The Development and Pilot of a Broadband Caregiver-Informant Measure of Autobiographical Memory

Kathryn Fagan

University of Vermont

Follow this and additional works at: https://scholarworks.uvm.edu/graddis

Part of the Cognitive Psychology Commons

Recommended Citation


This Thesis is brought to you for free and open access by the Dissertations and Theses at UVM ScholarWorks. It has been accepted for inclusion in Graduate College Dissertations and Theses by an authorized administrator of UVM ScholarWorks. For more information, please contact schwrs@uvm.edu.
THE DEVELOPMENT AND PILOT OF A BROADBAND CAREGIVER-INFORMANT MEASURE OF AUTOBIOGRAPHICAL MEMORY

A Thesis Presented

by

Kathryn Fagan

to

The Faculty of the Graduate College

of

The University of Vermont

In Partial Fulfillment of the Requirements
for the Degree of Master of Science
Specializing in Communication Sciences and Disorders

May, 2023

Defense Date: March 28th, 2023

Thesis Examination Committee:

Tiffany Hutchins, Ph.D. Advisor
Elizabeth Pinel, Ph.D., Chairperson
Patricia Prelock, Ph.D.
Cynthia J. Forehand, Ph.D., Dean of the Graduate College
ABSTRACT

Autobiographical memory (ABM) is memory of the self. It is pervasive in our daily lives and subserves a range of social cognitive functions such as theory of mind (i.e., the capacity to understand and attribute mental states), self-concept, personal narrative development, and socio-cultural learning. Disruption of ABM can have enduring and detrimental developmental consequences which underscores the importance of early identification for the purpose of treatment planning. Currently, no normative measures exist to assess children’s ABM in a standardized and content-valid way. The purpose of this study was to complete the first steps in the development of a clinically useful caregiver-informant measure of children’s ABM (ages 5 – 18). I had two specific aims: 1) to develop a content-valid measure of children’s ABM and, 2) to pilot the measure in preparation for a subsequent large norming study. Following a comprehensive literature review, a team of doctoral students and an expert in ABM developed the Autobiographical Memory Inventory (ABMI) which consisted of 122 items designed to tap a broad range of ABM and ABM-related functions. The ABMI was deployed on a secured online platform and data for 24 primary caregivers were analyzed to identify any statistical signal in the data. Because statistical operations were underpowered in this pilot, only mean and effect size data were evaluated. The ABMI performed as expected: composite ABMI scores positively correlated with child age and distinguished children with and without a developmental disability (all effect sizes were small to moderate). During the pilot process, several items were identified for removal, and survey modifications were developed to improve the clarity and carefulness of participant responding. This study provides support for the further development of the ABMI. Future directions are described.
ACKNOWLEDGEMENTS

First, I would like to thank my advisor, Dr. Tiffany Hutchins, as her prior experience made many aspects of this project possible. Dr. Hutchins, since my undergraduate career, you have inspired me to think more passionately about the field of communication sciences and disorders. I am incredibly grateful to have learned from you over the past 5 years. Thank you for encouraging me to be a better thinker, and writer, with every conversation.

I would like to show gratitude to my committee, Dr. Elizabeth Pinel and Dr. Patricia Prelock. Thank you for your advice and feedback over the course of this project.

Finally, I cannot express enough gratitude to my family, whose love and guidance have been with me in whatever I pursue. Your unwavering support has encouraged me to achieve goals I could not have thought possible.
# TABLE OF CONTENTS

ACKNOWLEDGEMENTS .......................................................................................................................... ii

LIST OF TABLES ........................................................................................................................................ v

LIST OF FIGURES ....................................................................................................................................... vi

CHAPTER 1: INTRODUCTION .................................................................................................................. 1

1.1 The Nature, Organization, and Development of ABM ........................................................................ 1
  1.1.2 The Nature of ABM ....................................................................................................................... 1
  1.1.3 ABM Neurological Substrates ....................................................................................................... 3
  1.1.4 Organization of ABM ................................................................................................................... 5
  1.1.5 The Development of ABM ............................................................................................................ 8

1.2 The Importance of ABM ................................................................................................................... 10
  1.2.1 ABM in Clinical Populations ....................................................................................................... 12

1.3 The Measurement of ABM ................................................................................................................. 18
  1.3.1 Laboratory-based ABM Measures ................................................................................................. 19
  1.3.2 Survey Measures of ABM ............................................................................................................ 22

1.4 Caregiver Report of Child Psychosocial Functioning ......................................................................... 27

1.5 Statement of the Problem .................................................................................................................. 28

CHAPTER 2: METHODOLOGY ................................................................................................................ 29

2.1 Development of the Autobiographical Memory Inventory ................................................................. 29
  2.1.1 Demographic Questionnaire ......................................................................................................... 29
  2.1.2 Survey Development .................................................................................................................... 29
  2.1.3 Item Structure and Response Arrangement .................................................................................... 36
LIST OF TABLES

TABLE 1: Description of ABM Across Various Clinical Populations ..........................13
TABLE 2: Child Characteristics ..................................................................................38
TABLE 3 Child Characteristics and Associated Composite Score .............................41
LIST OF FIGURES

FIGURE 1: Cognitive Mapping Relationships…………………………………………………5
FIGURE 2: Across Domains Hierarchical Structure of ABM (Hutchins et al, 2022; adapted from Conway & Pleydell-Pearce, 2000)……………………………………………………6
FIGURE 3: Visual Representation of Intertwined Cognitive Processes Developing Alongside ABM (Hutchins et al., 2022)…………………………………………………………12
FIGURE 4: Comparison of Composite Scores Between Groups…………………………44
CHAPTER 1: INTRODUCTION

Autobiographical memory (ABM) is memory of the self. It is pervasive in everyday life, underpins the human capacity to reason about the past and to plan for the future and is central to the development of social cognition, social communication, and self-concept. When ABM is disrupted, deficits appear in a wide range of functions.

Traditionally, assessment of ABM has focused on adult populations for the purpose of research and is characterized by limited ecological validity, content validity, and clinical utility. Yet, ABM deficits likely lead to significant socio-cognitive impairments in childhood and adolescence, representing rich opportunities for therapeutic interventions to support memory and learning. To summarize the current gaps in the literature, this chapter will describe 1) the nature, neurological underpinnings, organization, and development of ABM, 2) the importance of ABM for healthy development and its presentation in clinical populations, 3) traditional measures of ABM, and 4) the potential of parent report for the assessment of children’s ABM. Ultimately, I will argue that developing and piloting a caregiver-informant ABM measure are both timely and necessary to advance research and clinical practice to support ABM development.

