

The Impact of Partner Expressions on Felt Emotion in the Iterated Prisoner's Dilemma: An Event-level Analysis

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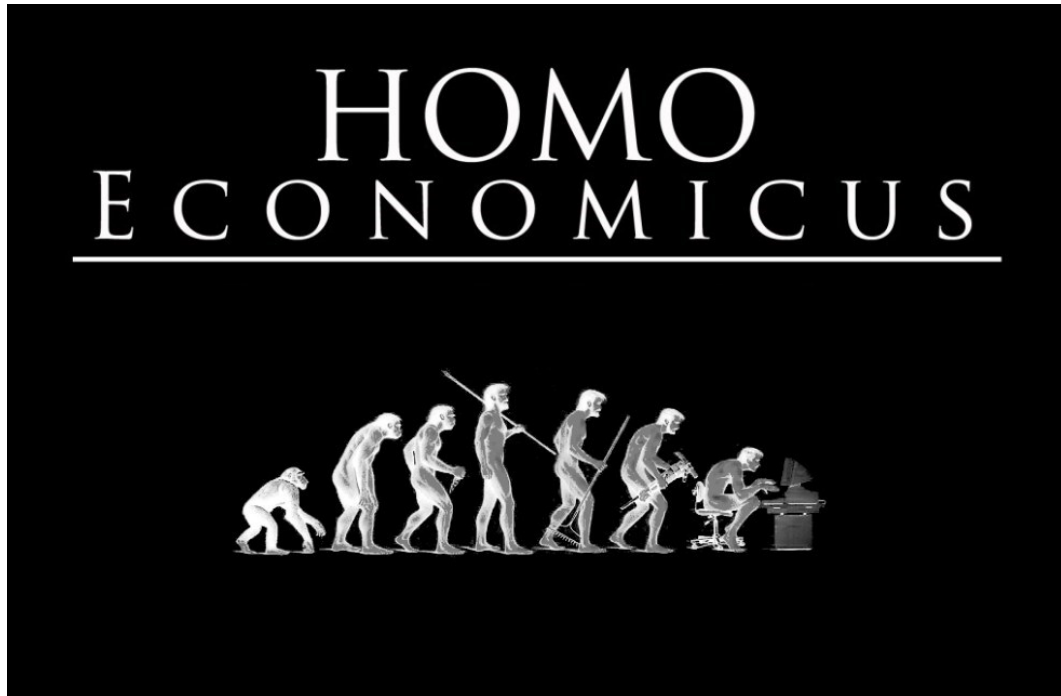
Jonathan Gratch (University of Southern California)



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Economic Games for Models of Social Cognition

- Rich tradition of using economic games to study and inform models of human social cognition



Prisoner's Dilemma

Ultimatum Game

Multi-issue bargaining

Stag-hunt

Economic Games for Models of Social Cognition

- Rich tradition of using economic games to study and model human social cognition
 - Use money to incentivize “real” decision-making
 - Measure behavior (decisions in the game)
 - Explore interaction between player and their partner/opponent
 - Led to mature frameworks for characterizing “rational” decisions (Game Theory)

Example: Iterated Prisoner's Dilemma

- Observation: People act “irrationally”: Violate game theory
- Emotion argued to explain departures from rational choice

Incentive to cooperate

Other

Your Choice

	SPLIT	STEAL
SPLIT	Other: 5 You: 5	Other: 10 You: 0
STEAL	Other: 0 You: 10	Other: 1 You: 1

Other

Player 1

Repeatedly Decide

Player 2

STEAL

STEAL

STEAL

Dominant strategy (Prediction from Rational Choice theory)

Prior emotion research

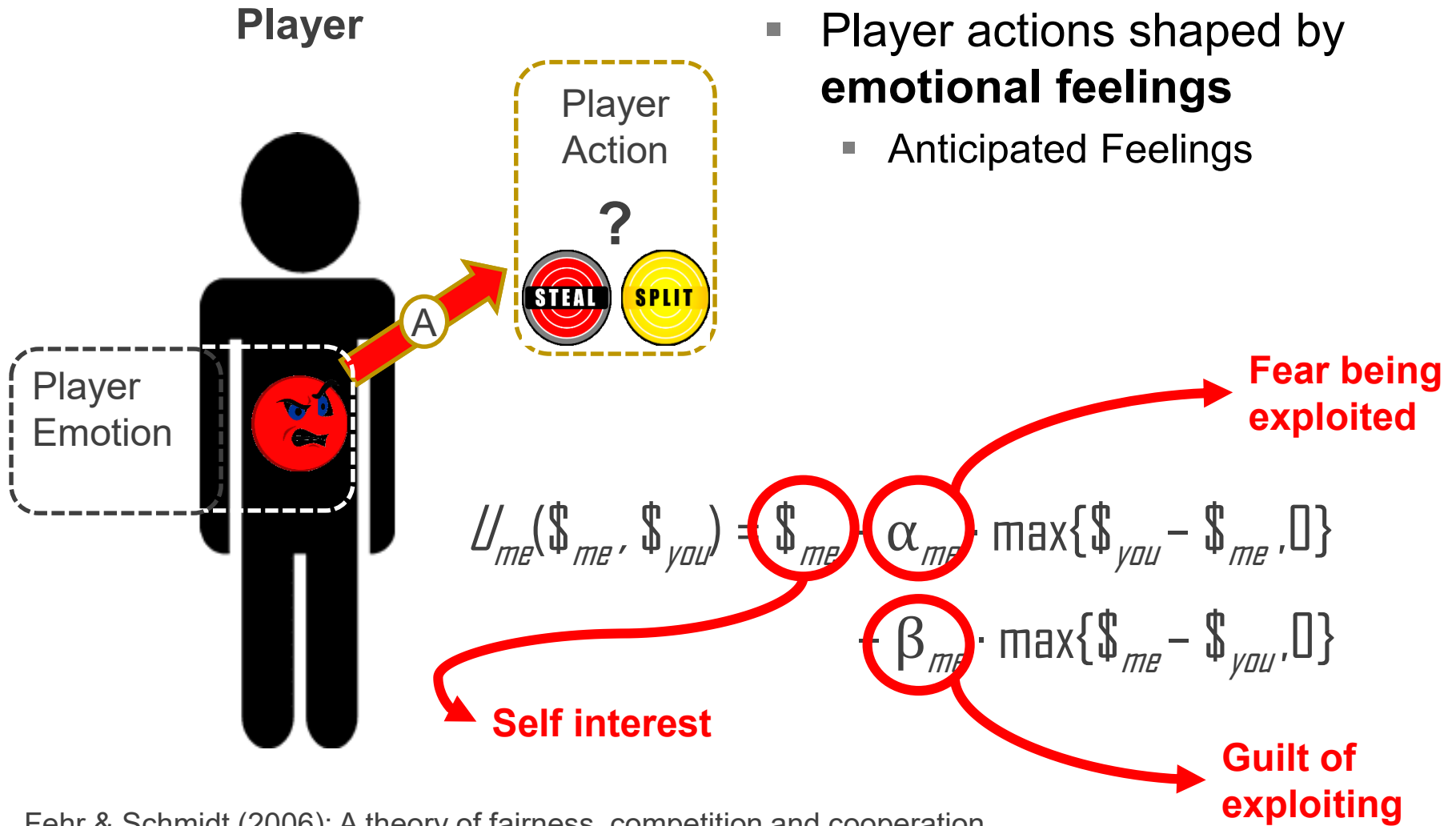
Player



Partner



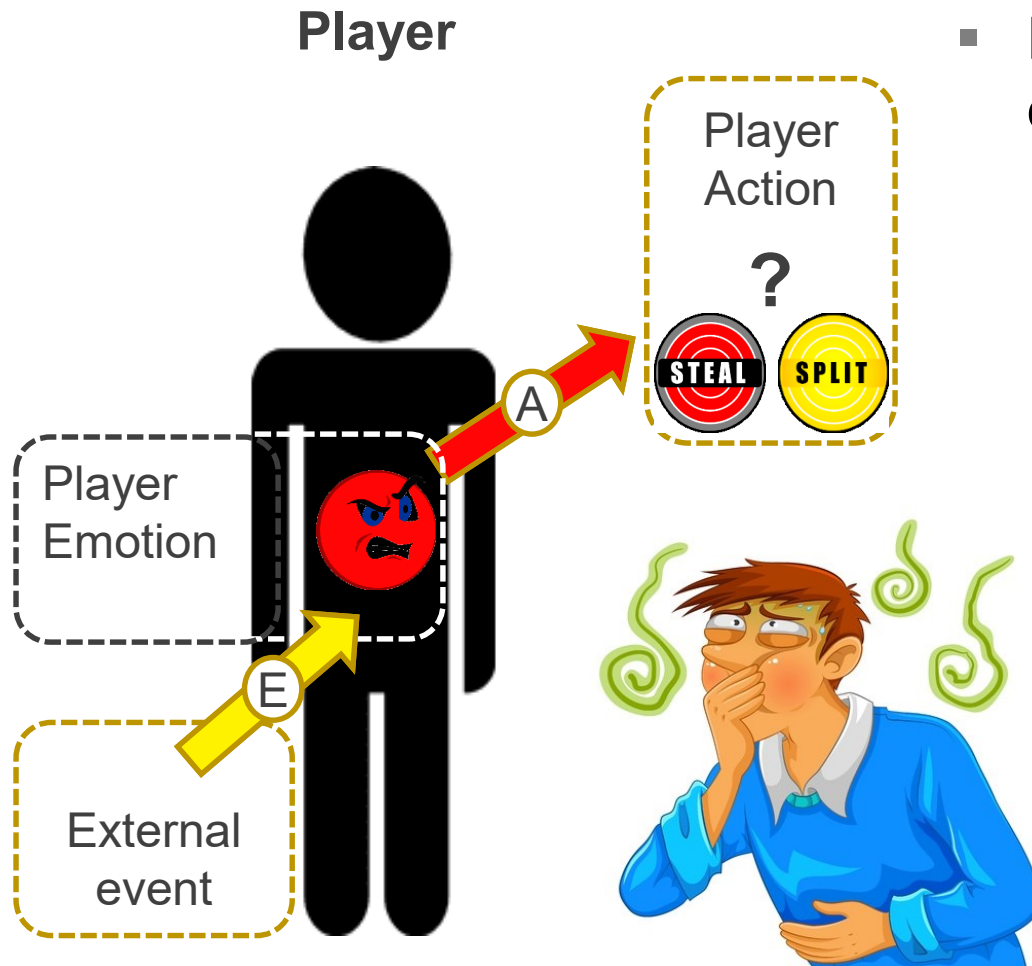
Prior emotion research: Focus on player emotions



