 97(3):347–356. [PubMed: 11964111]

El-Bassel N, Chen D, Cooper D. Social support and social network profiles among women on methadone. Soc Ser Rev. 1998; 72(3):379–491.10.1086/515764

Elliott DM, Briere J. Sexual abuse trauma among professional women: Validating the trauma symptom checklist-40 (TSC-40). Child Abuse Neglect. 1992; 16(3):391–398. [PubMed: 1617473]

Ellis B, Bernichon T, Yu P, Roberts T, Herrell JM. Effect of social support on substance abuse relapse in a residential treatment setting for women. Eval Prog, Planning. 2004; 27(2):213–221.10.1016/j.evalprogplan.2004.01.011

Falkin GP, Strauss SM. Social supporters and drug use enablers: A dilemma for women in recovery. Addict Beh. 2003; 28(1):141–155.10.1016/S0306-4603(01)00219-2

Flynn PM, Hubbard RL, Luckey JW, Forsyth BH, Smith TK, Phillips CD, Fountain DL, Hoffman JA, Koman JJ. Individual Assessment Profile (IAP). Standardizing the assessment of substance abusers. J Subst Abuse Treat. 1995; 12(3):213–221. [PubMed: 7474029]

Greenfield BL, Venner KL, Kelly JF, Slaymaker V, Bryan AD. The impact of depression on abstinence self-efficacy and substance use outcomes among emerging adults in residential treatment. Psych Addict Beh: J Soc Psych Addict Beh. 2012; 26(2):246–254.10.1037/a0026917

Grella CE. From generic to gender-responsive treatment: Changes in social policies, treatment services, and outcomes of women in substance abuse treatment. J Psychoac Drugs, Suppl. 2008; 5:327–343.

Helzer JE, Robins LN, McEvoy LT, Spitznagel EL, Stoltzman RK, Farmer A, Brockington IF. A comparison of clinical and diagnostic interview schedule diagnoses. physician reexamination of lay-interviewed cases in the general population. Arch Gen Psychiatry. 1985; 42(7):657–666. [PubMed: 4015307]

Joe GW, Broome KM, Rowan-Szal GA, Simpson DD. Measuring patient attributes and engagement in treatment. J Subst Abuse Treat. 2002; 22(4):183–196. [PubMed: 12072163]

Jun, M.; Tracy, EM.; Min, MO.; Park, H. The influence of formal and informal concrete support on discharge disposition among women in substance abuse treatment. Poster Presentation at Society for Social Work Research; San Antonio, TX. 2014 Jan.

Kelly JF, Hoeppner B, Stout RL, Pagano M. Determining the relative importance of the mechanisms of behavior change within alcoholics anonymous: A multiple mediator analysis. Addiction. 2012; 107(2):289–299.10.1111/j.1360-0443.2011.03593.x [PubMed: 21917054]

Kelly JF, Stout RL, Greene MC, Slaymaker V. Young adults, social networks, and addiction recovery: Post treatment changes in social ties and their role as a mediator of 12-step participation. PloS One. 2014; 9(6):e100121.10.1371/journal.pone.0100121 [PubMed: 24945357]

Kim KL, Davis MI, Jason LA, Ferrari JR. Chapter 8: Structural social support: Impact on adult substance use and recovery attempts. J Prevention Intervention Community. 2006; 31(1–2):85–94.10.1300/J005v31n01_08

Laudet AB, Stanick V. Predictors of motivation for abstinence at the end of outpatient substance abuse treatment. J Subst Abuse Treat. 2010; 38(4):317–327.10.1016/j.jsat.2010.01.007 [PubMed: 20185267]

Lazarus, RS.; Folkman, S. Stress, appraisal, and coping. New York: Springer; 1984.

Lincoln KD. Social support, negative social interactions, and psychological well-being. Soc Ser Rev. 2000; 74(2):231–252. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=sih&AN=3509227&site=ehost-live.

Manuel JJ, McCrady BS, Epstein EE, Cook S, Tonigan JS. The pretreatment social networks of women with alcohol dependence. J Stud Alcohol Drugs. 2007; 68:871–878. [PubMed: 17960305]

Marsella AJ, Snyder KK. Stress, social supports, and schizophrenic disorders. Schiz Bulletin. 1981; 7(1):152–163. Retrieved from http://journals.ohiolink.edu/ejc/article.cgi?issn=05867614&issue=v07i0001&article=152_sssasd.

McCarty C. Structure in personal networks. J Social Structure. 2002; 3(1) Retrieved from http://www.cmu.edu/joss/content/articles/volume3/McCarty.html.

McCarty C, Molina J, Aguilar C, Rota L. A comparison of social network mapping and personal network visualization. Field Methods. 2007; 19:145–162.