1.1 The Nature, Neurological Underpinnings, Organization, and Development of ABM

1.1.2 The Nature of ABM.

ABM is pervasive in human cognition, crucial for psychological well-being, and highly entwined with certain aspects of the self, including self-concept (Lind, 2010).

ABM is often understood as the integration of two distinct, but related, memory systems:
Semantic memory and episodic memory. Semantic memory (SM) is a kind of declarative memory that refers to the knowledge of a memorized fact about the self. SM is ‘noetic’ and has a particular “experiential flavor” (Brien et al., 2020, p. 2): it feels impersonal, fact-based, and acontextual and is experienced as a kind of ‘knowing’ or ‘familiarity’ (Gardiner, 2002; Tulving, 2002), that requires no recollection of a past personal experience (e.g., "I was born in Englewood, California"). SMs are accompanied by source amnesia, which is the inability to identify how a known fact was acquired (Schacter et al., 1984). For instance, one can know one was born in Englewood, California but not because one subjectively recalls experiences of the event. Rather, one knows it to be true as a rehearsed or rote memorized fact about oneself.

The other type of ABM, known as episodic memory (EM), refers to memory for past personal experiences (Tulving, 2002). In contrast to SM, which is acontextual, impersonal, and characterized by a feeling of knowing, EM involves mental time travel to the past and a reconstruction of a past event that creates a sense of re-experiencing for the rememberer (Conway & Pleydell-Pearce, 2000; Tulving, 2002). EM is ‘autonoetic’ in the sense that one is aware that one is remembering (as opposed to daydreaming or planning); it feels highly personal and subjective (Gardiner, 2002; Tulving, 1985; 2002). EM is also contextual and grounded in time (when) and space (where). Further, EM tends to be temporally sequenced (i.e., remembering what happened first, next, later; Aronowitz, 2018), teleological (i.e., recalling events in terms of people's goals or motives, e.g., "I was nervous about the speech and wanted to do a really good job"), and
characterized by causal reasoning (e.g., "I missed the bus because I overslept"; Hutchins et al., 2022; Keven, 2018).

1.1.3 ABM Neurological Substrates

The hippocampus is believed to be an information hub for the integration of sensory information and higher-order autobiographical conceptual knowledge (Cheng & Werning, 2016; Tulving, 1985) and several cortical areas (e.g., medial temporal lobe, parahippocampal cortex, fornix) contribute to the formation of memories in varying degrees (Raslau et al., 2014). The hippocampus is central to relational memory processes in that it integrates the input of sensory information and interfaces with higher order executive processes to continually consolidate and update information. Relational memory is the “association of meaningful co-occurring elements of experience” and it is believed to be essential for successful free recall including the recollection of specific past personal experience (e.g., “What did you do on your last vacation?”; Hutchins et al., 2022 p.32). As Derwent (2018) described:

Whenever we recall a memory of a personal experience, that memory is made up of several disparate elements specific to that experience, (e.g., a cinema trip, to see Moana, on a Wednesday, in the rain, with Jonah). These individual elements are bound together to form one coherent recollection of that specific experience. Relational memory…can be described as the ability to bind together these disparate, episode-specific aspects of experience into configurations which can then be used in a flexible way. These relations occur accidentally within the experience as a whole, and flexible use of them enables us to recall one or other...
element by itself (e.g., which film, which day, who came along), or the entire experience. (p. 36)

Recent frameworks of hippocampal function demonstrate a shift in the understanding of the hippocampus’ role from a systematic “control room” that responds to stimuli for efficient navigation (Tolman, 1948, p. 189), to the organizer of systematic and complex information that supports functions beyond spatial navigation (Banker et al., 2021). Specifically, this more contemporary view posits that the hippocampus enables relational representations of experience through cognitive mapping (Banker et al., 2021; Eichenbaum & Cohen, 2014; Raslau et al., 2014) for spatial information (for the purposes of wayfinding) as well as temporal and social information (Banker et al., 2021). The underlying rationale is that spatial coordinates, temporal information (e.g., temporal order), and social information (e.g., social status, social hierarchies, kinship relations) are complex, dynamic, and shifting, and that the hippocampus provides a model of the relationships for spatial, temporal, and social information which, in turn, can be used to make predictions and support adaptive decision-making (Banker et al., 2021. An illustration of these relational memory processes is presented in Figure 1 (from Banker et al., 2021).
Figure 1: Cognitive Mapping Relationships Across Temporal, Spatial, and Social Domains: “Cognitive mapping across domains. Cognitive maps store representations of the relationships between elements, including (A) memories, (B) physical locations, and (C) social relationships. In some experimental paradigms, social relationships are conceptualized within a 2D map, as illustrated in the schematic, of varying degrees of affiliation and power” (Banker et al., 2021, p. 10).

1.1.4 Organization of ABM

ABM has a complex organizational structure. Conway and Pleydell-Pearce (2000) proposed the self-memory system model, which detailed levels of ABM from high to low specificity: EMs, which include event-specific knowledge (i.e., detailed accounts of specific events, e.g., skinning my knee that one time while playing “lava” at recess), general events (e.g., playing games at recess), lifetime periods (e.g., grade school), all of which culminate into one’s life story. Of course, the content of ABM is both reflected in and shaped by the societal structures and values in which socialization experiences are
embedded. A visual representation of the organizational structure of ABM is shown in Figure 2.

**Figure 2:** Hierarchical Structure of ABM (Hutchins et al, 2022; adapted from Conway & Pleydell-Pearce, 2000)

As shown in Figure 2, event-specific memory (i.e., EM) forms the foundation of the hierarchical structure of ABM. This level represents the most specific of ABMs which is typically operationalized through the reporting of an event that took place at a single point (usually a particular day) in the past. When we recollect a specific experience (e.g., that one time we went to the horse races), the inclusion of detailed information associated with that specific event is believed to enhance the encoding of memory (Valentino, 2011). Details may take the form of event (e.g., “spilling my popcorn”), sensory or perceptual (e.g., “the jockeys wore bright red jackets”), or cognitive aspects
associated with the situation ("I was surprised the little horse won") which may be why this level is marked by imagery and vividness (Conway & Pleydell-Pearce, 2000). Indeed, it is likely the reconstruction and integration of these elements of experience that animate memory for specific past events and shape the complex episodes that we then subjectively re-experience during recollection (Cheng & Werning, 2016).

