

Dynamic spread of happiness in a large social network: longitudinal analysis over 20 years in the Framingham Heart Study



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Overview

- Research Question
 - *Can happiness spread from person to person?*
 - *Can we observe niches of happiness form within a social networks?*
- Method
 - *Longitudinal social network analysis*
- Result:
 - *Clusters of happy and unhappy people are visible in the network*
- Conclusion
 - *People's happiness depend on the happiness of others*

Glossary

- **Ego:** the focal individual
- **Alter:** A person connected to the Ego
- **Node:** An object that may or may not be connected to other objects in a network
- **Tie:** A connection between two nodes
- **Homophily:** Tendency of people choosing relationships with people who have similar attributes
- **Components:** A group of nodes that is a subset of a full network
 - Each node is connected by at least one path to every node in the same components
- **Clusters:** A group of nodes of a certain type that is a subset of a full network
 - Each node is connected by at least one path via nodes of the same type to every node in the same group.
- **Degree of separation:** The social distance between two individuals as measured by the smallest number of intermediary ties.

Introduction

- Happiness is a fundamental object of human existence
- Happiness is determined by a set of voluntary and involuntary factors
 - Lottery wins, elections, income, job loss, illness, bereavement, and *happiness of others*.
- Emotional states can be transferred directly from one individual to another via:
 - Mimicry and emotional contagion
- Emotional contagion is possible between strangers
 - Service with a smile and tipping

Methods

- 5124 participants from Framingham Heart Study from 1948 to 2002
- Each ego is connected to other people via:
 - Friendship, family, spousal, neighbour, and coworker relationships.
- Each relationship is a social tie
- There were 53228 observed social ties between 5124 egos and any alters.
- Each person who has a relationship with the ego is called alter

GOAL

- What is the influence of these alters on the ego?

Social Networks

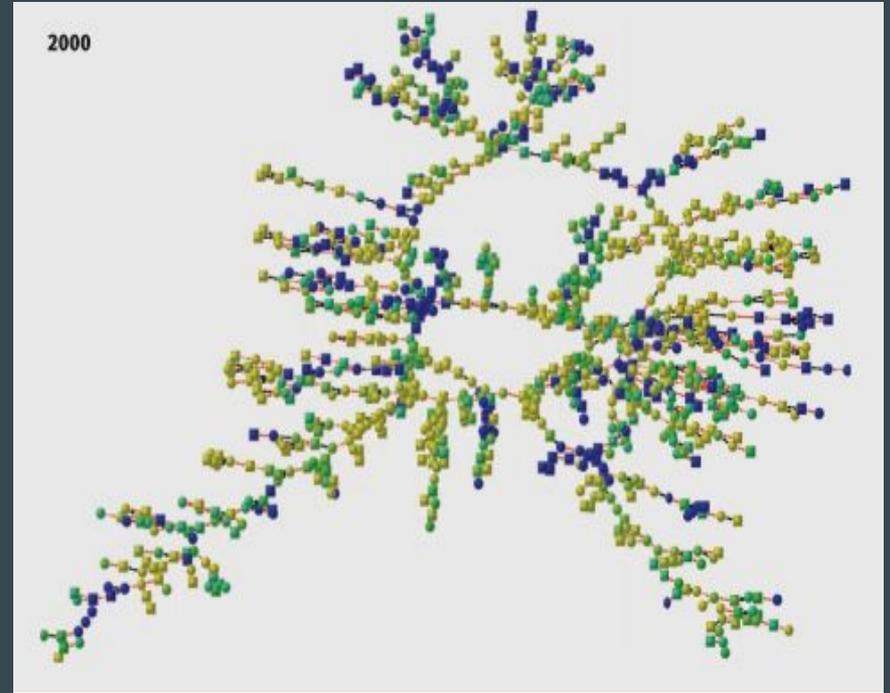
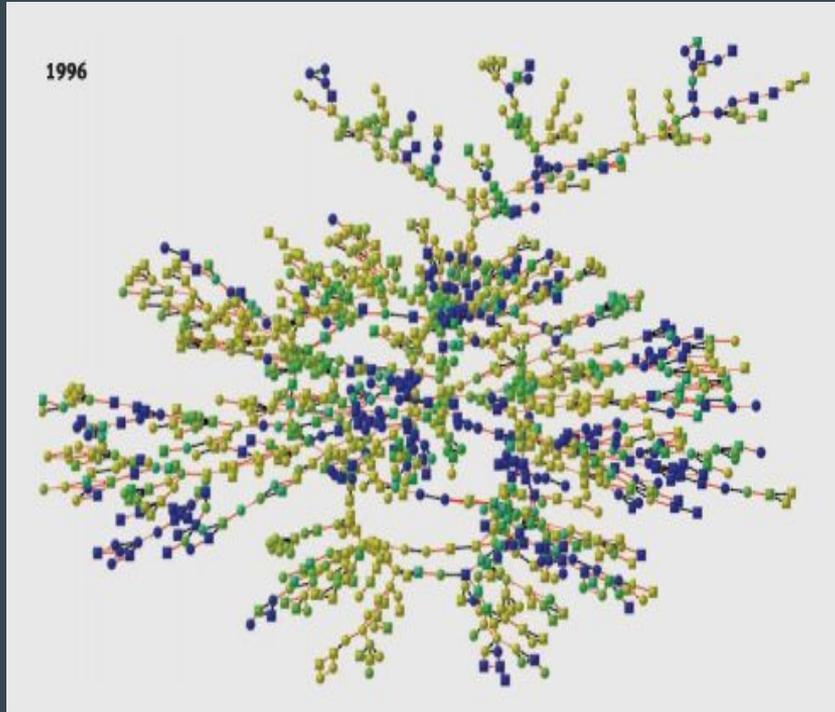


