

Assessing the validity a computational model of emotional coping

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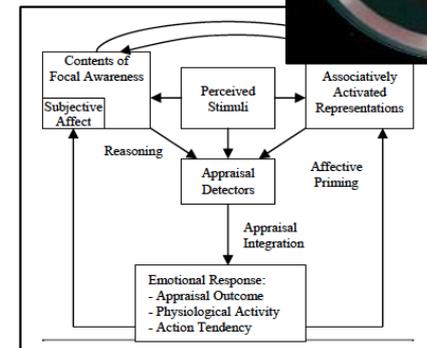
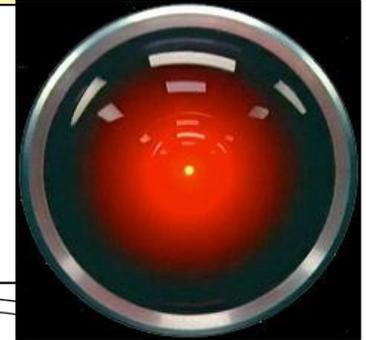


AFOSR



Why computationally model emotion?

- To inform applications
 - Virtual Humans for Education, Training and Health Interventions (Marsella et al., 2000)
 - Human Computer Interaction (Lisetti, 2005)
 - Student modeling (Conati & MacLaren, 2004)
- To inform intelligent system design
 - By drawing on insights from emotion's cognitive/social function
 - Simon 68; Minsky 85; Scheutz, & Sloman, 2001
- To inform emotion theory
 - Computational tools for social science research (ISRE09)



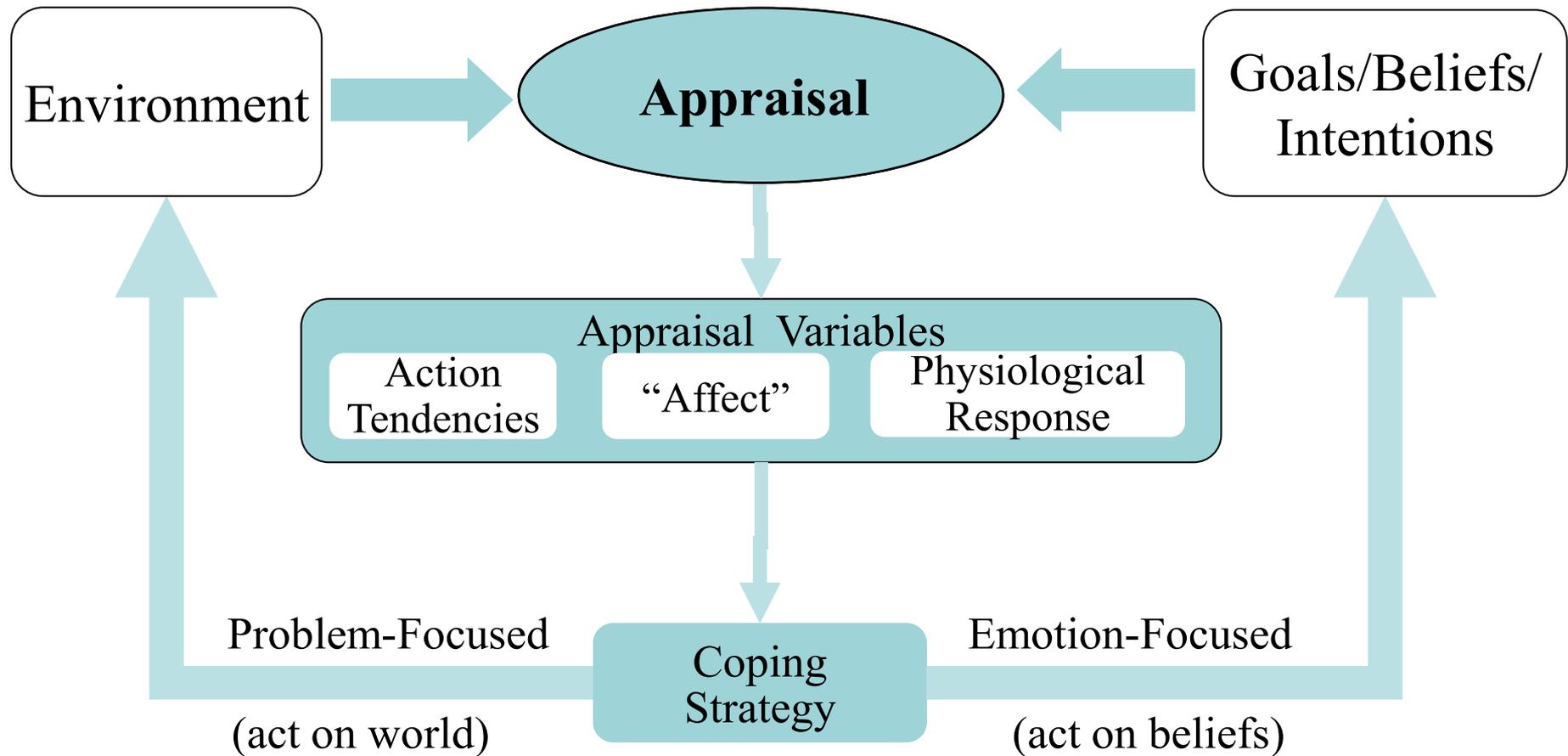
Why validate?