EM (specific event) recollections, in turn, are the foundation for general event memories which represent the next level in the ABM hierarchy. General event memories include repeated or habitual events (e.g., playing ‘eye-spy’ on family road trips), or single events with a duration longer than a day (e.g., driving cross country). General event and lifetime period memories are similar in that both are thematically related, but lifetime period memories are organized according to lengthier time periods (e.g., when I was in grade school) whereas general event memories tend to be bound to a specific theme (e.g., learning to drive a car; Conway & Pleydell-Pearce, 2000). Lifetime periods may not be discrete and may overlap multiple periods and schemas. Lifetime period memories provide broad representations of the people, places, events, goals, or characteristics that are coded in general event knowledge (Conway & Pleydell-Pearce, 2000).

As these three levels of organization develop and are shaped by the sociocultural frames in which they are embedded, they gradually accrete to form one’s life story (Conway & Pleydell-Pearce, 2000; Hutchins et al., 2022). A life story is the culmination of one’s subjective experiences, is central to identity and self-concept, and can be shared through telling our life narratives. The formation of a life story does not begin to mature
until late adolescence as it requires the integration and evaluation of experiences (Habermas & Bluck, 2000).

1.1.5 The Development of ABM

ABM has a protracted developmental course that begins in infancy with what is believed to be cognitive precursors that support the unfolding of more mature and sophisticated ABM capacities in childhood and adolescence (Bohn & Bernsten, 2008).

As previously noted, the development of ABM is highly intertwined with the self, including self-concept and identity (Bauer, 2015; Conway & Pleydell-Pearce, 2000; Gathercole 1998; Lind, 2010). This is important because a well-developed self-schema, in turn, supports the encoding and retrieval of past, personally relevant memories. Additionally, existing in subjective time means one must understand that the self that is remembered in the past is the same one that exists in the present (Nelson & Fivush, 2004). Thus, self-concept is believed to act as an enduring, organizational frame that allows for the formation of a continuous self: one that emerges from the past, into the present, and projects into the future.

As early as two years of age, adults may begin engaging children in shared reminiscing; however, children are unable to make substantive contributions to the conversation (Fivush, 2011; Gathercole, 1998). Around this same time, a typically developing child is believed to achieve a 'critical mass' for self-concept that coincides with the development of rudimentary autobiographical memories (Lind, 2010). Before two years of age, experiences are usually not encoded in any retrievable form: a phenomenon referred to as childhood amnesia (Gathercole, 1998; Nelson & Fivush,
Childhood amnesia is believed to persist until 3-5 years old, at which point children's ability to engage in reminiscing increases and is made possible by developmental gains in children’s receptive and expressive language (Fivush et al., 1995; Gathercole, 1998; Rathbone et al., 2008). Development of cognitive and narrative abilities is thought to end childhood amnesia and thus may vary based on the individual (Gathercole, 1998). Generally, by 4 years of age, typically developing children have developed sufficient narrative abilities that support their ABM in shared reminiscing (Fivush et al., 1995; Gathercole, 1998). From this point on, more ABMs (and more elaborate ABMs) can be reliably encoded and recalled (Conway & Pleydell-Pearce, 2000; Fivush et al., 1995; Gathercole, 1998).

Personal narrative discourse and ABM co-develop and are mutually reinforcing. Personal narratives help guide the mental organization of experience, which helps reinforce more coherent and elaborate ABM (Fivush, 2011; Reese et al., 2011). Further, there is compelling research to suggest that mothers’ reminiscing styles shape the nature and quality of children’s autobiographical memory through conversations about past shared experiences (for reviews see Bauer, 2007; Fivush et al., 2006). By the end of the preschool years, typically developing children can independently relay their experiences through personal narratives (Westby & Calcutta, 2016). In typical development, a more stable and adult-like form of the ABM system emerges around 7 years of age (Bauer, 2015; Gathercole, 1998) after which time children become even more adept at elaborating EMs and grounding memory in space (Bohn & Bernsten, 2008).
Adolescence and early adulthood also seem to be a crucial time in ABM development in light of a ‘reminiscence bump’ that has been observed between the ages of 10 and 30 (Gathercole, 1998; Rathbone et al., 2008). During this period, a high number of memories are encoded and tend to be easily retrieved during free recall (Rathbone et al., 2008). The reminiscence bump is thought to exist because of the salient self-defining or novel life experiences that occur during this period (Rathbone et al., 2008; Singer & Salovey, 1993).

Like many other cognitive faculties, ABM does not follow an even or linear trajectory throughout the lifespan. In summary, the precursors for healthy ABM are evident early in life. Developments in self-concept and personal narrative ability support the emergence and development of ABM. The development of ABM occurs rapidly in the preschool years but becomes more stable and adult-like by middle childhood. Still, ABM continues to mature into adolescence and early adulthood.

1.2 The Importance of ABM

Like other forms of memory, EM is a reconstructive process rather than a "perfect holistic record" of events (Hassabis et al., 2007, p. 14365). ABM emerges through the interaction of social, cognitive, and language/communicative domains (Nelson & Fivush, 2004). The emergence of ABM through the preschool years coincides with developmental milestones in theory of mind, personal narrative discourse, sociocultural learning, executive functions, and identity and self-concept. Considering the complexity of ABM, it is not surprising that it is related to the abilities of episodic future thinking (i.e., being able to imagine the future self), theory of mind (i.e., inferring and
understanding one's own and others’ inner mental states), and spatial navigation (i.e., the ability to find one's way around; Burgess et al., 2002; Lind et al., 2014). These co-developments in cognitive ability strongly suggest that these skills are developmentally integrated and functionally independent (Bauer, 2015; Brien et al., 2020; Conway & Pleydell-Pearce, 2000; Gathercole, 1998; Nelson & Fivush, 2004; Westby & Calcutta, 2016) such that disruption in one domain can affect functioning in the other domains. This makes ABM important for researchers and professionals seeking to support individuals with memory and learning differences and, indeed, ABM challenges have been observed in a wide variety of clinical populations. A visual representation of the interaction of key cognitive processes that develop alongside ABM is presented below (Figure 3).
1.2.1 ABM in Clinical Populations

It is well established that ABM is impacted in various clinical populations, including (but by no means limited to) autism, depression, trauma, dementia, and traumatic brain injury (TBI). The nature of ABM disruptions in these conditions differ in their varying etiologies and are important because they illustrate the complexity and importance of ABM for healthy and adaptive functioning. As such, a brief overview of the characterization of ABM challenges in each of these conditions is offered below.

