Erasmus School of
Social and
Behavioural Sciences

Media & Ethiek:

Social Networks and Health Interventions

Erasmus University Rotterdam

dr. Thabo van Woudenberg

Post-doc research at Erasmus University Rotterdam

Social influence on health-related behaviors

- Physical activity

Social Network Analysis

SocialMovez-project

AIM:

The overall aim of this project is to develop and test a framework for effective and responsible **health campaigns**, using **Online Social Networks** to identify and motivate **peer influencers** while safeguarding **digital privacy**.

my movez

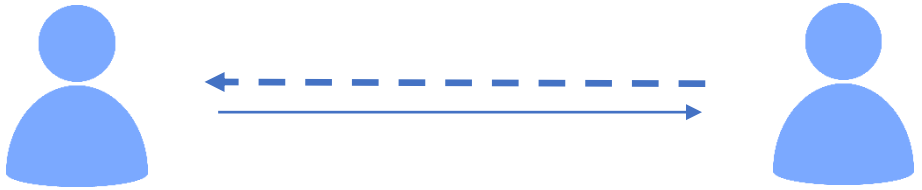
Why do we need Social Network Analysis?

Behavioral determinants

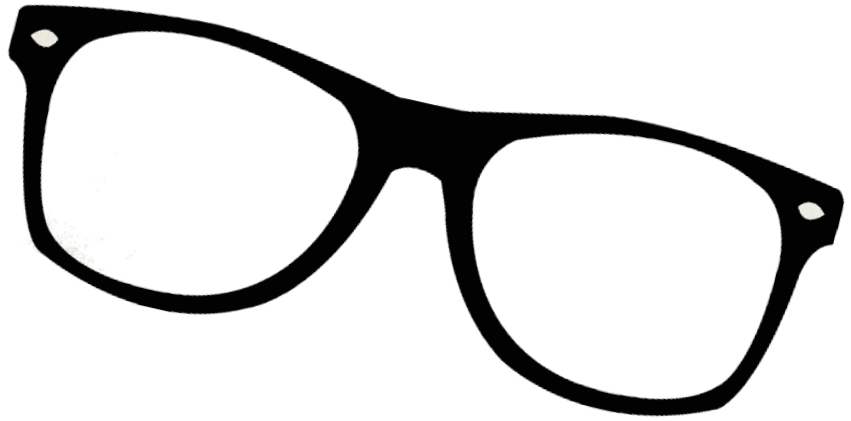
- Motivation
- Efficacy
- Demographics

Social influence:

- Social facilitation
- Modelling
- Impression management

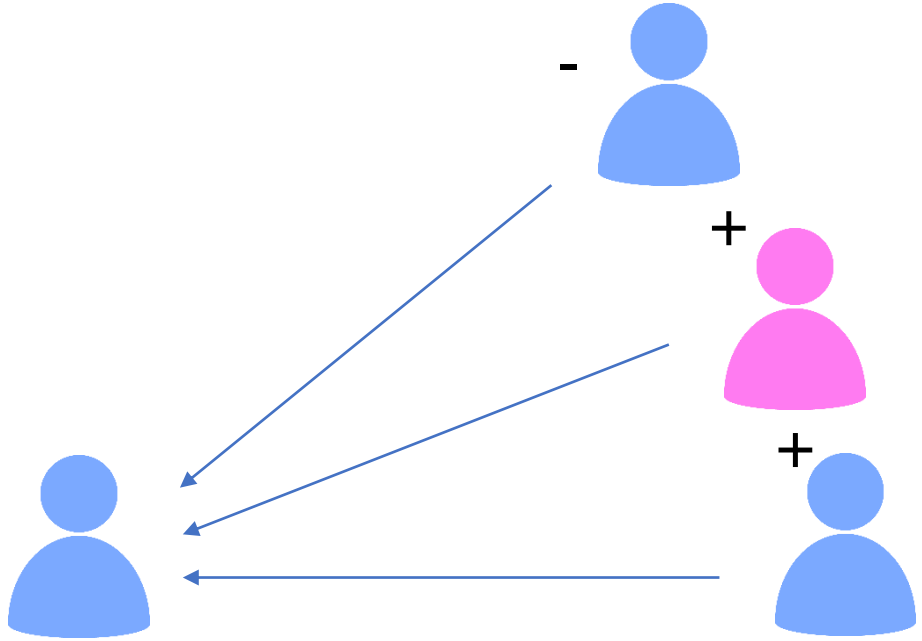


Social Network Analysis

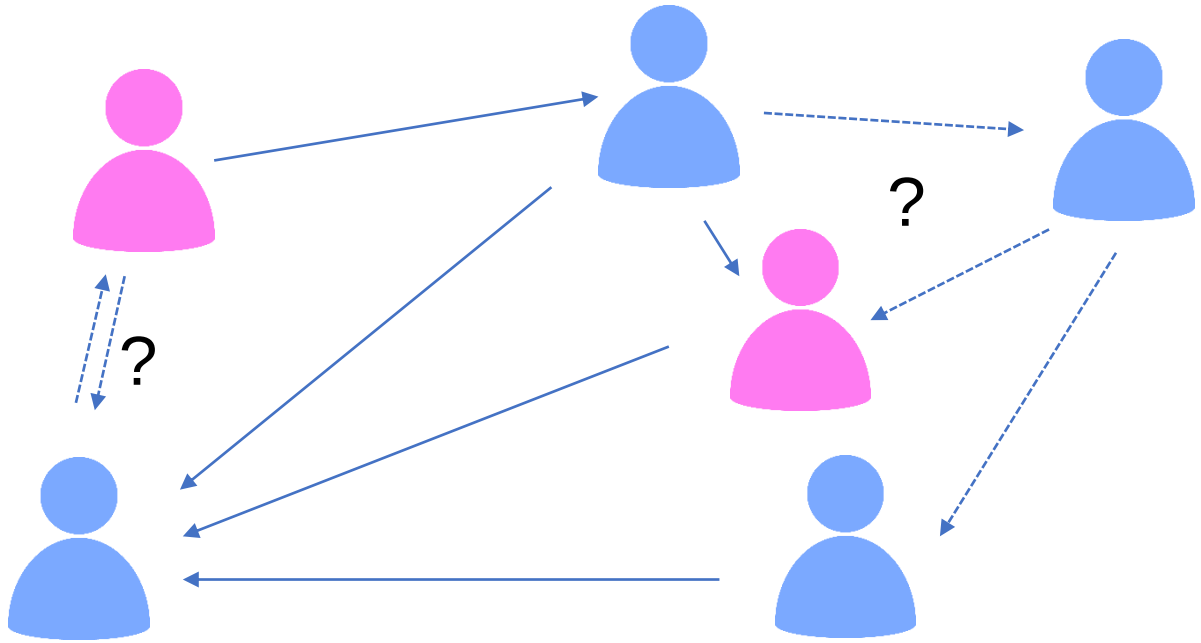


Social influence:

- Social norms



Social Network Analysis

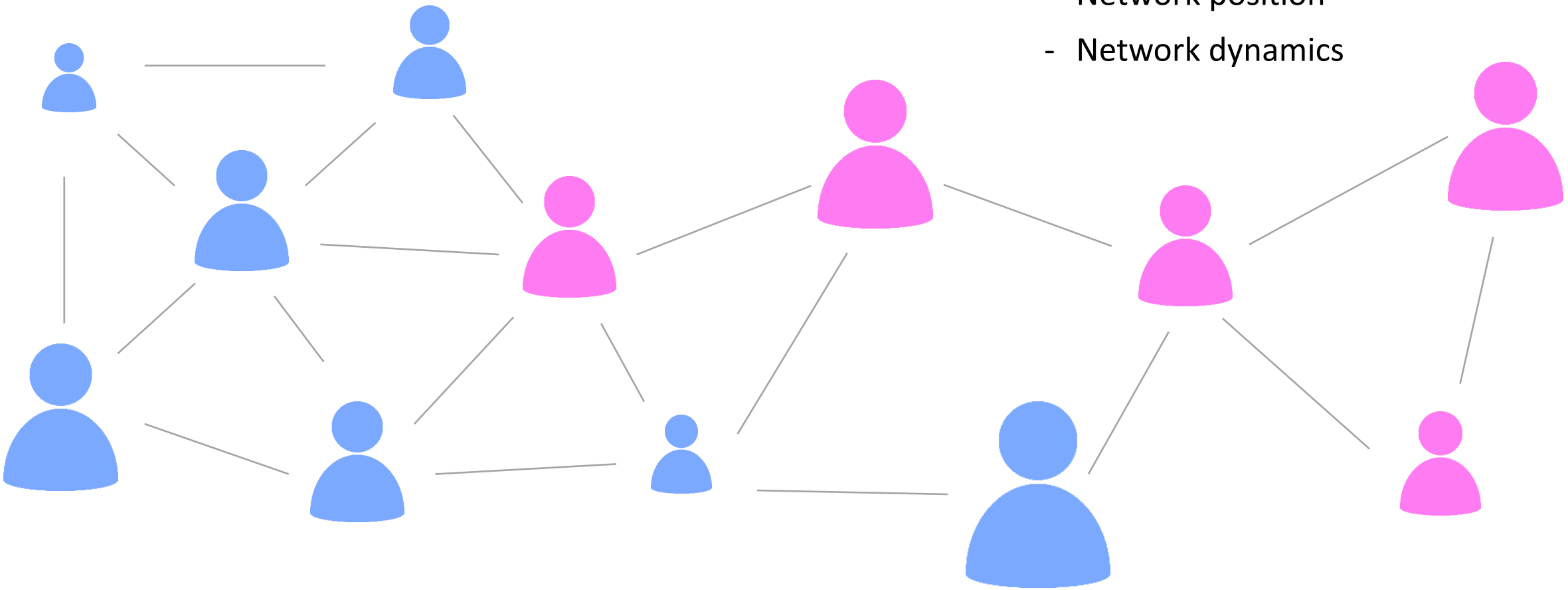


But these peers are all related to each other

Social Network Analysis

Graph theory

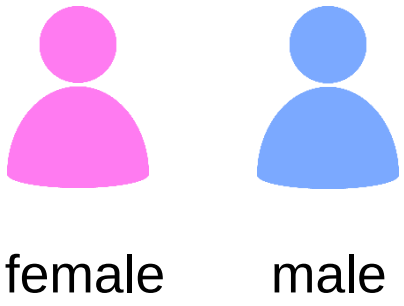
- Network influence
- Network position
- Network dynamics

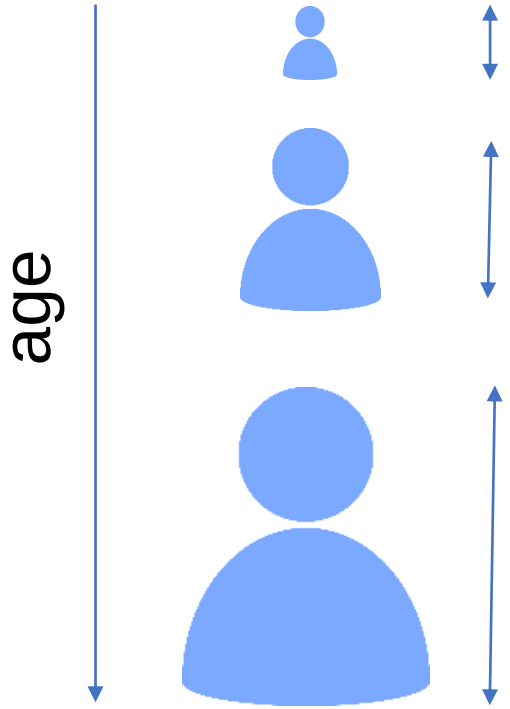


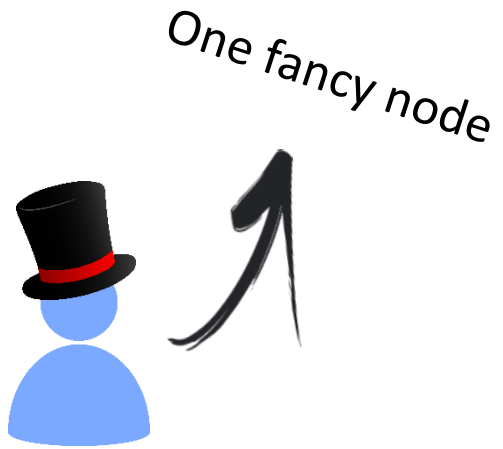
Relationships among Actors

Social Network Analysis

Actors (nodes/vertex)

