

An Agent-Based Model of the Influence of Lifetime Attendance on the Stability of Self-Help Groups

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Abstract

Within the literature on Alcoholics Anonymous, the empirical evidence for the benefits of lifetime attendance in maintaining sobriety is mixed (Kaskutas, Ammon, DeLucchi, Bond & Weisner, 2002; Lloyd, 2002). However, self-help groups face the challenge of maintaining themselves in the absence of professional staff. Lifetime attendance may benefit the stability of the group.

In this study, a model of self-help group growth was developed using NetLogo 4.0.2. Each agent represents an individual alcoholic searching for a meeting. Each agent has a sobriety score; higher sobriety scores reduce the chance of drinking. An agent affiliates with a meeting by affiliating with a mentor who is attending that meeting. Groups add members through this process of individual affiliation. Once a group reaches sufficient size it splits into two different groups. The model tracks the number of groups descended from the initial group and the number of members of those groups.

The model compared a group with lifetime attendance to a group in which attendance continues until the agents reach a sufficient sobriety score that a return to drinking is unlikely. When one group has lifetime attendance while members of the other leave when their sobriety score reaches 200, the lifetime attendance group has a strong statistical tendency to leave more descendant groups, have more current members, and have more members overall (including graduates) ($t = 8.80, 9.23, \text{ and } 6.43$ respectively, all p -values < 0.001). However, increasing the sobriety score at which agents graduate returned the two groups to parity.

This study suggests that length of attendance may influence the success of self-help groups regardless of its relationship to individual level outcomes. Self-help group researchers may have looked at lifetime membership through too narrow a lens, and should consider its relationship to group stability as well as individual sobriety.

Background

Alcoholics Anonymous encourages lifelong participation as a process of the recovery (Humphreys, 2002)

Participants are encouraged to carry the message on to others (AA, 2001)

Contradictory findings in long-term involvement studies: Continuing treatment correlated with abstinence and lack of drinking problems but has also been shown to grow weaker over time

AA is not an intervention, but a self-help group; it must maintain itself

Complex Adaptive System (CAS)

multiple components (members in AA)

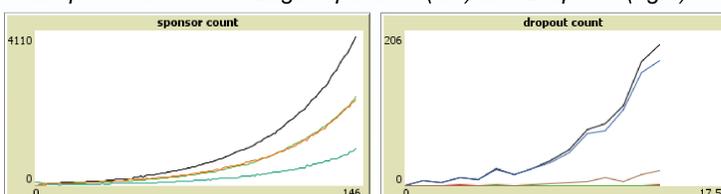
interact locally to produce emergent properties

whole is more than the sum of the parts (includes interactions between the parts)

adapts to surroundings

Lifelong membership may be limited in maintaining sobriety, but may be very important for maintaining AA meetings

Sample Plots from NetLogo: Sponsors (left) and Dropouts (right)



Methods

Exploratory Analysis—Agent Based Models

Capture interactions between components in CAS

Computer simulation (software NetLogo used)

Developed from theoretical framework based on believed valid stylized facts about AA

Repeated runs of model possible (100 times each for this study)

Three separate models tested

Model 1

One self help group, members attend indefinitely, group splits periodically when too large

Model 2

Two initially identical self help groups competing to attract members; groups split when large producing two networks of groups

Model 3

Two self help groups, one has graduations and one does not; groups split when large producing two networks of groups; all groups split from graduation group continue to have graduates

Model Components

Sobriety Score

Likelihood that individual will stay sober

More likely to drop out of AA when score is low (score = 0 is automatic dropout)

Lottery system to implement other dropouts

Number of lottery tickets is inversely proportional to sobriety score (higher score, fewer tickets, less likely to drop out)

Sobriety score changes based on individual

No sponsor, no sponsee, score decrease by 3 weekly

Sponsored, score increases by 1 weekly

For each sponsee, score increases by 1 weekly

Sponsor-Sponsee

Individual finds sponsor by comparing sobriety score (must be at least 100 points higher in this study)

Individuals without a sponsor compare score to a set number of others each week (5 for this study)

