**Research Strategy**

## Aim 1: The Dissertation Research Project (F99 Phase) – Exploring the formation of outcome-based social uncertainty judgements across early normative development.

## A.1. Significance

#### A.1.1. Understanding Uncertainty as a Construct. Uncertainty manifests from ambiguity (i.e., uncertain outcomes; unknown probabilities) 2. While these constructs are highly associated, they are distinct. *Ambiguity* refers to a feature of the stimulus, whereas *uncertainty* refers to a metacognitive assessment of one’s current state. Uncertainty generated from ambiguity is distinct from uncertainty generated from risk (i.e., uncertain outcomes; known probabilities) in neural 23–26 and behavioral 3,27–30 representations, and can occur in response to both social and non-social (e.g., economic, perceptual) sources 3,25,31. Trust games 32, in which a participant competes or collaborates with a real or fictitious other to make economic decisions, are an effective means of socializing non-social uncertainty sources, but lack key features of an ambiguous social world. Rather than being organized in neatly defined, unimodal trials, assessments of social sources of uncertainty (e.g., assessing a farfetched story, narratives) 33, are continuously updated as relevant multimodal information is identified and sorted from irrelevant information and probabilities are rarely known 1. Crucially, social and non-social sources of ambiguity yield different behavioral responses as individuals attempt to resolve ambiguity 33.

#### A.1.2. Social Ambiguity Aversion Has Significant Developmental Implications. Social ambiguity can be pernicious and aversive1. For example, adult populations consistently demonstrate aversion to ambiguous economic 2,4,34 and social sources of uncertainty (e.g., individuals exchange reward to reduce ambiguity in influencing others 8). Clinical populations, including those with schizophrenia 24, autism spectrum 5, and anxiety disorders 5 demonstrate even stronger aversive responses than typical populations and high uncertainty intolerance is associated with emotion dysregulation 35. Social ambiguity appears to have significant health ramifications for adolescents as well, as the presence of social stressors in early adolescence predicts depression susceptibility two years later 9. However, adolescents consistently fail to demonstrate ambiguity aversion to social and non-social outcomes 3,6. These two findings are hard to rectify with one another, but a limitation of the latter studies is an absence of ambiguous social sources of uncertainty as stimuli. Given the prominence and sensitivity adolescents characteristically demonstrate towards social reward 10,11, apathy towards social ambiguity should be surprising. A paradigm using social sources of ambiguity might find evidence of ambiguity aversion among adolescents, as adolescents readily review and make use of complex social information when making decisions under social ambiguity 36. Regardless of aversion response, what is important to note is that performance in experimental paradigms using ambiguous stimuli have predicted adolescents’ real-world risk-tasking behavior 3,14 and ambiguity responses often undergo greater maturation through early development than responses to risk 3. Means of regulating aversive reactions to ambiguity are also limited during this developmental stage 22 as development of self-regulatory and affective networks are still ongoing through early adulthood 15–19 leading adolescents to dangerous or detrimental coping behaviors, further emphasizing the importance of understanding ambiguity assessments during this specific developmental stage.

#### A.1.3. Reasons Social and Non-Social Ambiguity Assessments May Differ. Social Exchange Theories posit that social decisions are subject to similar cost-benefit analyses as economic decisions 7, arguing against social/non-social domain specificity. Some trends in the literature, though inconclusive, may suggest that adolescent-to-adult development is characterized by greater domain generality in uncertainty-related cognition 37. Adults, but not young children, can readily exchange certainty judgments across various sensory modalities (e.g., visual, auditory) 38 and can more flexibly apply certainty judgments across modalities as a common metric through which a target’s quality can be evaluated 39–41. While social and non-social reward do demonstrate overlap in neural representations 23, assessing social and non-social ambiguity recruits different circuitry with social evaluations uniquely relying on the inferior frontal gyrus (IFG), ventrolateral prefrontal cortex (vlPFC), and anterior insula (AI), and non-social evaluations relying on the intraparietal sulcus (IPS) 25,31. Such differences may stem from differences in goals or outcomes associated with social and non-social ambiguity assessments, as non-social assessments may demand greater focus on unimodal sensory details and quantifiable calculations while social assessments may demand greater focus on heuristics and prior experiences 31,42. As such, the features of a given stimulus and, more importantly, what features individuals attend to likely have a significant influence upon certainty assessments. Perceptual information plays a key role in directing higher cognition 43 and research suggests attention may be a stronger predictor of real-world decision-making than working memory 44. It should be noted that uncertainty directs attention from an early age 45 but that the relevance of information is better assessed as individuals age and gain more experience 37.