- Many models, but little evidence of validity
 - Models typically evaluated in context of application
 - Specific contribution of emotion model often unclear
- Focus on “Behavioral Fidelity” as a criteria
 - Is the behavior of the component consistent w/ human data
 - Gold standard for programs that must model/simulate human behavior (recognition, user modeling, simulations)
 - Not necessarily the best standard for certain effects
 - E.g., actors

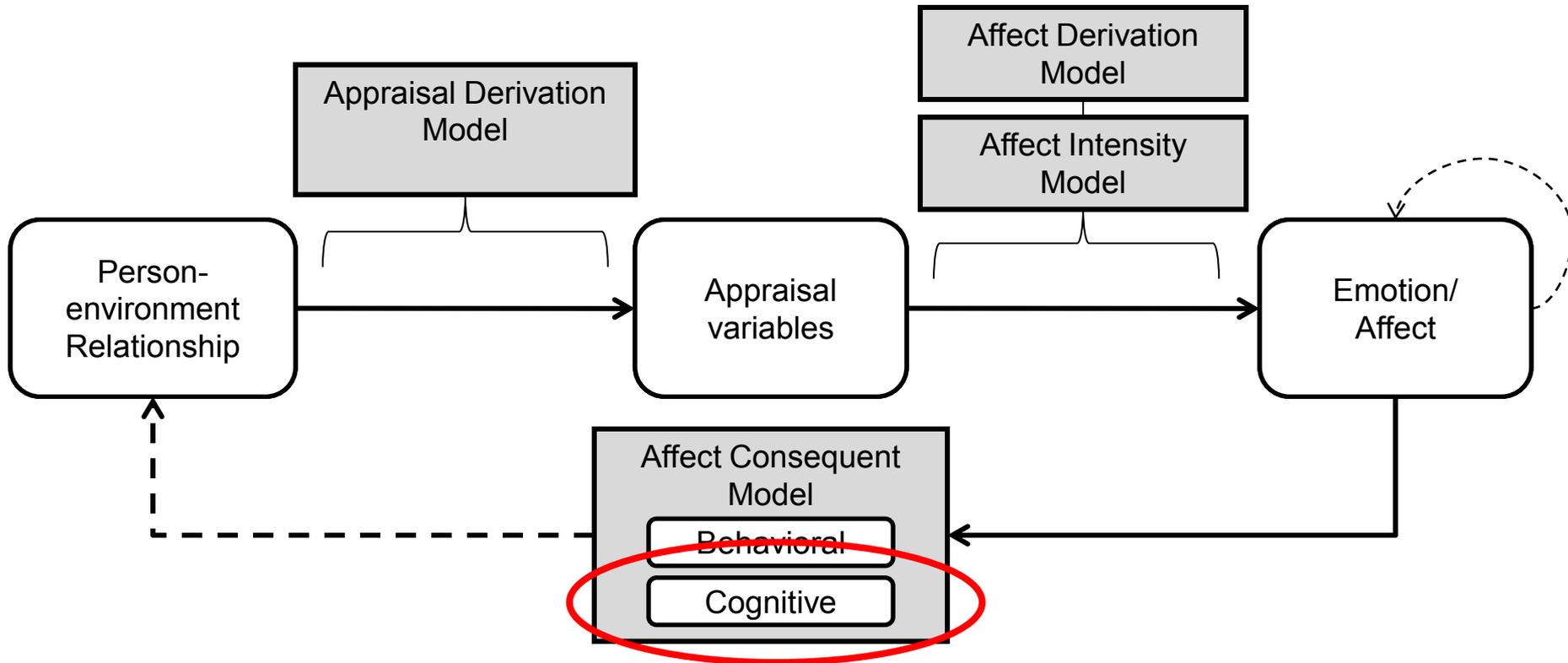
EMA: A Computational Model of Emotions

Theoretical Framework: Appraisal Theory

(Smith&Lazarus91)



A component model view of appraisal models



■ Question for today's talk

- What are the cognitive consequences emotional response?

Focus here: EMA's Model of Coping

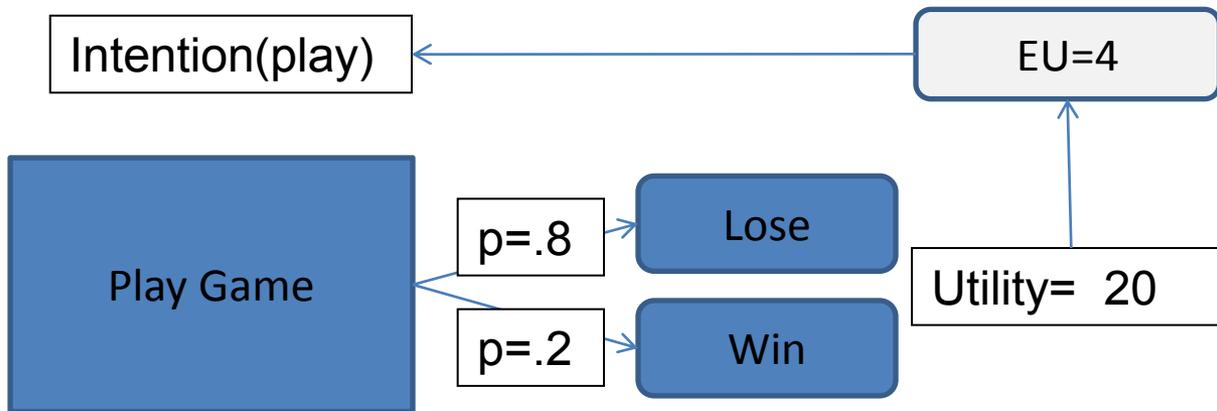
- **Attention-related coping:**
 - *Seek information:*
 - *Suppress information:*

- **Belief-related coping**
 - *Shift responsibility:* Alter probability of pending desirable (undesirable) outcome or assume intervening act or actor will improve desirability.
 - *Wishful Thinking:*

- **Desire-related coping**
 - *Distance :*
 - *Positive reinterpretation/silver lining* Alter utility of desired (threatened) state

- **Intention-related coping**
 - *Plan/Act*
 - *Seek instrumental support:*
 - *Make amends*
 - *Procrastination:* Alter intention to achieve a desired state
 - *Resignation:.*
 - *Avoidance:*

Contrast with Decision-Theory



Contrast with Decision-Theory



Coping → Appraisal → Coping

Fundamental question: Coping predictions

- **Decision theory decouples decision and motivation**
 - Preferences *fixed* over time
 - Preferences don't alter beliefs
- **Emotion findings argued these are coupled through coping**
 - Emotion-biases on decision making (Loewenstein & Lerner, 2003)
 - Cognitive dissonance (Festinger57; Kunda90;)
 - System of Thoughts (McGuire & McGuire, 91)
 - Almost no attempt to computationally model
 - (Marsella&Gratch; Dias)
- **Can EMA predict emotion-bias effects?**
 - Distancing
 - Resignation
 - Wishful thinking

