MEANING-MAKING PROCESSES ACROSS THE LIFESPAN: AN INVESTIGATION OF METACOGNITIVE CAPACITY AND AUTOBIOGRAPHICAL REASONING

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Dedicated to the friends and family who supported me along the way and the supervisors and mentors who were patient with me with me and pushed me when needed. I entered this program as a 22-year-old and all the associated naivete that comes with being so young, and I'm leaving this program wiser, more competent, and more self-confident. I am immensely grateful that I've been privileged enough to complete this journey and each of you have shaped the new person that I've become.

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ABSTRACT

Deficits in metacognitive capacity (i.e., the ability to integrate knowledge of oneself and others into a cohesive whole) have been shown to lead to poor functional outcome in psychosis. However, there is a gap in the literature concerning the role of metacognition in typically developing populations, which makes it difficult to define what level of metacognition is normative. Evidence from other models of self-experience such as autobiographical reasoning indicate that self-reflection increases across the lifespan, suggesting that the same may be true for metacognitive capacity. Thus, the current study expands knowledge of the self-concept by establishing a connection between metacognitive capacity and autobiographical reasoning and exploring the developmental course of metacognition in healthy populations. To that end, the following aims were evaluated: 1) Determining the developmental trajectory of metacognitive capacity; 2) Elucidating the relationship between metacognitive capacity and autobiographical reasoning; and 3) Exploring the potential moderating effect of autobiographical reasoning on the proposed relationship between age and metacognitive capacity. Our findings suggest that overall metacognitive capacity is consistent across the lifespan; however, awareness of the experiences of others increases with age. We also found that metacognitive capacity and autobiographical reasoning are separate constructs, with only a trend level negative association between autobiographical reasoning and decentration. This novel study elucidates the role of aging on metacognition and suggests that self-reflectivity is generally intact in the absence of severe psychopathology.

INTRODUCTION

The underlying processes that relate to the formation, maintenance, and modification of one's sense of self across the lifespan (Mclean & Pasupathi, 2007; Mclean & Pasupathi 2012; Semerari et al., 2003) have been explored across multiple disciplines. However, efforts to integrate models have been relatively sparse in the literature. Two specific models of self that have been studied extensively are metacognitive capacity, a synthetic process through which individuals integrate discrete components of psychological experience to form complex notions of themselves and others (Lysaker et al., 2018; Semerari et al., 2003), and autobiographical reasoning, commonly described as one's ability to integrate life experiences into their self-concept (Pasupathi & Mansour, 2006). Research on metacognitive capacity has linked metacognitive deficits to the fragmented sense of self observed in individuals with psychosis (Lysaker, Keane, Culleton, & Lundin, 2020; Lysaker & Klion, 2018); studies of autobiographical reasoning have shown that a cohesive sense of self increases across the lifespan in neurotypical populations (Pasupathi & Mansour, 2006; Mclean, Breen, & Fournier, 2010). Interestingly, metacognitive capacity has not been formally explored in neurotypical populations and little is known about its developmental trajectory. Given that research on both constructs has largely been siloed within academic disciplines, it is difficult to make meaningful conclusions about potential interrelations between metacognitive capacity and autobiographical reasoning. Thus, this study sought to formally establish a link between metacognition and age and to explore the relationship between metacognition and autobiographical reasoning.

Metacognition

Metacognition can broadly be defined as the ability to examine one's own cognitive processes (i.e., thinking about thinking). Given that metacognition's definition is broad, researchers have applied it in varying levels of complexity, ranging from simple awareness of cognitive experiences to the integration of knowledge about one's thoughts and experiences to form a cohesive sense of self. For example, some simply define it as the process of thinking about thinking (Thielsch, Andor, & Ehring, 2015), others add an additional layer of complexity and conceptualize it as insight into one's own cognitive processes and emotions (Wells, 2013),

and others still add that metacognition can be applied to understand others and cope with psychological distress (Semerari et al., 2003).

The model put forth by Semerari and colleagues (2003) and later refined by Lysaker et al (2018), henceforth referred to as metacognitive capacity, conceptualizes metacognition as the ability to synthesize granular psychological experiences (i.e., thoughts and emotions) into a cohesive whole (e.g., patterns of behavior and themes in one's life story). Metacognitive capacity is divided into four domains: self-reflectivity (the awareness and understanding of one's mental states), awareness of others' mental states (theory of mind), decentration (understanding that others' interests and motives are independent of oneself), and metacognitive mastery (ability to integrate knowledge of both others and one's own mental states to respond to psychological distress (Lysaker et al., 2005; Lysaker & Klion, 2017).

This model was selected for the current study because it encompasses a range of metacognitive activities that other models do not. For example, simply defining metacognition as awareness of one's cognitions fails to consider the role of these insights in developing coping skills and in social interactions. The knowledge of one's patterns of thinking and feeling leads to changes in the way one interacts with others and their environment, ultimately leading to the development of compensatory behaviors (i.e., coping strategies). These coping strategies can vary greatly in complexity and efficacy, ranging from simple avoidance to changing the way one thinks about a situation (Lysaker et al., 2005). Another limitation of other definitions is that they fail to account for the social cognitive process of theory of mind, which is understanding the intentions and emotions of others as well as how they perceive oneself (Pinkham, Penn, Green, & Harvey, 2016). Accurate use of this capacity requires one to understand what others might be thinking or feeling in a given moment, and to make inferences about why they may be feeling that way, which requires complex metacognitive activity. Thus, the model of metacognitive capacity used in the present study fully encompasses the notion of metacognition and adds social cognitive and coping components.

Research on metacognitive capacity has primarily focused on affected populations, such as those with serious mental illnesses (SMI; e.g., schizophrenia-spectrum disorders, borderline personality disorder, PTSD, major depressive disorder, etc.; Lysaker et al., 2011; Lysaker et al., 2015; Outcalt et al., 2016). In these populations, deficits in metacognitive capacity have been related to poorer clinical outcomes, such as increased symptom severity, lower insight, and poor

social and role functioning (Hamm et al., 2012; Hasson-Ohayon et al., 2015; Lysaker et al., 2012; Vohs et al., 2014). Despite evidence of the role of metacognitive deficits in SMI, no study to date has formally investigated how metacognition develops in neurotypical populations. Importantly, this makes it difficult to discern at what point low metacognitive capacity becomes pathological. Exploration of incidental findings from healthy control groups suggest the possibility of a developmental component of metacognitive capacity (Davis et al., 2020; Laadegard et al., 2014). Specifically, a study using a college sample found mean levels of metacognitive capacity as measured by the Metacognition Assessment Scale Abbreviated, (MAS-A; Lysaker et al., 2005) to be seven points lower than a sample of middle aged sample (15/28 vs. 22/28) (Laadegard et al., 2014; Davis et al., 2020). These studies suggest that a formal investigation of the developmental course of metacognitive capacity is warranted. Exploration of this gap in the literature could further elucidate the role of metacognitive capacity on functioning and establish what level of metacognitive capacity is normative in healthy populations.

Despite not being formally studied in neurotypical populations, extant studies of metacognitive capacity may provide insight into factors that influence the development and expression of metacognition in healthy populations. For example, a study by Lysaker and colleagues (2015) found that that people with PTSD had lower levels of metacognitive capacity relative to a control group and that lower levels of metacognitive capacity were associated with higher levels of subjective distress (Lysaker et al., 2015). This study suggests that experiences of trauma and current level of subjective distress may impact the expression of metacognitive capacity across populations. Another study exploring the metacognition in a sample of people with borderline personality disorder found that those with insecure attachment have poorer metacognitive capacity and higher symptoms of borderline personality disorder (e.g., poor emotion regulation; Outcalt et al., 2015). Moreover, those with poorer emotion regulation was associated with lower metacognitive mastery (i.e., adaptive coping). Although, these findings allow for inferences about factors that may influence metacognitive capacity in neurotypical populations, there have been no formal studies exploring these relationships. This underscores the novelty and importance of the current study.

Autobiographical Reasoning

Autobiographical reasoning has been defined in the literature as the ability to link the self to life experiences (Pasupathi & Mansour, 2006; Habermas & Bluck 2000; Singer & Bluck 2001). In contrast to metacognitive capacity, autobiographical reasoning has been explored primarily in neurotypical populations where it has been shown to have a developmental component. Studies of this capacity suggest that it does not fully manifest until early adolescence (Bluck & Habermas 2001). Moreover, others have found that likelihood of displaying sophisticated autobiographical reasoning increases with age (Randall et al., 2015; McLean, Breen, & Fournier, 2010). Prominent researchers of autobiographical reasoning theorize that it develops through an iterative process such that cohesive self-concepts emerge in adolescence and evolve over the lifespan with new experiences and reevaluations of old events (Singer & Bluck 2001; Habermas & Bluck, 2000).

Autobiographical reasoning is typically divided into two broad subtypes: change relations and stability relations. Change relations relate to one's tendency to view life experiences as transformative in some way (Habermas & Kober, 2015; Pasupathi & Mansour, 2006). Typical examples of this include turning points in life, rites of passage, lessons learned, and formative experiences. In contrast to change relations, stability relations focus on how events reaffirm existing characteristics of one's self-concept. An example of this would be someone describing how they overcame adversity through relying on their hard-working spirit that had been present since childhood.