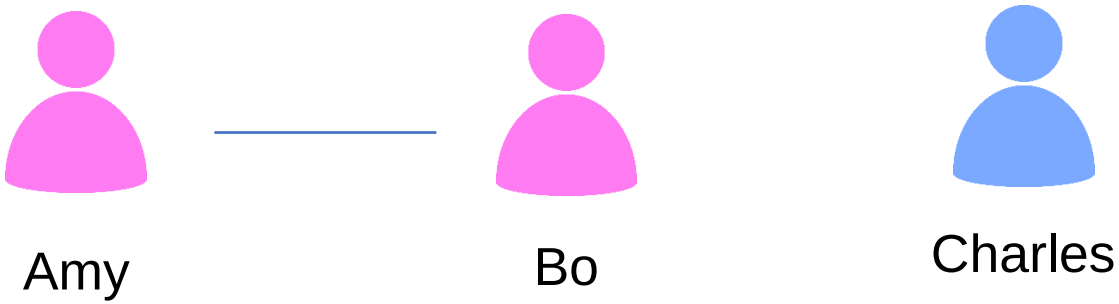


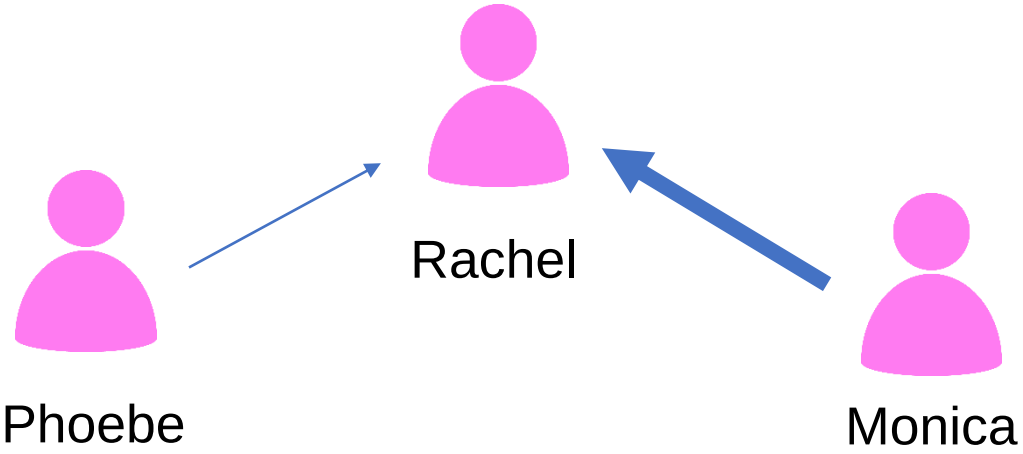


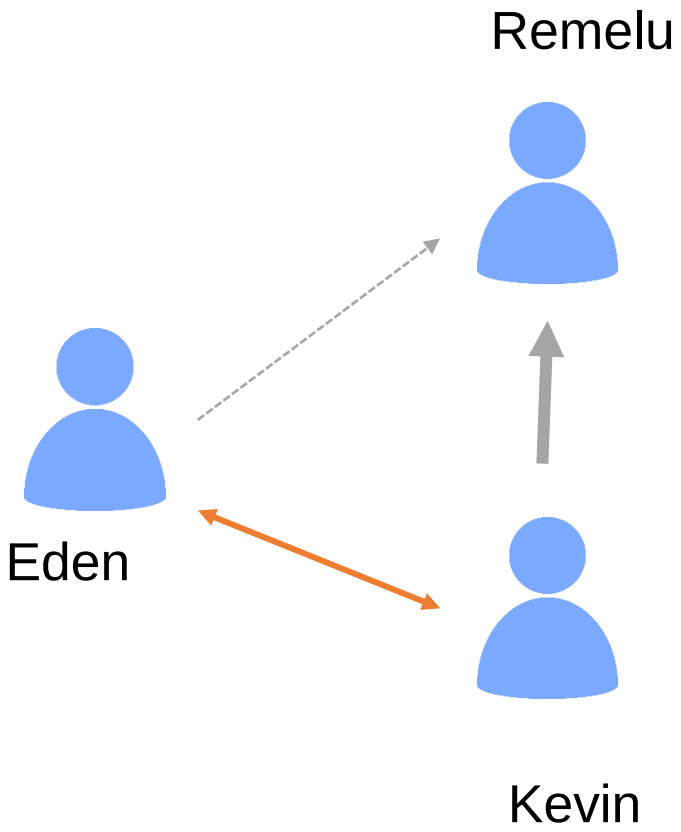


Social Network Analysis

Relationship (edges/ties)







Different types of edges

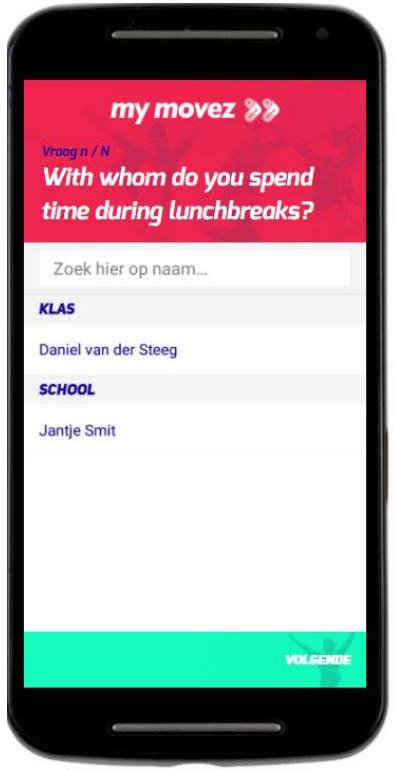
Network Science **8** (1): 62–78, 2020
doi:10.1017/nws.2019.65

CAMBRIDGE UNIVERSITY PRESS

ORIGINAL ARTICLE

Comparing the measurement of different social networks: Peer nominations, online communication, and proximity data

T. J. van Woudenberg[1*], K. E. Bevelander[2], W. J. Burk[1], C. R. Smit[1], L. Buijs[1] and M. Buijzen[1,3]

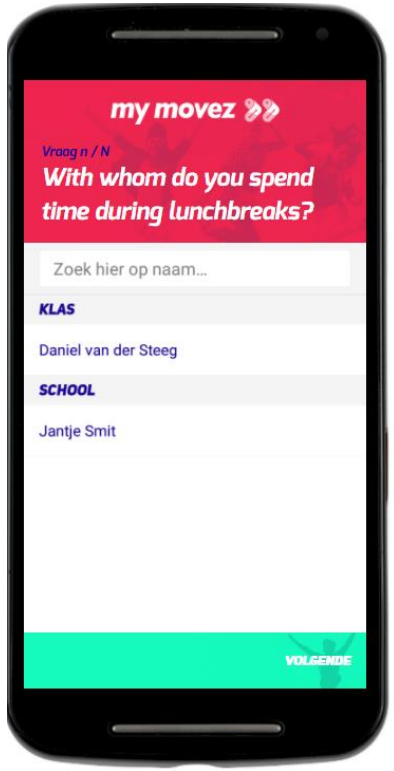


Nomination

Proximity

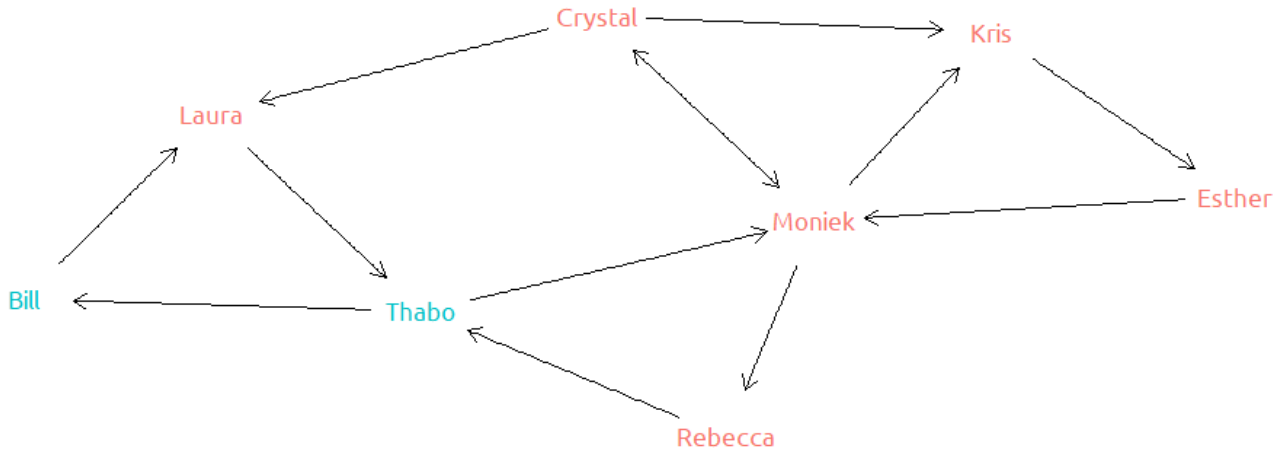
Communication

Nominated relationships



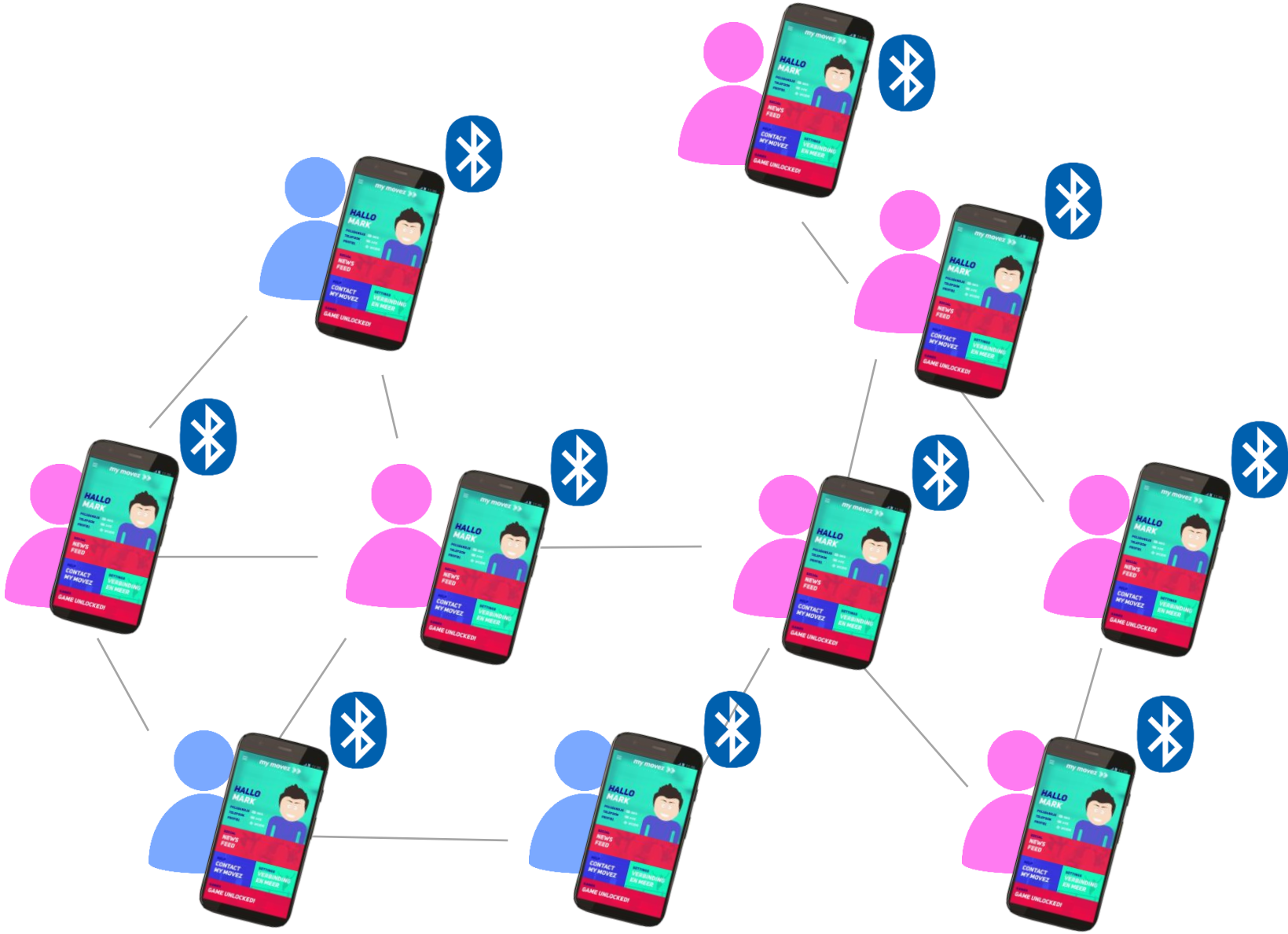
Nomination

Who nominates (ego)	Who is nominated (alter)
Bill	Laura
Laura	Thabo
Crystal	Kris; Laura; Moniek
…	…



Proximity

Proximity



Communication

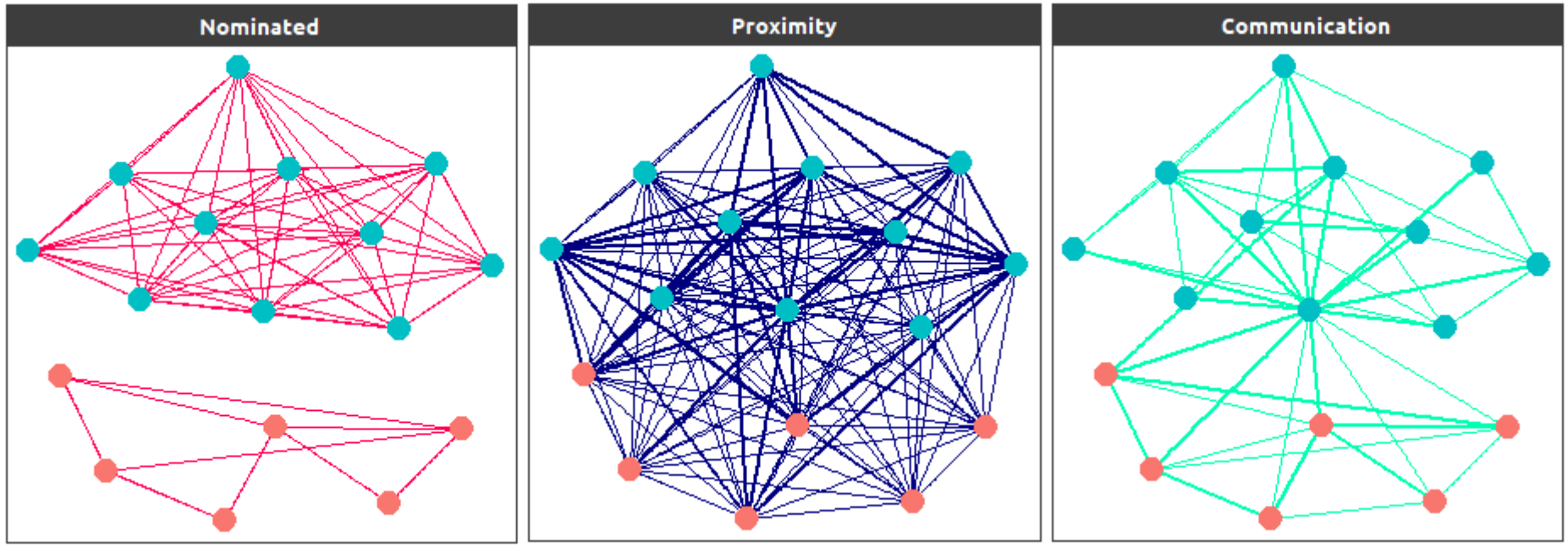
Communication

Kind	Datum	Tijd	UMID	Alter	Bericht
2268	14-2-2017	10:42	15454		Hoezi
2270	14-2-2017	10:42	15455		Lol
2268	14-2-2017	10:42	15456		Hoezo
2270	14-2-2017	10:42	15458		Hihi
2263	14-2-2017	10:42	15459	3310002270	
2275	14-2-2017	10:42	15461		Yolo????
2268	14-2-2017	10:43	15464		Hahahahha
2272	14-2-2017	10:43	15465	3310002265	Hey
2267	14-2-2017	10:43	15466		Hoii
2267	14-2-2017	10:43	15468		????
2272	14-2-2017	10:43	15469	3310002265	Wat dooooeeee je
2268	14-2-2017	10:44	15471	3310002271	Ilias
2272	14-2-2017	10:44	15472	3310002265	Hi hi
2263	14-2-2017	10:44	15474		Hey
2270	14-2-2017	10:45	15475	3310000000	Hallo
2263	14-2-2017	10:45	15476	3310000000	Maak de chat langer aan??
2298	14-2-2017	11:54	15477	3310100000	Hoiii
2298	14-2-2017	11:54	15478	3310100000	Hoe gaat het