ABM in autism is generally characterized by relatively spared or even superior SM abilities (Crane & Goddard, 2008; Lind, 2010; McDonnell et al., 2017) accompanied by severe disruptions in EM. For many autistic persons, differences in EM may include...
latency in memory retrieval (i.e., low spontaneity), less elaboration, detail, and narrative coherence, and lack of reference to time and space (Lind & Bowler, 2010; Lind et al., 2014; McDonnell et al., 2017). Additionally, the personal narratives of autistic individuals tend to include a higher number of unrelated details compared to their non-autistic peers (see McDonnell et al., 2017, for review). Interestingly, during EM recollection, autistic individuals have shown better recall of information performed by others when compared to themselves, but the opposite effect is observed in typically developing individuals (Millward et al., 2000). This finding suggests that autistic persons may tend to adopt an observer perspective (i.e., 3rd person) rather than a first-person perspective when recalling personally experienced events (Lind & Bowler, 2010).

Depressed individuals also often demonstrate an ‘observer’ perspective (Bergouignan et al., 2008; Lemogne et al., 2006). However, perspective is not the only difference observed in depressed individuals’ ability to recall EMs. The literature on clinical depression often references the presence of overgeneral memory (OGM): a phenomenon in which event-specific information is excluded resulting in an inability to produce rich, detailed, and specific EMs (Conway & Pleydell-Pearce, 2000; Williams et al., 2007). Individuals exhibiting OGM tend to recall general event memories (e.g., “Every party I’ve hosted”) or memories that occur over more than one day (e.g., “My trip to France”) but are challenged when recalling specific events (e.g., “That one time we ate at the bistro on the corner”). In depressed individuals, OGM tends to occur across contexts and affects memory for both negative and positive experiences (Conway &
Pleydell-Pearce, 2000; Williams et al., 2007); a feature that may contribute to the maintenance of depressive symptoms (Dalgleish & Werner-Seidler, 2014).

Persons with a trauma history often recall traumatic events through highly vivid, near-experience recall (Conway & Pleydell-Pearce, 2000). This near-experience recall indicates a lack of healthy, psychological ‘distancing’, or the ability to place memories safely in the past (Sumner, 2012). Excluding event-specific detail in traumatic memories serves a protective function insofar as it mitigates the intense negative emotions; eventually, this protective function may generalize to all ABM resulting in pervasive OGM (Sumner, 2012; Valentino, 2011; Williams et al., 2007). As a result, non-traumatic memories may become overgeneral (Williams et al., 2007), disorganized, and fragmented (Moore & Zoellner, 2007).

In dementia, deficits in ABM are often the foremost cognitive deficit (Green et al., 1995; Piolino et al., 2009) although ABM profiles vary greatly depending on the type of dementia (Irish et al., 2018; Piolino et al., 2009). For example, individuals with frontotemporal dementia provide more memories from the observer perspective than those with Alzheimer’s disease (Piolino et al., 2009). However, one generally observed difference is that EMs from the reminiscence bump period (i.e., around early adulthood) are typically preserved, whereas memories after this time rapidly deteriorate. Interestingly, semantic dementia (in which SM progressively worsens) typically shows a reverse temporal gradient (i.e., gist-like remote EM compromised with specific recent memories generally spared), whereas individuals with Alzheimer’s disease show challenges regardless of the recency or remoteness of the memory (Bernsten et al., 2022;
Grilli & Sheldon, 2022). This is unlike what is seen in healthy cognitive aging, in which older adults tend to maintain the main idea of older, more remote memories but cannot generally recall the specific details of recent events (Grilli & Sheldon, 2022).

Finally, individuals with TBI have ABM profiles characterized by OGM, more observer descriptions, and decreased autonoetic consciousness regardless of whether the encoding time period coincided with the reminiscence bump (Piolino et al., 2009). For example, Rassmusen and Bernsten (2012) found TBI patients had difficulty remembering and imagining remote past or future events and relied on more semantic knowledge during recollection. This is consistent with the finding that individuals with TBI tend to produce narratives that are less elaborate, coherent, and evaluative of causal relationships (Palombo et al., 2015).

Across these clinical populations, disruptions in ABM present variably but include a lack of specificity, atypical orientation or perspective, disorganization, fragmentation, and a lack of psychological distancing. These clinical features are important insofar as they demonstrate the potential utility of a valid measure for capturing a wide range of memory challenges that, if identified, are amenable to treatment to promote healthy ABM development. Table 1 provides additional details from the research findings concerning ABM in these populations.
Table 1. Description of ABM Across Various Clinical Populations

<table>
<thead>
<tr>
<th>Clinical Population</th>
<th>ABM Characteristics</th>
</tr>
</thead>
</table>
| Autism              | • Absence of a reminiscence bump, possibly related to atypical self-identity (Crane & Goddard, 2008)  
                      • Deficits in EM for personally-relevant past events but not all past events (McDonnell et al., 2017)  
                      • Increased SM or rote memorization relative to contextual EM detail (Crane & Goddard, 2008)  
                      • Fewer mental-state terms in reported past experiences (Lind et al., 2014)  
                      • Less elaboration and detail in personal narratives, regardless of cognitive and language ability (Capps et al., 1998; Lind & Bowler, 2010; McDonnell et al., 2017)  
                      • Positive correlation between age and EM during an interview but not with cued word recall (Goddard et al., 2014)  
                      • Confabulation of past experiences and imagination of implausible future experiences (Lind et al., 2014)  
                      • Deficits in spatial navigation (Lind et al., 2014)  
                      • Sense of identity impacted by lack of integration of SM and EM (Lind, 2010)  
                      • Increased prompting required to elicit specific memories as a result of low spontaneity (Goddard et al., 2014; Robinson et al., 2017) |
| Depression          | • Overgeneral memory (OGM; Williams et al., 2007)  
                      • Bias toward negative memories (e.g., “Every morning I drove to work was miserable”; Dalgleish & Werner-Seidler, 2014)  
                      • Positive memories are less vivid or emotionally salient compared to never-depressed individuals (Dalgleish & Werner-Seidler, 2014) |
• “Reduced specificity of both past and future autobiographical events” (Addis et al., 2007, p. 1364)
  o Correlated with decreased ability to problem solve (Dalgleish & Werner-Seidler, 2014)
• Field perspective deficit for positive memories (Bergouignan et al., 2008; Lemogne et al., 2006)

