A social network analysis approach to alcohol use and co-occurring addictive behavior in young adults

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HIGHLIGHTS

- Addictive behaviors tend to co-occur among network members.
- Network members cluster together based on co-occurring addictive behavior.
- At-risk drinkers perceive frequent use of addictive behaviors in their networks.

ARTICLE INFO

ABSTRACT

Introduction: The current study applied egocentric social network analysis (SNA) to investigate the prevalence of addictive behavior and co-occurring substance use in college students' networks. Specifically, we examined individuals' perceptions of the frequency of network members' co-occurring addictive behavior and investigated whether co-occurring addictive behavior is spread evenly throughout networks or is more localized in clusters. We also examined differences in network composition between individuals with varying levels of alcohol use.
Method: The study utilized an egocentric SNA approach in which respondents ("egos") enumerated 30 of their closest friends, family members, co-workers, and significant others ("alters") and the relations among alters listed. Participants were 281 undergraduates at a large university in the Southeastern United States.
Results: Robust associations were observed among the frequencies of gambling, smoking, drinking, and using marijuana by network members. We also found that alters tended to cluster together into two distinct groups: one cluster moderate-to-high on co-occurring addictive behavior and the other low on co-occurring addictive behavior. Lastly, significant differences were present when examining egos' perceptions of alters' substance use between the networks of at-risk, light, and nondrinkers.
Conclusions: These findings provide empirical evidence of distinct clustering of addictive behavior among young adults and suggest the promise of social network-based interventions for this cohort.

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1. Introduction

Excessive alcohol consumption is a serious problem in the United States, particularly in college populations (Hingson, Zha, & Weitzman, 2009). The most recent Monitoring the Future Survey found that 63% of college students consumed alcohol in the past month (Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2014). Furthermore, addictive behaviors tend to co-occur, such that individuals who frequently consume alcohol also tend to frequently engage in tobacco use, marijuana use, and gambling (Reboussin, Song, Shrestha, Lohman, & Wolfson,

2006; Shillington & Clapp, 2006; Weitzman & Chen, 2005). Individuals who engage in co-occurring substance use are at a greater risk of developing substance use related problems (Shillington & Clapp, 2006; Martens et al., 2009). Specifically, college students who use both marijuana and alcohol are more likely to drink and drive and to experience problems with alcohol than only those who consume alcohol (Shillington & Clapp, 2006).

It is widely accepted that social motives are among the most endorsed reasons for drinking among college students (Brennan, Walfish, & AuBuchon, 1986; Cronin, 1997; LaBrie, Hummer, & Pedersen, 2007). In a regression model, even after controlling for personal motives, social motives account for unique variance in alcohol use (Cronin, 1997; Haden & Edmundson, 1991; MacKillop et al., 2013). Furthermore, social motives in high school predict alcohol use in college (Corbin, Iwamoto,

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& Fromme, 2011), suggesting that younger adults' alcohol use is prospectively influenced by the desire to be socially compatible with peers.

Social network analysis (SNA) is a technique that quantifies and examines the structure of individuals' social networks. A *social network* refers to the individual's immediate social environment, such as friends, romantic partners, and family members. SNA allows researchers to examine compositional and structural characteristics of individuals' networks. *Compositional characteristics* refer to the proportion of individuals in a network with particular socio-demographic characteristics or behavioral traits. *Structural characteristics* refer to the pattern of relationships between individuals in a network. Structural characteristics, such as clustering in the network, can only be evaluated using SNA. In an egocentric SNA, the respondent (termed "ego") enumerates the most important individuals in his or her life (termed "alters"), answers questions pertaining to the alters, and classifies the relationships among alters.

Previous studies have examined compositional characteristics associated with addictive behavior. For example, individuals' alcohol consumption and misuse are positively associated with the proportion of network members who are drinkers, heavy drinkers, and "drinking buddies" (Fondacaro & Heller, 1983; MacKillop et al., 2013; Reifman, Watson, & McCourt, 2006). Similarly, individuals' smoking, drinking, and gambling are significantly associated with the same behaviors by peers (Andrews, Tildesley, Hops, & Li, 2002; Fortune et al., 2013; MacKillop et al., 2013; Meisel et al., 2013). Furthermore, heavy drinkers' networks have an overall greater rate of alcohol use as well as a greater proportion of "drinking buddies" compared to regular and infrequent drinkers' networks (Leonard, Kearns, & Mudar, 2000).