#### A.1.4. Reasons Adolescent and Adult Ambiguity Assessments May Differ. Most literature differentiating adult and adolescent ambiguity-related cognition has focused on responses to ambiguity. In these cases, neither familiarity biases (indicative of exploratory behaviors; e.g., ordering a new meal or your menu-favorite)4 nor pessimistic attitudes towards outcomes 46 explain why adults and adolescents differ in ambiguity aversion. Some research suggests fear of others’ negative evaluations 34 may predict aversion ambiguity, which may disproportionately affect adolescents relative to adults, given their focus on social others 10. Regardless, we are only aware of a single study which directly probed ambiguity-related cognition in adolescents using social sources 42. Ma et al. found that between 10 and 16 years old, children’s decisions to trust others gradually become determined more by empirically-based information than internal heuristics. Other developmental explorations of certainty have highlighted that our sensitivity to varying degrees of uncertainty 47 and our ability to calibrate uncertainty judgments to the different courses of action increases throughout normative development, which manifests as overconfidence early in life when interpreting ambiguous circumstances 48,49. Such overconfidence might reflect differences in ambiguity-related cognitions and aversion reactions.

#### A.1.5. Innovative Features of this Proposal. Our outlined proposal extends the extant literature on developmental differences in uncertainty assessment by capturing both neural and behavioral representations of uncertainty in response to multimodal ambiguous social and non-social sources as information unfolds over a time course within a novel naturalistic fMRI paradigm. This will be accomplished by having participants continuously assess how certain they are of a social (e.g., a character’s innocence/guilt) and non-social perceptual (i.e., video frame luminance) outcome while watching video stimuli. As previously noted (*See* **Research Strategy A.1.1.**), this naturalistic approach captures many features of a social world absent from other paradigms in the literature, and thus offers unprecedented ecological validity to a construct with such notable real-world implications. We also use advanced computational methods (intersubject representational similarity analysis (RSA)) which, to the best of our knowledge, have not been applied to an adolescent population or explorations of uncertainty-related cognition. Intersubject RSA is a robust analytical technique uniquely suited to explore commonalities in complex representations across age groups, modalities, and stimulus dimensions, granting us unprecedented granularity in explore domain and developmental differences. Lastly, our paradigm also makes use of free-recall to identify which features participants attended to while making their assessments. As noted (*See* **Research Strategy A.1.3.**), attention’s role in cognition cannot be understated and through topic modeling and natural language processing, we can identify which specific features participants attended to, how those features informed their certainty representations, and how attention shifts across adolescent development.