Coping Study

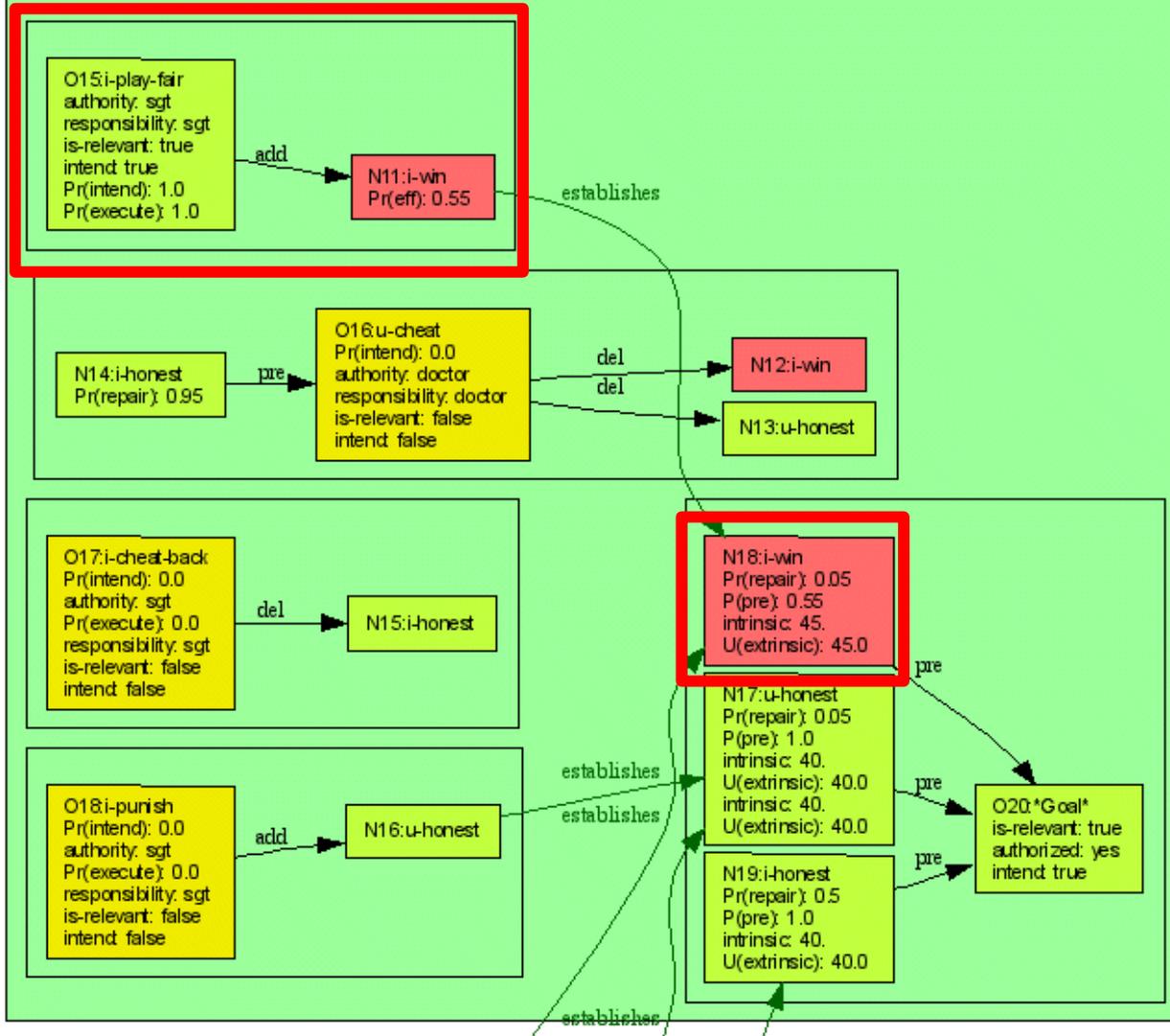
- **Use *Model Driven Experimentation Paradigm***
 - Use EMA to generate task specific predictions
 - Evaluate predictions through human subject experiments
- **Competitive Turn-based strategy game**
 - Partial Observability / uncertainty
 - Opportunities for deception
 - Social emotions
 - Dynamic: situation shifts over time



OBJECTIVE: examine dynamics of coping responses as goal of WINNING facilitated or threatened

- **Question: How do people cope with the emotions winning or losing gives rise to?**
- **Do results corroborate EMA model predictions?**