McCrady BS. To have but one true friend: Implications for practice of research on alcohol use disorders and social network. Psych Addict Beh: J Soc Psych in Addict Beh. 2004; 18(2):113–121.10.1037/0893-164X.18.2.113

McDonald LJ, Griffin ML, Kolodziej ME, Fitzmaurice GM, Weiss RD. The impact of drug use in social networks of patients with substance use and bipolar disorders. Am J Addict/Am Acad Psychiatrists Alcoholism Addictions. 2011; 20(2):100–105.10.1111/j.1521-0391.2010.00117.x

Mendelson T, Dariotis JK, Agus D. Psychosocial strengths and needs of low-income substance abusers in recovery. J Com Psychol. 2013; 41(1):19–34.10.1002/jcop.21507

Mickey RM, Greenland S. The impact of confounder selection criteria on effect estimation. American Journal of Epidemiology. 1989; 129:125–137. [PubMed: 2910056]

Min MO, Tracy EM, Kim H, Park H, Jun M, Brown S, Laudet A. Changes in personal networks of women in residential and outpatient substance abuse treatment. J Subst Abuse Treat. 2013; 45(4): 325–334. http://dx.doi.org/10.1016/j.jsat.2013.04.006. [PubMed: 23755971]

Min MO, Tracy EM, Park H. Impact of trauma symptomatology on personal networks among substance using women. Drug Alcohol Depend. 2014; 142:277–282.10.1016/j.drugalcdep. 2014.06.032 [PubMed: 25042762]

Morisano D, Babor TF, Robaina KA. Co-occurrence of substance use disorders with other psychiatric disorders: Implications for treatment services. Nordic Stud Alcohol Drugs. 2014; 31(1):5–25.10.2478/nsad-2014-0002

Najavits LM, Weiss RD, Shaw SR. The link between substance abuse and posttraumatic stress disorder in women. A research review. Am J Addict/Am Acad Psychiatrists Alcoholism Addict. 1997; 6(4):273–283.

Perkinson, RR. Chemical dependency counseling: A practical guide. 4. Thousand Oaks, Calif: Sage Publications; 2012.

Robins LN, Helzer JE, Croughan J, Ratcliff KS. National institute of mental health diagnostic interview schedule. its history, characteristics, and validity. Arch Gen Psychiatry. 1981; 38(4): 381–389. [PubMed: 6260053]

Savage A, Russell LA. Tangled in a web of affiliation: Social support networks of dually diagnosed women who are trauma survivors. J Beh Health Ser Res. 2005; 32(2):199–214.

Soyez V, De Leon G, Broekaert E, Rosseel Y. The impact of a social network intervention on retention in Belgian therapeutic communities: A quasi-experimental study. Addiction. 2006; 101(7):1027–1034.10.1111/j.1360-0443.2006.01441.x [PubMed: 16771894]

Stone A, Jason LA, Stevens E, Light JM. Factors affecting the stability of social networks during early recovery in ex-offenders. Am J Drug Alcohol Abuse. 2014; 40(3):187–191.10.3109/00952990.2013.852200 [PubMed: 24521088]

Substance Abuse and Mental Health Services Administration. Results from the 2012 national survey on drug use and health: National findings. Rockville, MD: SAMHSA, Office of Applied Studies; 2013.

Sun AP. Relapse among substance-abusing women: Components and processes. Subst Use Misuse. 2007; 42(1):1–21.10.1080/10826080601094082 [PubMed: 17366123]

Thoits PA. Stress, coping, and social support processes: Where are we? what next? J Health Soc Beh, Spec No. 1995:53–79.

Tracy EM, Johnson PJ. Personal social networks of women with co-occurring substance use and mental disorders. J Soc Work Pract Addict. 2007; 7(1):69–90.10.1300/J160v07n01_05

Tracy EM, Martin TC. Children's roles in the social networks of women in substance abuse treatment. J Subst Abuse Treat. 2007; 32(1):81–88.10.1016/j.jsat.2006.06.008 [PubMed: 17175401]

Tracy EM, Biegel DE. Personal social networks and dual disorders: A literature review and implications for practice and future research. J Dual Diagnosis. 2006; 2(2):59–88.10.1300/J374v02n02_04

Tucker JS, Wenzel SL, Golinelli D, Zhou A, Green HD Jr. Predictors of substance abuse treatment need and receipt among homeless women. J Subst Abuse Treat. 2011; 40(3):287–294.10.1016/j.jsat.2010.11.006 [PubMed: 21185682]

Walton MA, Blow FC, Bingham CR, Chermack ST. Individual and social/environmental predictors of alcohol and drug use 2 years following substance abuse treatment. Addict Beh. 2003; 28(4):627–642.10.1016/S0306-4603(01)00284-2

Warren JI, Stein JA, Grella CE. Role of social support and self-efficacy in treatment outcomes among clients with co-occurring disorders. Drug Alcohol Depend. 2007; 89(2–3):267–274.10.1016/j.drugalcdep.2007.01.009 [PubMed: 17329040]

Wasserman, S.; Faust, K. Social network analysis: Methods and applications. New York, NY: Cambridge University Press; 1994.