| Trauma | • Qualitative aspects of trauma (severity, length) inversely related to specificity of memory; increased severity more strongly related to OGM (Williams et al., 2007)
  • OGM presents even when not currently experiencing traumatic episodes (Conway & Pleydell-Pearce, 2000; Williams et al., 2007)
  • Initial recall of traumatic events includes vivid re-experiencing marked by increased sensory response; lack of psychological distancing (Conway & Pleydell-Pearce, 2000)
  • Memories fragmented or disorganized (Moore & Zoellner, 2007)
  • Sense of identity impacted by lack of integration of SM and EM (Williams et al., 2007) |
| Dementia (e.g., Alzheimer’s disease; AD) | • OGM (Piolino et al., 2009)
  • Deficits in specificity and autonoesis (Piolino et al., 2009)
  • Tendency toward observer perspective (Piolino et al., 2009)
  • Episodic future thinking impaired (Duval et al., 2012)
  • Recent EM disproportionately disrupted compared to remote EM (Bernsten et al., 2022; Duval et al., 2012; Greene et al., 1995; Irish et al., 2018)
  • Memories from reminiscence bump generally preserved (Bernsten et al., 2022)
  • Sense of identity impacted by lack of integration of SM and EM (Duval et al., 2012) |
1.3 The Measurement of ABM

ABM has been assessed using various methods and paradigms, each with their advantages and disadvantages. For the present purposes, measures of ABM can be categorized as laboratory-based assessments or as survey assessments. Laboratory measures of ABM include recognition and free recall tests where participants study lists of words, retell a previously presented story, or observe an event and later report what they saw (Gathercole, 1998; Gardiner, 2002; McDermott et al., 2009). In contrast, survey measures include self-report questionnaires, rating scales, and interviews to assess the subjective quality of ABM abilities (Gathercole, 1998). Each of these is briefly described below.

| Traumatic Brain Injury | • Deficits in EM and episodic future thinking, possibly related to decreased motivation or apathy in daily living (Piolino et al., 2007; Rasmussen & Bernsten, 2012)  
  • Difficulty imagining a future self (Hassabis et al., 2007)  
  • SM relatively intact  
  • Fewer episodic, event-specific details (Rasmussen & Bernsten, 2012)  
  • Fewer internal details, inversely related to the duration of loss of consciousness (Eskridge et al., 2013; Palombo et al., 2015)  
  • Narratives contain fewer elaborations and causal linkages; Palombo et al., 2015)  
  • Confabulation (Dalla Barba et al., 1997) |
|---|---|
1.3.1 Laboratory-based ABM Measures

Laboratory-based indices of ABM are intended to create conditions where there is control over the encoding and retrieval phases of recall to assess various dimensions of memory (e.g., specificity, accuracy) through the scoring of objectively correct or incorrect responses.

One example of a popular laboratory-based measure of EM is the Remember-Know Task (RK Task; developed by Tulving [1985] and refined by Gardiner [1988]). The RK task has been used to estimate the number and accuracy of memories as well as the source of memory (episodic or semantic). In this task, participants are shown a list of words or pictures (encoding phase) and are later asked to report whether they saw the item from the list (retrieval phase). If the participant reports seeing the word/picture, they are asked to identify the source of the memory by identifying whether their recollection of the item was accompanied by contextual information. Recollections that include contextual information are taken as indicators of EM (e.g., “I know I saw the keys because I remember thinking they looked just like mine”) whereas those that are not, are taken as indicators of SM (e.g., “I just know I saw the keys, but I cannot remember anything about them”; Gardiner, 1988; Tulving, 1985).

Another popular laboratory-based measure of ABM is the Cueing Task (Crovitz & Schiffman, 1974). In the Cueing Task, a single word (e.g., tree) is used to elicit a freely recalled memory from a participant’s life. Once recalled, participants identify when the memory took place (e.g., last summer). Similarly, the Autobiographical Memory Test (Williams & Broadbent, 1986) employs a cue-word paradigm using emotion-based words.
(e.g., happy, sorry). Like the Cueing Task, the Autobiographical Memory Test can be coded for memory specificity, detail, number of prompts required for retrieval, and age of memory (i.e., recent/remote).

More recently, the *Semantic Episodic Autobiographical Memory Task* (SEAM; Robinson et al., 2017) was developed for research purposes to assess the relationship between the retrieval of semantic personality traits and EM in typically developing and autistic youth. Like the Cueing Task, participants were given five personality trait cues (family, school, happy, sad, and general) and asked to generate personality traits that represented themselves. Then, participants were prompted to recall EMs that embodied the trait that was most representative of them as a person. Autobiographical SM ability was scored based on the number of personality traits produced whereas EM was coded for memory type (either specific or general). This task was slightly different than those previously mentioned in that it looked at the seemingly dissociable components of ABM (i.e., SM and EM) across groups using a single task. However, Robinson et al. (2017) found no significant effects for this task and no normative data exist.

Few standardized measures exist for assessing ABM, and even fewer are used with children. The *California Verbal Learning Test-Children’s Version* (CVLT-C; Delis et al., 1994) is a standardized assessment designed to assess verbal memory and learning strategies and is commonly used in research as an index of episodic memory (other comparable measures include the *Children’s Memory Scale* [CMS; Cohen, 1997] and the *Test of Memory and Learning* [TOMAL; Reynolds & Bigler, 1994]). The CVLT-C was normed on 920 children ages 5-16 and can aid in the diagnosis and treatment of verbal...
learning challenges. Test items are presented in the context of a shopping list and respondents are asked to recall (both cued and free recall) or recognize items after varying periods of time. The CLVT-C has demonstrated good psychometric properties including a strong coefficient alpha (.85) and good construct validity demonstrated by factor analysis; however, the test assesses auditory learning (verbal memory) and is therefore restricted in its modality (i.e., visual or verbal presentation, Phelps, 1998). More importantly, standardized assessments like the CVLT-C are arguably better understood as indicators of general semantic memory as opposed to autobiographical episodic memory.