- Player actions shaped by **emotional feelings**
 - Anticipated Feelings

Fehr & Schmidt (2006): A theory of fairness, competition and cooperation

Prior emotion research: Focus on player emotions



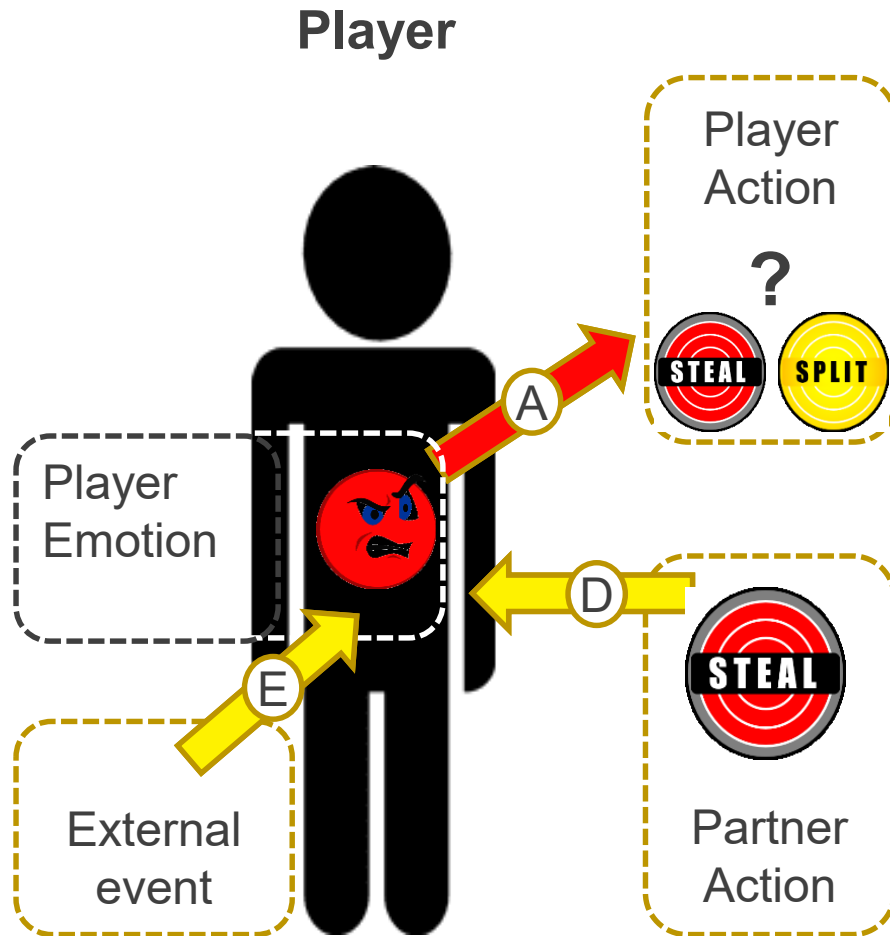
- Player actions shaped by **emotional feelings**
 - Anticipated Feelings
 - Exogenous feelings



Evoke disgust via unrelated to task

Lerner & Small (2004). Heart strings and Purse strings. *Psych Science*

Prior emotion research: Focus on player emotions



- Player decisions shaped by emotional feelings
 - Anticipated Feelings
 - Exogenous feelings
 - Endogenous feelings

Evoke an emotion via partner behavior

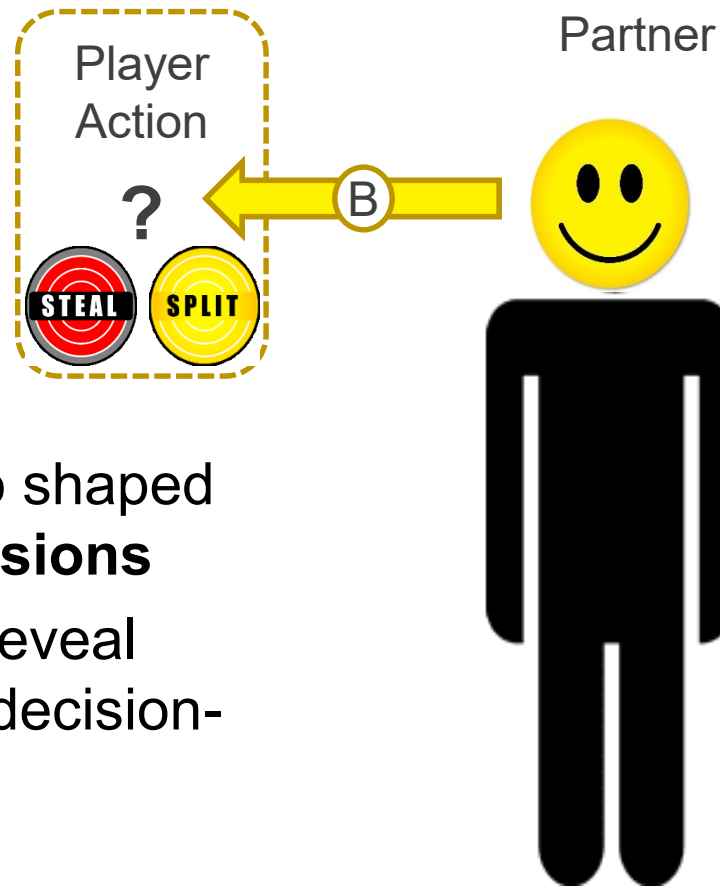
Grecucci et al. (2012). Reappraising the Ultimatum: *Cerebral Cortex*

Prior research: Focus on partner behavior

Decision-policy?

Partner

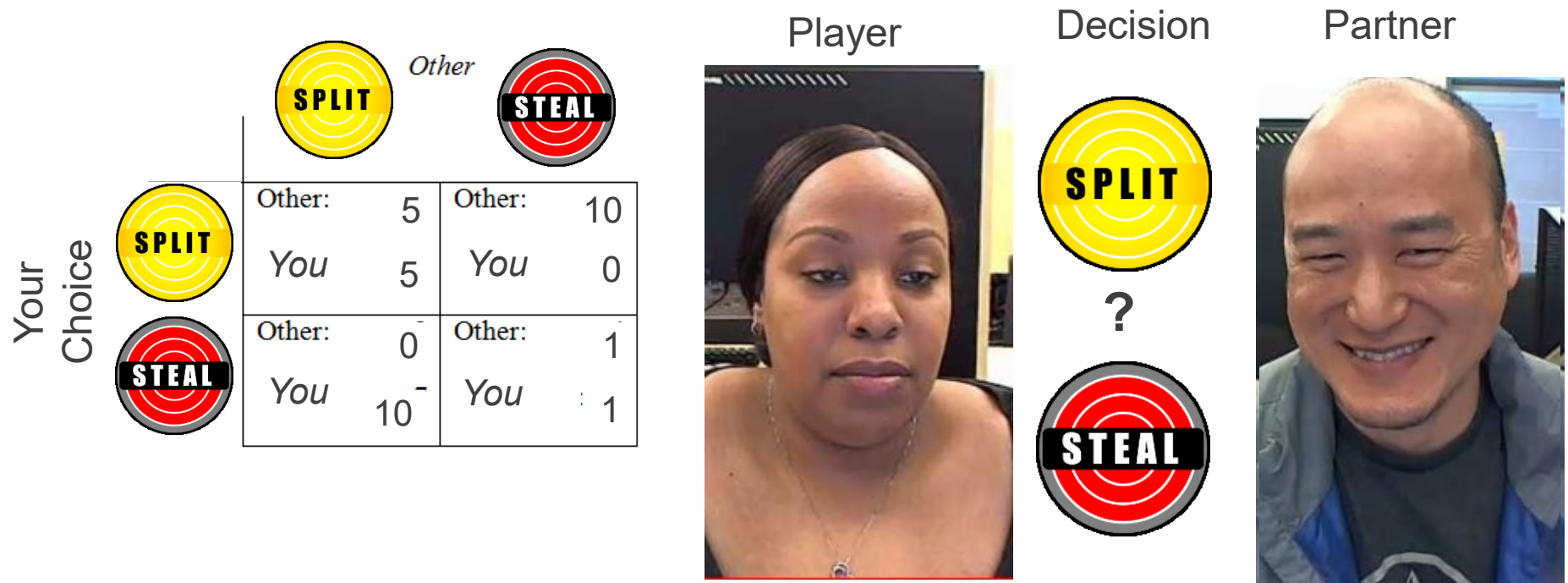
- Fixed policy?
- Tit-for-tat?
- Competitive?
- Cooperative?