Individuals become sponsors when sponsees select them

Multiple sponsees possible for each sponsor

New Members

Increases by $N = C / 30$ individuals each week; where C = total individuals currently in the model and N = new members

At least one new member a week

Begin with a sobriety score chosen randomly from the normal distribution (150, 35)

Graduation

Only included in Model 3

When sobriety score gets high enough, individuals leave AA due to graduation (not dropout)

Scores of 200, 250, and 300 are tested in Model 3

Starting Conditions

Two initial groups meeting once a week

Six individuals randomly assigned to two groups

Groups are set to split when they are relatively large (25 members)

Results

Model 1

Groups continued to grow

Average group number was 74.24 (SD 4.79) and average membership was 1346.60 (SD 84.33); roughly 18 members per group

Model 2

Negative correlation seen between number of groups ($r = -.815$) and number of members ($r = -.842$) in each network (see graphs below)

No consistency to which group would advance (groups: $t = -1.39, df=99, p = .169$; members: $t = -1.35, df = 99, p = .181$)

Short Model Runs (2000 ticks)

Mean difference 10.73 for groups and 191.20 for members

Kurtosis .038 (SE .478) and -.027 (SE .478)

Skewness .734 (SE .241) and .677 (SE .241)

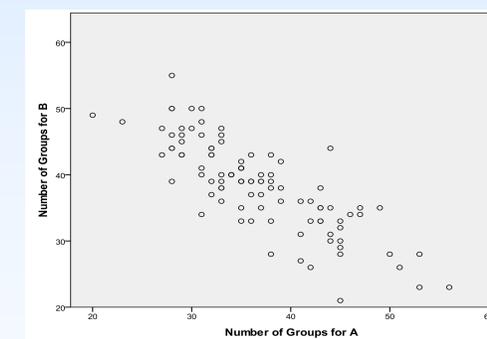
Long Model Runs (3000 ticks)

Mean difference 38.85 for groups and 700.12 for members

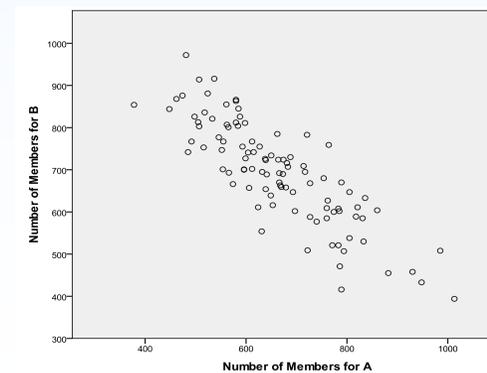
Kurtosis .292 (SE .478) and .318 (SE .478)

Skewness .856 (SE .241) and .835 (SE .241)

Correlation between number of groups in Network A and Network B in Model 2



Correlation between number of members in Network A and Network B in Model 2



Results

Model 3

Included graduation, tested at three levels low (sobriety score of 200 to graduate), medium (score of 250), and high (score of 300)

Low sobriety score graduations:

Average difference between number of groups 8.94 ($t = 8.80, p < 0.001$)

Average difference in number of members 166.91 ($t = 9.23, p\text{-value} < 0.001$).

Medium sobriety score graduations:

Average difference between groups was 1.86 ($t = 1.36, p\text{-value} = .178$)

Average difference between number of members was 28.16 ($t = 1.14, p\text{-value} = .259$).

High sobriety score graduations:

No significance differences between groups or members

Very few graduates, range from 0 to 8 across 100 runs of the model—results similar to model 2.

Conclusion

Path Dependence – one group becomes more dominant

Supported by increasing skewness and kurtosis values as the model runs longer

Supported by increased average differences between groups and members as model runs longer

Supported by negative correlation between number of group/members (graphs)

Multistability – two equally likely outcomes from same initial beginning settings

Seen in model 2 where both groups are equally likely to be the most successful

Disappears when comparing low graduation scores to lifetime membership in model 3—the lifetime membership group is more likely to take over

Lifelong or extended membership does appear to play a part in growth and maintenance of AA

More meetings to choose from

More sponsors to choose from

Sample Plot from NetLogo: Sobriety Scores of all individuals