2272 → 2265

2272 → 2265

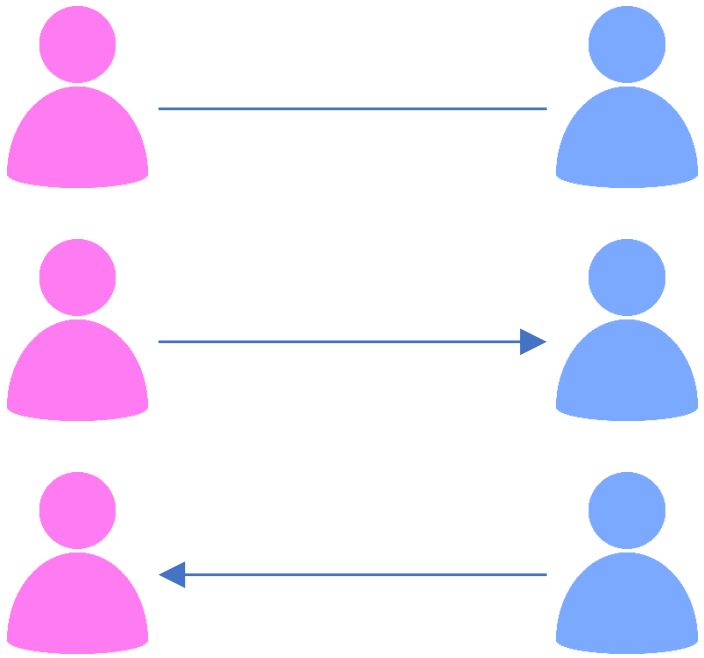
2268 → 2271


Nominated
Proximity
Communication

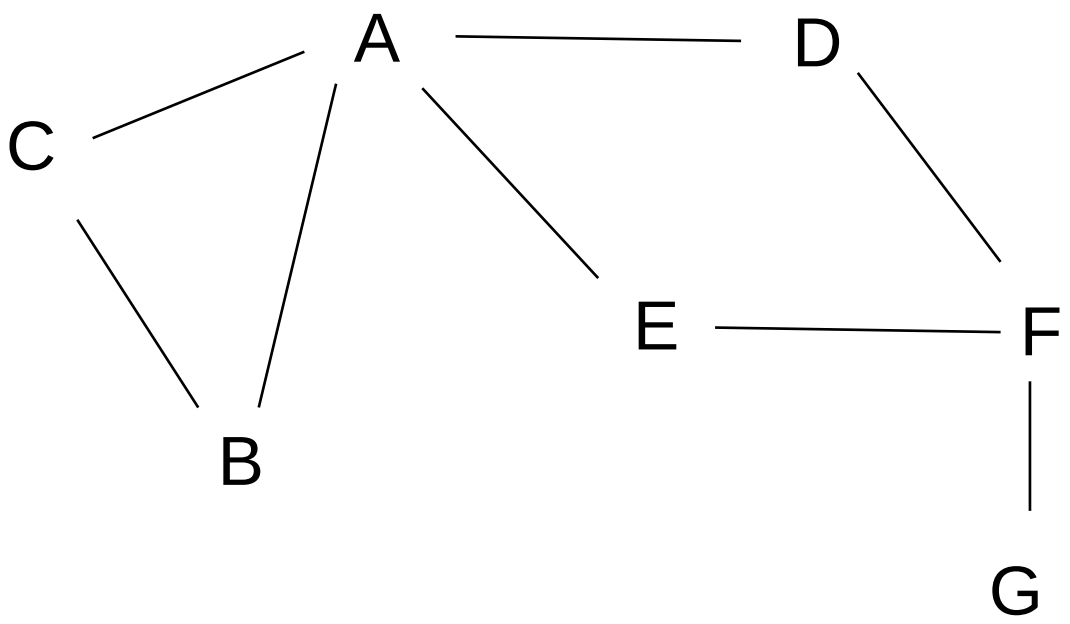
Node properties

Relationships as properties of the actors

- Neighbors: The set of nodes that have a tie with the given node.
- Degree: The number of ties attached to the given node.



- Directed networks:
  - In-Degree
  - Out-Degree

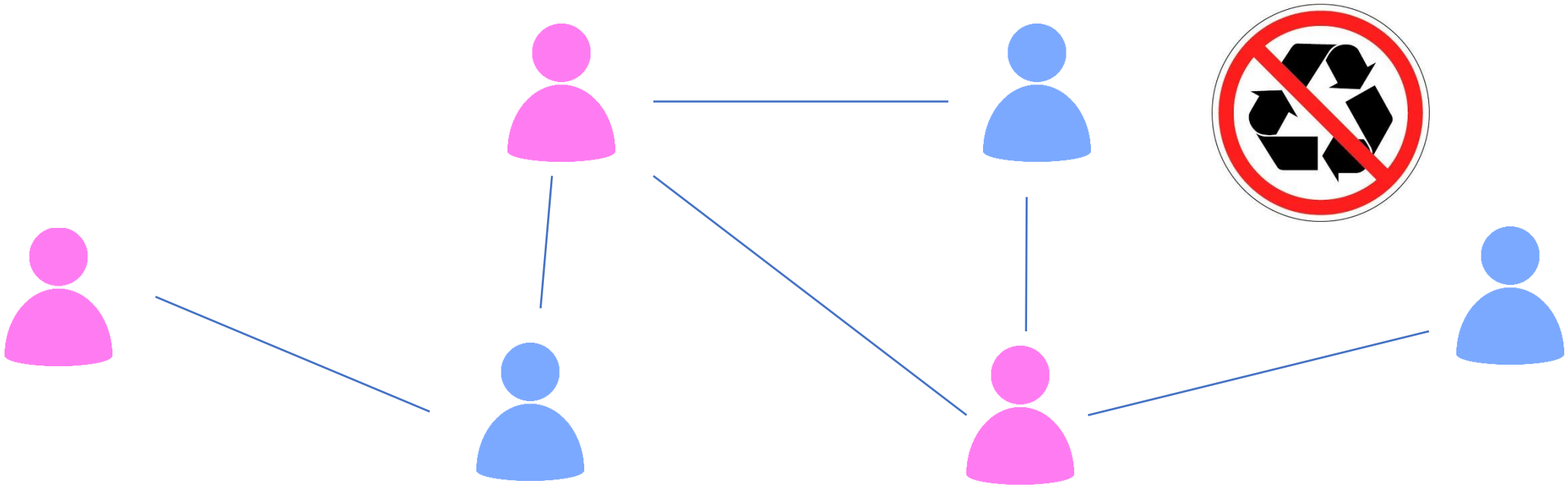


1: Neighbors of A?

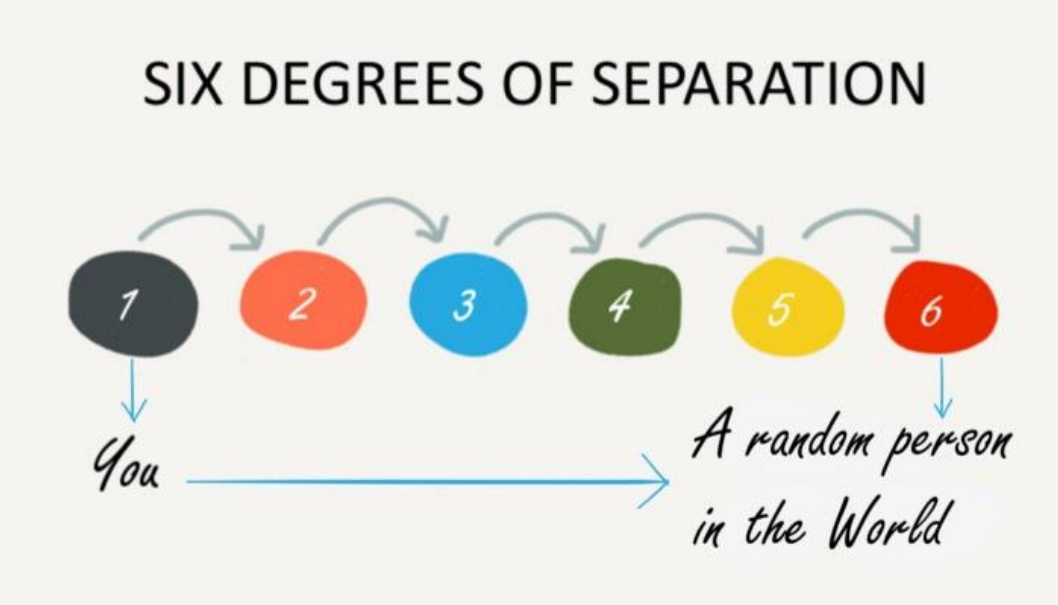
2: Degree of C?

Paths

- **Geodesic:** Formal name for the shortest path between a pair of nodes.
- **Diameter:** The length of the longest of all the shortest paths in the network. Note that some authors use ‘diameter’ to refer to the average length of shortest paths.

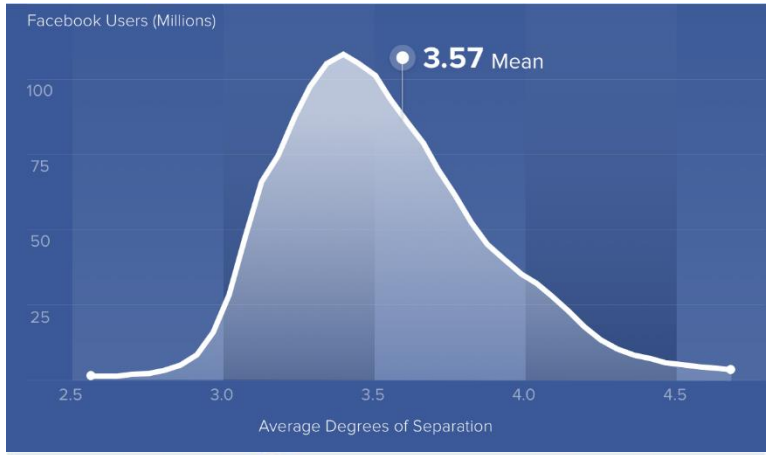


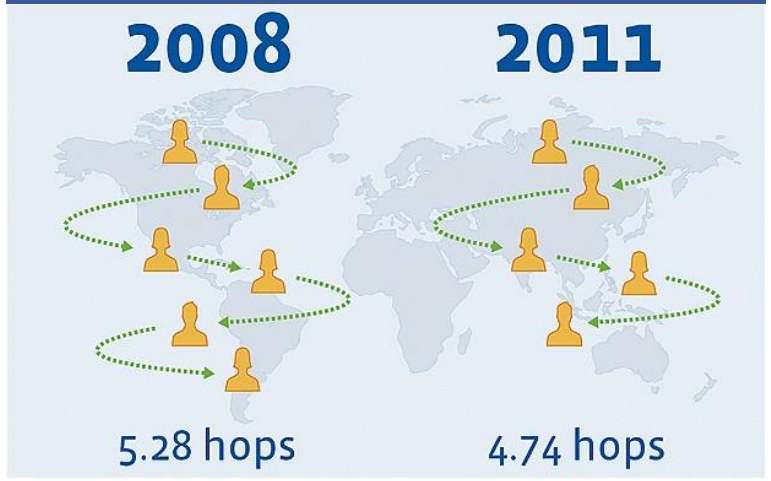
Intermezzo



44^6 =
7,26 Billion

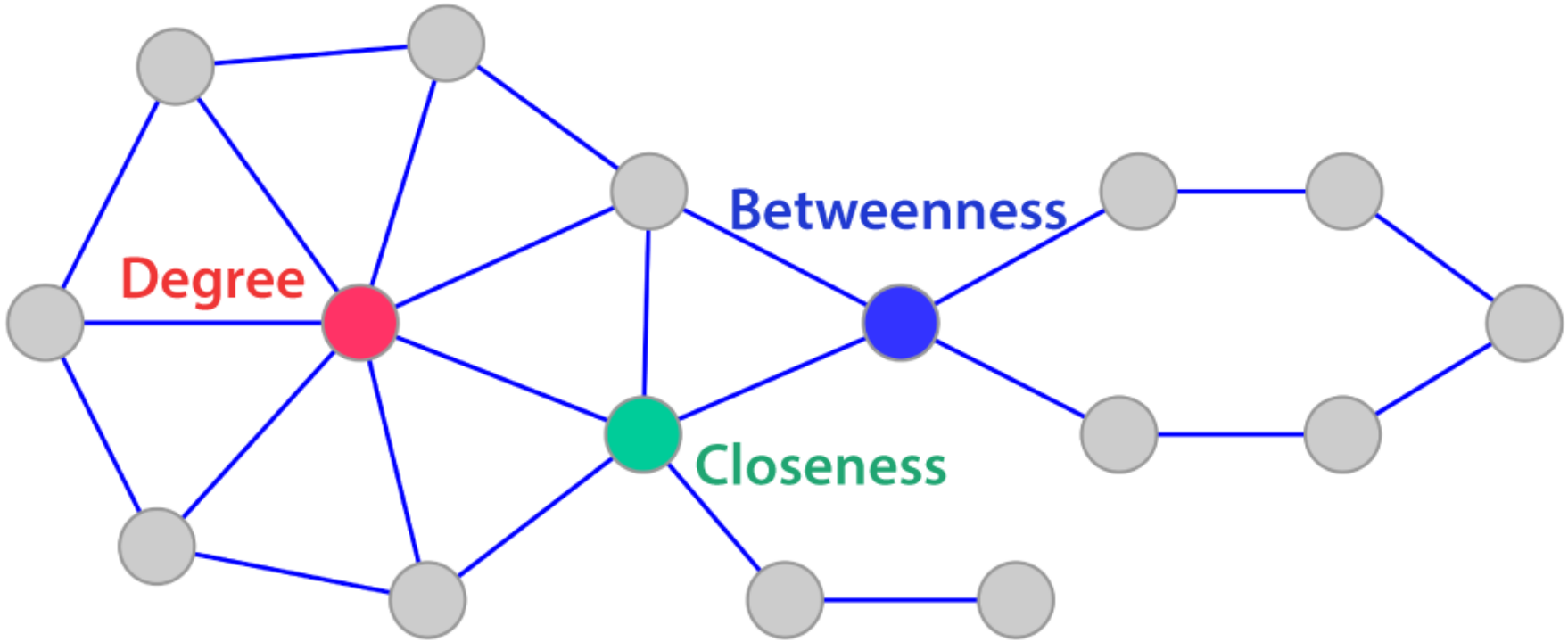
https://www.sciencealert.com/are-we-all-really-connected-by-just-six-degrees-of-separation