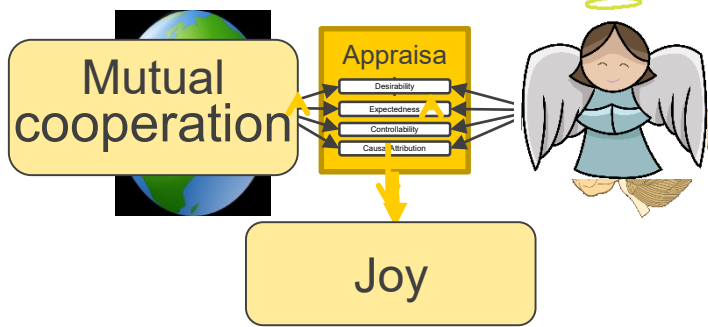
- Player actions also shaped by **partner expressions**
- Expressions may reveal partner goals and decision-policy

Example: Prisoner's Dilemma

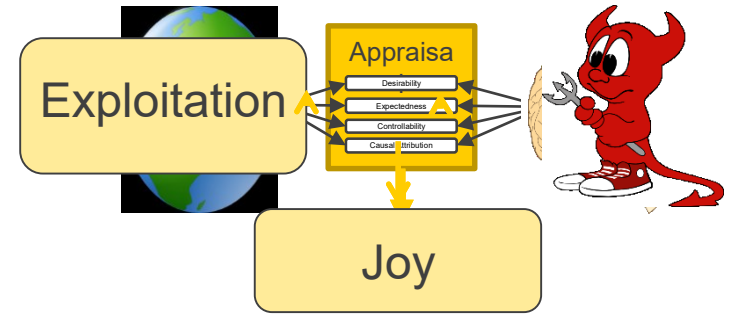
- Observation: People act “irrationally”: Violate game theory
- Emotion argued to explain departures from rational choice



de Melo et al. (2014). Reading people's minds from emotional expressions. *JPSP*



It depends on context



“Cooperative” agent

Cooperate Defect

Human	Coop	Joy	Guilt
	Def	Anger	Sadness



“Competitive” agent

Cooperate Defect

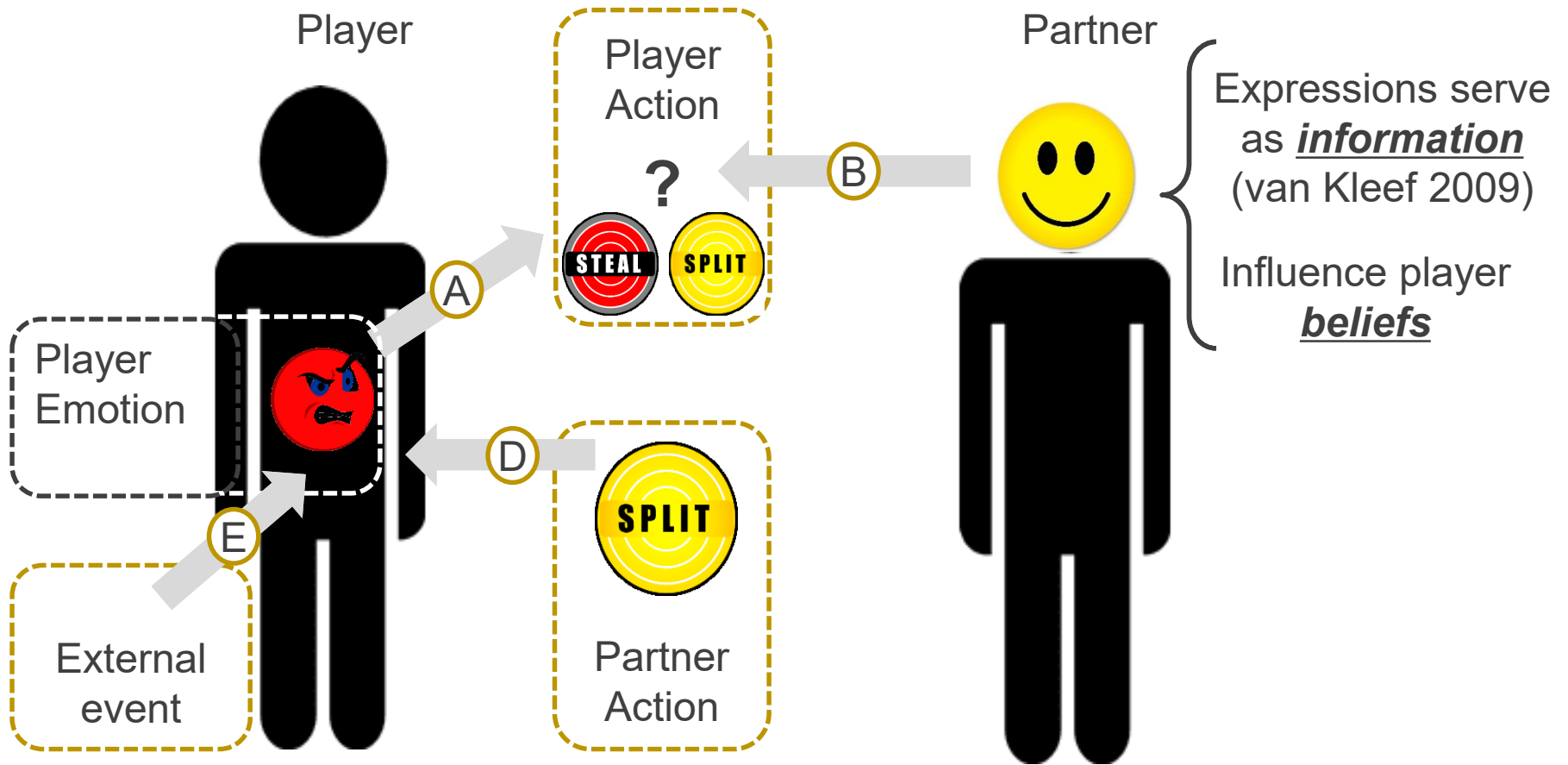
Human	Coop	Guilt	Joy
	Def	Anger	Sadness

Observers “recover” goals from pattern of expression w.r.t., game outcomes

e.g., Steal from partners that smile when they steal from your but cooperate with partners that show regret after stealing from you

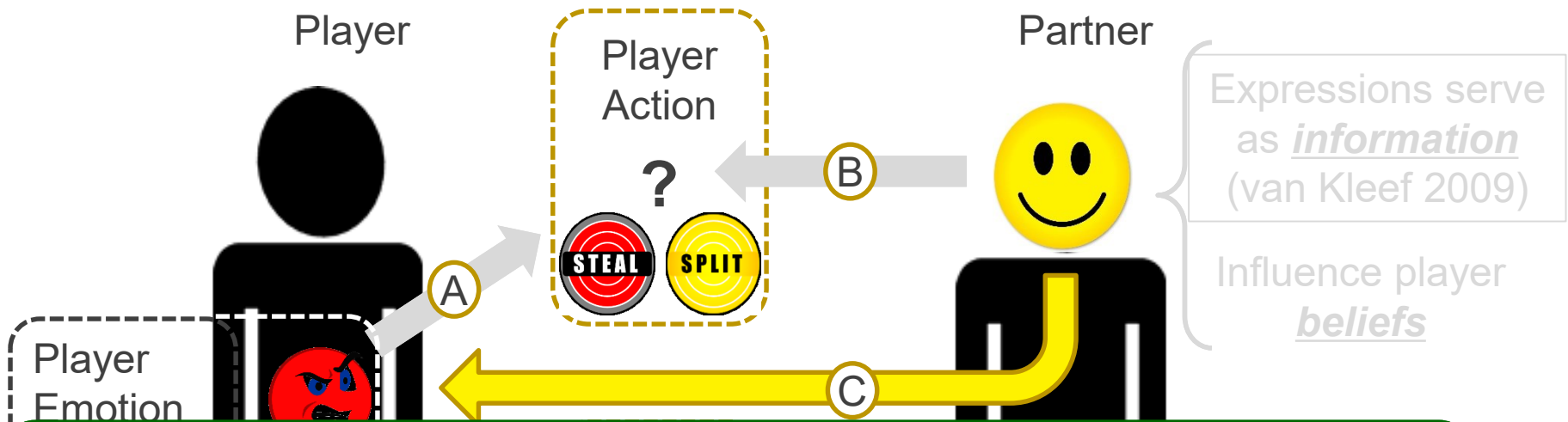
de Melo et al. (2014). Reading people’s minds from emotional expressions. *JPSP*

What's New?



What's New?

Do partner expressions serve to shape player emotions?