Although studies have used different methodological means to assess autobiographical reasoning, most studies identify causal connections (i.e., tying specific events to a causal effect on the self or the trajectory of one's life) that relate to change or stability relations (McLean, Breen, & Fournier, 2010; Randall et al., 2015). For example, in a study of the effects of autobiographical reasoning on a cohesive sense of self, Habermas and Kober (2015) had participants write out their seven most important, specific memories in chronological order and then narrate their life story for fifteen minutes. These interviews were then coded for the presence of common indicators of the change relation subtype of autobiographical reasoning. Using this method, they found that higher instances of autobiographical reasoning were negatively correlated with a sense of self-discontinuity. Thus, this study suggests that

autobiographical reasoning may serve to facilitate the development of a cohesive sense of self through relating the self to narrative (Habermas & Kober, 2015).

Many other studies have focused specifically on the sophistication of autobiographical reasoning used and found that that narratives increase in sophistication as we age (McLean, Breen, & Fournier, 2010; Randall et al., 2015). These findings directly relate to the work of Pasupathi and Mansour (2006) who explored the role of age in autobiographical reasoning. They did this using two separate interviews that asked participants to describe a turning point and a crisis in their life. These interviews were then transcribed and coded for the presence of self-event connections with three mutually exclusive, categorical themes: no relation to self (i.e., no autobiographical reasoning present), change relations, or stability relations. Using logistic regression with the presence/absence of autobiographical reasoning as the binary outcome, they found age significantly predicted autobiographical reasoning for crises but not turning points. The amalgamation of studies of the developmental course of autobiographical reasoning suggest that this capacity increases with age and is associated with better psychological well-being.

Relationship Between Metacognitive Capacity and Autobiographical Reasoning

Taken together, this collection of studies suggests that autobiographical reasoning appears to become more sophisticated as we age and that higher levels of this ability tend to be associated with better psychosocial functioning. This mirrors that findings of metacognitive capacity in SMI, where higher levels of metacognitive capacity have been found to link to better outcomes. Though metacognitive capacity and autobiographical reasoning represent separate processes, it is likely that research on one can inform the other, as they both relate to the higher order construct of a cohesive self-concept (Pasupathi & Mansour, 2006; Lysaker et al., 2007). In other words, metacognitive capacity differs from autobiographical reasoning in that it refers to a range of cognitive functions that coalesce to form intricate ideas about oneself and others, whereas autobiographical reasoning relates to the specific ability to relate novel experiences to an existing self-concept. Thus, it is that likely autobiographical reasoning represents an intermediate step needed to reach higher-order metacognitive capacity. The current study sought to formally explore the developmental trajectory of metacognitive capacity in neurotypical populations, and to link research on metacognitive capacity to the larger literature on autobiographical reasoning.

The Current Study

The current study seeks to clarify the developmental course of metacognitive capacity in healthy populations to further understanding of factors leading to metacognitive deficits in SMI. The scant literature on this topic comes from studies of metacognitive capacity which have compared healthy controls to people with mental illnesses (Laadegard et al., 2014; Davis et al., 2020). The differences in mean total metacognitive capacity across these studies seem to suggest that metacognitive capacity may follow a similar developmental trajectory as autobiographical reasoning, which has been found to be latent until adolescence and to become more sophisticated with age (Pasupathi & Mansour, 2006; Mclean & Pasupathi, 2011; Mclean & Fournier, 2010). The converging evidence of a developmental component for both metacognitive capacity and autobiographical reasoning suggests that autobiographical reasoning may be a moderating factor in the manifestation of higher order metacognitive capacity such that, the presence of higher levels of autobiographical reasoning is necessary for higher-order metacognitive capacity. This may be due to autobiographical reasoning's crystallization in emerging adulthood explaining the significantly lower levels of metacognitive capacity found in first year college samples compared to middle-aged adults (Davis et al., 2020; Laadegard et al., 2014).

Aims

The aims of this study were to determine the effect of age on total metacognitive capacity and to establish a connection between metacognitive capacity and autobiographical reasoning to expand knowledge of narrative identity. These goals were examined by testing relationships between these constructs in healthy populations and exploring if potential covariates from the literature (i.e., general distress, emotion regulation, and trauma) affected the relationship between them. To that end, the following aims were evaluated:1): Determine the developmental trajectory of metacognitive capacity; 2) Test the relationship between metacognitive capacity and autobiographical reasoning; 3) Explore the moderating effect of autobiographical reasoning on metacognitive capacity across the lifespan.

Although the proposed relationships have not been explored formally, reasonable inferences about the directionality of effects can be inferred from the literature. Regarding **Aim 1**, we hypothesized that age would have logarithmic relationship with metacognitive capacity,

such that metacognitive capacity will generally increase as age increases but begin to plateau at midlife. Regarding **Aim 2**, we expected that autobiographical reasoning would predict metacognitive capacity even when controlling for potential covariates (e.g., trauma, general distress, and emotion regulation). Lastly, the expectation in **Aim 3** is that there is a general linear increase in metacognitive capacity across the lifespan regardless of the presence of autobiographical reasoning, but that there would be a significant interaction effect such that the those who display high levels of autobiographical reasoning will have significantly higher metacognitive capacity at all ages.

METHODS

Participants

Seventy participants were recruited from the greater Indianapolis area. Data collection for this study was a part of a larger study exploring disorganization, cognition, and insight in SMI. To ensure that our sample consisted participants from all relevant age groups, recruitment was done in waves targeting potential participants in 5 different age groups: 18-29, 30-39, 40-49, 50-59, 60-65. We recruited our sample using the Indiana Clinical and Translational Sciences Institute (CTSI) All- IN for Research recruitment database, which consists of approximately 5,000 people who have expressed interest in research participation. Additionally, ads were posted in the Craigslist volunteer and research sections using a brief description of the study. Recruitment began in June of 2015 and ceased in May 2019. Participants were considered eligible if they: 1) did not meet criteria for any SMI, were not in a current episode of a mood disorder, and did not have a past or current history of substance use disorders as assessed by the Mini Interview for Neuropsychiatric Illnesses (MINI; Lecrubier et al., 1997); 2) were between ages 18-65; and 3) are proficient in English. Participants were excluded if they have: 1) documented history of intellectual disability; or 2) history of head injury resulting in a loss of consciousness greater than 5 minutes or any history of traumatic brain injury.

A breakdown of our sample can be found in Table 1. Overall, our recruitment goal of 16 participants per group was met for ages 18-29, 40-49, and 50-59; however, ages 30-39 (n=8) and 60-65 (n=9) were underrecruited. Thus, our final sample consisted of 70 participants.

Measures

The presence of psychiatric conditions was assessed using the MINI (Lecrubier et al., 1997), a brief structured interview for the major Axis I psychiatric illness in the DSM-IV. The MINI was chosen for its brevity, as it has been shown to be comparable to other frequently used diagnostic interviews (i.e. SCID-P and CIDI), but with a much shorter administration time (M= 18.7+/-11 minutes; Sheehan et al., 1997). The sections of the MINI pertaining to depression, mania, and psychosis were given and if a participant met criteria for a psychotic disorder, they

were not included in data analysis. Questions pertaining to substance abuse were asked if the participant disclosed substance use on our demographic and substance abuse questionnaire.

Metacognitive capacity was assessed with the Metacognition Assessment Scale-Abbreviated (MAS-A; Semerari et al., 2003), which is a rating scale used to identify an individual's ability to form complex and integrated concepts of oneself and others (i.e., metacognitive capacity). The MAS-A consists of four scales which are rated in a Likert scale format: 1) "self-reflectivity" which is the ability to understand one's internal mental states; 2) "understanding of others' minds" which is the ability to infer and understand others' mental states; 3) "decentration" which represents the understanding that others' interests and motives are independent of oneself; 4) "mastery" which measures the ability to use metacognitive knowledge about oneself and others to cope with psychological distress. Raters indicated whether participants have demonstrated a particular level of functioning for each scale in a hierarchal manner. Total score values range from 0 to 28, with higher scores being reflective of more complex notions of oneself and others and the ability to apply this knowledge appropriately.

The Indiana Psychiatric Illness Interview (IPII; Lysaker et al., 2002) was used as the basis for MAS-A ratings of metacognitive capacity. It is a semi-structured clinical interview originally developed to assess metacognitive capacity in SMI; however, a modified version has been developed to assess metacognitive capacity in non-affected populations. The IPII is divided into five sections: 1) initial rapport is established as participants are asked to tell the detailed story of their lives, beginning with their earliest memory; 2) participants are then asked to describe a psychological or emotionally distressing crisis that has occurred since adolescence, and how this event influenced different aspects of their lives; 3) participants are then asked the degree of control this had over their lives and what efforts they took to control it; 4) participants are asked how their mental state at the time was influenced by others; 5) participants are asked about their future expectancies.