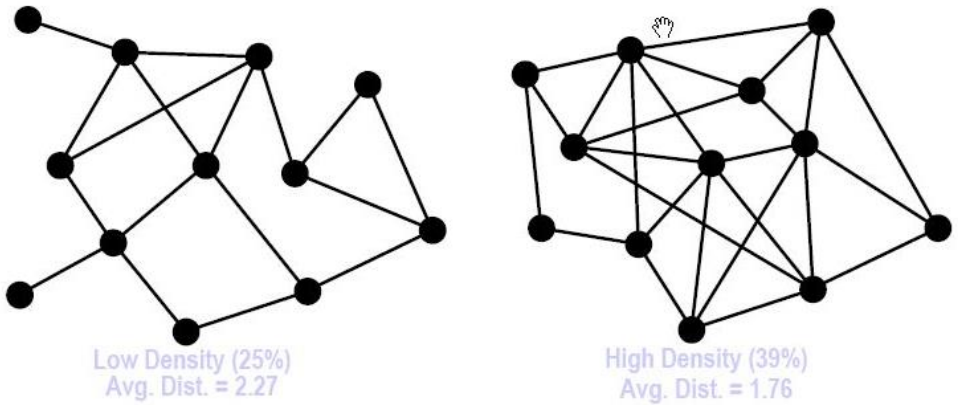


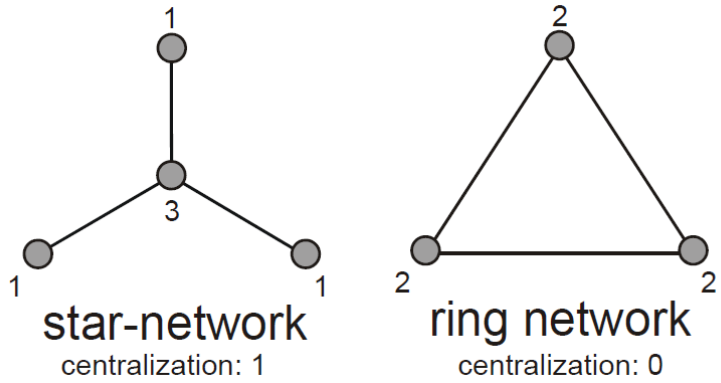
Node properties

- Neighbors: The set of nodes that have a tie with the given node.
- Degree: The number of ties attached to the given node. For example, the number of people that Amy thinks of as friends.
- Betweenness: The ratio of shortest paths between pairs of nodes that pass through the given node.
- Closeness: The average distance (number of edges on shortest path) to each other node in the network.


Degree
Betweenness
Closeness

Network properties





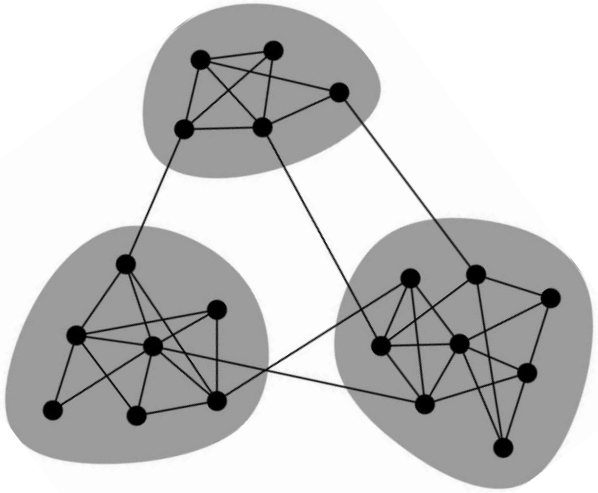
Density: portion of the potential connections in a network that are actual connections

$$\frac{\text{Observed ties}}{\text{All possible ties}}$$

Centralization: Concerns how much a single node dominates the network

$$\frac{\text{sum(Centrality of most central - centrality of other node)}}{\text{Theoretical maximum centrality of that node}}$$

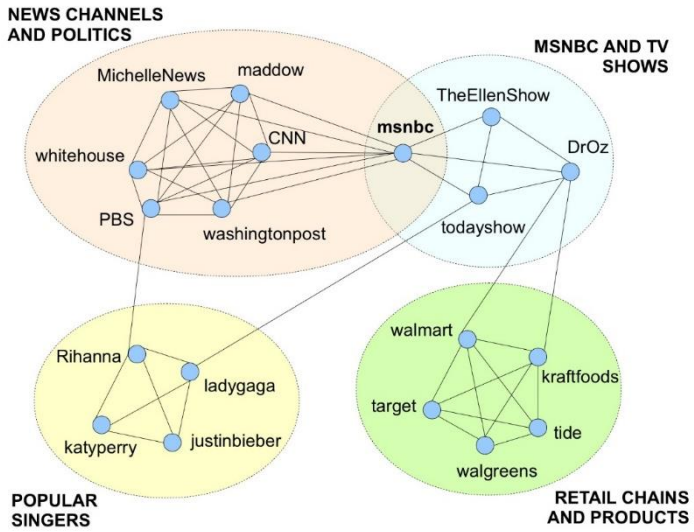
Network sub-parts



Component: A subset of nodes completely disconnected from the rest of the network.

Community: A subset of nodes with relatively high tie density, so the nodes are mostly connected to other nodes in the community rather than the rest of the network.

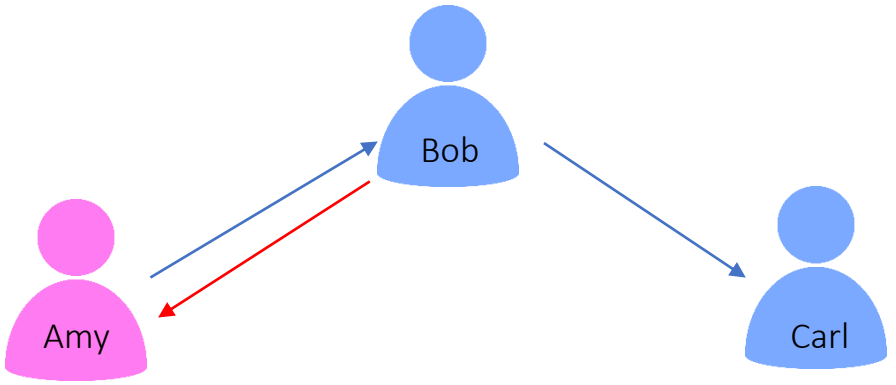
Clique: A subset of nodes where each node has ties with all other nodes.



https://www.nrc.nl/nieuws/2019/12/20/hoe-machtig-is-het-superknooppunt-a3984586

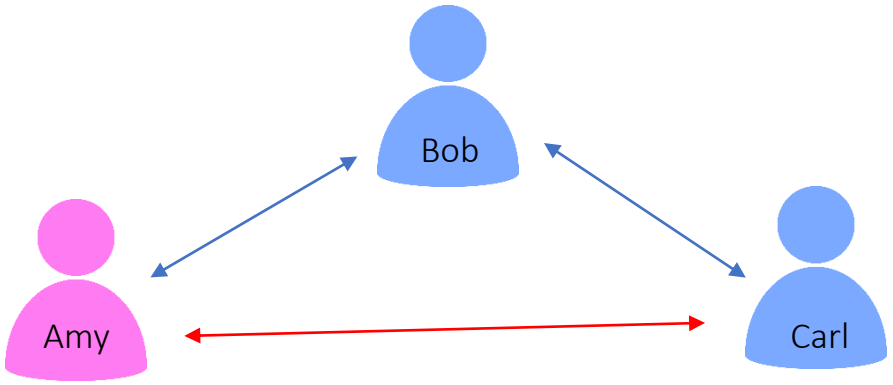
Often discussed network effects

- **Reciprocity**: Tendency for ties to be paired in both directions, only applies to directed networks. For example, if Amy considers Bob to be a friend then it is relatively likely that Bob considers Amy to be a friend.

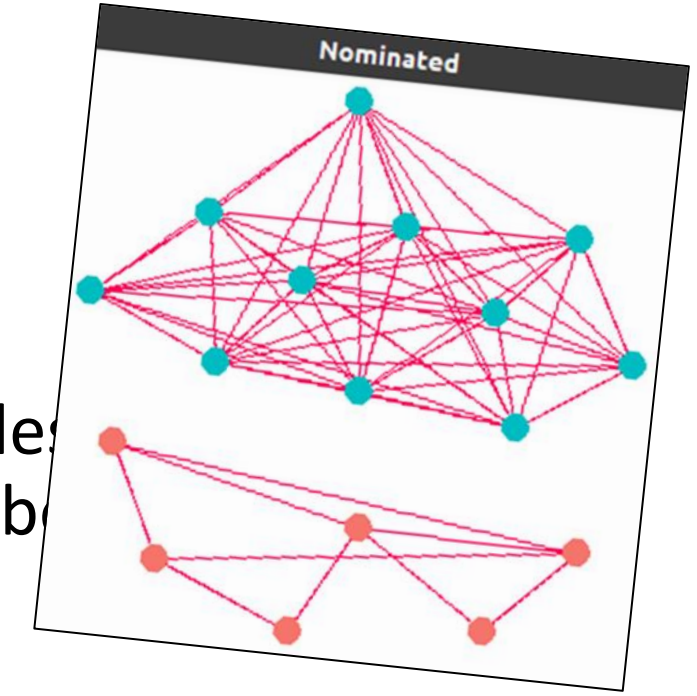


Often discussed network effects

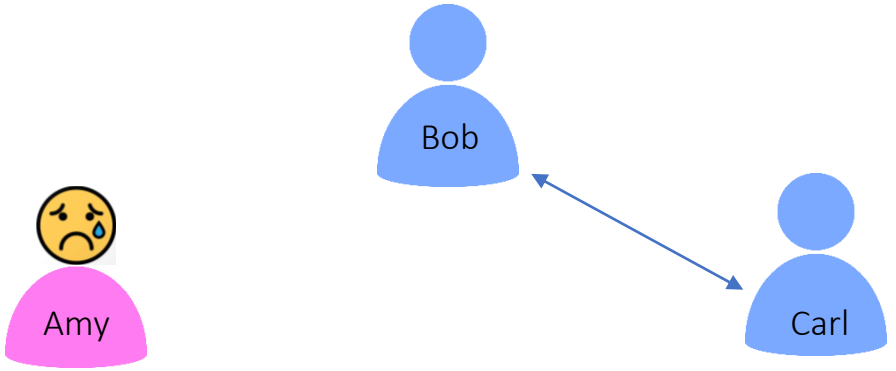
- **Transitivity**: Tendency to ‘close triangles’. For example, if Amy is friends with Bob and Bob is friends with Carl, then Amy and Carl are relatively likely to become friends.



Often discussed network effects



- **Homophily**: Tendency to form relationship with nodes characteristic in common. For example, 12 year old b likely to be friends with boys than girls.



Homophily

BIRDS OF A FEATHER: Homophily in Social Networks

Miller McPherson[1], Lynn Smith-Lovin[1], and James M Cook[2]
[1]*Department of Sociology, University of Arizona, Tucson, Arizona 85721; e-mail: mcpherson@u.arizona.edu; smithlov@u.arizona.edu*
[2]*Department of Sociology, Duke University, Durham, North Carolina 27708; e-mail: jcook@soc.duke.edu*

Birds of a feather flock together – and fall ill? Migrant

Interracial Friendships in the Transition to College: Do Birds of a Feather Flock Together Once They Leave the Nest?

The Spread of Obesity in a Large Social

Homophily and health behavior in social networks of older adults

Mr. Jason D. Flatt, MPH, MCHES, Mr. Yll Agimi, MPH, and Dr. Steve M. Albert, PhD

Author information ▸ Copyright and License information Disclaimer

The role of social networks in the development of overweight and obesity among adults: a scoping

Associations of friendship and children's physical activity during and outside of school: A social network stu

Jodie A. Stearns[a], Jenny Godley[b], Paul J
Biao Wu[d], John C. Spence[a,*]

[a] *University of Alberta, Faculty of Kinesiology, Sport and Recreation,*
[b] *University of Calgary, Department of Sociology, 2500 University Dr.*
[c] *University of Alberta, School of Public Health, 3-50 University Terra*
[d] *Group Risk Management, Royal Bank of Canada, 155 Wellington Street West, Toronto, Ontario, Canada M5V 3H8*

Network-Behavior Dynamics of Adolescent Friendships, Alcohol Use, and Physical Activity

Emily Long, Tyson S. Barrett, and Ginger Lockhart
Utah State University

Homophily: selection or influence?

