**PACCT Internal Working Models**

**Background**

Nim’s paper

* Surprising and interesting ideas – risk tasking reflecting trust in the environment, unpredictability schemas / schemas with poor integrity due to unpredictability
* Additional thoughts
  + Literature on aversive prediction errors
  + Memory literature – DRM paradigm and incidental memory tasks assessing self-/maternal-schemas
  + **Schema-induced bias**: an increase in prediction errors are ignored under uncertain conditions that require difficult mental transformations of information; bias acts as a compensation mechanism for dealing with uncertainty
    - *In conditions of high uncertainty, the habit-like learning system takes over as a default system when the need for updating the model is unclear*
  + Category learning and memory as a potential good model
* **Internal working models**
  + **Content**: expectations about self, significant others, and the relationship between the two
    - knowledge about details/interpersonal experiences **AND** **affect** associated with those experiences
  + **Functions**: help predict and understand environment, engage in survival promoting behaviors (proximity maintenance, establish “felt” security)
  + **Processes**: assimilation, accomodation, prediction error
* Johnson papers
* **Aversive prediction errors** - learning signals generated between discrepancy between actual and predicted aversive outcomes
  + “Positive” - positive direction of discrepancy; not expecting shock, but then you receive shock; strengthen cue-shock association and *increase* fear
  + “Negative” - negative direction of discrepancy; expecting a shock and you don’t get one; weaken cue-shock association and decrease fear ⇒ hypothesis that early adversity disrupts the use of -APEs
  + **Schema-induced bias**: an increase in prediction errors are ignored under uncertain conditions that require difficult mental transformations of information; bias acts as a compensation mechanism for dealing with uncertainty
    - ***In conditions of high uncertainty, the habit-like learning system takes over as a default system when the need for updating the model is unclear***
  + **Wright et al (2015)** - three cues with different probabilities of foot shock (never, 25%, always); in extinction, all cues were presented in the absence of shock
    - Probabilistic reinforcement type paradigm
    - Control rats - rapidly reduced fear to non-predictive and uncertain cues
    - **ELA rats** - slower to reduce fear to non-predictive cue and never reduced fear to uncertain cue
  + Papers from Cisler’s group on history of assault and neural encoding of prediction errors during trust tasks
    - **Cisler 2019 Biol Psychiatry** - female adolescent assault victims had decreased encoding (salience network response) of negative prediction errors - correlated with severity of assaultive violence and severity of early life maltreatment (CTQ)
      * **Promotes retention of learned associations** that may have an adaptive purpose in dangerous environments
    - **Lenow** **2014 Psychiatry Res** – female adolescent assault victims had decreased encoding (aINS, ACC response) of negative prediction errors and less behavioral slowing to these unexpected negative social outcomes during a task that varied the percentages of three faces delivering positive/negative feedback
    - **Cisler 2015 J Psychiatr Res**
* **Reinforcement/value prediction errors**
  + Gerin 2017 Dev Psychopathol
  + Ross et al 2018 J Psychiatr Res

**IWM fMRI Paradigm**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Condition | Separation | Anticipation | Caregiver Response | Expectation Rating | Affect Rating | ITI |
| Responsive Caregiver | Caregiver goes half way up the hill | Baby cries | returns (70%)  leaves (30%) | How expected? Unexpected? | Pre and Post Task? |  |
| Unresponsive Caregiver | Caregiver goes half way up the hill | Baby cries | leaves (70%)  returns (30%) |  |  |  |
| Unpredictable Caregiver | Caregiver goes half way up the hill | Baby cries | returns (50%)  leaves (50%) |  |  |  |

Different types of situations where a parent would be responsive or unresponsive

Could be different contexts and situations

Memory test afterward

… do affect ratings pre and post task? On the actual fribble, baby, self-relevance of stimuli

… How many conditions? How many trials per condition?

… what about an angry response?

… following up questions or behavioral paradigm about the caregivers they learn about?

**Behavioral Tasks**

* Prediction error
  + Value-based decision-making and prediction error memory paradigms
    - Predict the value of some object
    - Then test memory for associations later
  + Show participants blocks of video clips or pictures; 5 at once, then they can do a one-back task …. Press a button when the valence is same vs different
    - Something that is inconsistent …. Will take longer to learn
    - Response time is a good online measure of this
  + Distortion – show them something and cause interference