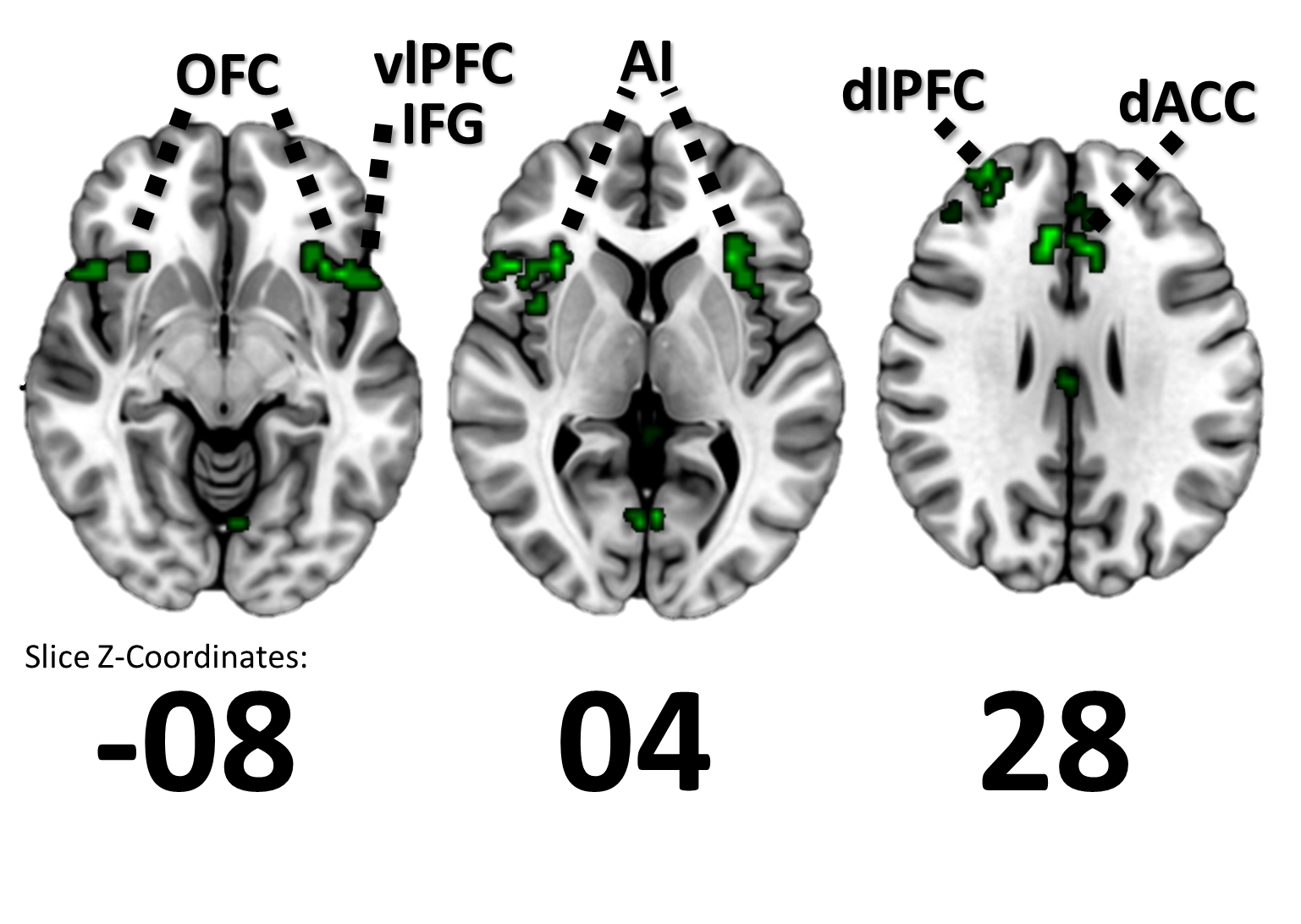
### A.2. Approach

#### A.2.1. Rationale and Overview

#### Though ambiguity can yield highly aversive reactions, responses to ambiguity (i.e., events with unknown outcomes and probabilities; e.g., not knowing the winner or chances of winning a competition) are often influenced by development. Furthermore, while research on ambiguous non-social uncertainty has been exhaustive, we know comparatively little about how individuals form judgments in response to ambiguous social sources, despite social uncertainty being closely tied to negative psychological reactions (e.g., anxiety, depression) 5,50–52. My dissertation work (i.e. Aim 1) will explore neural and behavioral developmental differences in uncertainty assessments of social and non-social ambiguity using a validated naturalistic fMRI paradigm. While the task is novel, it has been used to collect data from 26 adult participants and has yielded promising preliminary data (**Fig 1**) consistent with the extant literature examining uncertainty, but uses multimodal narrative stimuli that may better approximate features of real-world uncertainty.

**Figure 1.** Thresholded Z-statistic map from preliminary analyses of paradigm with adult participants (n = 26)

OFC = Orbitofrontal Cortex; IFG = Inferior Frontal Gyrus; vlPFC = Ventrolateral Prefrontal Cortex; AI = Anterior Insula; dlPFC = Dorsolateral Prefrontal Cortex; dACC = Dorsal Anterior Cingulate Cortex



Using this task in an adolescent population, my dissertation research will test whether assessments of social ambiguity render different patterns of neural activation for adolescents relative to adults. In addition, I will examine whether performance on a perceptual ambiguity task correlates to social ambiguity performance. This approach models important features of social ambiguity as it exists in daily life, but which are absent from other existing approaches. Rather than documenting only the final product of a certainty judgment (e.g., selecting low- or high- risk slot machines), this approach documents how certainty judgments form over time as individuals learn relevant or irrelevant information and filter it through their own personal hypotheses or biases.