The presence of *autobiographical reasoning* was assessed using a brief interview adapted from the methods of Habermas and Kober (2015); wherein participants were asked to write out their seven most important, specific memories in chronological order and then to narrate their life story for fifteen minutes. Although other interviews for assessing autobiographical reasoning have been used, this one was selected to reduce overall with section II of the IPII which asks participants to reflect on a crisis or hardship. Once transcribed, these brief interviews were

divided into propositions by two raters, and each of the propositions were then be assessed for indicators of autobiographical reasoning (e.g., turning points, developmental status, lessons learned, formative experience, etc.). Selected excerpts from transcripts illustrating autobiographical reasoning can be found in Table 6. Autobiographical reasoning scores were derived by the total count of propositions showing AR. These ratings were done by consensus by trained graduate students and undergraduate research assistant who were blinded to the ratings of metacognitive capacity to avoid bias. This group was entirely separate from the team of raters of metacognitive capacity. Interrater reliability was found to be Kappa = .77, ($p < .001$), which suggests substantial agreement between raters.

Potential Covariates

Neurocognitive Functioning was measured using the Brief Assessment of Cognition in Schizophrenia (BACS; Keefe et al., 2004). Neurocognition was primarily be measured to ensure that differences in cognitive functioning across age were not influencing metacognitive capacity or autobiographical reasoning. The BACS utilizes brief tasks to assess neurocognition across six domains: verbal memory, working memory, motor speed, semantic fluency, processing speed, and executive functioning. The Childhood Trauma Questionnaire- Short Form (CTQ; Bernstein & Fink, 1998) was used to assess *traumatic childhood experiences* that may impact the development a stable sense of self and others. The Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) was used to assess participants' efficacy in tolerating and *regulating emotions*. The DERS is a 36-item self-report measure that uses Likert scaled questions ranging from 1 (almost never) to 5 (almost always) to assess six facets of emotion regulation: lack of emotional awareness, lack of emotional clarity, difficulties controlling impulsive behaviors when distressed, difficulties in engaging in goal-directed behaviors when distressed, non-acceptance of negative emotions, and limited access to effective emotion regulation strategies. *General Distress* was assessed with the Symptom Check List 90 (SCL-90; Derogatis & Cleary, 1977). The SCL-90 consists of 90 items rated on a Likert scale ranging from 0 (not at all) to 4 (extremely), which are grouped into nine symptom dimensions (i.e., somatization, obsessive compulsive, interpersonal, depression, anxiety, hostility, phobia, paranoid ideation, and psychoticism) and three global indices of distress (general severity of distress, symptom distress, and number of symptoms).

Procedures

Once eligibility was established, participants completed a demographic and substance use interview along with the MINI with a trained research assistant. Participants were compensated for their time at a rate of $10/hr. Those who met study criteria completed a battery consisting of two, separate audio-recorded interviews which served as the basis for later ratings of metacognitive capacity and autobiographical reasoning. Participants also completed measures assessing emotion regulation, childhood trauma, general distress, and neurocognition, so these factors can be controlled for. Lastly, demographic data were gathered using a self-report demographic questionnaire that assessed age, sex, race, ethnicity, participant level of education, parent level of education, and substance use.

Of note, the initial battery used in this study did not include any assessment of autobiographical reasoning or any of our proposed covariates. Thus, an addendum to the IRB protocol was completed on June 2018 to include these measures. Prior to that point, 17 participants had completed the prior battery and were unable to be contacted to complete additional measures. This resulted in a final sample of 70 participants who had data on metacognitive capacity and age to be included in our analysis of Aim 1 (i.e., curve estimation of the relationship between age and metacognition). A total of 53 participants completed the battery which included assessment of proposed covariates. Lastly, this project was modified after the dissertation proposal stage to include a separate autobiographical reasoning interview. This resulted in 30 participants completing this interview. Thus, aims 2 and 3 consisted of 30 participants who completed a separate autobiographical reasoning interview in addition to assessments of metacognition and proposed covariates.

Analyses

Aim 1 (i.e., the exploration of developmental course of metacognition) was investigated using curve estimation comparing the linear, quadratic, and logarithmic models to determine which model best explains the relationship between age and metacognition. **Aim 2** (i.e., that autobiographical reasoning as a significant predictor of metacognitive capacity after controlling for potential covariates) was explored using multiple regression with four potential covariates entered at step one (i.e., childhood trauma, neurocognition, general distress, and emotion regulation) and autobiographical reasoning entered as the step two predictor. Metacognitive

capacity was the criterion variable in this analysis. **Aim 3** (i.e., autobiographical reasoning as a moderator of the proposed relationship between age and metacognitive capacity) was explored using multiple regression with autobiographical reasoning and age entered at step one, and the interaction term (e.g., the product of age times autobiographical reasoning) entered at step two.

Power analyses were conducted for each of our primary analyses at a two tailed alpha level of 0.05 and a power level of 0.80. G* Power (Faul et al., 2007) was used to examine the strength of effects that would be detected with our final sample size. For **Aim 1**, 70 participants is adequately powered to detect medium to large effects (F^2= 0.15; Linear multiple regression: R^2 deviation from zero, α=.05, β= 0.80, predictors= 1). For **Aim 2,** our sample size of 30 was adequate to detect large effects (F^2= 0.15; Linear multiple regression: R^2 deviation from zero, α=.05, β= 0.80, predictors= 4). Lastly, for **Aim 3**, our sample of 30 was adequate to detect large effects in our moderation analysis (F^2= 0.15-0.35; Linear multiple regression: R^2 deviation from zero, α=.05, β= 0.80, predictors= 2). Thus, our proposed sample size was sensitive to medium to large effects in all our analyses.

RESULTS

Sample Characteristics

Our overall sample (N = 70) tended to be middle-aged (*M*=46.36, *SD*=13.17), predominately female (62.9%), white (64.3%), and college-educated (65.7%; see Table 1). Recruitment goals (*n* = 15 per group) were met for all groups but the 30-39 age group (*n* = 8) and the 60-65 group (*n*=9). Our demographic groups did not significantly differ in terms of gender (X(4) =3.64, *p* = .461), race (X(4) =7.6, *p* = .353), or education (X(4) = 2.69, *p* = .374). Descriptive statistics for outcome variables are summarized in Table 2. We did not find significant differences between our a priori defined age groups (i.e., 18-29, 30-39, 40-49, 50-59, and 60-65) when compared on general distress (F(4,50) = .66, *p* = .622) or emotion regulation (F(4,50) = 1.87, *p* = .138); however, childhood trauma significantly varied between groups (F(4,48) = 2.98 , *p* = .028), with those in the 30-39 age range demonstrating significantly higher childhood trauma than other age groups.

Relationship between Age and Metacognition

The relationship between age and metacognitive capacity was explored using curve estimation (*n*= 70). Results indicated that age did not significantly predict total metacognition, self-reflectivity, decentration, or mastery (Table 3) using linear, quadratic, or logarithmic models. Estimation of age's effect on awareness of others provided significant results for both linear and logarithmic models; however, a linear model was selected due to it explained more variance. The linear model suggests a positive relationship between age and awareness of others (Table 3). Thus, our hypothesis that age would have logarithmic relationship with metacognition was not generally supported, as age only had a significant linear relationship with one subdomain.

Relationship between Autobiographical Reasoning and Metacognition

Next, we sought to explore the relationship between autobiographical reasoning and metacognition using multiple regression controlling for general distress, trauma, and emotion regulation (*n*=30*)*. Autobiographical reasoning did not significantly predict total metacognition

(b= -.16, $t_{(30)}$ = -.60, p = .556), self-reflectivity (b= .15, $t_{(30)}$ = .55, p = .588), awareness of others (b= - .43, $t_{(30)}$ = -1.65, p = .119), or mastery (b= - .06, $t_{(30)}$ = -.25, p = .804); however, it trended towards significance in its prediction of decentration (b= -.42, $t_{(30)}$ = -2.06, p = .057). Thus, our hypothesis that autobiographical reasoning would predict higher levels of metacognition was not supported.

Exploration of Moderating Effect of Autobiographical Reasoning on Metacognition

We investigated whether autobiographical reasoning moderated the relationship between age and metacognition (Table 4). In this subset of our overall sample, age predicted metacognition in step one; however, autobiographical reasoning did not. After controlling for the independent effects of both predictors, the cross product did not account for a significant variance in total metacognition. Thus, our hypothesis that the relationship between age and metacognition would be moderated by autobiographical reasoning was not supported.

Post Hoc exploration of the relationship between metacognition and proposed covariates

Lastly, we sought to explore the relationship between metacognition and our proposed covariates (i.e., trauma, general distress, and emotion regulation; n= 53). Emotion regulation had a significant negative relationship with decentration (r= -.35, p=.011). General distress had a significant inverse relationship with decentration (r=-.28, p=.045) and mastery (r=-.32, p=.023). None of these correlations survived a Bonferroni Correction for multiple comparisons. Surprisingly, none of our proposed covariates had significant relationships with self-reflectivity or awareness of others (see Table 5).