Hypothesis

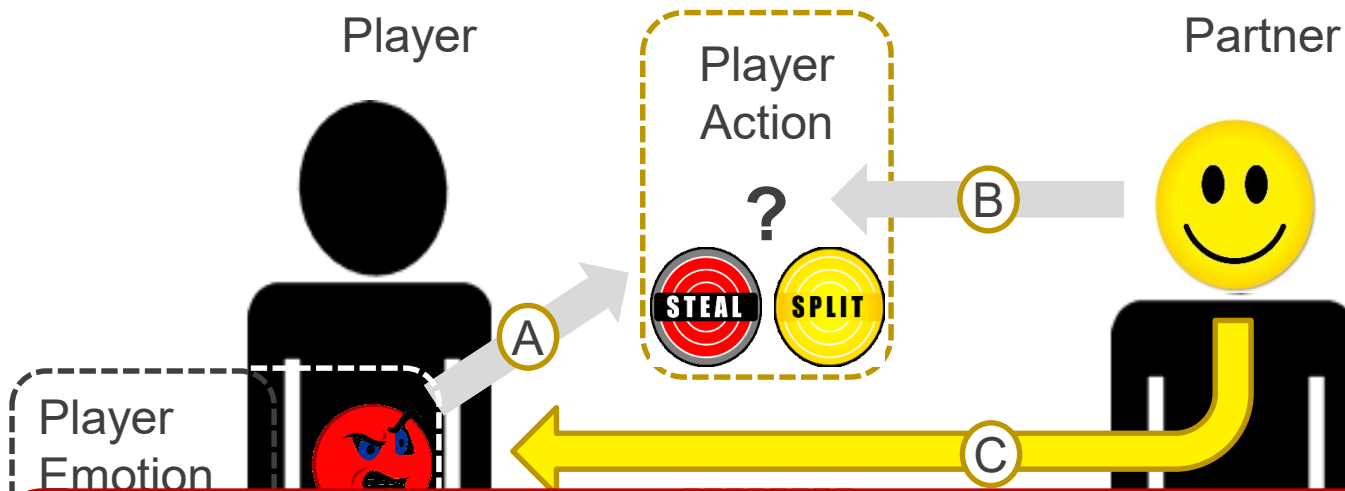
- Players feel better when they cooperate with partner showing “cooperative” pattern of expressions

“Cooperative” agent

	Cooperate	Defect
Coop	Smile	Guilt
Def	Anger	Sadness

What's New?

Do partner expressions serve to shape player emotions?



Hypothesis

- Players feel better when they cooperate with partner showing “cooperative” pattern of expressions
- Players feel better when they exploit a partner showing “competitive” pattern of expressions

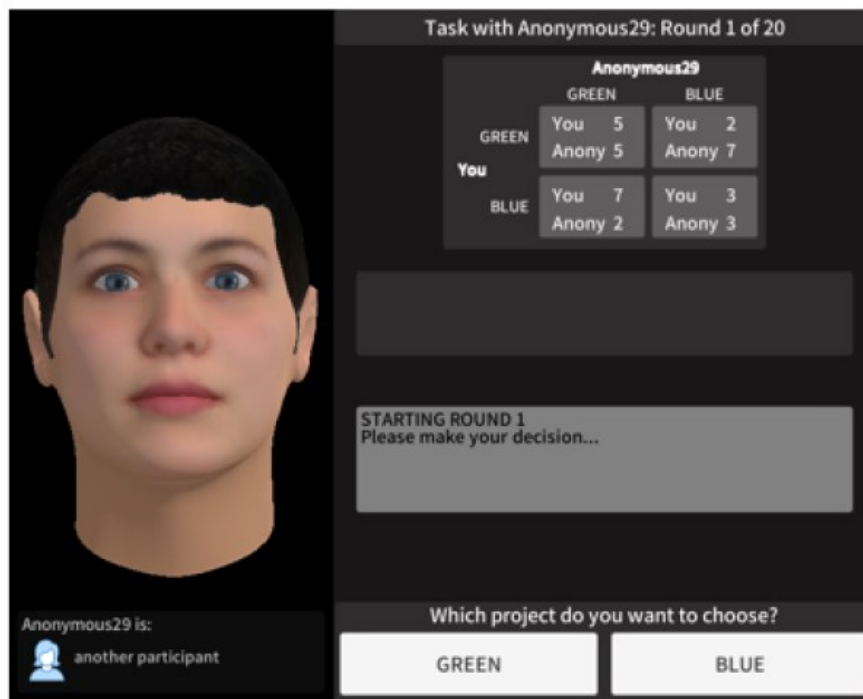
“Competitive” agent

	Cooperate	Defect
Coop	Guilt	Smile
Def	Anger	Sadness

Corpus: de Melo & Terada (2020)

- 319 participants played 20-round IPD (6380 joint decisions)
 - Framed as an investment game

A) Game Interface



- Players recruited from Mturk
- Told they would play another Turker
- Could “see” partner’s expressions
- Compensated based on performance

- Actually played a scripted agent
 - Were debriefed of deception after game

Corpus: de Melo & Terada (2020)

- 319 participants played 20-round IPD (6380 joint decisions)
- 2x2 Experimental design

Partner Pattern of Expressions

		Counterpart	
		Cooperation	Defection
Participant	Cooperation	Joy	Regret
	Defection	Anger	Neutral

		Counterpart	
		Cooperation	Defection
Participant	Cooperation	Regret	Joy
	Defection	Anger	Neutral

D) Agent Expressions



Corpus: de Melo & Terada (2020)

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D) Agent Expressions



Partner Pattern of Decisions

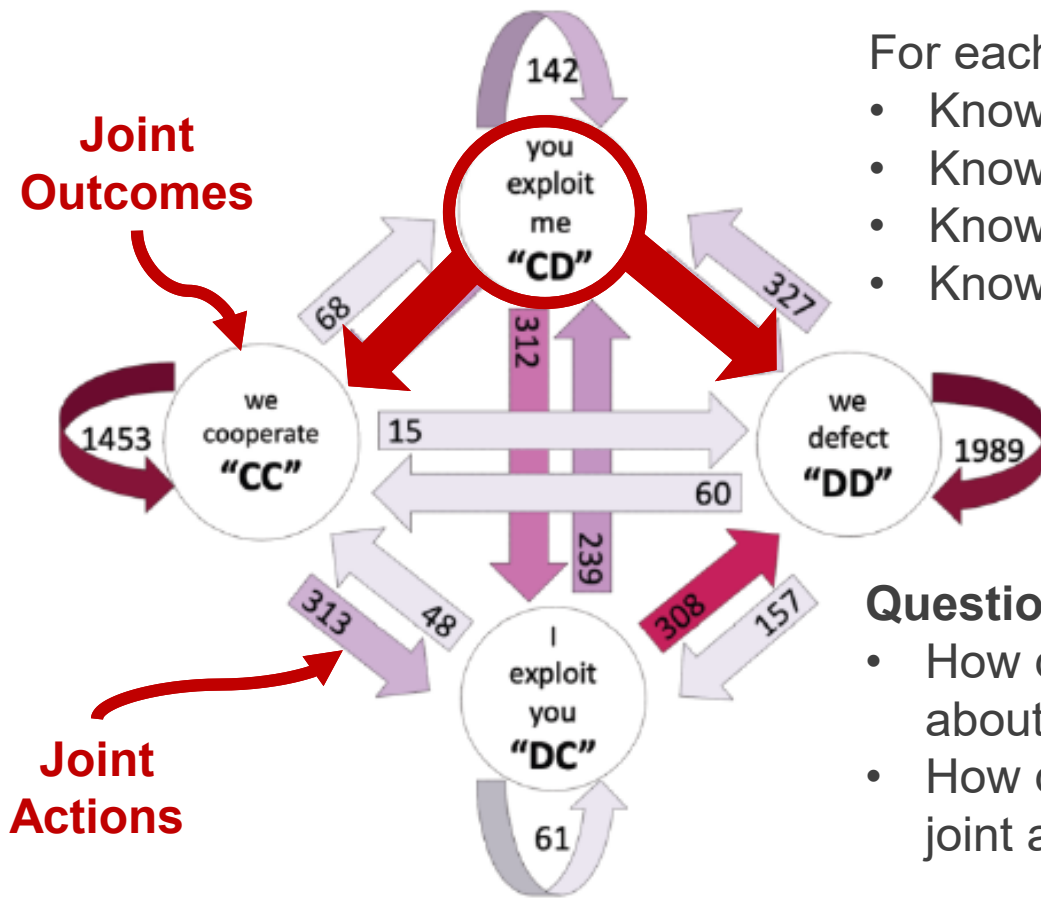
		Counterpart	
		Cooperation	Defection
Participant	Cooperation	100%	18%
	Defection	100%	36%

		Counterpart	
		Cooperation	Defection
Participant	Cooperation	69%	0%
	Defection	53%	0%

After each round, players reported how they felt about outcome (joy, regret, anger, neutral)

Corpus

- 319 participants played 20-round IPD (6380 joint decisions)



For each joint outcome:

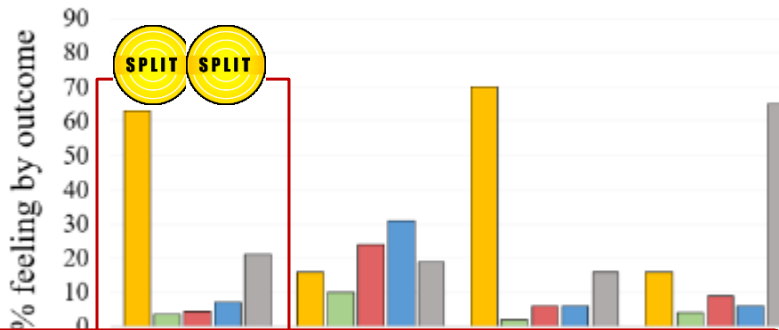
- Know how player felt
- Know partner's expression pattern
- Know partner's decision pattern
- Know what player decides next

Questions

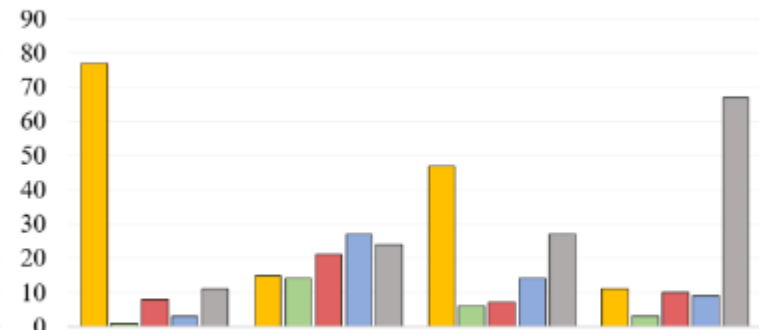
- How does condition impact feelings about joint outcome
- How does this influence the next joint action

Feelings by outcome x expression x decision

Extortion Action, Competitive Expression



Extortion Action, Cooperative Expression



Joint outcome

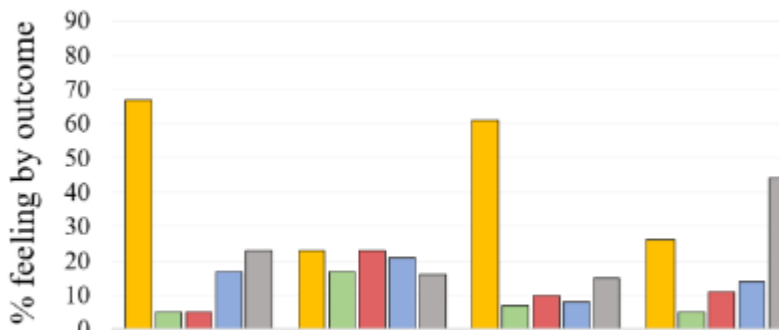
CC CD DC DD

Feelings

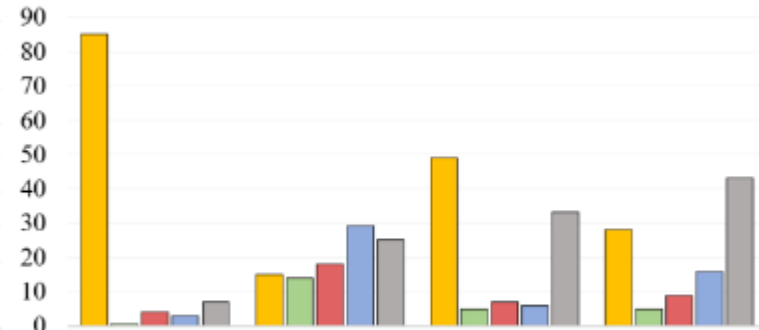
Joy Regret Anger Sadness Neutral

Joy Regret Anger Sadness Neutral

Generosity Action, Competitive Expression



Generosity Action, Cooperative Expression



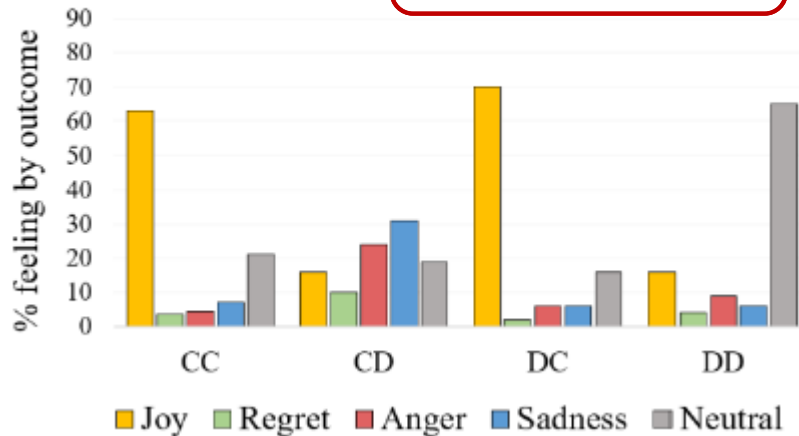
Joy Regret Anger Sadness Neutral

Joy Regret Anger Sadness Neutral

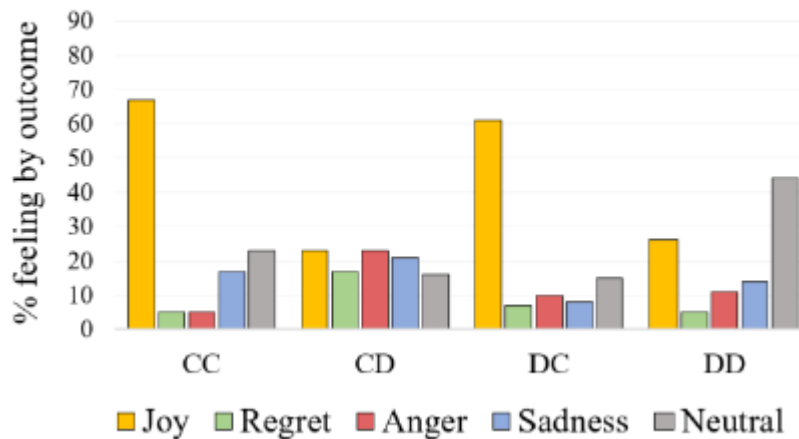
Feelings by outcome x expression x decision