#### A.2.2. Progress Thus Far

Based upon pre-existing literature 25,31, we hypothesized that the orbitofrontal (OFC) and dorsolateral prefrontal (dlPFC) regions would activate during uncertainty tasks in general with additional anterior insula (AI), dorsal anterior cingulate (dACC), ventrolateral prefrontal cortex (vlPFC) and inferior frontal gyrus (IFG) activation during social uncertainty tasks specifically. For additional validation, I also queried Neurosynth meta-analytic software 53 using the terms “social cognition”, “ambiguous”, and “uncertainty” to identify key regions that we might expect to respond if our paradigm is prompting social ambiguity-related cognition. Neurosynth’s composite association z-statistic map was largely consistent with our hypothesized circuitry. We then used FSL’s FEAT 54 to conduct a univariate analysis using data from 26 adult participants that have completed the outlined paradigm (*See* **Research Strategy A.2.4.**). We found strong activation within each of the previously outlined regions during our social task, according to the Automated Anatomical Labeling (AAL) atlas (**Fig 1**). While this analysis does suggest that our task is targeting ambiguity-related cognitions, it cannot identify which features are influencing these neural representations, which is why computational methodologies are so pivotal to this project.

#### A.2.3. Participants and Power Analysis

#### Participants will be healthy individuals, ages 13-20. Statistical power was determined using Stanford’s Neuropower 55 Toolkit with data from my doctoral lab. Power analysis indicated that 53 participants would be required for 1 - β = 0.80, as indicated by the random field theory parameter. However, to account for attrition at a rate of 15%, 60 participants will be recruited. Further details can be found in the **Human Subjects Section**.

#### A.2.4. fMRI-task

#### The fMRI task (**Fig 2**) has been extensively pilot tested and is currently being used to capture data from adult participants. Participants first complete a training exercise to ensure comfortably using a handheld device (i.e., button box/joystick) and assess ability to clearly hear audio. During the primary social uncertainty task, participants are introduced to the target and supporting characters by reviewing necessary but minimal background information (e.g., character’s names, general roles, and relationships to other characters). Participants then watch video (i.e., *The Undoing*, HBO Television) while continuously rating how certain they are of a given outcome (i.e., a character’s innocence or guilt) using their handheld device. A rotating checkered pattern precedes and follows each stimulus for 30 seconds, which is standard practice to assess responses from the visual system when using dynamic video stimuli 56. The stimulus is split into two 22 minute 17 second components and presented to participants across two sequential runs, with the first 17 seconds of each run being ignored to account for initial scanner lag. Following the primary task, participants watch 5 minutes of video from a different episode of the stimulus show, but containing the same characters, and rate how certain they are that the luminance of each frame is lighter or darker than a target image. The target image is visible throughout the task and is the frame closest to the average luminance of all frames contained within the stimulus, such that an approximately even number of frames are lighter and darker than the target image. This measures a participant’s formation of perceptual certainty judgments. Participants then perform a surprise free recall task in which they must recite any detail that they can remember from the primary task stimulus. This data will be recorded and transcribed. Participants will be encouraged to speak for at least ten minutes to provide sufficient data, however, recall of any length will be acceptable. Lastly, participants are removed from the scanner and complete questionnaires to assess anxiety 57, uncertainty intolerance 58,59, depression 60, demographics, character assessments (e.g. “How agreeable was character X?”) based upon a validated measure of person perception dimensions 61, engagement with and difficulties in completing the task, and how their personal theories of the outcome (e.g., which character committed the crime) evolved over time.

**Figure 2.** fMRI task. Participants are given background information and view one minute of visual baseline (fixation cross and rotating checked pattern). While viewing the video, participants will continuously indicate their certainty as events occur.

A.2.5. Behavioral data collection and processing

Behavioral certainty ratings, which are sampled at the stimulus’s framerate (24 Hz), are averaged across 2 second periods to match the repetition time (2000ms) of our image acquisition. The luminance of each frame in the perceptual certainty task is derived from its calculated luma value. The function used to calculate these values was built in R by the applicant, works with any video stimulus, and is publicly-available for other users via Github. Free recall recordings are first processed through a standard audio editing pipeline to ensure clarity and then annotated by trained researchers in combination with an AI transcription platform (OtterAI).