DISCUSSION

This study expanded the existing literature on metacognitive capacity by investigating the developmental trajectory of metacognition in a neurotypical sample and exploring its relationship with autobiographical reasoning. Prior research on metacognitive capacity primarily linked deficits in metacognition to poor outcome in SMI, so our findings formally establish normative levels of metacognitive functioning. Contrary to our hypotheses, we found that only the awareness of others subdomain of metacognitive capacity had a significant, linear relationship with age. This suggests that the only metacognitive growth that occurs throughout adulthood is one's ability to understand others. Relatedly, our exploration of the relationship between metacognitive capacity and our proposed covariates (i.e., trauma, general distress, and emotion regulation), suggests that disordered emotion regulation and higher levels of general distress are associated with poorer decentration (i.e., understating that other have separate cognitive experiences than oneself). Moreover, higher general distress was also associated with lower mastery (i.e., coping skills). Finally, autobiographical reasoning did not significantly relate to metacognitive capacity or its subdomains, suggesting that these constructs are separate from one another. Taken together, these findings provide unique insights into the factors that influence metacognition in typically developing adults.

The finding that overall metacognitive capacity does not appear to increase with age is surprising, given our a priori speculation that the ability to abstract and self-reflect would increase across the lifespan. Indeed, our data suggest that one's abilities to self-reflect and use metacognitive knowledge to cope remain constant across adulthood, but that our ability to appreciate the perspectives of others increases with age. On the surface, these findings seem counterintuitive due to evidence from other models of the self, such as autobiographical reasoning, which suggest one's ability to self-reflect increases across the lifespan (Pasupathi & Mansour, 2006; Habermas & Bluck 2000; Singer & Bluck 2001). However, the fact that our sample's mean age was midlife (i.e., mean age of 46), suggests the possibility that aspects of metacognition may have developed and stabilized in in adolescence or early adulthood.

Additional support from this notion comes from a case study by Lysaker, Buck, and Ringer (2006) that followed the course of therapy for a client who showed severe metacognitive

deficits. Over the course of 32 months of therapy specifically focused on promoting metacognitive growth, an interesting pattern emerged; wherein, the client began to show increases in self-reflectivity and mastery almost immediately, but little to no change in awareness of others other domains until 17 months into therapy (Lysaker, Buck & Ringer, 2006). This pattern appears to be a microcosm of what we observe in our sample (i.e., stable self-reflectivity, decentration, and mastery and increases in awareness of others), suggesting the developmental milestones for adequate self-reflectivity and mastery may have already been met prior to adulthood. Thus, our results suggest that one's ability to comprehend the intentions of others increases across adulthood, while our ability to self-reflect and cope with distress remains constant.

Consideration of the developmental psychology literature provides additional context for the finding that awareness of others increases with age. For example, Erickson's theory of psychosocial development (Erikson, 1968) mirrors our observed pattern of increasing focus on the experiences of others across the lifespan. The initial stages of development encompassing birth to age 18 (i.e., trust vs. mistrust, autonomy vs. shame, initiative vs. guilt, industry vs. inferiority, and identity vs. role confusion) are fixated on increasing one's understanding of themselves in relation to their environment (McAdams, de St Aubin, & Logan, 1993; Sneed, Whitbourne, & Culang, 2006). As age increases, the concerns of this model turn outward and focus more on the development of meaningful relationships (i.e., intimacy vs. isolation) and contribution to one's larger community (i.e., generativity vs. stagnation). In the context of metacognitive development, it may be the case that people are not able to focus fully on others until they have a stable sense of self and identity. This self-awareness and understanding allows individuals to turn their focus outward and engage with others in a meaningful way.

Lastly, post hoc exploration of the relationship between metacognition and our proposed covariates (trauma, disordered emotion regulation, and general distress) mirrored findings in SMI. Our data replicated findings that higher levels of distress and poor emotion regulation relate to lower levels of metacognition (Lysaker et al., 2015; Outcalt et al., 2017). However, these findings did not survive correction for multiple comparisons, suggesting that they may need to be replicated in a larger sample to draw meaningful conclusions.

Metacognitive capacity appeared to be independent from autobiographical reasoning. Indeed, the only relationship that trended towards significance in our sample was between

autobiographical reasoning and decentration. Trend level associations in our data suggest that higher levels of autobiographical reasoning may be associated with decreases in decentration. In other words, the propensity to link life experiences to one's self-concept may be associated with lower ability to recognize that others have separate cognitive and emotional experiences from oneself. On its surface, this suggests that individuals in our sample who were more likely to share how experiences affected their sense of identity were less likely to adequately reflect on the experiences of others. A possible explanation for this is that those higher in autobiographical reasoning may be more internally focused (i.e., ego-centric) than those lower in this ability.

Our finding that autobiographical reasoning was not associated with any other subdomains of metacognitive capacity suggests that these abilities are separate from one another. Thus, reflection on how life events relate to one's identity (i.e., autobiographical reasoning) is different than one's ability to integrate their subjective psychological experiences into a cohesive whole and to use that knowledge to cope with distress (i.e., metacognitive capacity). Comparisons of transtheoretical model of autobiographical memory, which serves as the basis for present conceptualizations of autobiographical reasoning (Conway & Plydell-Pearce, 2000), and the integrated model of metacognition (Lysaker et al., 2018) provide additional clarity on this distinction. In their seminal paper regarding the relation between autobiographical memory and the self, Conway and Plydell-Pearce (2000) suggest the self is constructed through a reciprocal process; wherein, the self integrates autobiographical memories that are relevant to its current goals and that novel experiences serve to reinforce or modify one's working concept of the self. Through this model, autobiographical reasoning is seen as the primary mechanism through which the self and memory relate (Bluck & Habermas, 2001). Therefore, this model is inherently focused on the self and does not concern itself with the self in relation to the others. In contrast to this, the integrated model of metacognition views the develop of a cohesive sense of self as an intersubjective process that is necessarily dependent on one's interactions with others (Lysaker et al., 2018; Lysaker & Lysaker, 2010). Thus, the separation between these constructs in our sample furthers the divide between models of the self which view it as wholly distinct and independent from others, and those that view self-development as a result of social interactions.

Although this study is bolstered by many strengths, there are a few notable limitations worth discussion. Chief among our limitations is the use of a cross-sectional design, which may limit the generalizability of our findings. Our analyses may not have been sensitive to

idiographic factors that may impact metacognitive growth across the lifespan. Indeed, longitudinal studies focusing on other conceptualizations of metacognition such as self-monitoring find that these abilities increase across childhood and adolescence (O'Leary & Sloutsky, 2019; Roeber et al., 2019). Future studies should seek to explore the development of metacognitive capacity longitudinally to assess inter-individual changes in this capacity. Another limitation is our sample size; our final overall sample size was underpowered to detect small to medium effects. Our analysis of the relationship between autobiographical reasoning was most strongly affected by this, as we only had 30 participants who completed a separate interview on autobiographical reasoning. Thus, our findings should be replicated with a larger sample.

Our findings broaden the larger literature on metacognitive capacity by establishing what typical levels of metacognition exist in neurotypical populations. Exploration of the subdomains of metacognitive capacity suggests that the average adult is able to appreciate that their hopes and expectations for life may not match reality, recognize the emotions of others, and understand that others have thoughts and emotions separate from oneself. Regarding mastery (i.e., the ability to use metacognitive knowledge to cope with distress), the two most common strategies in our sample were seeking social support and changing how one thinks about a problem or oneself. Given that metacognitive capacity is conceptualized as a dynamic ability, future research should focus on factors that promote higher levels of metacognitive reflection.

Conclusions

Metacognitive capacity is a complex ability that allows individuals to synthesize discreet elements of inter and intrapersonal experiences into a cohesive whole. Hitherto, it had primarily been studied in SMI (e.g., psychosis, borderline personality disorder), where deficit have been evidenced to be associated with poorer outcome. Our novel study explored the developmental trajectory of metacognitive capacity in a typically developed population and explored its potential relation with autobiographical reasoning, another conceptualization of self-experience. Our findings suggest that metacognitive self-reflectivity is consistent across the lifespan, but that one's ability to recognize and understand the experience of others increases with age. Moreover, we found that higher levels of general distress and disordered emotion regulation were associated with decreases in the ability to understand that others have cognitive and emotional experiences separate from oneself (i.e., decentration). Higher levels of general distress were also associated

with decreased metacognitive mastery (i.e., the ability to use metacognitive knowledge to cope with distress). Finally, we found that autobiographical reasoning and metacognitive capacity did not relate to one another, providing evidence that they are separate constructs. Our findings highlight the need for longitudinal studies exploring the individual factors that may influence increases in metacognitive capacity over the lifespan.