Partner expression

Extortion Action, Competitive Expression



Generosity Action, Competitive Expression



“Competitive” agent

Cooperate Defect

Coop

Guilt

Smile

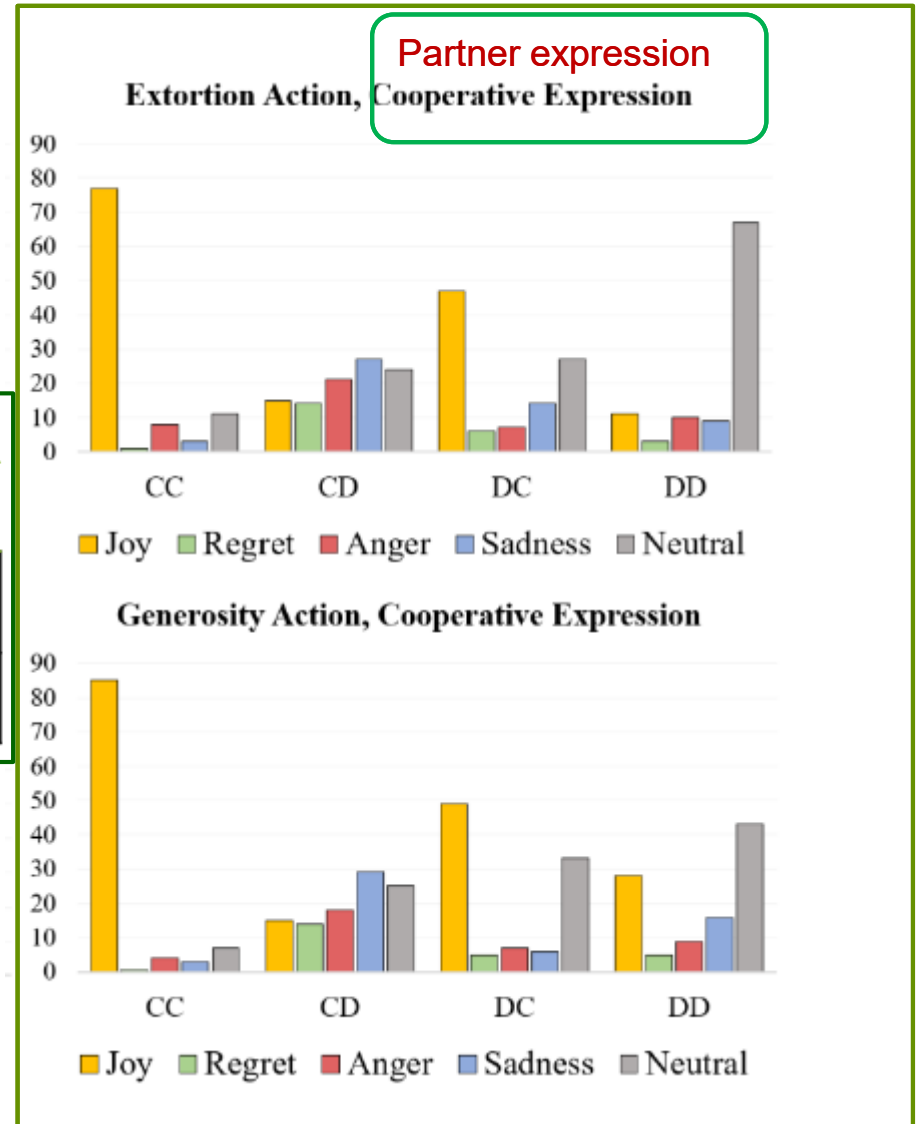
Def

Anger

Sadness

Feelings by outcome x expression x decision

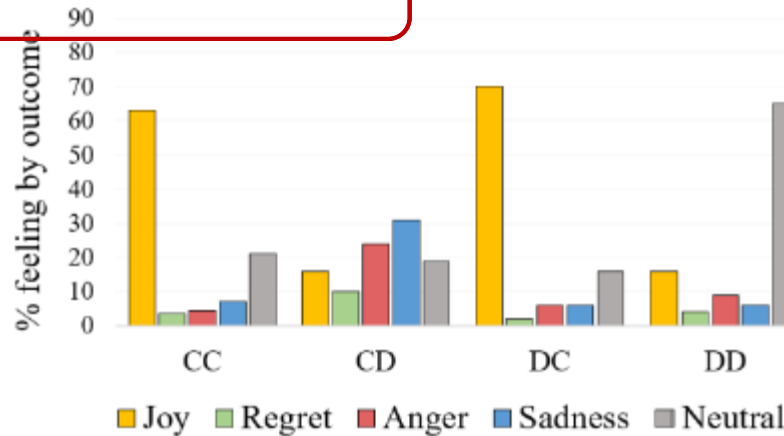
		"Cooperative" agent	
		Cooperate	Defect
Coop	Coop	Smile	Guilt
	Def	Anger	Sadness



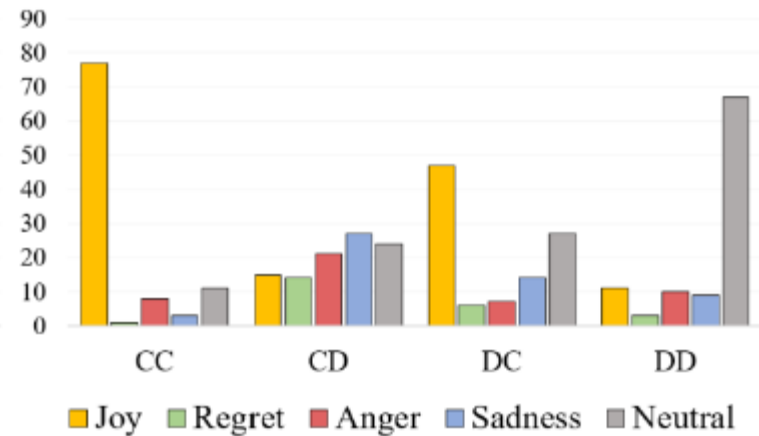
Feelings by outcome x expression x decision

Partner action

Extortion Action, Competitive Expression



Extortion Action, Cooperative Expression



		Counterpart	
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Participant	Cooperation	69%	0%
	Defection	53%	0%

Extortionist

Counterpart

Cooperation Defection

Participant Cooperation

69%

0%

Defection

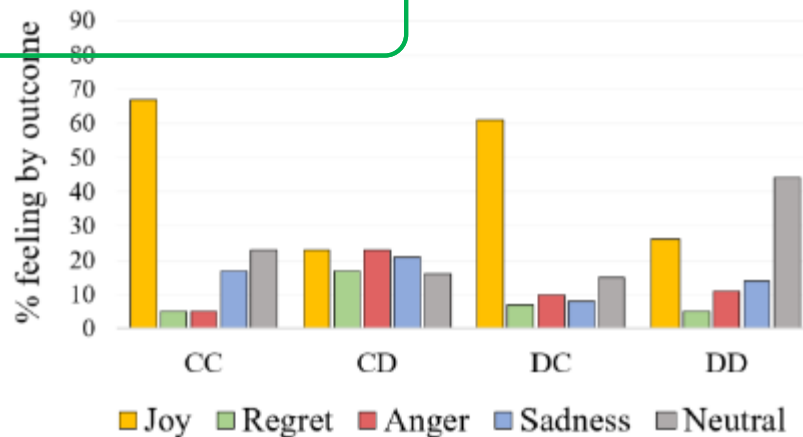
53%

0%

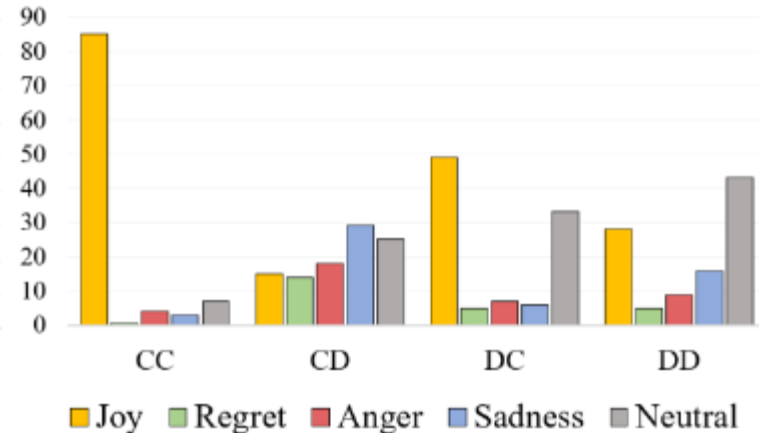
Feelings by outcome x expression x decision

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Partner action Generosity Action, Competitive Expression



Generosity Action, Cooperative Expression



Feelings by outcome x expression x decision

Strong impact of immediate outcome

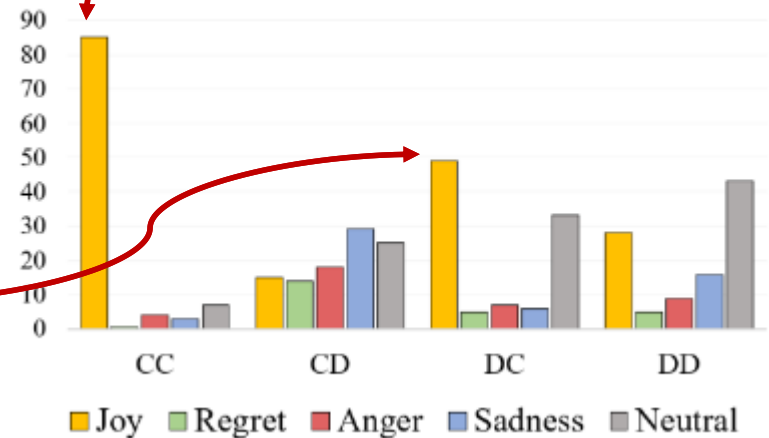
Feel Joy-AT mutual cooperation



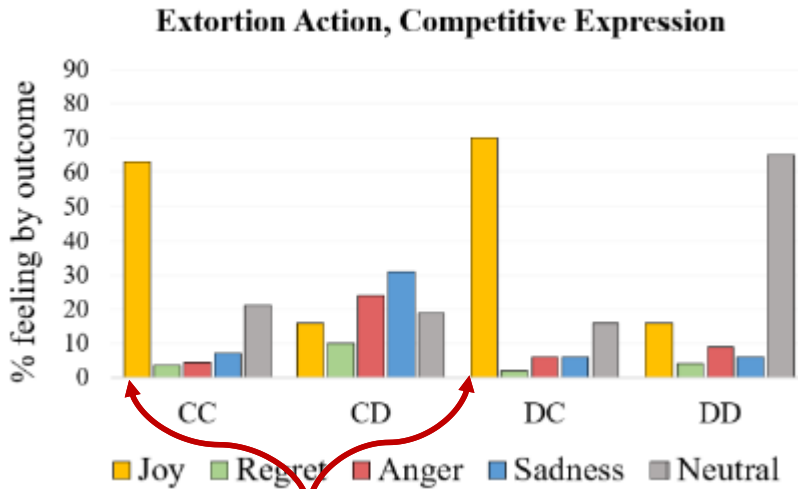
Less Joy-AT exploiting partner



Generosity Action, Cooperative Expression

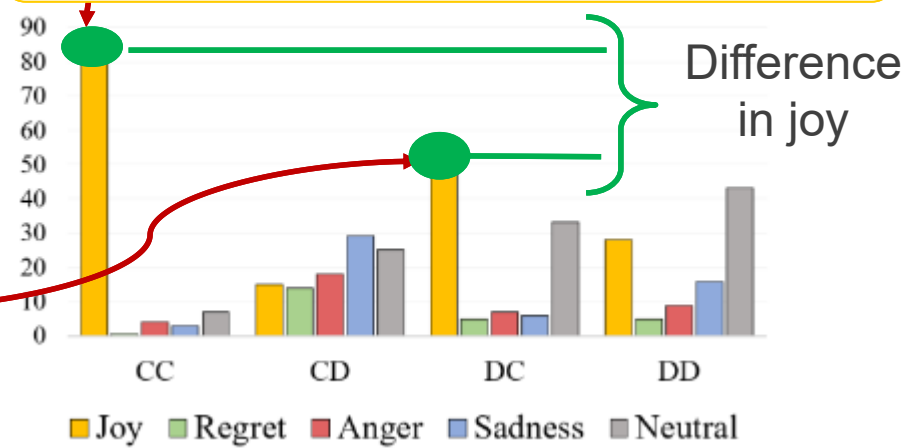


Feelings by outcome x expression x decision



Feel Joy-AT mutual cooperation

We call this "selfless pattern of feelings"