#### A.2.6. Image acquisition, pre-processing, and data analysis

Scanning will be performed on a 3T Siemens Tim Trio MRI system at Temple University (*See* **Equipment and Facilities** for more details). Acquisition parameters for the T2\* EPI BOLD sequence includes 3 mm slice thickness, a TR = 2000 ms; TE = 25 ms; flip angle of 75°, and a FOV = 1680 x 1680 mm. Data will be preprocessed with the standard fMRIPrep pipeline 63 to maintain generalizability. Though traditional fMRI video paradigms bin segments of video (e.g., 30 seconds) into trials 56, such an approach would be inappropriate in conjunction with our behavioral measure, as it would necessitate averaging ratings across the length of the bin. As such, our analysis takes inspiration from event segmentation and defines each event as any rating inflection, indicating a change in cognition regarding the predetermined outcome 64. Motion outliers will be assessed using the FSL Motion Outlier Tool 54, which defines outlier thresholds as the 75th percentile plus 1.5 times the interquartile range. Head motion can be a pernicious issue with adolescents and, as such, outlying TRs will be statistically censored. If greater than 15% of TRs that compose a trial are outliers, the TR will not be used for analyses. Mock MRI training sessions will precede data collection to reduce the need for motion correction.

Analyses will be done with the nltools Python package 65. Single subject and group-level data will be analyzed using General Linear Models (GLMs). Participants’ certainty ratings from moment to moment will be detrended (resulting in a time course of only rating inflections), demeaned, and z-standardized, to reduce spurious correlative influences and lagged by 10 seconds to capture the decision-making cognitive processes that precede rating changes. Such a lag is analogous to standard practices in the memory event-segmentation literature 20,64. Complex social and cognitive phenomena can often be obscured using univariate methodology, which are sensitive to changes in magnitude within a region, but not changes in activation patterns within a region 66,67. As such, intersubject representational similarity analyses (RSA) are necessary to parse adult and adolescent differences in representations and identify which features, if any, disproportionately influence adult and adolescent representations and behaviors. Intersubject RSA is uniquely well-suited to explore our data and research questions as it grants the ability to compare multimodal data across trials, individuals, and age groups in both block- and event-related fMRI task designs 66,67. By identifying which characters, events, and contexts participants identify during immediate free recall (i.e., topics) 20, the order in which they are recalled (i.e., linearity) 68, and the detail and the tone with which they are recalled (i.e., semantics) 62, we can identify which features participants attend to, how they subjectively experience those features, and how their experience informs their uncertainty assessments. I have used RSA approaches with naturalistic fMRI stimuli previously 69 and directed RSA workshops. Though these previous analyses differ in the quantity and quality of features incorporated into the analysis, my experience provides confidence that I have the technical skillset to conduct this analysis.

A.2.7. Predicted results

Traditional univariate techniques and Intersubject RSA analysis will be used to investigate developmental differences in neural responses to social and non-social sources of ambiguity. We predict that, regardless of age, social certainty will be positively associated with activation in the dACC, AI, IFG, and vlPFC/OFC, but the magnitude of activity in social reward regions (dACC, IFG) may peak around ages 16-17 corresponding with social reward response peaks. Primary analyses will examine correlative similarity among neural patterns in non-visual and non-motor regions to identify how domain, age, behavioral indications, stimulus features, and attention to those features inform how similar neural representations of social and non-social ambiguity are to one another. This analytic approach grants unprecedented resolution to examine nuances in how uncertainty is represented across modalities. We anticipate that adolescents and adults will generate less similar behavioral and neural representations of uncertainty in response to non-social versus social ambiguity. We expect that adolescent representations will be more like adult representations as age increases. We also predict that stimulus features will be more predictive of certainty representations in later adolescence than in earlier adolescence.

#### A.2.8. Potential pitfalls

We may find no statistically significant differences across age groups or domains. Though unlikely, such a result would itself constitute an unexpected finding in the context of the extant literature, suggesting that, though responses to ambiguity differ, the cognition underlying these decisions is unexpectedly similar. If this were found, a new line of research would be pursued to attempt to identify another mechanism to explain developmental and domain differences in responses to ambiguity.