Homophily, Selection, and Socialization in Adolescent Friendships[1]

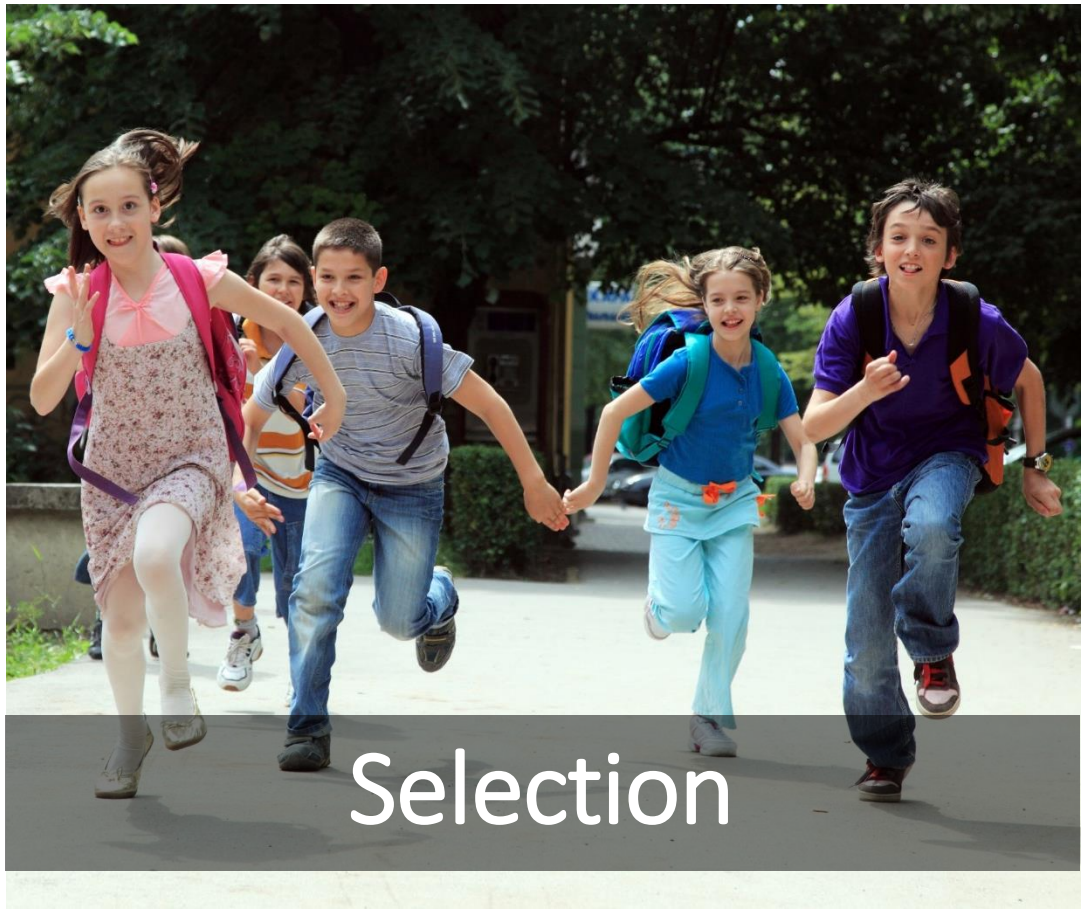
Denise B. Kandel
New York State Psychiatric Institute and Columbia University

How physical activity shapes, and is shaped by, adolescent friendships

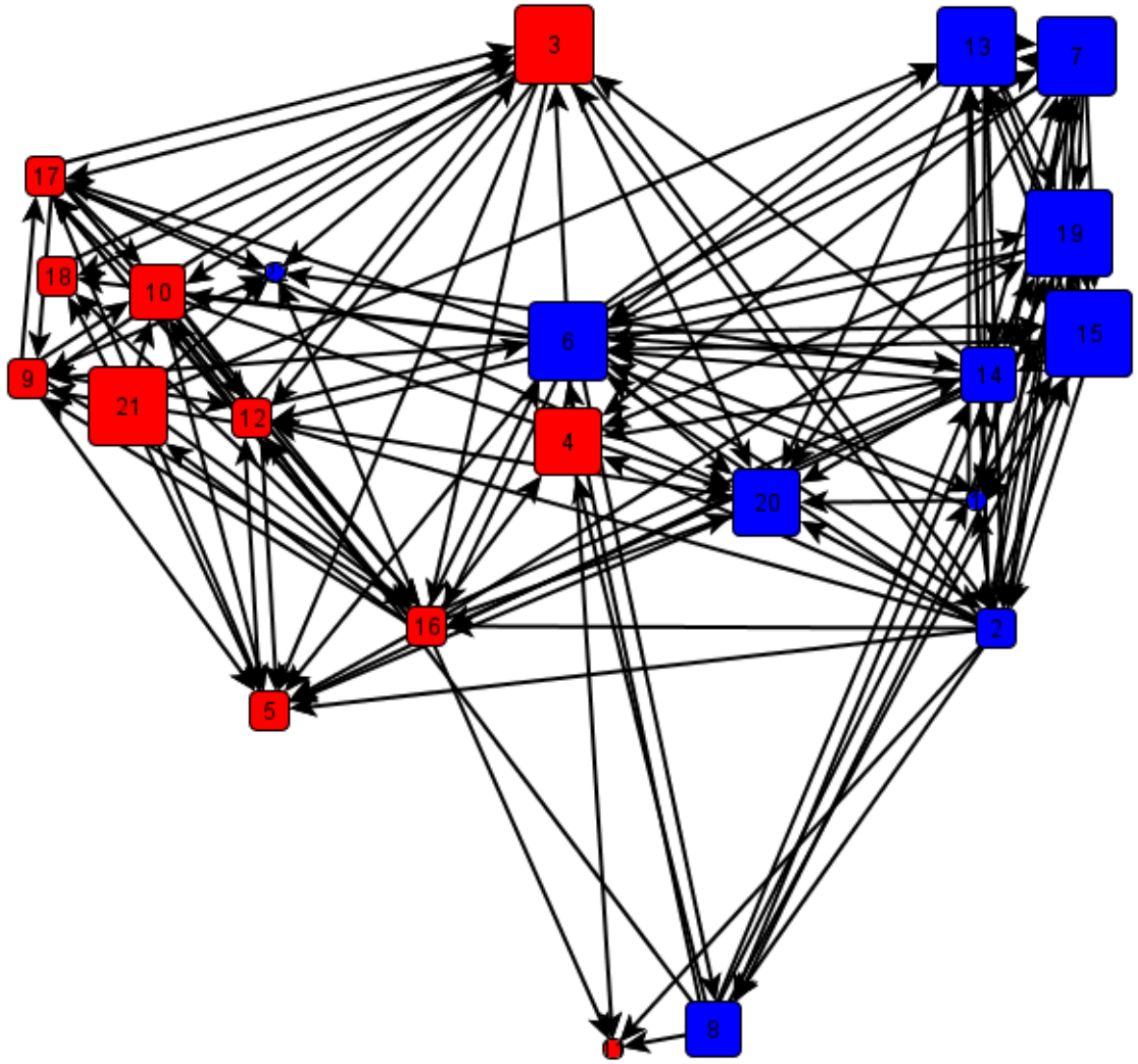
Kayla de la Haye [a,*], Garry Robins [b], Philip Mohr [c], Carlene Wilson [d]

[a] *University of Adelaide and CSIRO Preventative Health Flagship, South Australia, Australia*
[b] *University of Melbourne, Australia*
[c] *CSIRO Food and Nutritional Sciences, Adelaide, Australia*
[d] *Flinders University and Cancer Council South Australia, South Australia, Australia*