In the current study, we utilized an egocentric network design to extend past findings in three ways. First, we investigated the frequency of co-occurring addictive behaviors in college students' networks, hypothesizing that alters who were perceived to engage in one addictive behavior would also be perceived to engage in multiple addictive behaviors. Second, we examined whether addictive behaviors tended to co-occur among clusters of alters within networks. Third, we examined differences in not only alters' alcohol use, but alters' marijuana use, tobacco use, and gambling as well, between ego's with varying degrees of alcohol use and alcohol-related problems, the most common form of substance misuse among young adults. Based on previous studies, we hypothesized that, compared to light and nondrinkers, at-risk drinkers would report greater frequencies of addictive behavior among their alters. Based on the accuracy of ego's perceptions of their alters' substance use, two different interventions may be implemented. If the ego misperceives the frequency of addictive behavior by alters (e.g., the ego perceives that alters engage in addictive behavior more frequently than reality), normative interventions may be conducted to correct egos' perceptions. However, if the alters actually engage in multiple addictive behaviors frequently, social network interventions may be utilized to dissolve or attenuate the ego's ties to these network members. Alternatively, a social network intervention could focus on increasing the ego's ties to low-risk individuals. Social network interventions may be especially useful if addictive behaviors tend to co-occur among clusters of alters within social networks. If addictive behaviors tend to co-occur in clusters, clinicians can inform clients to not only dissolve ties to separate alters, but multiple alters connected to one another. Furthermore, it is important to understand that the relationships among alters may be critical to the ego. For example, alter A who engages in addictive behavior modestly, may be connected to alters B, C, and D who engage in addictive behavior frequently. It may be important for the ego to not only sever ties to alters B, C, and D, but also A because of his or her ties to the more problematic alters.

2. Method

2.1. Participants

281 undergraduates (189 females) enrolled in lower-level psychology courses at a large university participated in the study. Respondents

were compensated with course credit for their participation. The mean age was 19.4 ($SD = 1.44$). The majority of respondents classified themselves as Caucasian (82.2%), followed by African American (7.5%), Asian American (6.8%), and Other (3.5%).

2.2. Procedure

Respondents provided informed consent at the beginning of the study, completed a battery of assessments in an on-campus laboratory, and then were debriefed. The study was approved by the University of Georgia Institutional Review Board.

2.3. Measures

2.3.1. Ego questionnaires

Respondents completed the Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). This questionnaire assesses individuals' alcohol use and alcohol-related problems. Based on recommendations by DeMartini and Carey (2012), respondents were classified into three categories based on their total AUDIT score: nondrinkers were those who scored 0, light drinkers scored 1–7, and at-risk drinkers scored ≥8. Based on this classification, the sample included 57 nondrinkers, 115 light drinkers, and 109 at-risk drinkers.

Respondents answered questions pertaining to their own frequency of alcohol use, tobacco use, marijuana use, and gambling. Each behavior was assessed on a 6-point Likert frequency scale: *1) Not in the past year*, *2) Less than once a month*, *3) Once a month*, *4) Once a week*, *5) Multiple times a week*, and *6) Daily*.

2.3.2. Social network questionnaire

We utilized an egocentric network analysis approach, in which the respondent (i.e., "ego") enumerated 30 individuals (i.e., "alters") who had the most significant impact on the respondent's life in the past year. Each alter was classified as a friend, family member, romantic partner, or co-worker. The ego answered questions pertaining to the ego's perceptions of each alter's alcohol use, tobacco use, marijuana use, and gambling frequency on a 6-point Likert frequency scale: *1) Not in the past year*, *2) Less than once a month*, *3) Once a month*, *4) Once a week*, *5) Multiple times a week*, and *6) Daily*. Egos then evaluated the relationships among alters listed. Specifically, the ego answered questions about the closeness among the alters on a 5-point Likert scale. For purposes of analysis, a tie between alters was considered to be present if they were classified as either very or moderately close.

2.4. Data analysis

To test the first aim, whether alters engaged in co-occurring addictive behaviors, Pearson correlations were conducted. To examine the second aim, whether alters tended to cluster together based on similarities in co-occurring addictive behaviors, two unique cluster analyses were conducted. First, we partitioned the 281 egocentric networks into unique, non-overlapping clusters using the Markov Clustering algorithm (Van Dongen, 2000). Because egos are connected to each

Table 1
Frequency of alcohol use, marijuana use, tobacco use, and gambling by respondents. All values are percentages.

Frequency	Alcohol	Marijuana	Tobacco	Gamble
Not in the past year	21.0	55.5	72.2	80.1
Less than once a month	15.3	22.1	12.5	15.7
Once a month	9.6	8.2	6.8	1.4
Once a week	23.5	5.3	2.5	2.2
Multiple times a week	30.3	5.7	3.6	0.3
Daily	0.3	3.2	2.4	0.3