## B. Aim 2: The Postdoctoral Research Direction (K00 Phase) – Comparing the efficacy of and mechanisms

## behind regulatory strategies to manage uncertainty.

### B.1. Significance

B.1.1. Social situations can produce pervasive and aversive feelings of uncertainty 52,70–72 and this is especially true in social contexts 1. Heightened uncertainty can trigger negative stress reactions 73–75 which are pernicious for clinical and non-clinical populations alike 5,76–79. Moreover, intolerance of uncertainty is associated with maladaptive explicit regulatory behaviors (e.g., inflexibility; dysregulation) 13,35,50,51,80. This dynamic creates a negative feedback loops wherein an individual’s ability to resolve uncertainty is limited by the aversive experience causing the reaction 1,81. Explicit regulatory strategies (e.g., reappraisal) rely on neural networks that undergo significant maturation through early development 15–19, leaving children disadvantaged in managing the negative emotional responses uncertainty elicits 22. Implicit cognitive regulatory responses are also used to reduce uncertainty 58,75,82 (e.g., applying stereotypes and heuristics) 83, but the efficacy of such a response is limited by one’s pre-existing knowledge base and a person’s ability to organize that information into accurate, relevant representations 84,85. The long-term effects of uncertainty within a child’s environment are well-documented and severe 86. **Thus, identifying effective regulatory strategies for mitigating the negative emotions elicited by uncertainty in the everyday life of children is of the utmost importance.**

B.1.2. Perspective-based emotion regulation (PBER) through role play may be an especially effective tool for children to manage aversive reactions to uncertainty. PBER may be especially useful during early development when children have access to perspective-based cognitive tools, but limited access to other options. Role-play is a naturally engaging activity most children practice by the age of three 21 which requires little training 21,87,88 and supplements insufficient representations 89. Perspective-based role play also recruits a network of neural structures (e.g., superior temporal sulcus; temporal poles 90,91) that do not demonstrate as significant functional deficits at early ages as the prefrontal circuitry (e.g., ventromedial and ventrolateral prefrontal cortices 17) that underlies regulatory strategies like reappraisal. However, while associations have been drawn between role play and emotion regulation broadly 92, the efficacy of PBER during early development to manage uncertainty has not yet been explored. The proposed project aims to identify how PBER differs from other recognized emotion regulation techniques in efficacy and mechanism from late childhood through adulthood. To do so, we will utilize a naturalistic neuroimaging approach like that used in Aim 1. The proposed research will be the first to examine regulatory processes in a developmental sample using this approach.

### B.2. Approach

#### B.2.1. Overview

Self-regulation, as understood through the Process Model, is more effective when the intervention is applied earlier in the time course of an aversive event 93. As such, role-play deployed as an antecedent strategy could positively influence both attention and appraisals downstream of it with relatively low cognitive costs. Role-play might function as an especially effective self-regulatory tool to moderate uncertainty before it rises to aversive levels at a life stage when conventional strategies (e.g., reappraisal) are relatively ineffective. A behavioral study from my doctoral lab which first assigned participants a role (i.e., detective, friend of the victim, friend of the accused) and then continuously tracked their certainty of a social outcome (i.e., guilt/innocence of a character) while watching videos (i.e., crime mystery) found that role assignment influenced the magnitude of certainty ratings during the video, at its conclusion, and influenced how participants judged information of unknown relevance. This suggests that perspective alters how certainty judgements are formed. My post-doctoral work (i.e., Aim 2) will supplement my dissertation work (i.e., Aim 1) by exploring how certainty judgments in response to ambiguous social stimuli might be effectively regulated among developmental populations.

#### B.2.2. Methods

The task design used during my F99 Phase will be adapted to accommodate the goals of the K00 Phase. Prior to beginning study tasks, participants will complete training exercises to develop competency with reappraisal and PBER strategies, as is standard in most emotion regulation strategy choice paradigms 94. Rather than using a single long-form stimulus, participants will be exposed to several shorter videos, which will limit carryover effects between conditions. Prior to each video, participants will be assigned to a condition, wherein they’ll either be asked to adopt an ideally neutral role (e.g., a judge, a detective), a biased role (e.g., a character’s friend), maintain a distanced reappraisal (i.e., close, far), or naturally watch the events as they typically would. In addition to providing continuous ratings of uncertainty, each trial would be followed by a series of questions assessing the participant’s affective response, engagement, and ability to sustain their assignment.

#### B.2.3. Predicted Results

Comparing PBER to distanced reappraisals and passive observation provides optimal contrasts to determine whether the effects of PBER are due to distancing, distraction, or the rich schemas that role-play can elicit. In line with our prior work, I predict that role-play will demonstrate observable influences upon behavioral certainty judgments. Furthermore, I predict that while role-play may be an effective means of self-regulation throughout development, the difference in efficacy between role-play and a cognitively-taxing prefrontal-reliant strategy like reappraisal will negatively correlate with age, such that as individuals age, reappraisal will become a more viable strategy. In line with these results, we would expect to see greater recruitment of the Angular Gyrus, Precuneus, Temporal Poles, and medial Prefrontal Cortices as the success of PBER strategies increase, and greater ventrolateral prefrontal cortex activation during successful reappraisal as age increases A picture containing sushi, dish, dark

Description automatically generated(**Fig 3**).