Fig 1 | Happiness clusters in the Framingham social network. Graphs show largest component of friends, spouses, and siblings at exam 6 (centred on year 1996, showing 1181 individuals) and exam 7 (year 2000, showing 1020 individuals). Each node represents one person (circles are female, squares are male). Lines between nodes indicate relationship (black for siblings, red for friends and spouses). Node colour denotes mean happiness of ego and all directly connected (distance 1) alters, with blue shades indicating least happy and yellow shades indicating most happy (shades of green are intermediate)

Social Network Hypothesis and measures

- The influence a friend has on an ego would be affected by the type of friendship
 - Strongest effect between mutual friends
 - Followed by ego perceived friendships
 - Followed by alter perceived friendships
- They used four items from CES-D
 - People were asked how often they experienced certain feelings
 - I feel happy, I enjoyed life, etc
 - Happiness was defined as perfect score on all four questions

Social Network Analysis

- Centrality captures the extent to which a node connects, or lies between, other nodes
- The simplest measure of centrality is a count of the number of friends (this is called “degree” centrality).
- People with more friends will tend to be more central

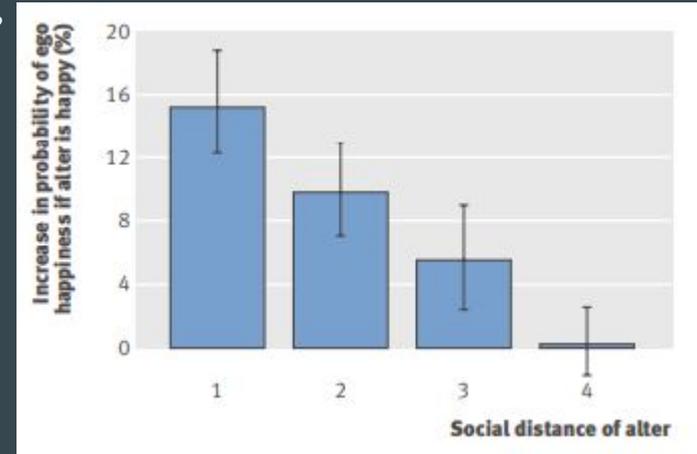


Fig 2 | Social distance and happiness in the Framingham social network. Percentage increase in likelihood an ego is happy if friend or family member at certain social distance is happy (instead of unhappy). The relationship is strongest between individuals who are directly connected but remains significantly >0 at social distances up to three degrees of separation, meaning that a person’s happiness is associated with happiness of people up to three degrees removed from them in the network. Values derived by comparing conditional probability of being happy in observed network with an identical network (with topology and incidence of happiness preserved) in which same number of happy people are randomly distributed. Alter social distance refers to closest social distance between alter and ego (alter=distance 1, alter’s alter=distance 2, etc). Error bars show 95% confidence intervals