Similarity in physical activity



Friendship



Boys

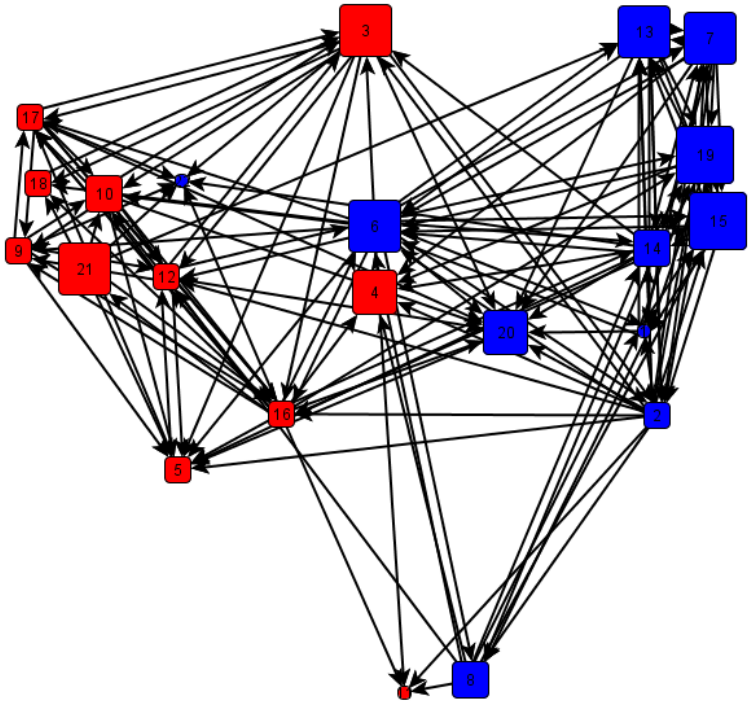
Girls

inactive

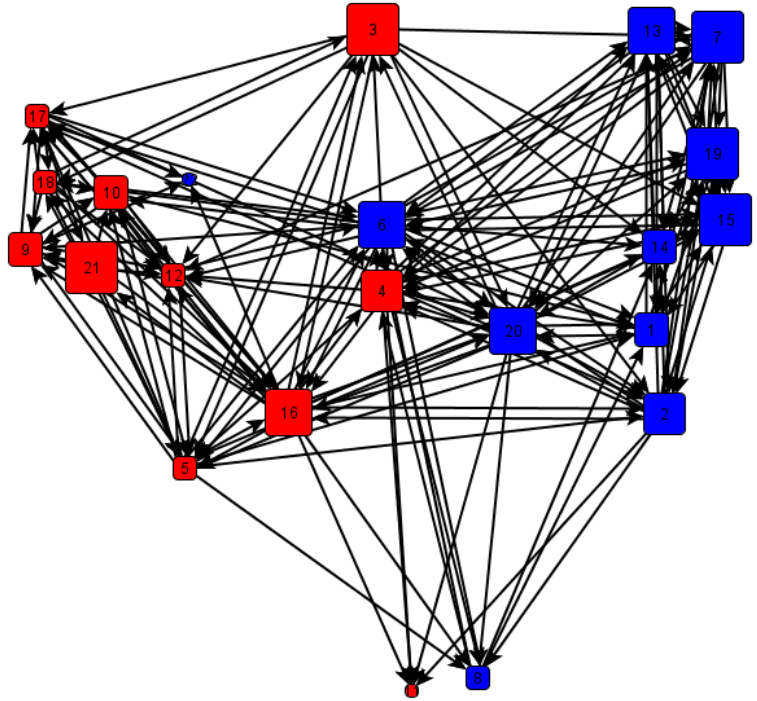
active

Social network of a class over time

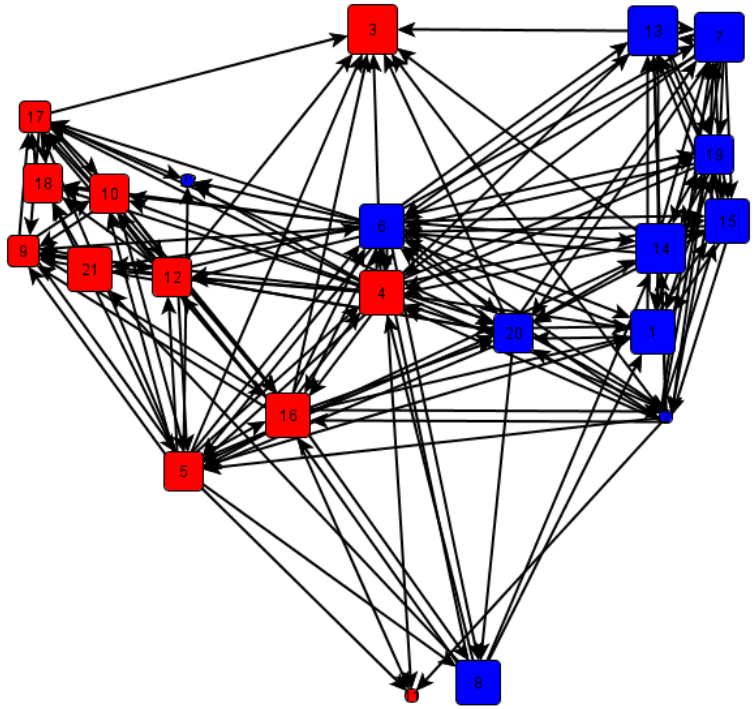
Wave 1



Wave 2

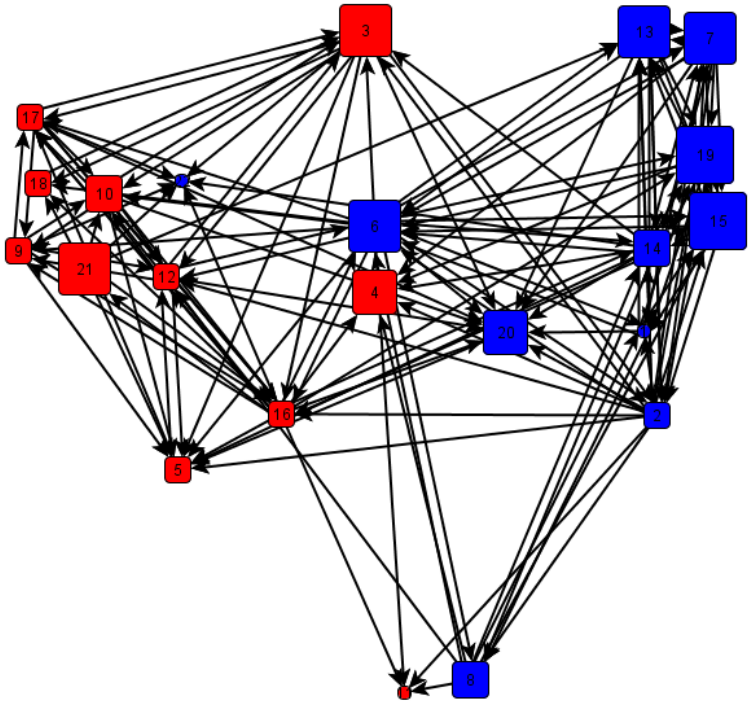


Wave 3

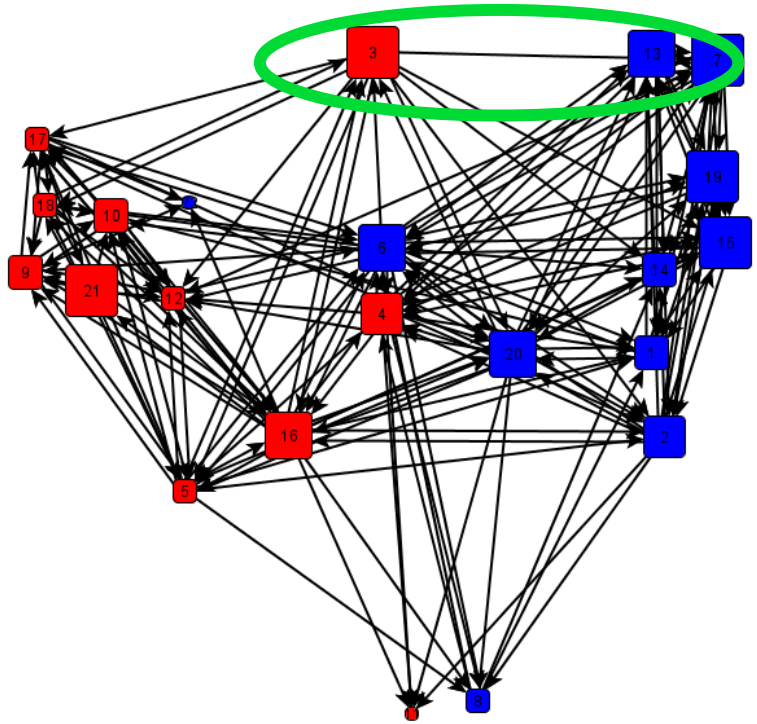


Social network of a class over time

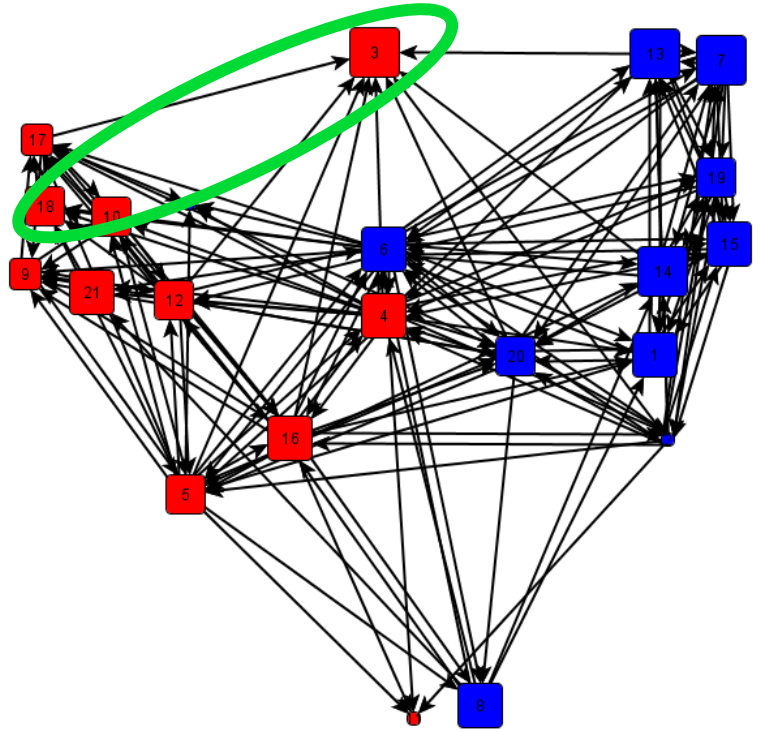
Wave 1



Wave 2

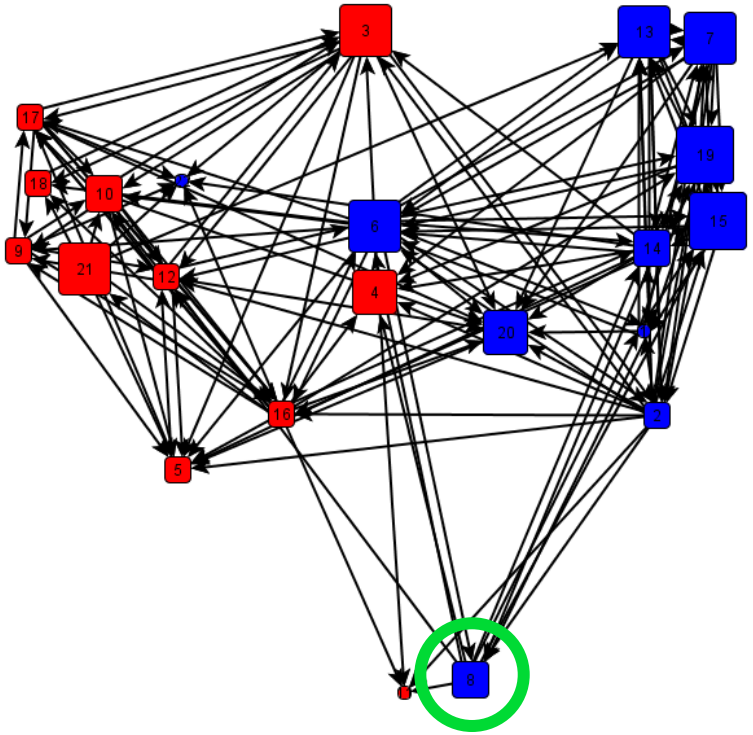


Wave 3

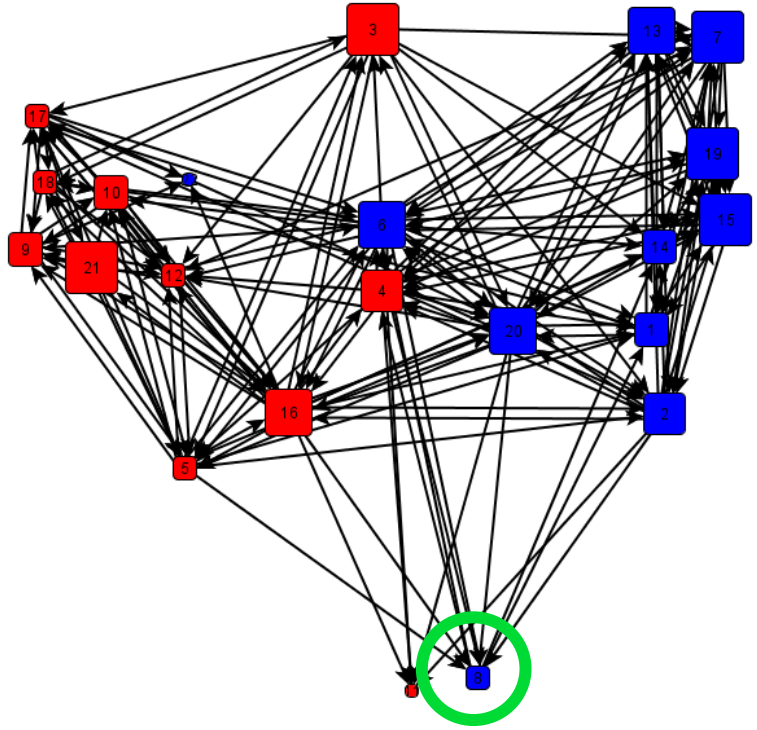


Social network of a class over time

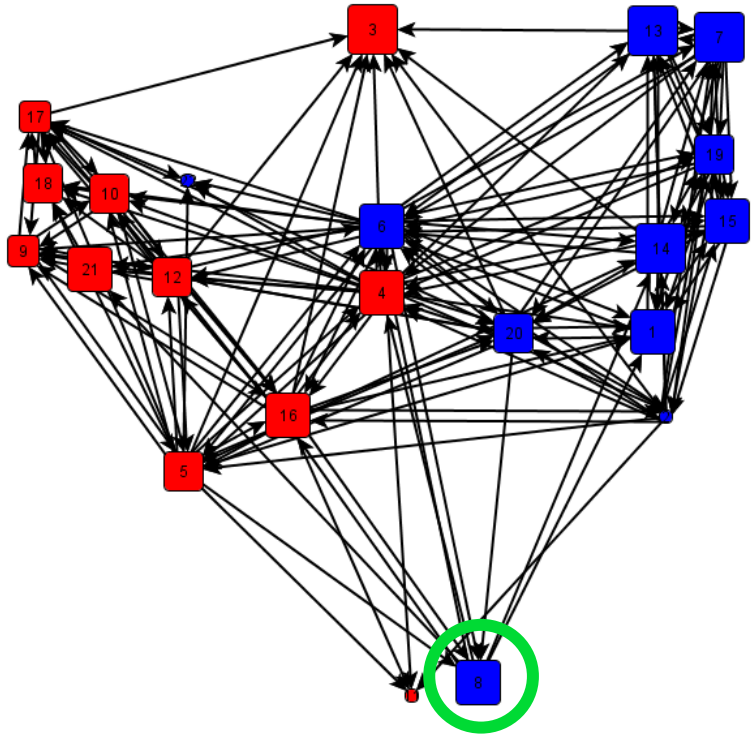
Wave 1



Wave 2



Wave 3



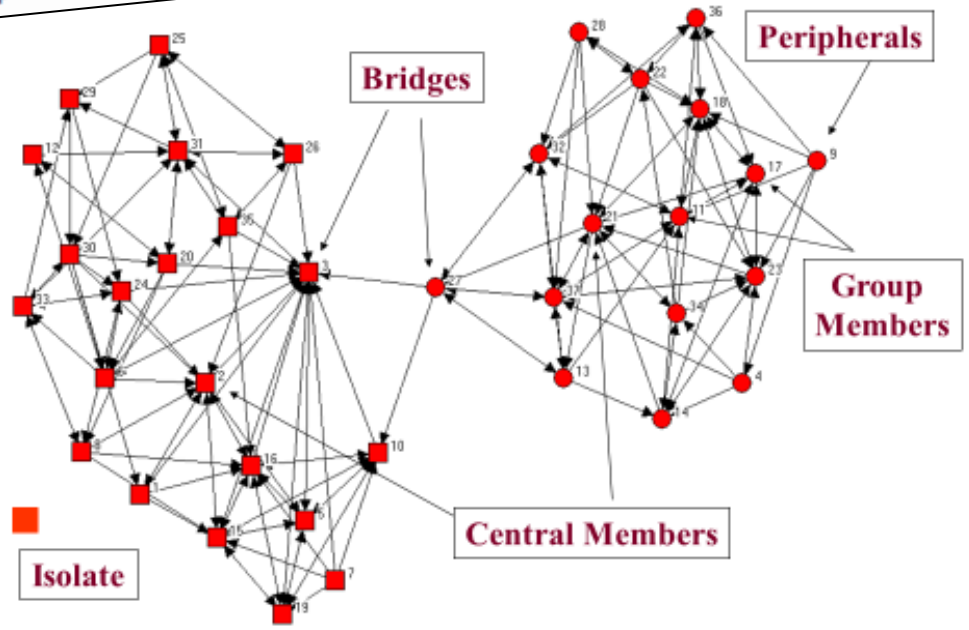
Results

Network Interventions

SCIENCE VOL 337 6 JULY 2012

Thomas W. Valente

The term "network interventions" describes the process of using social network data to accelerate behavior change or improve organizational performance. In this Review, four strategies for network interventions are described, each of which has multiple tactical alternatives. Many of these tactics can incorporate different mathematical algorithms. Consequently, researchers have many intervention choices at their disposal. Selecting the appropriate network intervention depends on the availability and character of network data, perceived characteristics of the behavior, its existing prevalence, and the social context of the program.



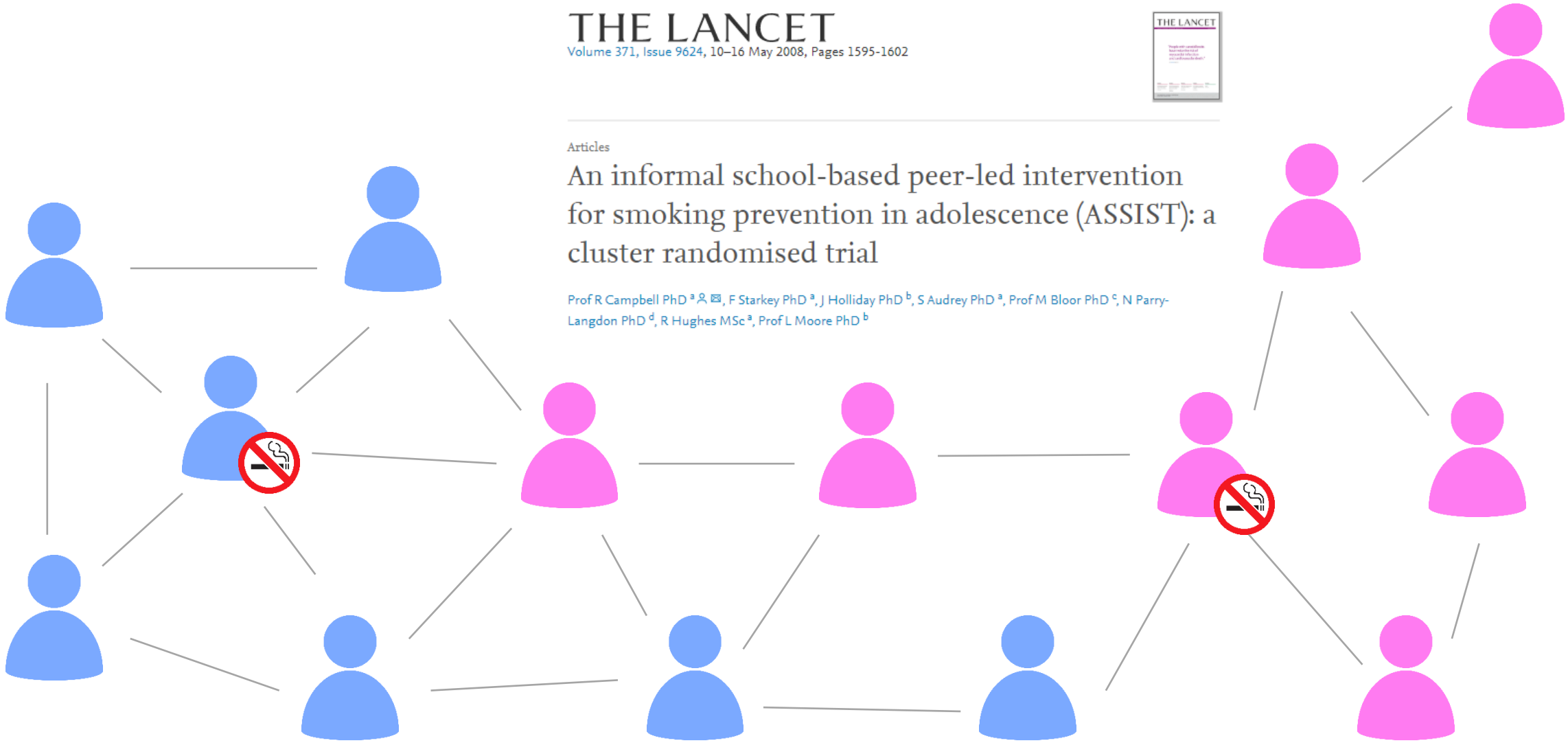
Strategy	Tactic
Identification	Leaders Bridges Key Players Peripherals Low Thresholds
Segmentation	Groups Positions
Induction	Word Of Mouth Snowball Matching
Alteration (Manipulation)	Deleting/Adding Nodes Deleting/Adding Links Rewiring