**Figure 3.** Proposed regions which should respond to Perspective-Taking versus Reappraisal. Perspective-taking relies upon a more disperse network of regions which do not demonstrate as pronounced developmental functional trajectories.

#### B.2.4. Challenges

I may find role-play to be ineffective for regulating uncertainty judgments or that role-play demonstrates no significant difference relative to reappraisal across the lifespan. While that might be disappointing, the application of explicit self-regulatory strategies to regulate uncertainty directly, rather than the emotions it produces, is itself a novel approach and the conventional regulation contrasts (i.e., reappraisal) would still yield results of interest to developmental and affective researchers. Additionally, such a paradigm lends itself well to behavioral paradigms, which could not differentiate mechanisms, but could test efficacy and workshop alternatives before committing to a full fMRI design.

vlPFC = Ventrolateral Prefrontal Cortex; ventromedial prefrontal cortex; dmPFC = Dorsomedial Prefrontal Cortex; CUN = Precuneus; AG = Angular Gyrus; TP = Temporal Poles; Amyg = Amygdala;

#### B.2.5. Career and Professional Development

***Research & Writing****:* When I begin my postdoctoral phase, I will revise and publish manuscripts based upon my dissertation research. I also plan to review and synthesize relevant topics from the extant literature on social affective developmental neuroscience into manuscripts to strengthen my expertise and my contributions to the field. Lastly, I would like to work with my postdoctoral advisor to develop my skills related to grant production and review to better prepare me for my future as an independent researcher.

***Teaching & Mentorship****:* Building a sustainable, diverse, and accessible lab culture is of the utmost importance to me, and, as such, I intend to spend much of my time improving my mentoring as a postdoctoral fellow. I will work directly with the graduate and undergraduate researchers within my lab to not only share the skills that I’ve developed throughout my career, but also build sustainable research infrastructure which others can reference and learn from after I have moved to new positions. As both the first graduate student in my lab and a director of Temple’s Coding Outreach Group (COG), I already have experience creating neuroimaging and statistical analysis pipelines from scratch and documenting every step of those processes for others to use and adapt. Given my expertise in programming, I would like to formalize my mentorship by creating or collaborating with an organization similar to COG at my postdoctoral institution, wherein individuals of all skill levels could troubleshoot issues and learn new skills relevant to psychological and neuroscience research.

***Becoming an Independent Researcher****:* By developing greater expertise in the social affective developmental neuroscience literature and learning new computational neuroscience techniques with the assistance of my post-doctoral advisor, I will be better equipped to pursue my goal as a social affective developmental neuroscientist defining my own independent line of research. Social affective phenomena are rich and complex and, as such, often difficult to parse without equally complex models. Computational approaches with rich naturalistic stimuli are uniquely suited to explore these phenomena and identify associations that would otherwise go unnoticed. As such, the value of an education in computational neuroscience will only increase as the social affective developmental field progresses and thus it is crucial to my future as an independent researcher.

#### B.2.6. Identifying My K00 Institution and Postdoctoral Mentor

My ideal K00 institution would be an R1 research institution, possibly in or near a large population center, with robust access to developmental populations. My experiences in studying self-regulation, affect, and development has reinforced my belief that access to a diverse community is critical for accurate representation of any social phenomenon. An institution with a strong emphasis on collaboration would help me gain new skills and increase my academic network. My ideal mentor has a history of working with developmental populations in affective and/or self-regulatory cognitive neuroscience using naturalistic stimuli. My primary training goals are (1) to apply advanced multimodal computational approaches to analyze self-regulatory developmental phenomenon; and (2) to improve my skills in behavioral task design and hypothesis testing to mitigate the methodological concerns that using naturalistic stimuli can introduce while maximizing the ecological validity of the results. I will begin identifying potential postdoctoral mentors during the spring of 2024, one year before my expected PhD completion date. I will seek the input of my PhD mentor and advisory committee. I hope to be able to network at in-person conferences during this time and the summer, before finally reaching out to my finalized list of postdoctoral mentors in the fall of 2025.