APPENDIX A TABLES AND FIGURES

Table 1.
Demographic Characteristics of Sample

Characteristic		Total Sample	18-29	30-39	40-49	50-59	60-65
		N=70	*n*=16	*n=8*	*n*=15	*n*=22	*n*=9
Average Age (+/-SD)		46.36(13.17)	25.62(3.62)	34.20(3.16)	45.59(3.06)	55.22(2.54)	61.67(1.93)
Sex							
	Male	26(37.1%)	5(31.3%)	3(37.5%)	8(53.3%)	8(36.4%)	2(22.2%)
	Female	44(62.9%)	11(68.8%)	5(62.5%)	7(46.7%)	14(63.6%)	7(77.8%)
Race							
	Non-Caucasian	25(35.7%)	4(25%)	5(62.5%)	7(46.7%)	8(36.4%)	1(11.1%)
	Caucasian	45(64.3%)	12(75%)	3(37.5%)	8(53.3%)	14(63.6%)	8(88.9%)
Ethnicity							
	Hispanic/Latino	2(2.8%)	0(0%)	1(12.5%)	0(0%)	1(4.6%)	0(0%)
	Non-Hispanic	68(97.2%)	16(100%)	7(87.5%)	15(100%)	21(95.4%)	9(100%)
Level of Education Completed							
	<Bachelor's Degree	24(34.3%)	2(12.5%)	4(50%)	5(33.3%)	8(36.4%)	5(55.6%)
	≥Bachelor's Degree	46(65.7%)	14(87.5%)	4(50%)	10(66.7%)	14(63.6%)	4(44.4%)

Note. SD = Standard Deviation.

Table 2
Descriptive Statistics for Outcome Variables

Outcome		*M*(*SD*)					
		Total Sample	18-29	30-39	40-49	50-59	60-65
MAS- A		*N*=70	*n*=16	*n*=8	*n*=15	*n*=22	*n*=9
	Total	16.16(4.43)	15.31(4.06)	13.31(3.08)	16.65(4.63)	16.52(5.28)	16.94(3.61)
	Self-Reflectivity	5.90(1.60)	5.72(1.63)	5.31(1.28)	6.00(1.61)	5.86(1.82)	6.17(1.52)
	Awareness of Others	4.07(1.14)	3.84(1.20)	3.430(.49)	4.00(1.06)	4.34(1.23)	4.39(1.17)
	Decentration	1.28(.66)	1.21(.71)	.87(.58)	1.31(.60)	1.36(.67)	1.33(.71)
	Mastery	4.91(1.83)	4.53(1.49)	3.69(1.74)	5.34(1.94)	4.93(2.21)	5.05(1.52)
Trauma							
		N=53	*n*=11	*n*=4	*n*=13	*n*=16	*n*=9
	CTQ Total	45.77(15.72)	39.45(5.22)	61.67(7.50)	49.00(16.93)	40.31(7.88)	47.78(13.14)
General Distress		*N*=53	*n*=11	*n*=4	*n*=13	*n*=16	*n*=9
	SCL-90 Total	22.50(23.23)	22.27(22.51)	36.83(34.63)	21.00(18.67)	19.39(24.33)	20.33(20.01)
Emotion Regulation		*N*=53	*n*=11	*n*=4	*n*=13	*n*=16	*n*=9
	DERS Total	45.85(12.44)	47.36(9.42)	49.83(19.00)	52.27(14.24)	42.11(10.50)	40.67(9.65)
Autobiographical Reasoning		*N*=30	*n*=11	*n*=4	*n*=9	*n*=4	*n*=2
	AR Quantity	4.72(2.44)	5.75(2.97)	3.67(1.52)	4.5(1.73)	2.5(2.13)	4.8(1.12)

Note. M = Mean; SD = Standard Deviation; MAS-A = Metacognition Assessment Scale-Abbreviated; CTQ = Childhood Trauma Questionnaire; SCL = Symptom Checklist ; DERS = Disorders of Emotion Regulation Scale; AR = Autobiographical Reasoning.

Table 3.
Curve Estimation of the Relationship Between Age and Metacognition, (n = 70).

	R^2	B	SE B	B	*P*
Total Metacognition					
Linear	.03	.06	.04	.17	.178
Quadratic	.06	-.38	.33	-1.12	.212
Logarithmic	.02	2.07	1.60	.16	.334
Self-reflectivity					
Linear	.01	.01	.02	.09	.571
Quadratic	.02	-.09	.12	- .75	.585
Logarithmic	.01	.35	.58	.07	.834
Awareness of Others					
Linear	.07	.02	.1	.26	.028
Quadratic	.09	-.09	.08	-1.00	.043
Logarithmic	.06	.83	.40	.24	.047
Decentration					
Linear	.02	.01	.01	.14	.270
Quadratic	.04	-.05	.05	-.94	.324
Logarithmic	.01	.23	.24	.12	.453
Mastery					
Linear	.02	.02	.02	.14	.311
Quadratic	.04	-.15	.14	-1.10	.349
Logarithmic	.01	.66	.67	.12	.555

Table 4.

Autobiographical reasoning as a moderating variable in the relationship between age and metacognition (n = 30),

	Metacognition Total			
	R^2	B	SE B	β
Step 1	.18			
Age		.18	0.09	.45*
AR		.33	.46	.17
Step 2	.28			
Age		.41	.18	2.27*
AR		2.08	1.29	1.61
AR x Age		-.06	.04	-1.45

Note. AR = Autobiographical Reasoning, *p<.05

Table 5

Correlations Between Outcome Variables (n = 53).

Measure	*n*	1	2	3	4	5	6	7	8	9
1. Self-Reflectivity	(*n = 53)*	X								
2. Awareness of Other	(*n = 53)*	.61**	X							
3. Decentration	(*n = 53)*	.41**	.61**	X						
4. Mastery	(*n = 53)*	.69*	.61*	.52**	X					
5. Total Metacognition	(*n = 53)*	.89**	.81**	.71**	.89**	X				
6. Trauma	(*n = 53)*	.07	-.06	.21	.57	-.05	X			
7. Emotion Regulation	(*n = 53)*	-.06	-.16	-.35*	.21	.26	.27	X		
8. General Distress	(*n = 53)*	-.05	-.00	-.28*	-.32*	-.13	.28*	.58**	X	
9. Neurocognition	(*n = 50)*	.05	.12	.02	-.12	-.01	-.12	.02	-.13	X

Note. *$p<0.05$, **$p<0.01$, $^{+}$trend-level significance.

Table 6.
Examples of Autobiographical Reasoning Found in the Current Sample.

Type of Connection	Example
Formative Experience	*"When I think back now, if somebody had just worked on me with making a change, it would have been much easier, but I remember thinking 'If I'm going to grow up and have a job, I need to know this.'"*
Lesson Learned	*"I was like the purity poster child, like I'm not going to kiss someone until I'm married, so having my first boyfriend taught me a lot… it loosened me up a lot, I was super uptight."*
Turning Point	"*They can talk to you about love, but until [my child] came out of me, I never knew that type of love. It's completely different. It changed my world."*

APPENDIX B CHILDHOOD TRAUMA QUESTIONAIRE

CHILD TRAUMA QUESTIONAIRE (CTQ) – SHORT FORM

Directions: These questions ask about some of your experiences growing up as a child and a teenager. For each question, circle the number that best describes how you feel. Although some of these questions are of a personal nature, please try to answer as honestly as you can. Your answers will be kept confidential.

When I was growing up, . . .		Never true	Rarely true	Some times true	Often true	Very Often true
1.	I didn't have enough to eat.	1	2	3	4	5
2.	I knew that there was someone to take care of me and protect me.	1	2	3	4	5
3.	People in my family called me things like "stupid", "lazy", or "ugly".	1	2	3	4	5
4.	My parents were too drunk or high to take care of the family.	1	2	3	4	5
5.	There was someone in my family who helped me feel important or special.	1	2	3	4	5
When I was growing up, . . .						
6.	I had to wear dirty clothes.	1	2	3	4	5
7.	I felt loved.	1	2	3	4	5
8.	I thought that my parents wished I had never been born.	1	2	3	4	5
9.	I got hit so hard by someone in my family that I had to see a doctor or go to the hospital.	1	2	3	4	5
10.	There was nothing I wanted to change about my family.	1	2	3	4	5
When I was growing up, . . .						
11.	People in my family hit me so hard that it left me with bruises or marks.	1	2	3	4	5
12.	I was punished with a belt, a board, a cord (or some other hard object).	1	2	3	4	5
13.	People in my family looked out for each other.	1	2	3	4	5
14.	People in my family said hurtful or insulting things to me.	1	2	3	4	5
15.	I believe that I was physically abused.	1	2	3	4	5

When I was growing up, . . .		Never true	Rarely true	Some times true	Often true	Very Often true
16.	I had the perfect childhood.	1	2	3	4	5
17.	I got hit or beaten so badly that it was noticed by someone like a teacher, neighbor, or doctor.	1	2	3	4	5
18.	Someone in my family hated me.	1	2	3	4	5
19.	People in my family felt close to each other.	1	2	3	4	5
20.	Someone tried to touch me in a sexual way or tried to make me touch them.	1	2	3	4	5
When I was growing up, . . .						
21.	Someone threatened to hurt me or tell lies about me unless I did something sexual with them.	1	2	3	4	5
22.	I had the best family in the world.	1	2	3	4	5
23.	Someone tried to make me do sexual things or watch sexual things.	1	2	3	4	5
24.	Someone molested me (took advantage of me sexually).	1	2	3	4	5
25.	I believe that I was emotionally abused.	1	2	3	4	5
When I was growing up, . . .						
26.	There was someone to take me to the doctor if I needed it.	1	2	3	4	5
27.	I believe that I was sexually abused.	1	2	3	4	5
28.	My family was a source of strength and support.	1	2	3	4	5

APPENDIX C SCL-90

SCL-90

Below is a list of problems and complaints that people sometimes have. Please read each one carefully. After you have done so, select one of the numbered descriptors that best describes HOW MUCH THAT PROBLEM HAS BOTHERED OR DISTRESSED YOU DURING THE PAST WEEK, INCLUDING TODAY. Circle the number in the space to the right of the problem and do not skip any items. Use the following key to guide how you respond:

Circle 0 if your answer is NOT AT ALL
Circle 1 if A LITTLE BIT
Circle 2 if MODERATELY
Circle 3 if QUITE A BIT
Circle 4 if EXTREMELY

Please read the following example before beginning:

Example: In the previous week, how much were you bothered by:

Backaches 0 (1) 2 3 4

In this case, the respondent experienced backaches a little bit (1).
Please proceed with the questionnaire.