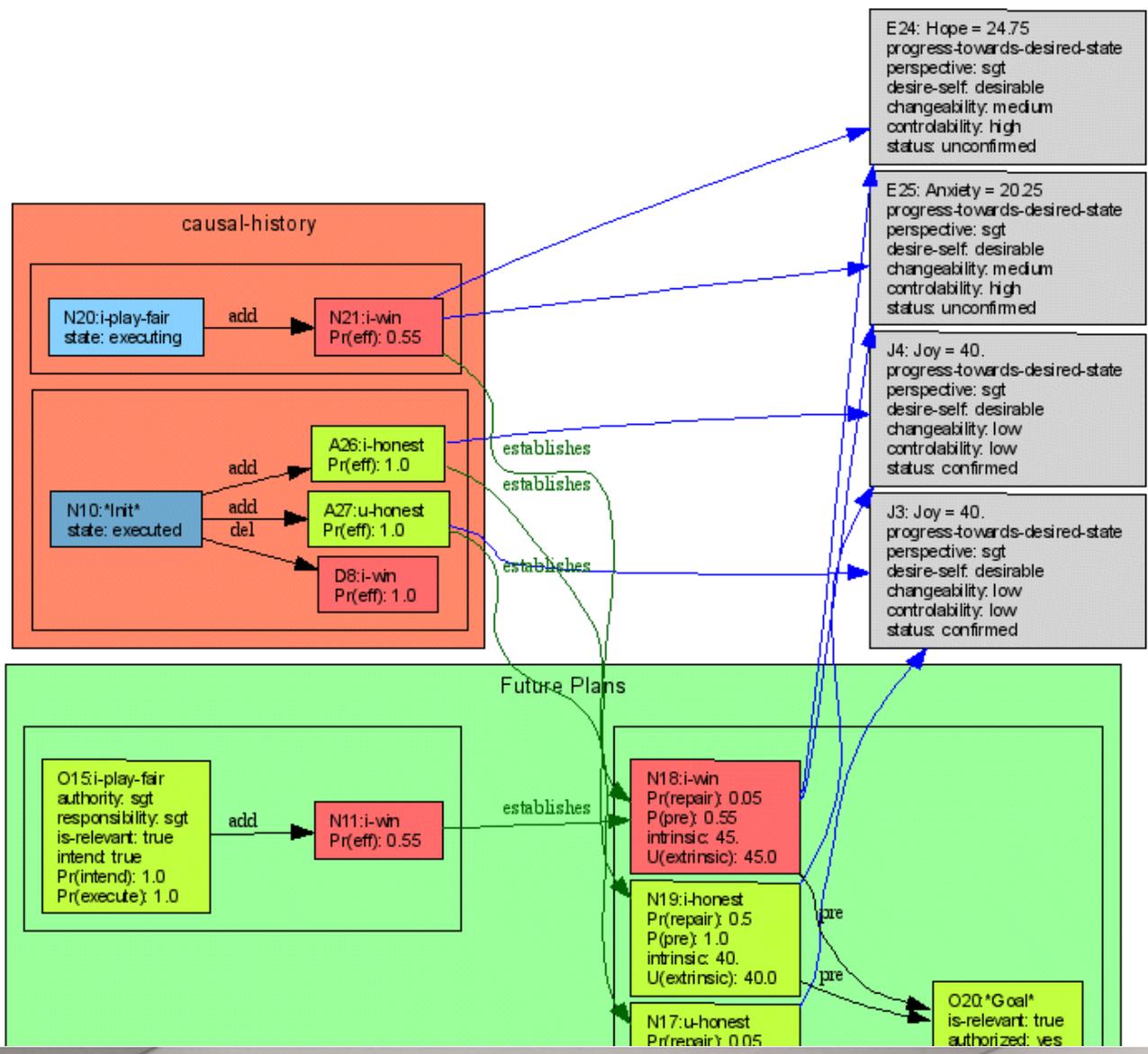
Future Plans



EMA Predictions

Task Model

- Developed and validated in 2 pilot studies
- People have two goals
 - Winning
 - Fairness
- Most subjects assume the game is fair
 - Can ignore cheating/fairness for main analysis



EMA Predictions

EMA

- Automatically derives emotion and coping tendencies from task model
- Automatically updates in response to game events
- Appraisals and coping tendencies constitute a set of predictions that can be tested against data