Weisner C, Delucchi K, Matzger H, Schmidt L. The role of community services and informal support on five-year drinking trajectories of alcohol dependent and problem drinkers. J Stud Alcohol. 2003; 64(6):862–873. [PubMed: 14743951]

Zlotnick C, Shea MT, Begin A, Pearlstein T, Simpson E, Costello E. The validation of the trauma symptom checklist-40 (TSC-40) in a sample of inpatients. Child Abuse Neglect. 1996; 20(6):503–510. http://dx.doi.org/10.1016/0145-2134(96)00032-4. [PubMed: 8800525]

Zywiak WH, Longabaugh R, Wirtz PW. Decomposing the relationships between pretreatment social network characteristics and alcohol treatment outcome. J Stud Alcohol. 2002; 63(1):114–121. [PubMed: 11925053]

Zywiak WH, Neighbors CJ, Martin RA, Johnson JE, Eaton CA, Rohsenow DJ. The important people drug and alcohol interview: Psychometric properties, predictive validity, and implications for treatment. J Subst Abuse Treat. 2009; 36(3):321–330.10.1016/j.jsat.2008.08.001 [PubMed: 18835677]

Highlights

- Study examined impact of women's personal networks on substance use by 12 months post treatment intake

- Network structure as well as substance users in the network was found to be predictive of substance use

- More densely connected networks were associated with an increased likelihood of substance use

- Non using isolates in women's networks were associated with decreased odds of substance use.

- Isolates who are not substance users may be a particular strength to cultivate for women in recovery

Table 1

Sample characteristics and correlations of study variables (*N* = 284)

	n (%)	M (SD)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Substance use by 12 months (yes)	116 (40.8)		1														
Clinical Characteristics																	
2. Outpatient (yes)	209 (73.6)		−.087	1													
3. Previous treatment history (yes)	205 (72.2)		−.140*	−.033	1												
4. Dual disorder (yes)	208 (73.2)		.211**	−.037	.139*	1											
5. Abstinence self-efficacy		76.9 (19.6)	−.217**	.166**	−.031	−.063	1										
6. Levels of trauma		43.2 (21.5)	.174**	−.123*	.058	.428**	−.087	1									
Personal network characteristics at 6 months post treatment intake																	
7. # of treatment related alters		3.9 (4.8)	−.074	−.055	.245**	.180**	.031	.212**	1								
8. # of substance using alters		7.0 (5.7)	.261**	−.049	−.127*	.064	−.097	.058	−.063	1							
9. # of alters providing concrete support		13.6 (7.6)	−.105	.076	.026	−.040	.099	−.072	−.049	−.411**	1						
10. # of alters providing sobriety support		20.9 (4.9)	−.193**	.043	.148*	.011	.053	−.071	.266**	−.359**	.583**	1					
11. # of critical alters		2.7 (4.1)	.117*	−.014	−.070	.079	.072	.115	−.083	.143*	−.087	−.177**	1				
12. # of reciprocal relationships		17.8 (4.9)	−.128*	.078	−.082	−.122*	.105	−.124*	−.127*	−.125*	.125*	.039	−.155**	1			
13. # of very close alters		12.5 (5.7)	−.157**	.088	−.009	−.129*	.046	−.195**	−.122*	−.335**	.509**	.438**	−.055	.126*	1		
14. Density		35.6 (29.4)	−.110	.057	−.066	−.130*	−.037	−.069	−.236**	−.178**	.209**	.127*	.022	.129*	.357**	1	
15. Isolates		4.0 (5.8)	−.086	−.016	−.016	.002	.065	−.097	.083	.063	−.134*	−.047	−.091	.071	−.173**	−.597**	1
16. Component		1.4 (0.7)	.145*	−.036	.109	.153**	−.103	.095	.214**	.055	−.093	−.074	−.039	−.143*	−.195**	−.277**	−.038

Note.

*
$p < .05$.

**
$p < .01$.

Table 2

Results of Hierarchical Logistic Regression

	Model 1	Model 2
	OR (95% CI)	*OR (95% CI)*
Clinical characteristics		
Outpatient (Yes)	0.80 (0.45, 1.43)	0.80 (0.43, 1.48)
Previous treatment history	**0.40 (0.22, 0.71)**	**0.43 (0.23, 0.82)**
Dual disorders	**2.84 (1.44, 5.62)**	**2.64 (1.28, 5.42)**
Abstinence self-efficacy	**0.98 (0.96, 0.99)**	**0.98 (0.96, 0.99)**
Trauma symptoms	1.01 (0.996, 1.02)	1.01 (0.99, 1.02)
Personal network characteristics at T3		
# of treatment related alters		0.95 (0.88,1.02)
# of substance using alters		**1.08 (1.02, 1.14)**
# of alters providing concrete support		1.04 (0.99, 1.09)
# of alters providing sobriety support		0.95 (0.88, 1.03)
# of critical alters		1.17 (0.89, 1.54)
# of reciprocal relationships		0.98 (0.92, 1.04)
# of very close alters		0.99 (0.93, 1.05)
Density		**0.98 (0.97, 0.998)**
Isolates		**0.92 (0.86, 0.99)**
Components		1.26 (0.84, 1.88)

Note. Model 1, $\chi^2(5) = 38.14$, $p < .001$. Pseudo $R^2 = .126$; Model 2, $\chi^2(15) = 71.06$, $p < .001$. Pseudo $R^2 = .221$, $\chi^2(10) = 32.92$, $p < .001$