	HOW MUCH WERE YOU BOTHERED BY:	NOT AT ALL	A LITTLE BIT	MODERATELY	QUITE A BIT	EXTREMELY
1.	Headaches	0	1	2	3	4
2.	Nervousness or shakiness inside	0	1	2	3	4
3.	Unwanted thoughts, words, or ideas that won't leave your mind	0	1	2	3	4
4.	Faintness or dizziness	0	1	2	3	4
5.	Loss of sexual interest or pleasure	0	1	2	3	4
6.	Feeling critical of others	0	1	2	3	4
7.	The idea that someone else can control your thoughts	0	1	2	3	4
8.	Feeling others are to blame for most of your troubles	0	1	2	3	4
9.	Trouble remembering things	0	1	2	3	4
10.	Worried about sloppiness or carelessness	0	1	2	3	4
11.	Feeling easily annoyed or irritated	0	1	2	3	4
12.	Pains in heart or chest	0	1	2	3	4
13.	Feeling afraid in open spaces or on the streets	0	1	2	3	4
14.	Feeling low in energy or slowed down	0	1	2	3	4
15.	Thoughts of ending your life	0	1	2	3	4
16.	Hearing voices that other people do not hear	0	1	2	3	4
17.	Trembling	0	1	2	3	4
18.	Feeling that most people cannot be trusted	0	1	2	3	4
19.	Poor appetite	0	1	2	3	4

HOW MUCH WERE YOU BOTHERED BY:		NOT AT ALL	A LITTLE BIT	MODERATELY	QUITE A BIT	EXTREMELY
20.	Crying easily	0	1	2	3	4
21.	Feeling shy or uneasy with the opposite sex	0	1	2	3	4
22.	Feeling of being trapped or caught	0	1	2	3	4
23.	Suddenly scared for no reason	0	1	2	3	4
24.	Temper outbursts that you could not control	0	1	2	3	4
25.	Feeling afraid to go out of your house alone	0	1	2	3	4
26.	Blaming yourself for things	0	1	2	3	4
27.	Pains in lower back	0	1	2	3	4
28.	Feeling blocked in getting things done	0	1	2	3	4
29.	Feeling lonely	0	1	2	3	4
30.	Feeling blue	0	1	2	3	4
31.	Worrying too much about things	0	1	2	3	4
32.	Feeling no interest in things	0	1	2	3	4
33.	Feeling fearful	0	1	2	3	4
34.	Your feelings being easily hurt	0	1	2	3	4
35.	Other people being aware of your private thoughts	0	1	2	3	4
36.	Feeling others do not understand you or are unsympathetic	0	1	2	3	4
37.	Feeling that people are unfriendly or dislike you	0	1	2	3	4
38.	Having to do things very slowly to insure correctness	0	1	2	3	4
39.	Heart pounding or racing	0	1	2	3	4
40.	Nausea or upset stomach	0	1	2	3	4
41.	Feeling inferior to others	0	1	2	3	4
42.	Soreness of your muscles	0	1	2	3	4
43.	Feeling that you are watched or talked about by others	0	1	2	3	4
44.	Trouble falling asleep	0	1	2	3	4
45.	Having to check and double-check what you do	0	1	2	3	4
46.	Difficulty making decisions	0	1	2	3	4
47.	Feeling afraid to travel on buses, subways, trains	0	1	2	3	4
48.	Trouble getting your breath	0	1	2	3	4
49.	Hot or cold spells	0	1	2	3	4
50.	Having to avoid certain things, places, or activities because they frighten you	0	1	2	3	4
51.	Your mind going blank	0	1	2	3	4
52.	Numbness or tingling in parts of your body	0	1	2	3	4
53.	A lump in your throat	0	1	2	3	4
54.	Feeling hopeless about the future	0	1	2	3	4
55.	Trouble concentrating	0	1	2	3	4

HOW MUCH WERE YOU BOTHERED BY:		NOT AT ALL	A LITTLE BIT	MODERATELY	QUITE A BIT	EXTREMELY
56.	Feeling weak in parts of your body	0	1	2	3	4
57.	Feeling tense or keyed up	0	1	2	3	4
58.	Heavy feelings in your arms or legs	0	1	2	3	4
59.	Thoughts of death or dying	0	1	2	3	4
60.	Overeating	0	1	2	3	4
61.	Feeling uneasy when people are watching or talking about you	0	1	2	3	4
62.	Having thoughts that are not your own	0	1	2	3	4
63.	Having urges to beat, injure, or harm someone	0	1	2	3	4
64.	Awakening in the early morning	0	1	2	3	4
65.	Having to repeat the same actions such as touching, counting, washing	0	1	2	3	4
66.	Sleep that is restless or disturbed	0	1	2	3	4
67.	Having urges to break or smash things	0	1	2	3	4
68.	Having ideas or beliefs that others do not share	0	1	2	3	4
69.	Feeling very self-conscious with others	0	1	2	3	4
70.	Feeling uneasy in crowds, such as shopping or at a movie	0	1	2	3	4
71.	Feeling everything is an effort	0	1	2	3	4
72.	Spells of terror or panic	0	1	2	3	4
73.	Feeling uncomfortable about eating or drinking in public	0	1	2	3	4
74.	Getting into frequent arguments	0	1	2	3	4
75.	Feeling nervous when you are left alone	0	1	2	3	4
76.	Others not giving you proper credit for your achievements	0	1	2	3	4
77.	Feeling lonely even when you are with people	0	1	2	3	4
78.	Feeling so restless you couldn't sit still	0	1	2	3	4
79.	Feelings of worthlessness	0	1	2	3	4
80.	Feeling that familiar things are strange or unreal	0	1	2	3	4
81.	Shouting or throwing things	0	1	2	3	4
82.	Feeling afraid you will faint in public	0	1	2	3	4
83.	Feeling that people will take advantage of you if you let them	0	1	2	3	4
84.	Having thoughts about sex that bother you a lot	0	1	2	3	4
85.	The idea that you should be punished for your sins	0	1	2	3	4
86.	Feeling pushed to get things done	0	1	2	3	4
87.	The idea that something serious is wrong with your body	0	1	2	3	4
88.	Never feeling close to another person	0	1	2	3	4
89.	Feelings of guilt	0	1	2	3	4
90.	The idea that something is wrong with your mind	0	1	2	3	4

Reference: Derogatis, L.R., Lipman, R.S., & Covi, L. (1973). SCL-90: An outpatient psychiatric rating scale—Preliminary Report. *Psychopharmacol. Bull. 9*, 13–28.

APPENDIX D DERS-SF

Please indicate how often the following apply to you.

	Almost Never (0–10%)	Some-times (11–35%)	About Half Of the Time (36–65%)	Most of the Time (66–90%)	Almost Always (91–100%)
1. I pay attention to how I feel	1	2	3	4	5
2. I have no idea how I am feeling	1	2	3	4	5
3. I have difficulty making sense out of my feelings	1	2	3	4	5
4. I care about what I am feeling	1	2	3	4	5
5. I am confused about how I feel	1	2	3	4	5
6. When I'm upset, I acknowledge my emotions	1	2	3	4	5
7. When I'm upset, I become embarrassed for feeling that way	1	2	3	4	5
8. When I'm upset, I have difficulty getting work done	1	2	3	4	5
9. When I'm upset, I become out of control	1	2	3	4	5
10. When I'm upset, I believe that I will end up feeling very depressed	1	2	3	4	5
11. When I'm upset, I have difficulty focusing on other things	1	2	3	4	5
12. When I'm upset, I feel guilty for feeling that way	1	2	3	4	5
13. When I'm upset, I have difficulty concentrating	1	2	3	4	5
14. When I'm upset, I have difficulty controlling my behaviors	1	2	3	4	5
15. When I'm upset, I believe there is nothing I can do to make myself feel better	1	2	3	4	5
16. When I'm upset, I become irritated with myself for feeling that way	1	2	3	4	5
17. When I'm upset, I lose control over my behavior	1	2	3	4	5
18. When I'm upset, it takes me a long time to feel better	1	2	3	4	5

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Wells, A. (2013). Advances in metacognitive therapy. *International Journal of Cognitive Therapy*, *6*(2), 186-201.