Human subjects study 101 participants (2 conditions)*



Coping Questionnaire



Confederate



Subject



EMA's Coping Predictions

Beliefs, desires and intentions will change

- **Distancing:**
 - H1: Perceived utility of winning will drop as player loses
 - H1a: Goal utility predicts intensity of effect
- **Resignation:**
 - H2: Willingness to play will drop as player loses
 - H1a: Goal utility predicts intensity of effect
- **Wishful thinking:**
 - H3: Losing interacts with utility to predict probability bias
 - Players that want to win will perceive higher win probability in lose condition

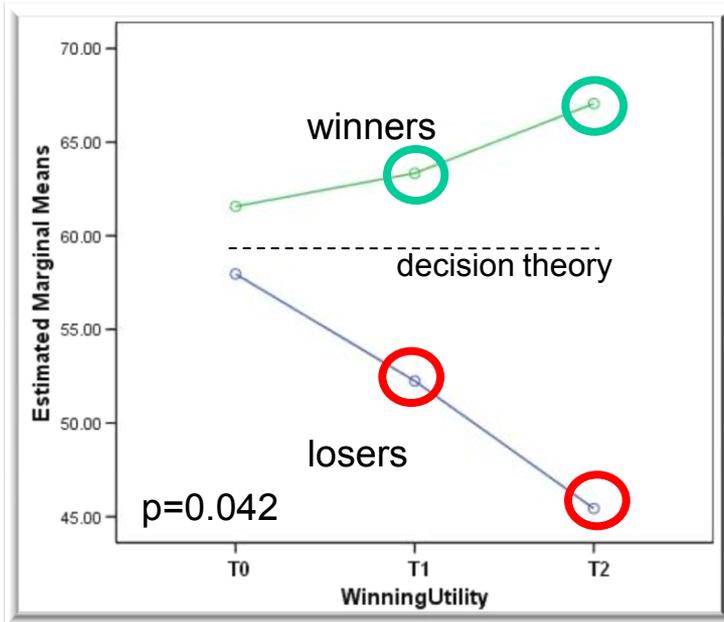
Additional Questions to address

Use study to propose refinements and extensions to EMA

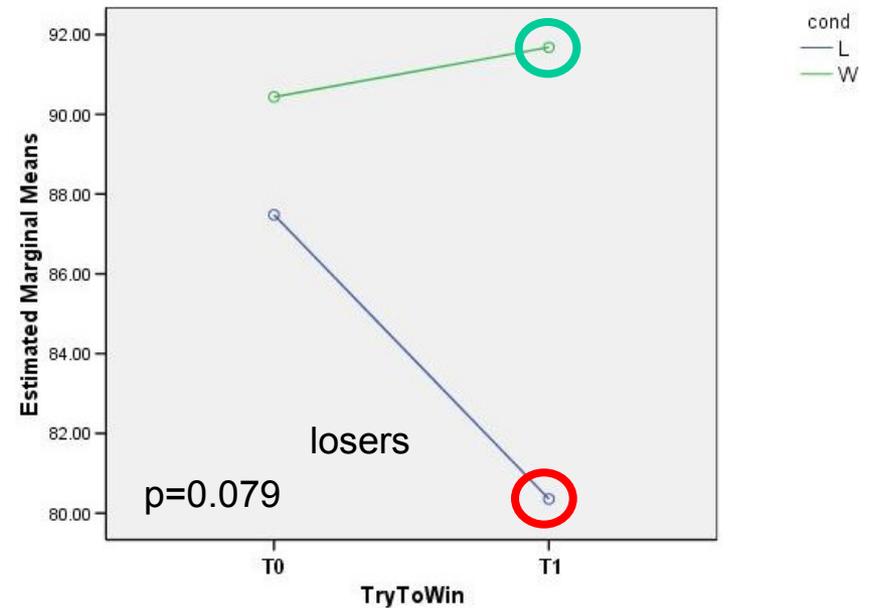
- **EMA makes no predictions in the case of positive emotion**
 - How will winning impact distancing, resignation, wishful thinking?