Although laboratory-type measures of ABM like those described above have been useful for testing and refining theories of memory, an important criticism is that they lack ecological validity. Specifically, the tasks are artificial and contrived and, thus, tend to have low self-significance or relevance in that the participant has little to no personal investment in the experience (Gathercole, 1998). Crucially, they also lack content validity (i.e., the extent to which the test’s content covers the construct of interest). Content validity is important because of the complex, multifaceted nature of ABM and the potential for divergence in the functioning of ABM dimensions (e.g., as is seen in different clinical conditions). Finally, the standardized assessments of general learning and memory that are available for children lack ecological, content, and construct validity for the assessment of ABM making it difficult to identify those who may be at risk for poor ABM development.
1.3.2 Survey Measures of ABM

In response to the limitations posed by laboratory-based measures, several surveys to assess ABM have been developed. For survey measures, ABM has been assessed through self-report questionnaires, rating scales, and interviews. In contrast to laboratory-based measures, survey measures of ABM have better ecological validity in that they arguably tap memory for content that has a higher degree of self-relevance as they measure ABM using personally recalled reflections in more naturalistic ways (Gathercole, 1998). Content validity is also improved; survey measures of ABM tend to tap a broader range of ABM abilities that are relevant to psychological and socio-cognitive functioning. A brief description of the most commonly used ABM survey measures is provided below.

**Memory Characteristics Questionnaire.** The *Memory Characteristics Questionnaire* (Johnson et al., 1988) was developed for research to examine the theoretical differences of remembering real versus fictitious (i.e., imagined) events in typically developing undergraduate students (ages unspecified). The 39 items on this self-report measure are organized according to five dimensions of ABM: vividness (i.e., the ability to clearly ‘see’ the memory), sensory reactions (e.g., visual input, sound, smell, touch, taste), contextual coherence (e.g., order of events is comprehensible, story like is complex), thoughts and feelings (e.g., remembering feelings that occurred during memory encoding), and intensity of feelings (e.g., was the memory positive or negative, how intense). Although this measure improves upon laboratory-based tests of ABM with better ecological and content validity, one notable disadvantage is that a description of
the development procedures and assessment of psychometric properties are lacking. Finally, this measure was not developed to assess children and no norms are available to evaluate risk for poor ABM functioning.

*The Autobiographical Interview.* The Autobiographical Interview (Levine et al., 2002) was developed for the purpose of quantifying EM and SM in remote memories of typically developing adults to examine EM in healthy aging. The Autobiographical Interview is a self-report measure in which participants are asked to recall five specific memories from different life periods (early childhood, adolescent-teenage years, early adulthood, middle age, and within the past year). During recollection, general and specific probes are given to increase the detail and information provided by the respondent. Specific probes are given in the form of a structured interview, adapted from the Memory Characteristics Questionnaire (Johnson et al., 1988) directly following the sampling of all five time periods. The details of the respondents’ recollections are identified as internal details (i.e., related to the “main event”, conveying a sense of re-experiencing, grounded in time and space) and external details (i.e., semantic information unrelated to the main event). In this assessment, EM is scored for qualitative richness (i.e., description is detailed, specific, evocative), place (i.e., setting is identified), perception (i.e., the perspective of the teller when reexperiencing), thought/emotion (i.e., inclusion of cognitive or affective details), and time integration (i.e., integration into a larger timeline, such as relating the event to other time periods). Overall, the psychometrics of this assessment revealed that the Autobiographical Interview had adequate internal consistency (alpha coefficients of internal and external detail
composites were > .88). Additionally, interrater reliability was high based on intraclass correlations and scores correlated strongly with other memory assessments demonstrating convergent validity (e.g., Autobiographical Memory Interview; Kopelman et al., 1989). On the other hand, this assessment has not been used for children nor neurodivergent individuals and, again, no norms are available.

The Autobiographical Memories Questionnaire. The Autobiographical Memories Questionnaire (Rubin et al., 2003) is a self-report measure developed for research purposes (specifically to examine the integration of recollection and sensory aspects of memory in typically developing college students). In the Autobiographical Memories Questionnaire, participants are asked to recall a memory associated with the cue word and answer questions about the quality of that memory. The questionnaire includes items intended to tap 20 dimensions (in parentheses) of ABM that are organized under three, more general constructs: 1) recollection and belief in the accuracy of the memory (reliving, back in time, remember/know, real/imagine, ability to be persuaded that memory is wrong or accurate, ability to report), 2) component processes (see, setting, spatial, hear, talk, in words, story, emotions), and 3) reported properties of events or memories (importance, rehearsal, once/many, merged/extended, age of memory; Rubin et al., 2003). Rubin et al. (2003) reported that internal consistency (Cronbach’s alpha) for this measure was high which is taken as an indicator of homogeneity of content. As was the case with its forbearers, this measure was developed for adults and no normative data are available.
The Memory Experiences Questionnaire. The Memory Experiences Questionnaire (MEQ; Sutin & Robins, 2007) is a self-report measure that is administered following an elicitation of a personal narrative in which participants are asked to share a personally meaningful memory that is important and central to their identity (called a ‘self-defining memory’). The MEQ is intended to evaluate 10 phenomenological dimensions of ABM: vividness, coherence, accessibility, time perspective, sensory detail, emotional intensity, visual perspective, sharing, distancing, and valence. Sutin and Robins (2007) identified these domains by classifying dimensions of autobiographical memories following a review of the theoretical and empirical literature. The MEQ includes 104 statements about the respondent’s memory across these domains. Participants rate their level of agreement with each statement (e.g., ‘My memory for this event is clear’) on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). The test developers collected data from a sample of 941 typically developing undergraduate students and reported good internal consistency, construct validity, and content validity (Sutin & Robins, 2007). On the other hand, the measure lacks content validity insofar as respondents are asked to only include self-defining memories as opposed to the flexible (comparatively mundane) memory that is routine in daily life. Although this measure demonstrated adequate psychometrics on typically developing individuals for the purpose of research, its clinical application was not assessed. Again, no norms are available to assess the risk for ABM challenges.