<http://learnmem.cshlp.org/content/23/2/72.full.pdf+html>

<http://m.learnmem.cshlp.org/content/26/7/219/F1.expansion.html>

* **Potential inspirations**
  + Statistical learning literature – WHAT CAME NEXT ….
    - WHAT SEQUENCE OF EVENTS DID YOU RETAIN
  + **Modified DRM paradigm** – presented of positive, negative, and neutral words, then complete a free recall and recognition memory task comprised of true, lures, and false unrelated
    - Video version of DRM might be fun
    - Incidental – performance would be really low
    - Add some online measure during learning … clips, impossible to do; with pictures, it would be possible … measure something that’s consistent or inconsistent with the schema (association task)
    - <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5266749/>
  + **Self- / Maternal-schema incidental memory task** – encoding instructions about self, caregiver for positive/negative valence
    - Hard to tell – depends a lot on the performance on the memory
    - Hard enough to show some individual differences
    - Differences based on memory vs inconsistent with schema
  + **Implicit association test** - show two pairs of words – one of them is consistent with mom/good and the other is inconsistent like mom/bad
    - Association test with more complex stimuli – show pair of mom and pictures; mom and photos
      * Online prediction error with response time, slower would indicate its not consistent with your schema
    - How related are these two words ….
  + A list, but you show one word at a time … some will be a critical trial, whereas others could go either direction. Computer – book, person would be a neutral target word, then mom – positive/negative … whether this has the same valence of the previous one; measure response time of the next trial … then test on memory for these words later on, like a carry over effect
    - Positive/negative word following critical and non-critical words
    - Neutral person
  + Daphna Shohamy’s work
    - <https://www.sciencedirect.com/science/article/pii/S0896627316301234#bib50>
    - Inferential reasoning
      * Association phase – different color squares paired with different color circles
      * Reward/feedback phase – circles either rewarded or not rewarded
      * Decision phase – which do square do you prefer?
        + *Who do you trust more?*
        + *You’re a crying baby – which mommy do you go to? Or where do you go to find mommy*?
      * *What about a memory phase???*
    - Decisions about preferred snacks elicit retrieval of [spatial memories](https://www.sciencedirect.com/topics/neuroscience/spatial-memory) (following [Gluth et al., 2015](https://www.sciencedirect.com/science/article/pii/S0896627316301234" \l "bib50)). Participants learn a series of associations between snacks and a spatial location on the screen. Some associations are trained twice as often as others, creating memories that are relatively strong or weak. Participants are then probed to make choices between two locations, choices that require retrieval of the memory for the location-snack association. Choice accuracy and reaction times conform to bounded evidence accumulation and are impacted by the strength of the memory. Choice value on this task is correlated with BOLD activity in the hippocampus and in vmPFC.
    - Learn associations between certain video clips or pictures and a spatial location on the screen …
      * Categories – warm/responsive, ignore/abandon, angry/mean, sad, unpredictable
      * Where to go to find the mommy when you are crying ... forced choice
      * Make choices that require retrieval of memory for location-snack association 🡺 can use choice accuracy and reaction times … impacted by strength of the memory

**Category learning task (preprint from Wangjing)**

* Category learning task – when you don’t have a better memory for the event, you rely on your previous memory/schema
  + When you don’t have memory for a specific event/thing from a category, you rely on your prior knowledge to make a judgment about that
  + When you don’t have explicit memory for that screenshot …. Rely on whether it’s consistent or inconsistent
  + When you LEARN vs when you DON’T learn – when you don’t learn, rely on the
* Show a map with clusters of words, either from same category (animals, tools) … one tool in the animal cluster; later ask to retrieve memory for spatial location of words
  + Go to correct location when they don’t remember words
  + Go to incorrect location when they do remember words
  + Videos that are negative / positive but not about caregivers … all videos about caregivers – will remember better when consistent, when they don’t remember – will rely on schema to make judgement … possible to make background consistent – pair of things that are COMMON between them (kind of like)
    - Later show them images of moms/parents and ask if they saw the character in that video
    - Remember – correct response
    - 2-stage question
      * Recognition – did you see this picture before
      * Detailed – which video did you see this

***Old/new? … add lures that are caregiver related.***

***SOME ARE IN THE CORRECT CLUSTER AND OMSE ARE IN THE INCONSISTENT CLUSTER.***

***Confidence rating?***

**Present a number of trials that doesn’t involve learning – not what we are learning on. Maintains their initial priors. But metric is something like memory for a particular fribble.**

* **Daphne; hardcore dependent measure of memory**

**What do you think these kids are thinking and feeling – theory of mind tasks**

The task consisted of three conditions: (1) a SELF condition in which items from the first word-grouping were paired with the question “Does this word describe you?” (2) a SIGNIFICANT OTHER condition in which the second group of words was paired with the question “Does this word describe your best friend?” and (3) a VALENCE condition in which the third group of words was paired with the question “Does this word describe something good?”