Results for H1 & H2: Distancing and Resignation

Self-reported desire to win



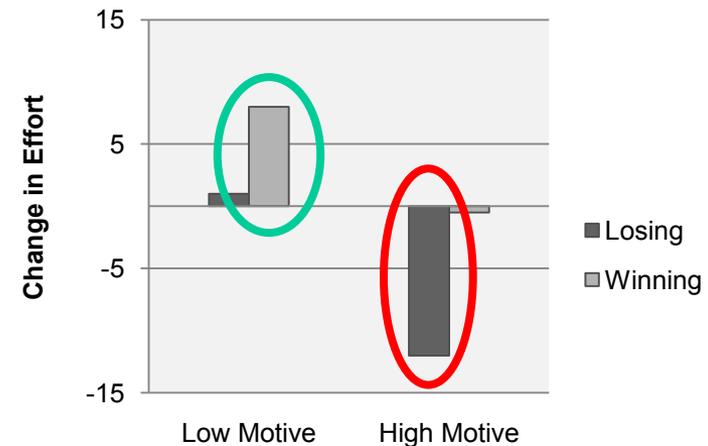
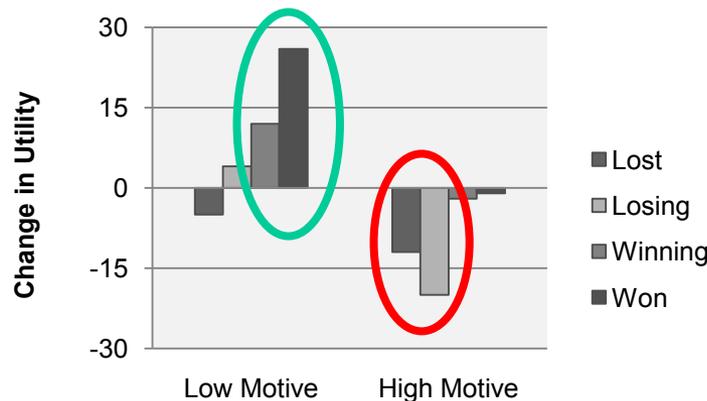
Self-reported willingness to play



- H1 and H2 supported: losers distance and resign
- But also “coping” with winning observed
 - EMA implementation makes no prediction

Results for H1a & H2a: Utility's impact

- H1a and H2a also supported: utility does impact intensity of distancing and resignation response
 - In Lose condition: Subject's with initial high desire to win distanced and resigned more
 - *In Win condition: Subject's with initial low initial desire to win became more engaged (EMA makes no prediction)*



Results: Wishful thinking

- **Probability-bias observed not what predicted**
 - Prediction: utility and probability positively correlated (losing cond.)
 - Observed: utility and probability weak negative correlation (losing cond.)
 - » nearly significant $R = -0.23$, $p=0.11$
 - utility and probability positively correlated (winning cond.)
 - » $R = 0.46$, $p<0.0001$
- **Support for motivated beliefs BUT Inconsistent with EMA predictions**
- **Possible explanations**
 - High motivation leads to stronger emotions
 - Valence impacts critical vs heuristic thinking styles (Clore&Storbeck06)
 - High motivated subjects are more skillful at battleship

Discussion

- **Overall, results suggest that coping moves subjects toward more positive emotional states**
 - Distancing and resignation of losing, high motive subjects reduces negative emotionality of threat to high utility goal
 - Over-optimistic wishful thinking of winning high motive subjects enhances positive emotions
 - Increased engagement of winning, low motive subjects enhances positive emotions from previously unattainable goal

Summary

- **Constructed paradigm for investigating unfolding emotional situations**
- **Support for coping predictions of EMA model**
- **Demonstrated emotion-biases in decision-making**
 - Inconsistent with classical decision models (decision/game theory)
 - Some success in modeling these biases
 - Identified several limitations in our coping models

Open issues (just starting to scratch surface)

- **Alternative explanations**
- **Decision dynamics**
 - Explored monotonically-evolving decisions (losing vs. winning)
 - Should explore other trajectories
 - does early failure impact future perceptions when circumstances improve?
- **Individual differences**
 - Subjects with low motivation to win show very different behavioral/coping patterns
 - Other appraisal/dispositional factors seem to improve predictions
 - Social Value Orientation
 - Personality
 - Cultural factors?
- **Social factors**
 - Battleship is a competitive game (theory of mind factors)

Thank You

Questions?



Results: Wishful thinking

