



# Cooperation in Adolescent Social Networks




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## Background



- Adolescent peer relationships
  - Complex - best friend, clique, crowd
  - Important
    - Identity, self esteem, harmful behavior, later onset psychological disorders
    - (Brown 2004)


- How to capture this complexity?
  - Need for quantitative but ecologically valid measures of adolescent peer relationships
- How to understand this complexity?
  - Measures should be amenable to cognitive neuroscience investigation

Map relationships in authentic adolescent social networks

→


Prosocial behaviour in a cooperative investment task

## Background




- Prosocial behavior
  - Voluntary behaviour intended to benefit another (Eisenberg et al. 1995)
  - "Another" can be other people or society as a whole
  - Behaviours include helping, sharing, donating, co-operating, and volunteering
  - May be motivated by empathy and concern about the welfare and rights of others, or for egoistic or practical concerns
- Can entail subtle social understanding

## Background





- Sophisticated prosociality develops in adolescence
  - Observation, interview and questionnaire studies
    - Protracted development of stereotypic reasoning -> prosocial moral reasoning (Eisenberg et al. 1995)
  - Behavioral economic games theory
    - Competitive -> cooperative maximization of gains (van Lang et al, 1997)
    - Strictly egalitarian -> meritocratic cooperation (Almas et al., 2010)
    - Strategic cooperation and reciprocation (Guroglu et al. 2009; van den Bos et al. 2010)

## Cooperation Background



- Economic games played against strangers or computer programs
- Real world cooperation
  - Repeated interaction, reciprocation, image maintenance (Milinski et al., 2002; Nowak & Sigmund, 1998)
- Cooperation studies using authentic social relationships
  - Contributions to public good (Haan et al., 2006)
  - Smaller perceived social distance increases giving in dictator games (Goeree et al., 2007; Jones & Rachlin, 2006)

## Harrison, Sciberras, & James (2011)

- Mapped authentic adult social network
  - Detailed social network questionnaire
- Cooperative behavioral task
  - Isometric ski-training exercise
- Results
  - Cost endured positively correlated with strength of social tie
  - Greater cost endured for close peers than for self
  - Greater cost endured when relationship was reciprocated



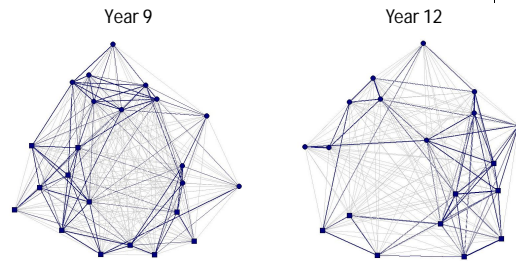
## Results: SNQ Descriptives

Year		Master matrix relationship strength	Reciprocation
9	Mean	.39	0
	Range	-.11-1.00	-.78-.78
	Inter-quartile range	.22-.56	-.11-.11
12	Mean	.32	0
	Range	-.33-1.00	-.67-.67
	Inter-quartile range	.11-.44	-.11-.11

**Example of heterogeneity**  
Master matrix relationship strength between participant and four peers.



## Results: Master Matrix



Relationship strength is represented by edge thickness. Circles indicates females, squares indicates males. Node distance is based on NetDraw iterative metric multidimensional scaling (UCINET; Hanneman & Riddle, 2005).

## Results: Points Descriptives

Year	N		Points to self	Points to others
9	23	Mean	13.57	3.64
		Range	0-100	0-15
		Inter-quartile range	3.50-8.08	2.97-5
12	19	Mean	27.73	3.82
		Range	0-100	0-20
		Inter-quartile range	5-40	0-5

## Results 2: MRQAP

Year 9: Points task

Independent variable	Coefficient	p
Intercept	2.39	<.001
Master matrix	4.47	<.001
Reciprocity	0.03	.324
Gender giving	-0.89	.027
Gender receiving	0.42	.002
MACH giving	0.01	.432
Time known giving	-0.02	.331

Perceived relationship strength predicts co-operative investment

...but the extent to which relationships are reciprocated does not

Girls give more and receive less

## Results 2: MRQAP

Year 12: Points task

Independent variable	Coefficient	p
Intercept	6.92	<.001
Master matrix	5.70	<.001
Reciprocity	2.01	.031
Gender giving	-1.51	.022
Gender receiving	-0.07	.456
MACH giving	-0.07	.032
Time known giving	-0.14	.105

Perceived relationship strength predicts co-operative investment

...as does the extent to which relationships are reciprocated

Girls give more (but don't receive less)

Individuals higher in Machiavellian traits give slightly less

## Summary

- Novel method for mapping adolescent peer relationships situated within authentic social networks
- Effect of social network structure on cooperative investment
  - Adolescents (aged 13-14 and 16-17) give more to individuals to whom they report a stronger social tie
  - Older adolescents (aged 16-17) give more to individuals who *reciprocate* strong social ties
  - Structural effects larger than effects of individual differences - importance of using social networks to increase ecological validity

## Future Research



- Comparing wider developmental age range
  - Different cooperative strategies
  - What ages?
- Effort based cooperative task
- Reciprocation mechanism?
  - fMRI
- Generative modeling
  - Cooperation/reciprocation, social anxiety

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