THE LANCET
Volume 371, Issue 9624, 10–16 May 2008, Pages 1595-1602

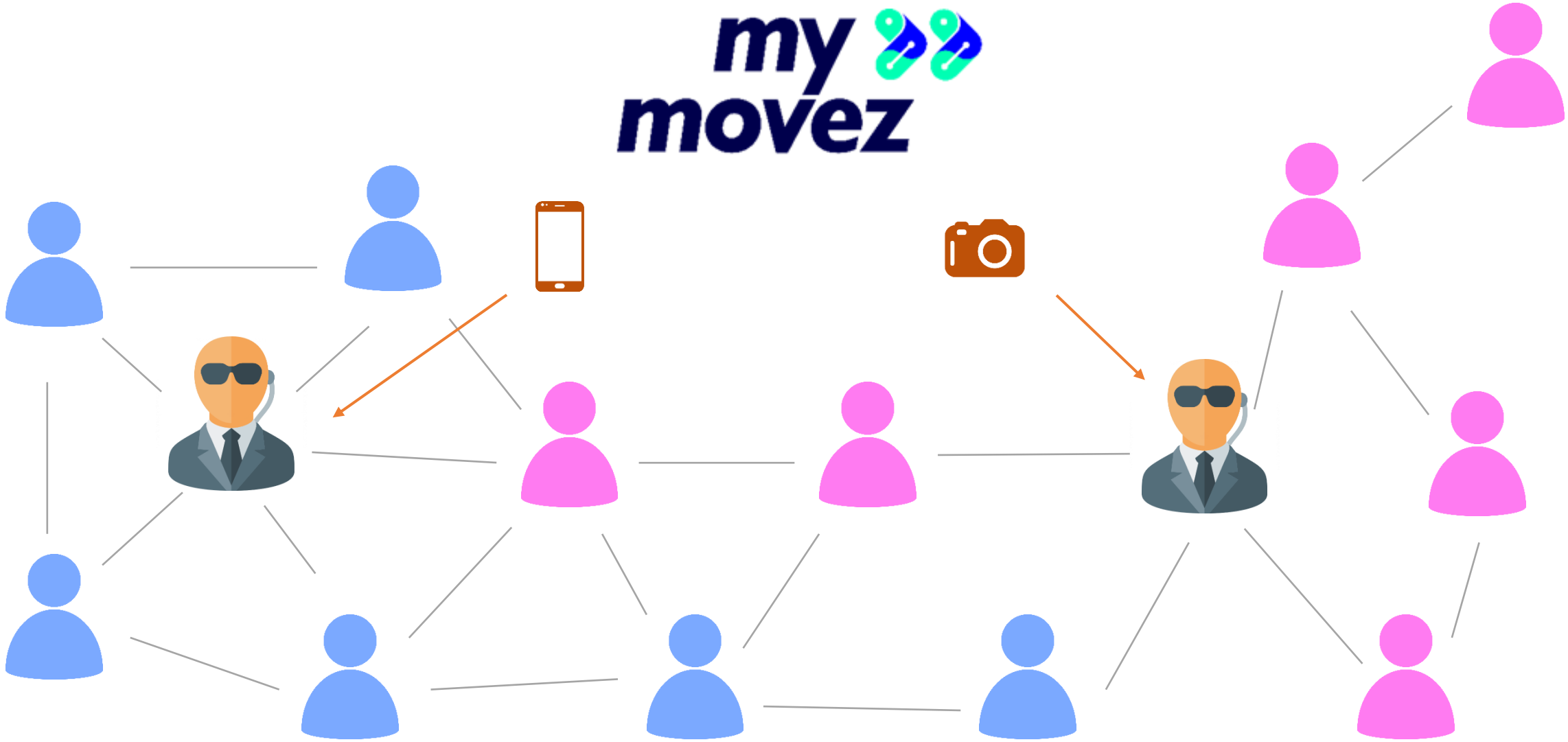
Articles

An informal school-based peer-led intervention for smoking prevention in adolescence (ASSIST): a cluster randomised trial

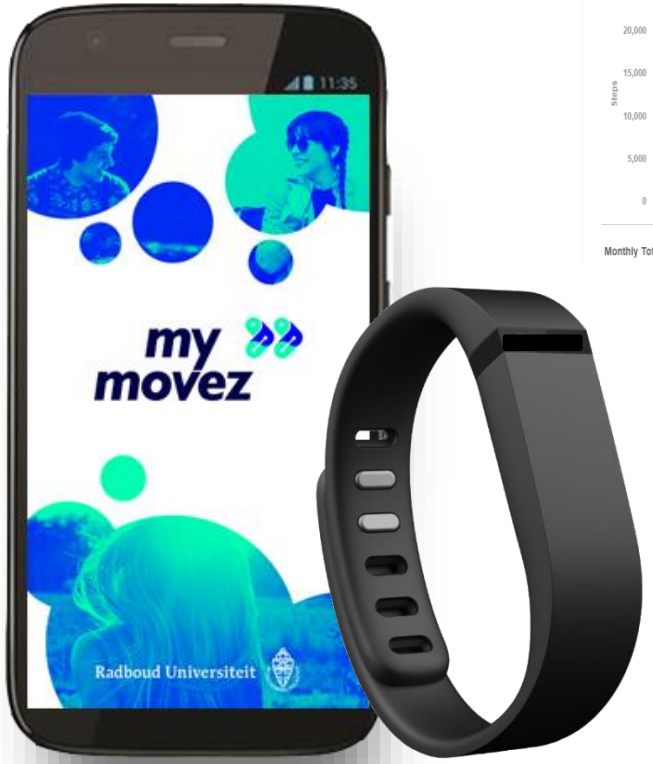
Prof R Campbell PhD [a], F Starkey PhD [a], J Holliday PhD [b], S Audrey PhD [a], Prof M Bloor PhD [c], N Parry-Langdon PhD [d], R Hughes MSc [a], Prof L Moore PhD [b]



my movez



MyMovez wearable lab



Questionnaires

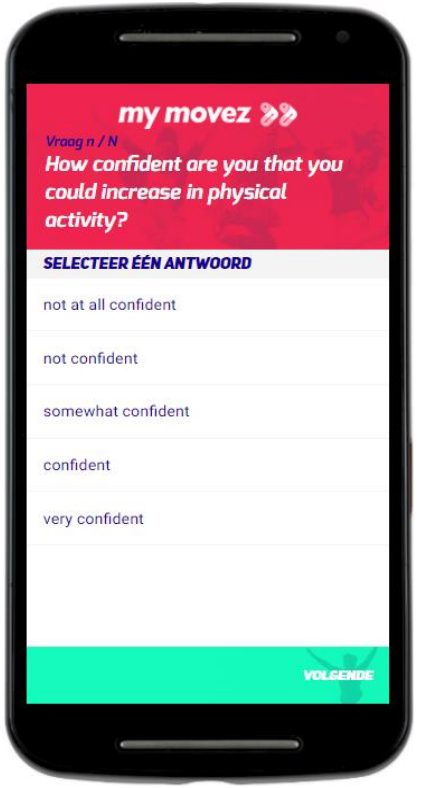
Self-efficacy

Social norms

Intentions

Motivations

Athletic Competence



Multi day training session

MyMovez online training

B: How to train the influence agents

Pretest to match the language of the target audience

Appetite 103 (2016) 294–301

Contents lists available at ScienceDirect

Appetite

journal homepage: www.elsevier.com/locate/appet

A social network-based intervention stimulating peer influence on children's self-reported water consumption: A randomized control trial

Crystal R. Smit*, Rebecca N.H. de Leeuw, Kirsten E. Bevelander, William J. Burk, Moniek Buijzen

They did not like ‘special agents’

Suggested ‘team captain’.

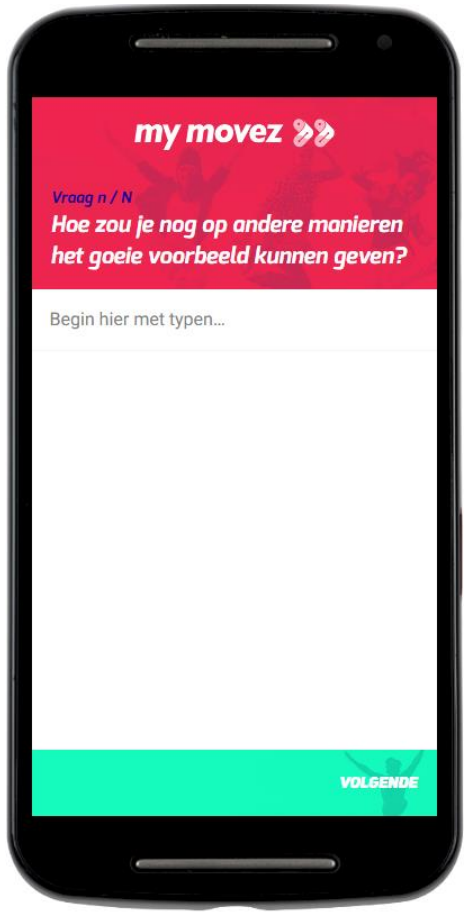
The training:

‘Your role as captain’

Provide information and fun facts to the Influence agent

Train the influence agents how the can influence the physical activity of friends

Ask for their personal strategies and preferences [Self determination/ Self persuasion]



Create commitment by asking whether they accept the role of team captain

Keep in touch with the influence agents via the app

Sample

Active parental consent for participation

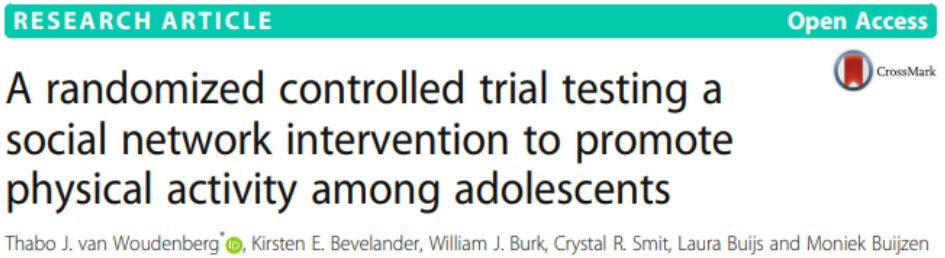
1 School

- 11 Classes (5 intervention classes)
- 190 participants (46% male)
- 11 to 14 years old (*M* = 12.17 years, *SD* = .50)

Influence agents:

24 approached:

- 1 declined
- 4 no reaction
- 19 accepted role -> 3 or 4 influence agents per class.


RESEARCH ARTICLE Open Access

A randomized controlled trial testing a social network intervention to promote physical activity among adolescents

Thabo J. van Woudenberg, Kirsten E. Bevelander, William J. Burk, Crystal R. Smit, Laura Buijs and Moniek Buijzen

November

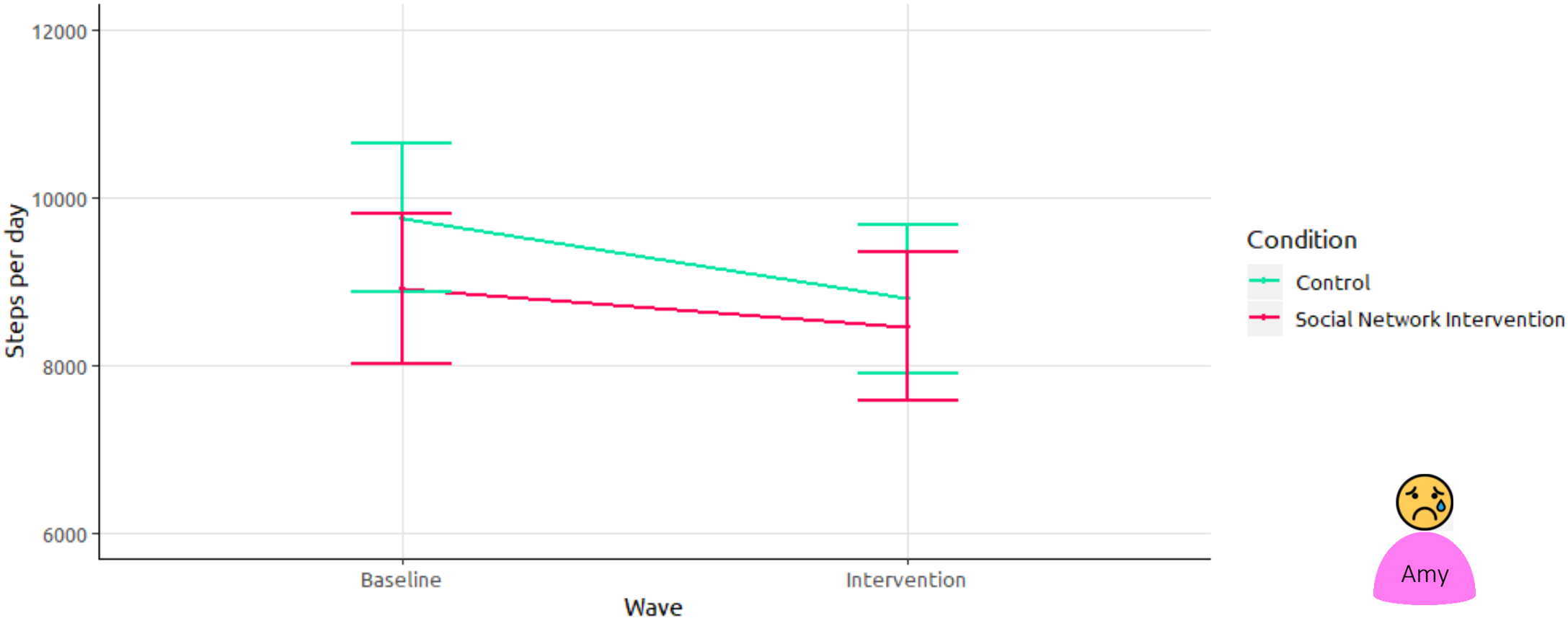
December

1 week

1 week

Demographics

Social network questions


12000
10000
8000
6000
Steps per day
Baseline
Intervention
Wave
Condition
Control
Social Network Intervention