Pattern reverses depending on nature of partner

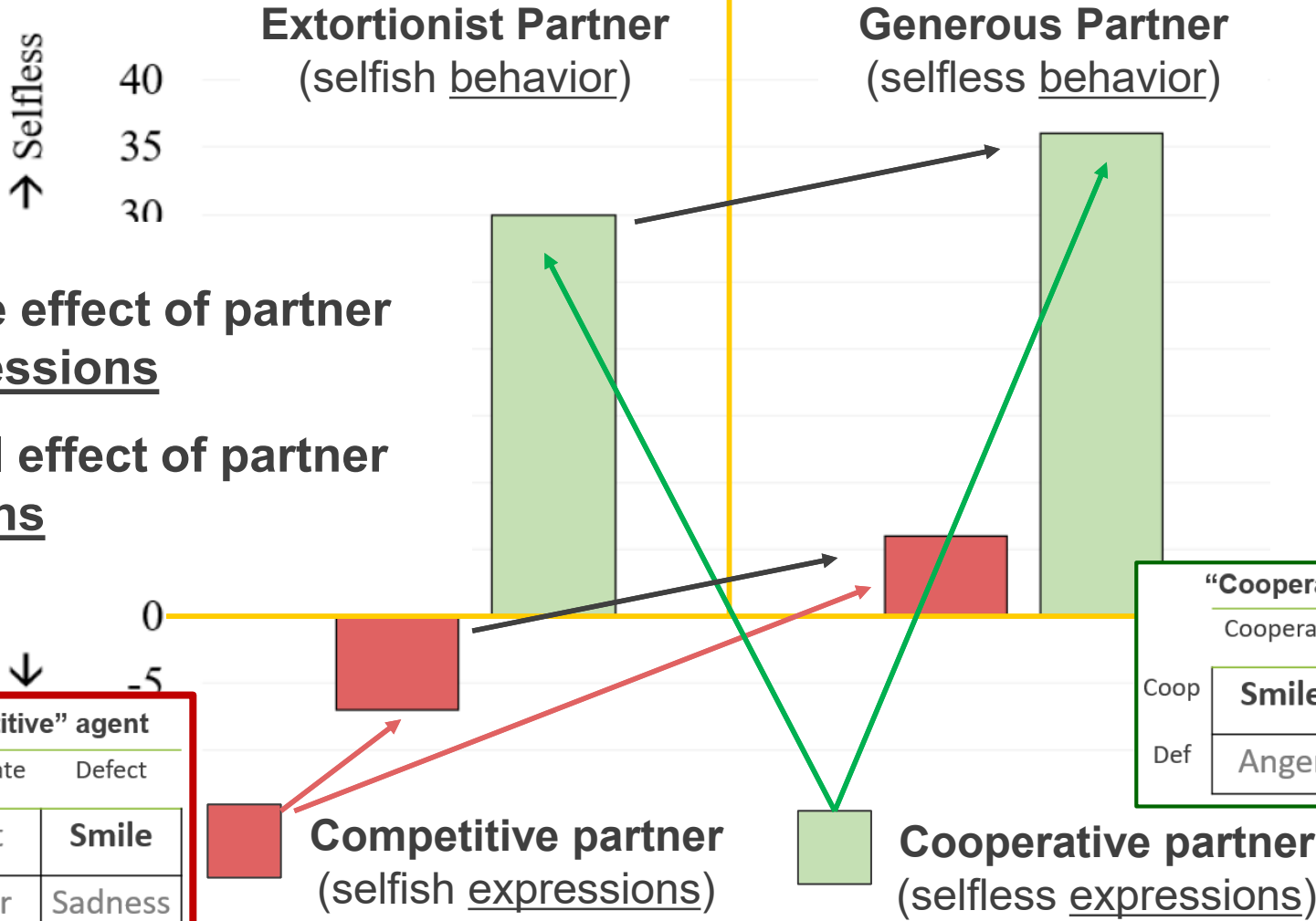
Less Joy-AT exploiting partner

Selfie

		Counterpart	
		Cooperation	Defection
Participant	Cooperation	69%	0%
	Defection	53%	0%

n (behavior)

		Counterpart	
		Cooperation	Defection
Participant	Cooperation	100%	18%
	Defection	100%	36%



- Large effect of partner expressions
- Small effect of partner actions

		"Competitive" agent	
		Cooperate	Defect
Coop	Coop	Guilt	Smile
	Def	Anger	Sadness

		"Cooperative" agent	
		Cooperate	Defect
Coop	Coop	Smile	Guilt
	Def	Anger	Sadness

Selfless Feelings Takeaway

- Selfless feelings = feeling good after mutual cooperation
- Selfish feelings = feeling good after exploiting opponent
- Proportion of selfless vs selfish feelings shaped by partner's expressions far more than their actual behavior
- Possible mechanisms? Norm internalization
 - If partner signals joy after exploiting you, suggests you don't need to feel guilt in this context

$$U_{me}(\$_{me}, \$_{you}) = \$_{me} + \alpha_m \cdot \max\{\$_{you} - \$_{me}, 0\}$$

Fear being exploited

Self interest

How does this impact player behavior?

- Analyzed if player feelings impact decision on next round
 - Small impact of felt emotion
 - Stronger impact of partner's actual actions
- So self-reported feelings (as induced by partner expressions) have weak link on immediate behavior



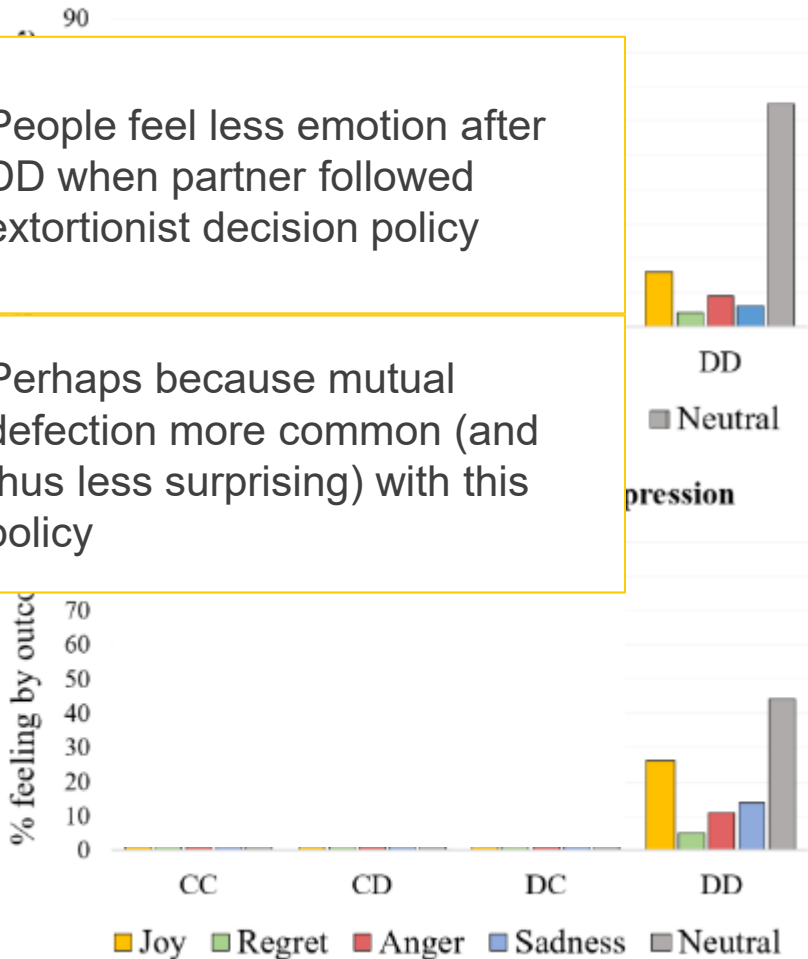
Limitations

- Needs replication
- Do self-reported feelings truly reflect emotional experience?
 - No “objective measure”: e.g., EDA, SCR, fNIRS
 - Participants may have believed their partner could “see” their emotions and engaged in regulation
- Here we focused on Joy
 - Joy-At mutual cooperation vs Joy-At exploitationBut other differences observed

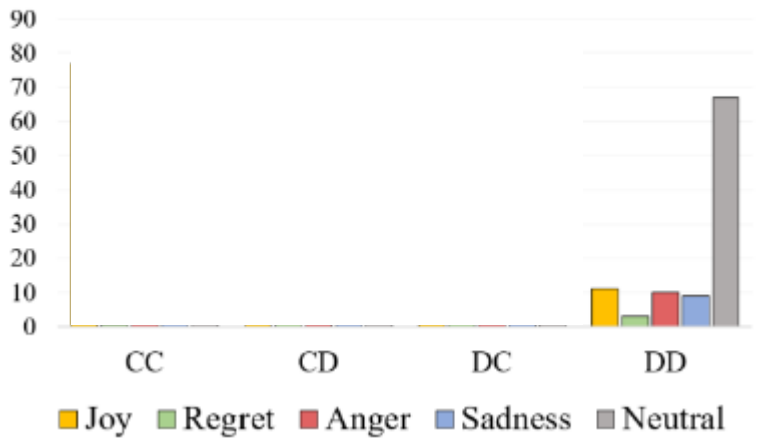
Feelings by outcome x expression x decision