The SRET consisted of a set of 40 adjectives, half of which were negative and half of which were positive. The adjectives were selected from previous studies of information processing in depression (e.g. [Gotlib et al., 2004](https://www.sciencedirect.com/science/article/pii/S0165032714000585" \l "bib16)).

When completing the SRET, participants were seated at a computer and were instructed to focus on a cross in the middle of the screen. For each trial, the words “Describes me?” replaced the cross for 500 ms, followed by a 250-ms pause, after which one of the stimulus words was presented. Participants indicated whether the displayed word described them. After the task, participants were asked to recall as many words as possible from the task. We used the proportion of endorsed positive and negative adjectives that were recalled to assess biases in memory.

The final set of negative words included: negative, hostile, enemy, angry, spank, hate, mean, slap, kick, and hit. The final set of neutral words included: something, number, other, every, small, long, what, many, from, and the. The final set of positive words included: positive, playful, peace, happy, sweet, love, care, nice, kind, and hug.

* Abandon, leave,

A self-schema incidental memory task was previously adapted by Hammen and Zupan (1984) from procedures employed with adults (e.g., Derry & Kuiper, 1981; Hammen, Miklowitz, & Dyck, 1986), based on the hypothesis that a schema about the self stored in memory guides the selective encoding and retrieval of information about the self, so that self-descriptive adjectives that are consistent with the schema are recalled better than schemairrelevant words. The procedure consists of presenting 44 self-descriptive adjectives, half positive and half negative in content, under one of two encoding instructions: self-referent ("is this word like you?") and structural ("is this a long word?"). Children check yes or no on a response sheet after each question. At the end of the presentation, they are unexpectedly asked to remember as many words as possible. For the present analyses, a positive self-schema score was computed as the proportion of positive content words rated self-descriptive (yes) that were recalled from all the words rated yes. The first and last two words of the list were omitted from recall proportions to control for primacy and recency effects.

**Prospection**

**John frieman – mouse tracking to look at the arc – racial biases**

* **Experimental recombination paradigm** with emotional events – parents / kids provide names of familiar people, places, and objects by providing memories or independent lists; then researcher randomly reorganizes these lists to create a set of person-location-object triads that evoke novel simulations of the future
  + Puig & Szubar (2017) Emotion – the devil is in the details
    - 14 people, places, and objects
    - Randomly put together these things and paired with an emotion in order to generate potential future events
    - Code for internal details and external details
    - Provide ratings of emotional valence, arousal, and difficulty in reinstantiation of the event
    - Simulate for 12 s and then type brief description into a response box that would serve as the simulation cue
    - Participants were given 2 min to simulate and verbally describe an event in response to each cue. The descriptions were audio-recorded and later transcribed for analysis
    - Then rated on level of detail, plausibility, and emotional reaction
* **Delay discounting** perhaps as a behavioral way to assess prospection – intertemporal choice; have kids be cued to imagine specific, personally relevant future events while they make intertemporal choices or face temptations
  + <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6277467/>
  + [Bulley et al., 2016](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6277467/#B22); [Benoit et al., 2018](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6277467/#B14); [Rung and Madden, 2018](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6277467/#B80)
  + Nim – when trust in the environment is called into question, people are more likely to prioritize immediate reinforcement (over delayed)
  + *What about unpredictability schemas? Or schemas with poor integrity??*
* Threat prospection
  + <https://pubmed.ncbi.nlm.nih.gov/28157585/>
  + Social affective threat prospection and positive stuff too
* Apply **computational models** to brain activity during certain events to predict their emotional responses and behavior; develop a computational model of attachment / internal working models? Inferring emotional experiences from brain activity

**IWM Behavioral Task**

* **Part two of the fMRI task**
  + **All 3 caregiver types are at the top of the screen**
  + Baby is crying and you pick what caregiver to go to, then receive feedback (e.g., smile, angry face, leaves, etc.)
* **Naturalistic task with an experimental manipulation embedded**
  + Watching a variety of clips related to internal working models, provide continuous affective ratings; then afterward talk for 2-3 minutes about each character, self-relevance / personal memories, tell a story of what happens before and after with the characters, and make predictions about what happens next? Create tweets/instagram posts and pick emojis to represent some feelings and/or thoughts of the character
    - Infants crying
    - Parental rejection / bad stuff
    - Peer rejection / exclusion / good stuff
  + **Potential experimental manipulations**
    - Both parents and kids do this separately, and then do some recall, self-relevant, and predictions with parent present / absent
    - Emotional schema instantiation of different types
    - Expectation violation of different types

**References**