Amy

Vloggers

frontiers in Psychology

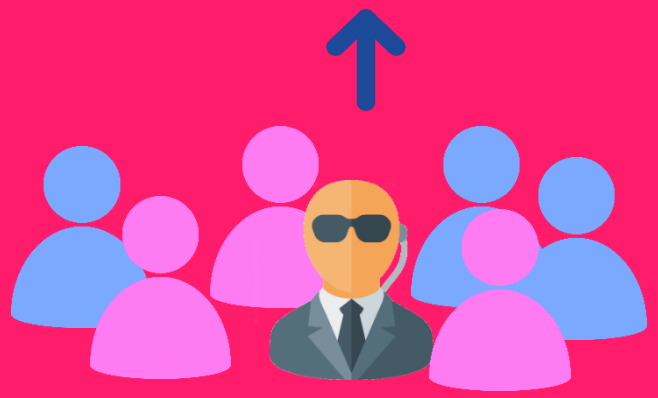
CLINICAL TRIAL
published: 10 January 2020
doi: 10.3389/fpsyg.2019.02913

Testing a Social Network Intervention Using Vlogs to Promote Physical Activity Among Adolescents: A Randomized Controlled Trial

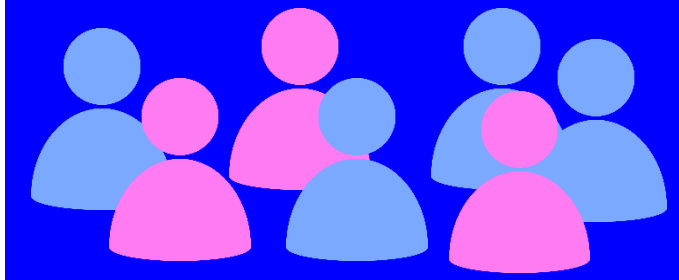
Thabo J. Van Woudenberg[1], Kirsten E. Bevelander[1,2], William J. Burk[1], Crystal R. Smit[1], Laura Buijs[1] and Moniek Buijzen[1,3]*

Conditions

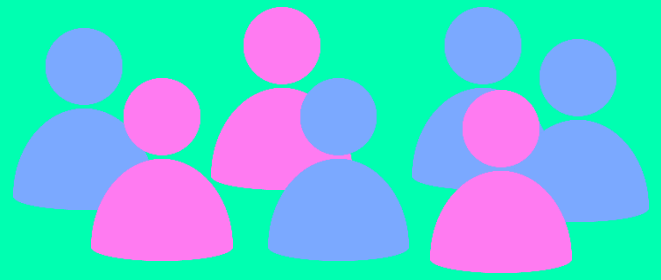
Social network intervention



Mass media campaign



Control



Sample

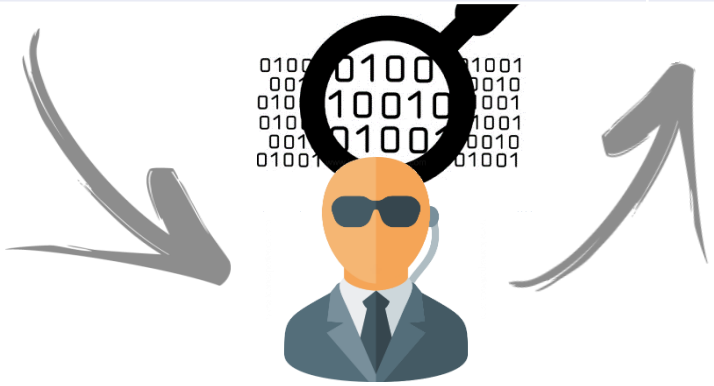
Participants:

- **446** participants (47% man)
- 9 - 16 years old (*M* = 11.35, *SD* = 1.34)
- 24 Classes

Social Network	Mass media	Control
7 (N=131)	7 (N=123)	10 (N=192)

Timeline

Pre-measure (February)						
1	2	3	4	5	6	7
	Daily PA					
Control variables						
Sociometric Measures						



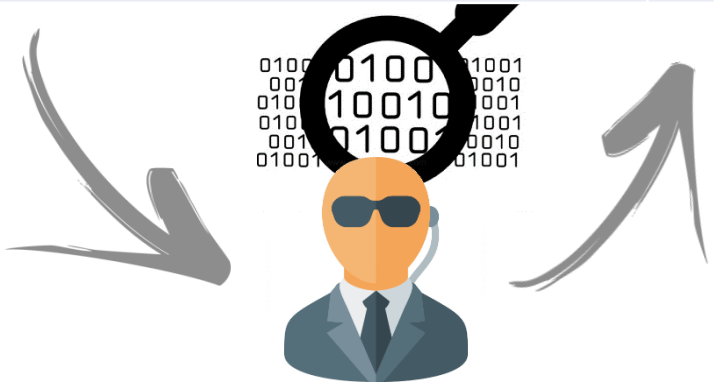
Instruction

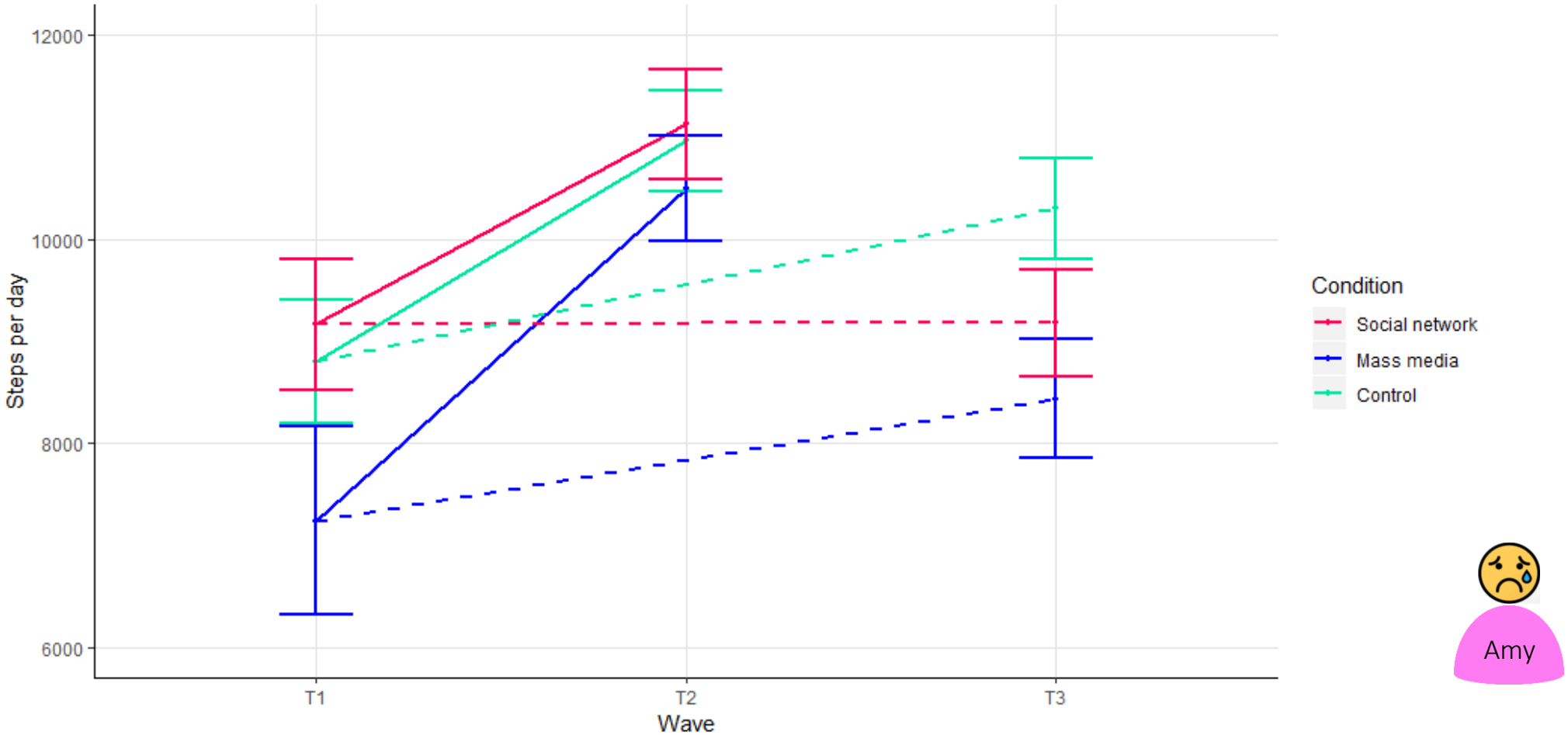
Editing

YourMovez

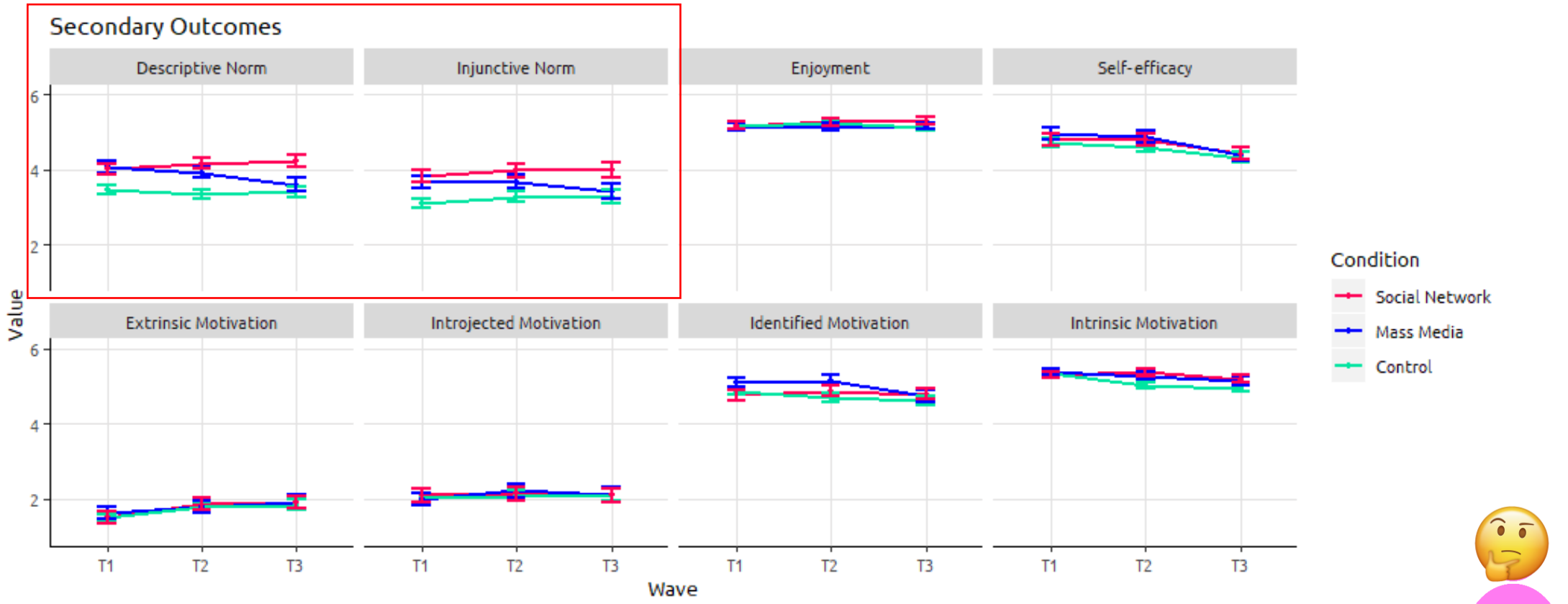
Timeline

Pre-measure (February)							Intervention (April)						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
X	Daily PA					X	X	Daily PA					X
Control variables							Control variables						
Sociometric Measures						📷	V1	V2	V3	V4	V5	V6	



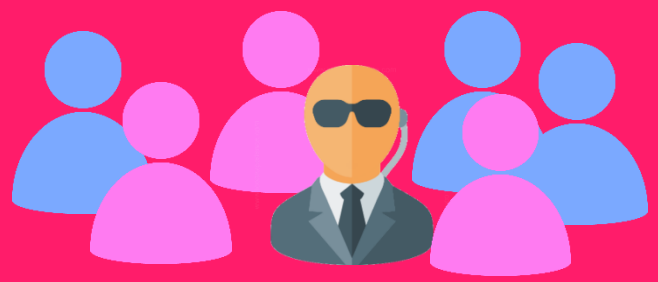

12000
10000
8000
6000
Steps per day
T1
T2
T3
Wave
Condition
Social network
Mass media
Control

Amy


Secondary Outcomes
Descriptive Norm
Injunctive Norm
Enjoyment
Self-efficacy
Extrinsic Motivation
Introjected Motivation
Identified Motivation
Intrinsic Motivation
Value
Wave
T1
T2
T3
2
4
6
Condition
Social Network
Mass Media
Control

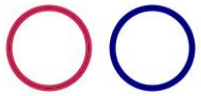
Amy

Sociale netwerk interventie

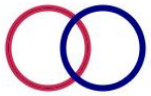


SCREENTIME

1



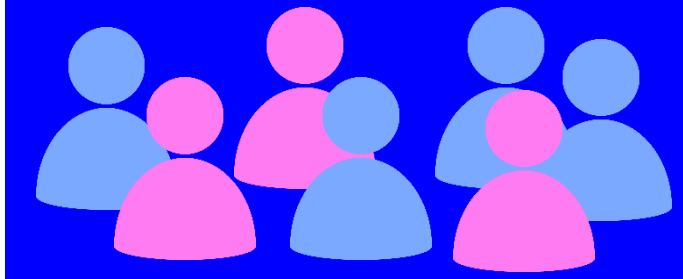
IK VLOGGER(S)



7

IK VLOGGER(S)

Traditionele media interventie



Conclusions

- Mensen leven niet in een sociaal vacuüm, maar het netwerk heeft op verschillende niveaus effect op de mensen
  - Relaties met anderen
  - Positie in het sociale netwerk
  - Eigenschappen van het netwerk

- Netwerken bestaan weer uit verschillende soorten relaties.

- Mensen die het zelfde zijn, hebben ook vaker relaties met elkaar (homophily)
  - Selectie: Je maakt nieuwe vrienden met mensen die het zelfde zijn
  - Invloed: Je beïnvloed je vrienden

- Het is lastig gebleken om deze invloeden ook te gebruiken om sporten en beweging in klassen te promoten.
  - Sociale norm in de klas.

dr. Thabo van Woudenberg

Post-doc research at Erasmus University Rotterdam

vanwoudenberg@eur.nl

@Thabovw

www.tvanwoudenberg.com