Zawadzki, B., & Popiel, A. (2012). Temperamental traits and severity of PTSD symptoms. *Journal of Individual Differences*

VITA

Beshaun J. Davis, PhD

Education

Indiana University-Purdue University Indianapolis

Ph.D., Clinical Psychology August 2020

Dissertation Title: *Meaning-Making Processes Across the Lifespan: An Investigation of Metacognitive Capacity and Autobiographical Reasoning*

Advisors: Kyle Minor, PhD, Paul Lysaker, PhD, Michelle Salyers, PhD

Admitted to Doctoral Candidacy March 2018

Preliminary Examination Project: *Insight and Quality of Life in Schizophrenia: A Meta-Analysis*

Advisor: Kyle Minor, PhD Paul Lysaker, PhD, Michelle Salyers, PhD

Indiana University- Purdue University Indianapolis

M.S., Psychological Science May 2016

Advisor: Kyle Minor, PhD, Paul Lysaker, PhD, Michelle Salyers, PhD

Thesis Title: *Making Meaning in the Presence of Sub-threshold Psychotic Symptoms: An Investigation of Metacognitive Capacity in Psychometric Schizotypy.*

University of Maryland, Baltimore County May 2014

Degrees: B.S., Psychology (with Departmental Honors)

Psychology of the Workplace Certificate

Honors Thesis: *Practitioner Preferences Regarding Psychosis Risk Screening*

Advisor: Jason Schiffman, PhD.

Concentration: Human Services Psychology

Appointments

Harvard Fellow July 2020- Present

Beth Israel Deaconess Medical Center

Boston, Massachusetts

Clinical Psychology Intern, Psychosis Track July 2019- June 2020

Vanderbilt University Medical Center (APA Accredited)

Nashville, TN

Training Director: Blythe Corbett, Ph.D., Preceptor: Neil Woodward, Ph.D.

Grants and Other Funding

Department of Psychology Dissertation Research Award 2018

Clinical Psychology Department, IUPUI

Department of Psychology Travel Award 2017

Clinical Psychology Department, IUPUI

Graduate and Professional Enhancement Grant 2017

Graduate Professional Student Government, IUPUI

Departmental of Psychology Travel Award 2016

Clinical Psychology Department, IUPUI

Travel Grant 2015

School of Science Graduate Student Council, IUPUI

Graduate and Professional Enhancement Grant 2015

Graduate Professional Student Government, IUPUI

Departmental of Psychology Travel Award 2015

Clinical Psychology Department, IUPUI

Undergraduate Research Award 2014

Office of Undergraduate Education, UMBC

Publications

Peer-Reviewed Articles

1) Kline, E., **Davis, B**., & Schiffman, J. (2014). Who should treat youth with emerging psychosis?. *Schizophrenia research*, *157*(1), 310-311.

2) Nugent, K. L., Chiappelli, J., Sampath, H., Rowland, L. M., Thangavelu, K., **Davis, B.,** ... & Hong, L. E. (2015). Cortisol Reactivity to Stress and Its Association With White Matter Integrity in Adults With Schizophrenia. *Psychosomatic medicine*, *77*(7), 733-742.

3) Luther, L., Salyers, M. P., Firmin, R. L., Marggraf, M. P., **Davis, B**., & Minor, K. S. (2016). Additional support for the cognitive model of schizophrenia: evidence of elevated defeatist beliefs in schizotypy. *Comprehensive psychiatry*, *68*, 40-47.

4) Minor, K. S., Marggraf, M. P., **Davis, B. J**., Luther, L., Vohs, J. L., Buck, K. D., & Lysaker, P. H. (2015). Conceptual disorganization weakens links in cognitive pathways: Disentangling neurocognition, social cognition, and metacognition in schizophrenia. *Schizophrenia research*, *169*(1), 153-158.

5) Minor, K. S., Marggraf, M. P., **Davis, B. J.,** Mehdiyoun, N. F., & Breier, A. (2016). Affective systems induce formal thought disorder in early-stage psychosis. *Journal of abnormal psychology,125*(4), 537.

6) Martin, A. M. S., Bonfils, K. A., **Davis, B. J**., Smith, E. A., Schuder, K., & Lysaker, P. H. (2016). Compared to high and low cannabis use, moderate use is associated with fewer cognitive deficits in psychosis. *Schizophrenia Research: Cognition*, *6*, 15-21.

7) Minor, K. S., **Davis, B. J**., Marggraf, M. P., Luther, L., & Robbins, M. L. (2018). Words matter: Implementing the electronically activated recorder in schizotypy. *Personality Disorders: Theory, Research, and Treatment*, *9*(2), 133.

8) Marggraf, M. P., Cohen, A. S., **Davis, B. J**., DeCrescenzo, P., Bair, N., & Minor, K. S. (2018). Semantic coherence in psychometric schizotypy: An investigation using Latent Semantic Analysis. *Psychiatry research*, *259*, 63-67.

9) Marggraf, M. P., **Davis, B. J**., Hardin, K. L., Abplanalp, S. J., Haller, J. A., DeCrescenzo, P., & Minor, K. S. (2019). Speech production and disorganization in schizotypy: Investigating the role of cognitive and affective systems. *Journal of psychiatric research*, *114*, 11-16.

10) **Davis, B. J.,** Firmin, R. L., Lysaker, P. H., Salyers, M. P., McGrew, J., & Minor, K. S. (2020). An investigation of metacognition in schizotypy: Evidence of linkage with negative traits. *Translational Issues in Psychological Science*, *6*(1), 81.

Articles in Preparation or Under Review

1) **Davis, B.J.,** Salyers, M.P., Lysaker, P.H., Minor, K.S. Insight and Quality of Life in Schizophrenia: A Meta-Analysis. *Schizophrenia Research.*

Poster Presentations

1) **Davis, B.J.,** Salyers, M.P., Lysaker, P., Minor, K.S. Insight and Quality of Life in Schizophrenia: A Meta-Analysis. (2018) Society for Research in Psychopathology., Indianapolis, IN.

2) **Davis, B.J.,** Firmin, R. L., Lysaker, P.H., Salyer, M.P., McGrew, J., Minor, K.S. The Role of Metacognitive Capacity in Psychometric Schizotypy. (2017). Society for Research in Psychopathology. Denver, CO.
3) **Davis, B.J**., Marggraf, M. P., Decrescenzo, P., Mehdiyoun, N.F., Breier, A., Minor, K.S. Prediction of Social and Role Functioning in Early Psychosis: A Comparison of Computational and Clinician-Rated Measures of Disorganization. (2016) Society for Research in Psychopathology., Baltimore, MD.
4) **Davis,B.J**., Marggraf, M., Metzler, E., Benson, K., Mehdiyoun, N., Breier, A., Minor, K. Semantic Incoherence in First Episode Psychosis: An Investigation Using Latent Semantic Analysis. (2015). International Congress on Schizophrenia Research., Colorado Springs, Colorado.
5) Marggraf, M., **Davis, B.J**., Minor, K. The Schizotypy Paradox: Deficits in Perceived Accuracy of Emotion Recognition. (2015). International Congress on Schizophrenia Research., Colorado Springs, Colorado.
6) **Davis, B.J**., Kline, E., Schiffman, J.S., Practitioner Preferences of Psychosis Risk Screening. (2014). Undergraduate Creative and Achievement Day, University of Maryland, Baltimore County.

Clinical Experience

Intern, Vanderbilt Psychotic Disorders Program **July 2019-June 2019**

Vanderbilt University Medical Center

Supervisors: Julia Sheffield, Ph.D., Kimberly Brown, Ph.D., Frank Byndloss, Ph.D.

- Provided individual therapy to clients who recently experienced their first episode of psychosis, using cognitive behavioral therapy for psychosis (CBT-P) and metacognitive reflective and insight therapy. Led weekly psychosis recovery groups for first episode clients. Provided brief interventions to clients who were inpatient due to acute episodes of psychosis. Led twice weekly CBT-P groups for clients in a voluntary inpatient unit. Also, facilitated a process group focused on stigma and recovery on the inpatient unit. Lastly, provided neuropsychological assessment and feedback for clients who recently experienced their first episode of psychosis.

Intern, Vanderbilt Neuropsychological Evaluation Service **July 2019-June 2019**

Vanderbilt University Medical Center

Supervisor: Neil Woodward, Ph.D.

- Provided structured neuropsychological assessment to adults with a wide range of neuropsychiatric conditions (i.e., ADHD, vascular dementia, Alzheimer's disease, etc.) on a weekly basis. Received weekly supervision on cases by a trained neuropsychologist for clients with complex presentations. Attended weekly neuropsychology didactics.

Intern, Vanderbilt Forensic Evaluation Service **July 2019-June 2019**

Vanderbilt University Medical Center

Supervisors: Mary Wood, PhD., Kimberly Brown., PhD

- Evaluated youth detained by the Davidson County department of child services for a variety of crimes ranging from petty theft, to attempted murder to assess competency, mental status at time of alleged offense, and diagnoses and treatment recommendations.