The Survey of Autobiographical Memory. The Survey of Autobiographical Memory (SAM; Palombo et al., 2012) is a self-report measure designed to assess adults’
(18+ years) autobiographical EM and SM as well as spatial information and future thinking abilities. For this measure, individuals rate their ABM abilities in response to a series of statements (e.g., “specific events are difficult for me to recall”). Statements are designed to evaluate specific dimensions of ABM including spatial awareness, awareness of the event, scene construction, people present, and social knowledge. Subscale items demonstrated good internal consistency with EM and SM showing the greatest amount of shared variance (Palombo et al., 2012), and construct validity was supported by multiple correspondence analysis (a factor analytic technique). Again, this measure was developed for adults and no normative data are available.

In summary, laboratory-based measures of ABM have contributed to our understanding of the nature and development of ABM, but they are sorely lacking in ecological, content, and construct validity. Meanwhile, several survey measures of ABM have been developed to capture the content and complexity of ABM more adequately under conditions that better approximate real-life applications of memory. They also have promising construct validity insofar as respondents are able to report accurately on the quality of their EM and SM. Nevertheless, these measures have been designed for typically developing adults for research purposes. Crucially, no survey measures exist to assess children’s ABM, thus limiting their clinical application. Furthermore, apart from the CVLT-C (which is not well suited for clinical use), there are no normed, standardized measures for children at risk for poor ABM development.
1.4 Caregiver Report of Child Psychosocial Functioning

One possibility for addressing the lack of a broadband, standardized, norm-referenced ABM assessment for children is to recruit caregivers as informants of children’s memory abilities (i.e., caregiver report). Historically, many professionals had assumed that caregiver reports were riddled with error due to bias (resulting in an over- or underestimation of skills or faulty interpretation of test content, see Schulz et al., 2013); however, decades of empirical scrutiny using caregivers as informants of children’s knowledge and abilities does not support this conclusion (e.g., Dale et al., 1989). Caregiver reports are useful for the valid assessment of children’s cognitive abilities, including receptive and expressive language (Brown, Bzoch, & League, 2021), social cognition (Hutchins & Prelock, 2016), pragmatic language (Gilliam & Miller, 2006), and communicative development (Fenson et al., 1993). These assessments are supported by sound reasoning including: caregivers have opportunities to observe the social interactions of their child across a wide range of contexts; parents are likely experts in their child’s knowledge beyond what is accessible by an examiner; and, caregiver-informant surveys are cost-effective and easily distributed (Brown et al., 2022). Of special note, parents have been found to be particularly knowledgeable when reporting on their children’s ABM using a semi-structured interview format (Hutchins, in preparation) suggesting that they can provide rich and accurate information regarding their children’s ABM abilities. Indeed, a valid and reliable caregiver report measure of children’s ABM has great potential for the assessment and treatment of ABM deficits across clinical populations.
1.5 Statement of the Problem

ABM is essential for the development of higher-order human-specific cognitive functions as well as successful social communication, all of which have clear clinical implications. The lack of measures to validly assess ABM abilities in children represents a remarkable gap in the literature and addressing this gap is important for the identification of those at risk for poor ABM development. The development of a measure that employs caregivers to report on their children’s ABM development would presumably provide an indirect yet reliable way to evaluate a child’s ABM strengths and challenges.

Completing a pilot study provides the opportunity to determine the measure’s feasibility, elucidate practical problems, and find solutions in preparation of a major study that seeks to obtain high-quality standardized data (Peat et al., 2002). Additionally, a pilot study provides the opportunity to identify faults in research protocol, complicated or ineffective items, and the potential success of the study as a whole (van Teijlingen & Hundley, 2002). The goals of the present study were to 1) develop a content- and construct-valid measure of ABM and 2) conduct a pilot study with the goal of refining the measure for future large-scale validation efforts. The first aim of this study, to develop a content-valid caregiver report measure of child ABM is described first. This is followed by a description of the participants, methods, and results of the pilot study.
CHAPTER 2: METHODOLOGY

2.1 Development of the Autobiographical Memory Inventory

2.1.1 Demographic Questionnaire

A demographic questionnaire (Appendix A) was developed to be administered prior to completion of the survey. This questionnaire solicited relevant demographic information including but not limited to, the child’s age, biological sex, grade level, and developmental status, and caregiver’s age, biological sex, highest level of education, and household income. The demographic questionnaire included a statement that the information provided was anonymous, meaning that the information collected could not be traced back to respondents in any way.

2.1.2 Survey Development

One of the first stages of survey development involves the establishment of content validity (Anastasi & Urbina, 1997; McCauley, 2001). Content validity involves ensuring that the “measure’s content is consistent with the construct or constructs it is being used to measure” (McCauley, 2001, p. 56). This, in turn, requires careful consideration of the breadth and scope of the intended construct, thus addressing concerns about content coverage and content relevance, respectively (McCauley, 2001).

In this study, content validity began with establishing the dimensions of ABM to be assessed. This was determined by a comprehensive review of the literature (both theoretical and empirical) concerned with the nature and development of ABM in typically developing and clinical populations. A large item pool was developed so that the survey was a face-valid, broadband assessment of children’s ABM. Items were culled
from existing assessments of ABM, including those developed for research purposes (e.g., Lind & Bowler, 2010). The method for establishing content involved a team that conducted and analyzed the literature for the identification of various ABM dimensions. This collaborative process involved an expert in ABM and two graduate research assistants studying ABM. The following characteristics were identified in the literature as relevant to the construct of ABM and corresponding items were included in the pilot study survey (Appendix B presents the developed items and their intended construct). This process was designed to ensure that items adequately covered the domain of functions relevant to the ABM system.

- **Vividness.** Vividness refers to the ability to clearly and intensely ‘see’ the memory (Sutin, 2006). Reisberg et al. (1988) found a strong correlation between emotional arousal and reported memory vividness. The vividness of memories is strongly correlated with both emotion and detail; however, caution should be taken when assuming that a vivid memory indicates accuracy (which is a different dimension of ABM).