Statistical Analysis

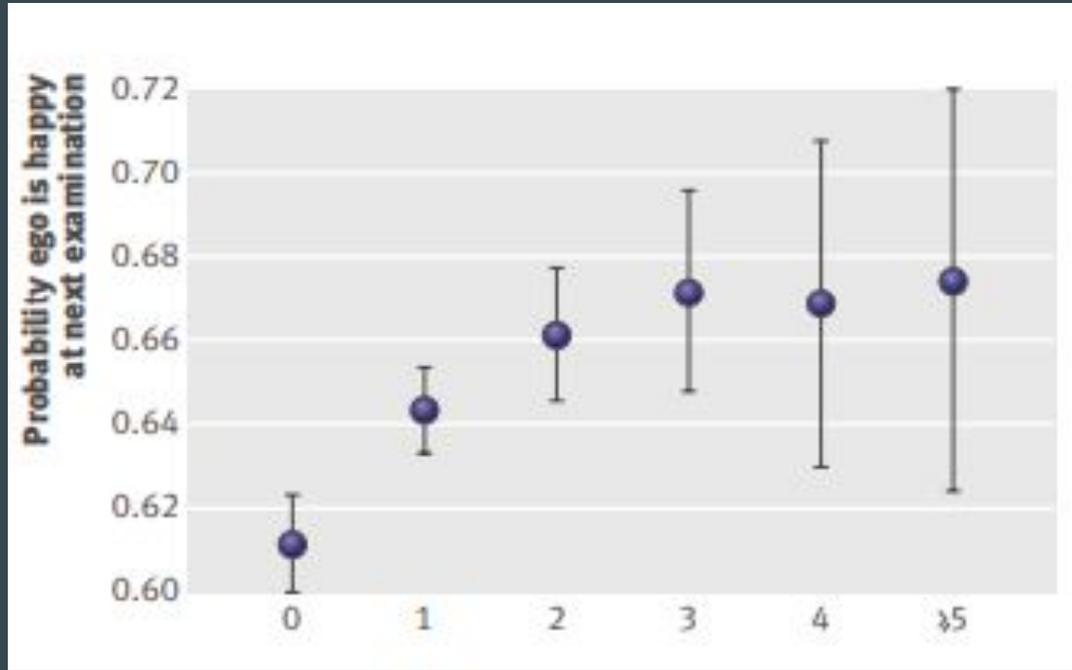


Fig 3 | Happy alters in Framingham social network. Mean probabilities observed in raw data with standard errors. Ego happiness in exams 6 and 7 (dichotomised between those who are maximally happy and everyone else) is positively associated with number of happy alters in previous exam.

Statistical Analysis

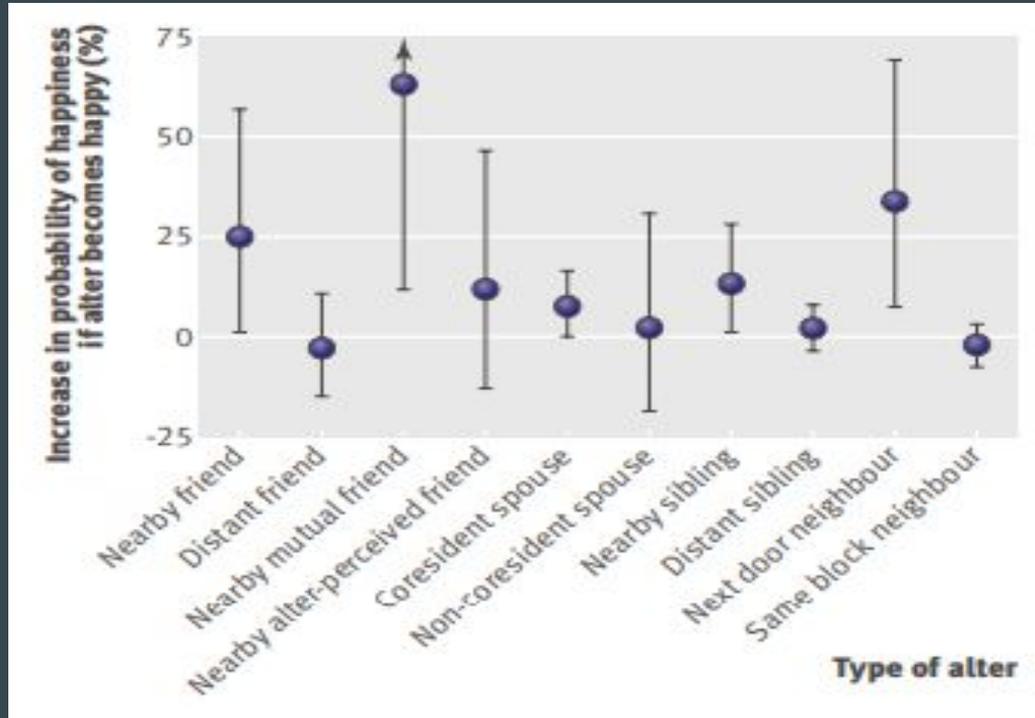


Fig 4 | Alter type and happiness in the Framingham social network. Friends, spouses, siblings, and neighbours significantly influence happiness, but only if they live close to ego. Effects estimated with generalised estimating equation logit models of happiness on several different subsamples of the network (see table S6 in appendix on bmj.com)