Department of Adolescent Medicine, Indiana University School of Medicine
Forensic Psychological Evaluations for the Indiana Juvenile Justice System
Supervisor: Matthew Aalsma, Ph.D., HSPP

- Provided psychodiagnostic assessments for youth (ages 13-18) detained as part of Indiana's Juvenile Justice System with misdemeanor or felony charges.
- Administered a variety of assessment instruments measuring intelligence, academic achievement, personality, and social and emotional functioning.
- Interviewed parents of juvenile offenders to inform psychological evaluation and home conditions available upon release.
- Scored and interpreted assessments; wrote psychological reports that were shared with probation officers and the courts to assist in sentencing for youths with true charges.
- Received individual supervision for each assessment with a licensed clinical psychologist.

IU Outpatient Psychiatry Nov 2017-Mar 2018

Supervisor: Kristine Chapleau, Ph.D., HSPP

- Saw clients for individual therapy with disorders ranging from depression, anxiety, and PTSD.
- Utilized eclectic treatment strategies tailored to individual client needs such as cognitive-behavioral therapy, acceptance and commitment therapy, mentalization-based therapy, imagery rescripting and reprocessing therapy, and prolonged exposure.
- Did intake interviews for new clients entering the clinic.

Clinical Research Study for Midtown Mental Health Center Jul 2016-June 2019

Implementing Wearable Technologies as Novel Therapeutic Tools for Serious Mental Illness
Supervisor: Paul Lysaker, Ph.D., HSPP
Study PI: Kyle Minor, Ph.D

- Provide psychotherapy to people with schizophrenia as part of a randomized controlled trial to investigate the effectiveness of Metacognitive Reflection and Insight Therapy (MERIT) paired with ecological momentary assessment recording devices (MERIT-EAR).
- Maintain a caseload of 5 clients continuously (8 hours per week)
- Provided initial, midpoint, and final assessments for study participants (PANSS, QLS, GFS/GFR. MCQ-30, SF-36)
- Provide therapy for clients in both the control (MERIT alone) and experimental (MERIT-EAR) conditions.
- In the experimental condition, MERIT psychotherapy is enhanced by assisting clients to listen to and integrate perceptions of recorded audio samples of their social interactions each week.

- Track clients' metacognitive capacity using the Metacognitive Assessment Scale-Abbreviated (MAS-A).
- Track therapist adherence to the MERIT model with the Therapist Metacognitive Adherence Scale (TMAS).
- Receive weekly group supervision with a licensed clinical psychologist.

Roedebush VAMC July 2016- July 2017

Psychosocial Rehabilitation and Recovery Center

Supervisor: Paul Lysaker, Ph.D., HSPP

- Led weekly Illness Management and Recovery groups for veterans with prolonged psychosis.
- Provided individual therapy using Metacognitive Reflection and Insight Therapy to people with schizophrenia-spectrum disorders.

Indiana University Psychotic Disorders Program Mar 16- July 17

Prevention and Recovery Center for Early Psychosis

Supervisor: Bethany Leondhardt, Ph.D., HSPP

- Led process therapy group for people with early psychosis.
- Performed psychodiagnostic assessments for differential diagnosis.
- Provided individual therapy for clients who had recently experienced their first episode of psychosis.
- Performed cognitive remediation for clients with cognitive symptoms of schizophrenia.

Eskenazi Health July 2015-Aug 2016

Midtown Community Mental Health Center

Supervisor: Jay Hamm, Ph.D., HSPP

- Coordinated care with an interdisciplinary treatment team
- Led a recovery-oriented "Living with Voices" process group using the Intervoice framework for clients with prolonged psychosis.
- Provided individual therapy to people with chronic schizophrenia-spectrum disorders.
- Completed psychodiagnostic assessments for educational accommodations for clients.

Teaching Experience

Spring 2019 **Instructor of Record: B110 Introduction to Psychology**

Course Evaluation Average: 4.96/6

Fall 2018 **Instructor of Record: B380 Abnormal Psychology**

Course Evaluation Average: 5.11/6

Summer 2018 **Instructor of Record: B110 Introduction to Psychology**

Course Evaluation Average: 5.54/6

Spring 2018 **Instructor of Record: B110 Introduction to Psychology**

Course Evaluation Average: 4.92/6

Fall 2017 **Teaching Assistant, Assessment**

Instructor, Dr. Kyle Minor

Responsibilities included administering WAIS Certification exams to 1st year graduate students, grading integrated report assignments, and demoing the WAIS-IV and WISC-V

Spring 2017 **Instructor: Statistics Lab**

Course Evaluation Average: 5.21/6

Supervisor, Dr. Chris Lapish

Responsibilities included leading weekly lab meetings where students completed exercises, developing exercises, and proctoring exams.

Fall 2016 **Instructor: Statistics Lab**

Course Evaluation Average: 5.26/6

Supervisor, Dr. Denis Devine

Responsibilities included leading weekly lab meetings where students completed exercises, developing exercises, and proctoring exams.

Fall 2016 **Teaching Assistant, Developmental Psychology**

Instructor, Dr. Michelle Carrol

Responsibilities included grading application essays wherein students applied some aspect of developmental theory to their own lives.

Summer 2016 **Teaching Assistant, Research Capstone Course**

Instructor, Dr. Milena Petrovic

Responsibilities included aiding students in developing research projects using archival data, critiquing data analysis, and evaluating final research reports.

Spring 2016 **Teaching Assistant, Capstone Course in Service**

Instructor, Dr. Lisa Contino

Responsibilities included grading reflective journal assignments.

Fall 2015 **Teaching Assistant, Intro to Psychology**

Instructor, Dr. Sandra Hellyer

Responsibilities included grading online discussion board posts and reflective papers throughout the semester.

Spring 2015 **Teaching Assistant, Research Capstone Course**

Instructor, Dr. Kyle Minor

Responsibilities included aiding students in developing research projects using archival data, critiquing data analysis, and evaluating final research reports.

Fall 2014 **Teaching Assistant, Abnormal Psychology**

Instructor: Dr. Kyle Minor

Responsibilities included test administration, grading exams, and meeting with students to discuss exam results.

Fall 2014 **Teaching Assistant, Social Psychology**

Instructor, Dr. Kristine Chapleau

Responsibilities included developing extra credit assignments for the course, and proctoring and grading exams.

Memberships, Awards, and Fellowships

Elite 50 IUPUI (Top 50 Graduate Students)	April 2018
Indiana Psychological Association Science and Education Committee	April 2018- Present
Indiana Psychological Association Student Committee President	April 2018- Present
Hoosier State Science Fair Special Award Judge	March 2018
Graduate and Professional Student Government Representative	August 2017- Present
Indiana Psychological Association Campus Representative	Jan 2017-April 2018
Hoosier State Science Fair Special Award Judge	March 2017
Southern Regional Educational Board Institutional Scholar	Aug 2014-Current
Undergraduate Research Award Scholar	2014
Psi Chi	2012

Research Experience

Indiana University, Purdue University Indianapolis

Minor CLASP Lab August 2014- June 2019

Research Assistant

- Administered semi-structured clinical interviews to undergraduates identified as high schizotypy in a study assessing speech disturbances in this population.
- Transcribed the aforementioned clinical interviews for semantic analysis.
- Conducted assessments of people diagnosed with schizophrenia as a part of a larger study investigating the role of speech, insight, and metacognition on social functioning.
- Collected ecological momentary assessment data from participants to assess real world social functioning.
- Served as an assessor and therapist in a study of the impact of ecological momentary assessment on metacogntive therapy for people with schizophrenia.

University of Maryland, Baltimore County

Schiffman Youth FIRST Lab October 2012- May 2014

Research Assistant

Administered clinical and neurocognitive assessments to clinically high-risk youth participating in a longitudinal study of psychosis risk symptoms.

- Assisted investigators in their publication efforts by compiling references and proofing manuscripts.
- Participated in data collection for a metabolic study of youth at risk for schizophrenia, a study on stigma and schizophrenia, and a study on hypopsychois in undergraduates.
- Entered subject data from the three studies listed above for analysis.

University of Maryland School of Medicine

Maryland Psychiatric Research Center October 2011- July 2014

Under the Supervision of Dr. L. Elliot Hong

Research Assistant

- Organized and entered substantial amounts of subject data for analysis.
- Gained extensive experience with recruitment, scheduling, and follow-up with patients and healthy controls.
- Collected data from research participants through clinical and neurocognitive assessments.
- Observed group therapy with patients dealing with their first episodes of psychosis, as well as those suffering from chronic schizophrenia.
- Gained extensive experience with interacting with patients suffering from schizophrenia.
- Shadowed experienced researchers and gained first-hand insights into human subjects research.

University of Maryland, Baltimore County

Maton Lab January 2013-August 2013

Research Assistant

Coded qualitative data for a study on stress and coping in African American adolescents.

- Assisted investigators in the literature review for a manuscript on predictors of tobacco use in African American adolescents**.**

Food and Drug Administration

Division of Animal and Food Microbiology June 2010- August 2011

Research Intern

- Shadowed experienced Biologists and Microbiologists while assisting around the lab.
- Headed my own research project involving antibiotic resistance in microbial organisms.