Extortion Action, Competitive Expression

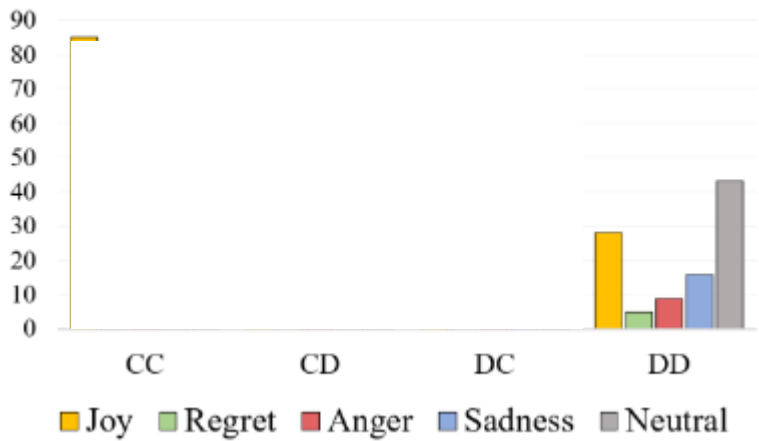
- People feel less emotion after DD when partner followed extortionist decision policy
- Perhaps because mutual defection more common (and thus less surprising) with this policy



Extortion Action, Cooperative Expression



Generosity Action, Cooperative Expression



Limitations

- Relied on stylized emotional expressions



From de Melo et al. (2014). Reading people's minds from emotional expressions. *JPSP*

Limitations

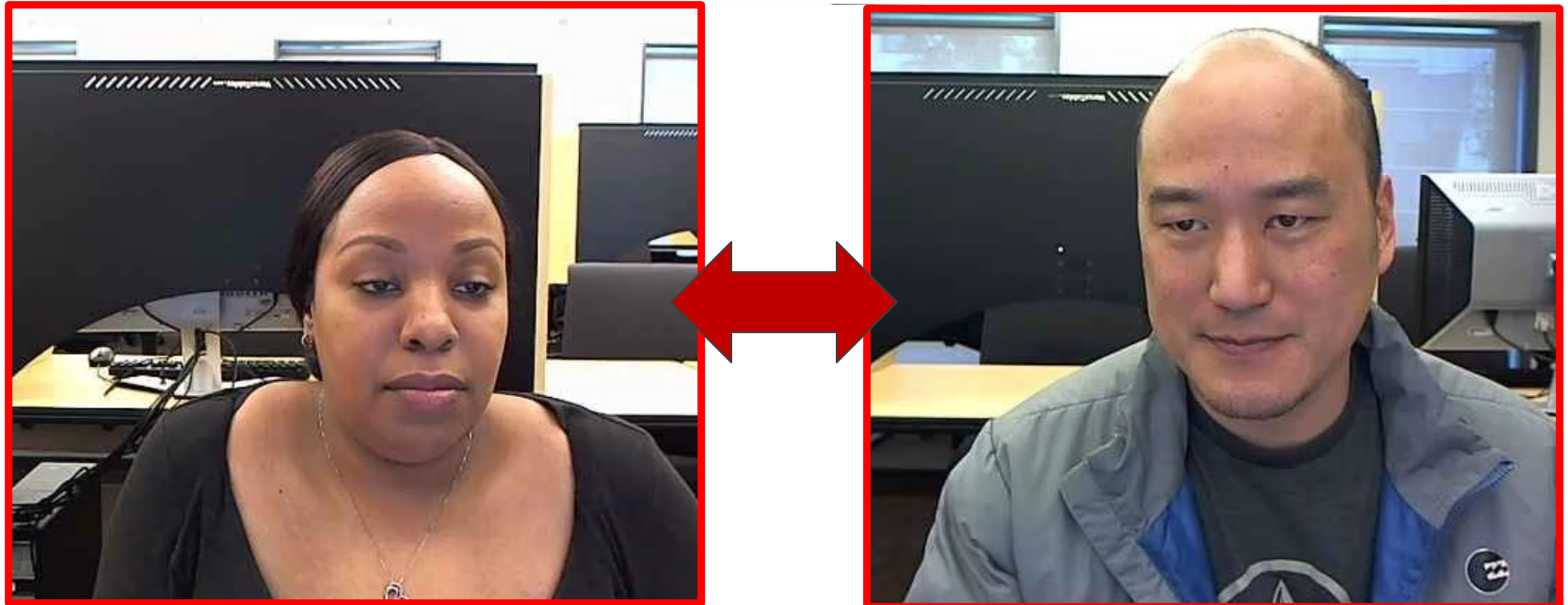
- Real facial expressions



Hoegen, et al. (2017); Incorporating emotion perception into opponent modeling for social dilemmas. *AAMAS*

Limitations

- Real facial expressions



Hoegen et al. (2019). Signals of Emotion Regulation in a Social. *ACII*

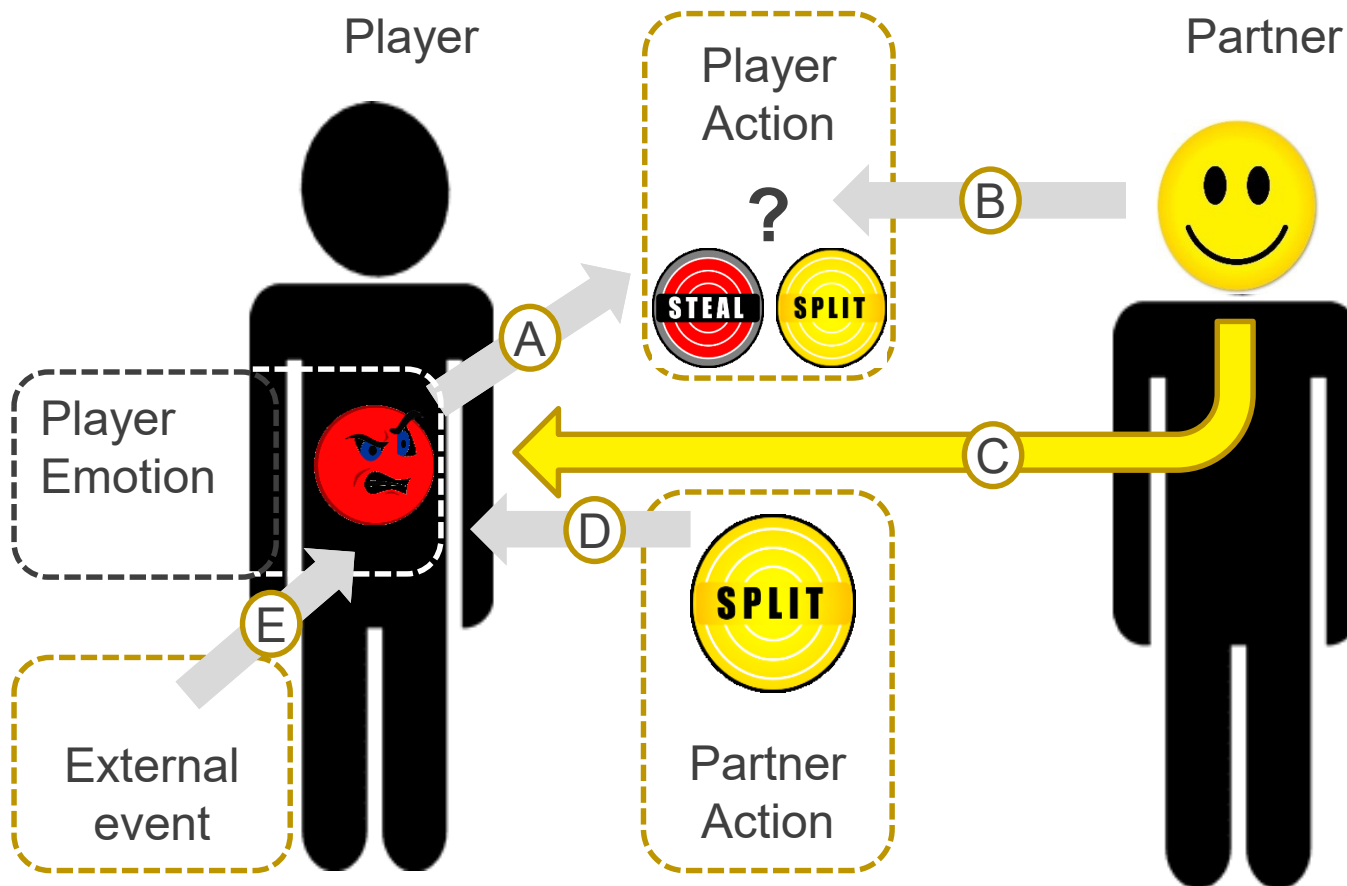
Lei & Gratch (2019). Smile Signals Surprise in a Social Dilemma. *ACII*

Stratou et al. (2017). Investigating Gender Differences in Temporal Dynamics during an Iterated Social Dilemma. *ACII*

Review

Emotions shape feelings and decisions in social tasks

Partner expressions serve to shape player emotions



250 word abstract due THIS SUNDAY



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Q & A