Statistical Analysis

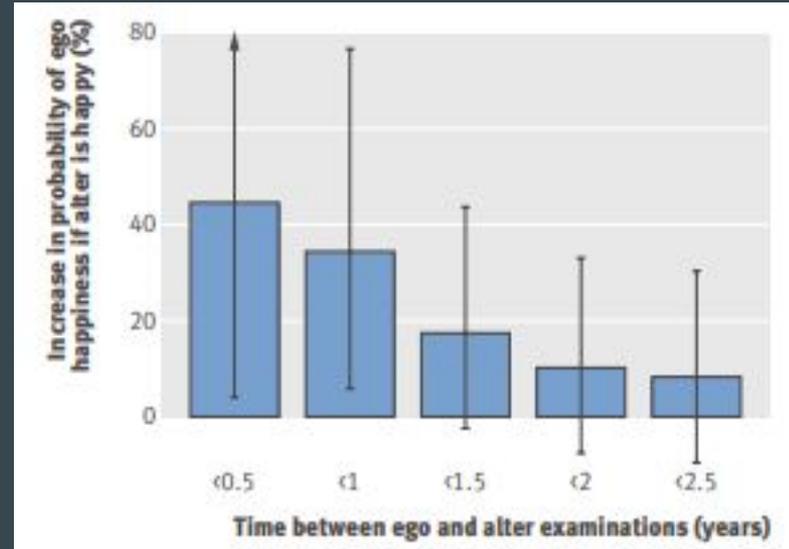
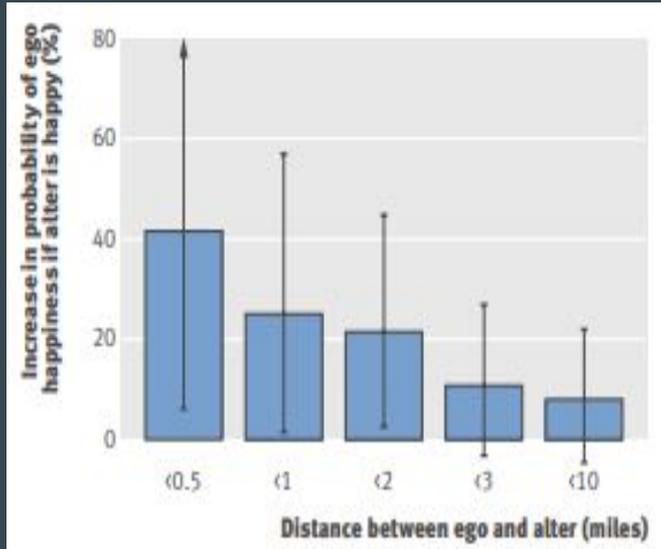


Fig 5 | Physical and temporal separation and spread of happiness in Framingham social network. Figure shows probability that ego is happy given that alter friend is happy, for different subsamples. left: effect of gradually increasing maximum distance allowed between ego and alter households. Friends who live less than half mile (0.8 km) away have the strongest effect on ego happiness, and effect decreases with distance. right: effect of gradually increasing maximum time allowed between ego and alter exams. Friends who report becoming happy within past half year exert strongest influence on ego happiness, and effect decreases as time between ego and alter exams increases.

Results

- Happy People tends to be connected to one another
- A person is 15.3% more likely to be happy if a directly connected alter (distance 1) is happy.
 - The effect for distance two alters is 9.8% (7.0% to 12.9%) and for distance three alters is 5.6% (2.4% to 9.0%).
- “Nearby” friends (who live within a mile (1.6 km)) and who become happy increase the probability ego is happy by 25% (1% to 57%).
 - “Distant” friends(who live more than a mile away) have no significant effect on ego

Results

- Nearby mutual friends have a stronger effect than nearby ego perceived friends;
- People at the core of their local networks seem more likely to be happy, while those on the periphery seem more likely to be unhappy
- The better connected are one's friends and family, the more likely one will attain happiness in the future.
- Happy alters consistently influence ego happiness more than unhappy alters
 - The number of happy friends seems to have a more reliable effect on ego happiness than the number of unhappy friends.

Results

- Coresident spouses increase the probability their spouse is happy
 - Non-co resident spouses have no significant effect.
- Nearby siblings increase their sibling's chance of happiness
 - While distant siblings have no significant effect.
- Next door neighbours increase ego's happiness by 34%
 - Neighbours who live on the same block have no significant effect
- Coworker has no effect on the happiness of an ego

Results

- An ego is more likely to be happy if a friend who lives less than half a mile away becomes happy
 - The effect declines and ceases to be significant at greater distances.
- Changes in happiness are temporary and that there is “hedonic adaptation” to diverse stimuli
 - People get used to good or bad fortune after some time.
- Sex also plays a part in the spread of happiness.
 - Happiness spreads significantly more through same sex relationships than opposite sex relationships

Thank you for listening happy people