- **Accuracy.** Accuracy refers to the correctness of the recollection. Individuals with strong ABM demonstrate more accurate recall than those with ABM deficits (Hutchins et al., 2022). However, even in typical development, ABM can include inaccurate details but be accurate in reflecting what probably happened in past events based on what is expected (Barclay & Wellman, 1986). For example, one may not be able to recall the name of the server at the restaurant but can still remember that the server came to the table, took their order, and brought food.
Although the precise details of a memory may be mentally revised or omitted during recall, the factuality of the event remains important to its accuracy (Barclay, 1988).

- **Detail.** ABM characteristically includes sensory (e.g., sight, sound), physiological (e.g., cold, hungry), cognitive (e.g., thoughts), or affective (e.g., feelings) detail. These details reveal the teller’s perspective and add potentially engaging information to a personal narrative. Sensory details are considered crucial for rich autobiographical recall (Willander et al., 2015).

- **Accessibility.** Accessibility refers to how easily or spontaneously a memory is recalled (Sutin & Robins, 2007). Operationally, this could be observed in the degree of prompting required to recall a memory. An individual with low spontaneity may require several prompts to recall specific memories (e.g., Goddard et al., 2014).

- **Emotional Valence.** Emotional valence refers to whether the content of a memory is positive, negative, or neutral as well as the intensity of the emotional response during recall. Emotional intensity is often diminished at the point of recall and tends to decrease over time (Sutin & Robins, 2007; Talarico & Rubin, 2007) and children learn early on that their emotional reactions are unique to them (Nelson & Fivush, 2004).

- **Perspective.** Perspective refers to how the individual internally orients or views the memory, commonly referred to as field- or observer-perspective. Field perspective refers to memories that are re-experienced in the first person, whereas
observer perspective refers to memories re-experienced as an observer, like watching a play. As previously noted, field perspective (i.e., first-person perspective) is typical of ABM recollection. Memories among persons with various clinical conditions often show the atypical presentation of the ‘observer’ (i.e., third-person) perspective.

- **Recency/Remoteness.** ABM can perform variably depending on the recency or remoteness of the memory. The recency or remoteness of the memory refers to the passing of time from when the memory was first encoded. Over time, the autonoetic consciousness of memories seems to shift to rely more on objective “know” information and adopt an “observer” perspective (Piolino et al., 2009). The recency of the event may also contribute to temporal distance. Temporal distance refers to the ability to place the memory in subjective time (e.g., the far past, not long ago). It can also include being able to identify the day, month, or year that the event took place (Sutin & Robins, 2007).

- **Specificity.** Specificity refers to the hierarchical level (i.e., lifetime period, general event, event-specific) from which the memory is recalled. EMs are considered the most specific of recollections, as they include information about the time and place as well as increased imagery detail and vividness. In typical development, ABM is thought to be recruited from the broad to more specific levels of the self-memory system model based on the motivation of the teller or the cognitive resources available (Conway & Pleydell-Pearce, 2000; Sutin & Robins, 2007; Valentino et al., 2011).
• **Narrative Coherence.** ABM coherence is usually operationalized by examining narrative coherence (Vanaken et al., 2020). Narrative coherence refers to the ability to recall a memory in a way that makes sense to an unfamiliar listener (Reese et al., 2011). A coherent narrative is one that orients the listener, grounds the event in space and time, portrays a logical order of events, and includes evaluations that convey the importance of the event to the speaker (Reese et al., 2011). Indeed, language plays a fundamental role in how we organize and share the content of ABM (Nelson & Fivush, 2004). Although ABM is not always linguistically based, the use of narratives shapes the individual and shared understanding of our personal past (Fivush, 2011).

• **Sharing.** Sharing refers to the extent that personal memories are shared with others. Sharing memories with others serves an important function in the development of one’s identity and social relationships (McLean, 2005; Sutin, 2006). Memories can be shared for reasons like self-explanation, entertainment, validation, intimacy, or emotional regulation, to name a few (McLean, 2005). As such, the pragmatic functions associated with the sharing of memories is relevant to the content domain of ABM.

• **Social/Nonsocial.** Here, “social” refers to memory for information with a social dimension. For example, remembering faces, names, or details about people with whom relationships are established. In contrast, non-social refers to information unrelated to people or the self, but still relevant to EM (e.g., “I remember we parked on the top floor of the parking garage”).
• **Agency.** Agency refers to the ability to make choices that influence and affect one’s life (Westby, 2021). This develops in children as they become aware of the effect their decisions have on the world around them. Personal narratives have been used to explore why and how we use themes of agency, revealing that a key motivation for agency is to form positive connections with others (i.e., communion) by expressing our personal achievements or empowering experiences (e.g., McAdams, 2013). Although themes of agency in personal narratives tend to increase with age, children as young as 4 years old have exhibited themes of agency and communion within their narratives (Ely et al., 1998). Further, this finding in children seems to be linked to sociocultural experiences and may have implications for greater well-being and executive functioning skills through daily experiences (Westby, 2021). Pragmatically, the ability to share experiences or form connections with others underlies an ability to develop ABM.

• **Self-Knowledge.** The knowledge one has about oneself (e.g., one’s likes, dislikes, personal history, personality traits or dispositions, or other aspects of identity) is known as self-knowledge, and it is critical to ABM. As exemplified by the self-memory system model (Conway & Pleydell-Pearce, 2000), self-concept and self-knowledge are transactionally related; therefore, an understanding of oneself in the past (e.g., a feeling of being there and being able to evaluate the past experience) has clear implications for how one takes meaning from an experience (Tanweer et al., 2010). Developmentally, the formation of identity is closely tied
to our self-concept, which is thought to provide a referent for organizing autobiographical memories (Lind, 2010). Without a sense of self, it would be impossible to identify ourselves in the past and code memories as personally relevant (Lind, 2010). Self-knowledge is thus important to the content validity of an ABM measure.

- **Spatial Navigation.** Spatial navigation, or the ability to find one’s way around (Burgess et al., 2002), is thought to rely on the same neural network underlying other high-level cognitive faculties including EM and theory of mind (Lind et al., 2014). Wayfinding can be supported externally (e.g., with maps) or internally (e.g., mental representations of our environment). Internal navigation is often referred to as “memory-guided” navigation and can be employed using strategies like “route-based” or “survey-based” navigation (Lind et al., 2014). Route-based navigation relies on an egocentric perspective of previously learned, inflexible, landmark-based routes. In contrast, survey-based navigation relies on an allocentric perspective and cognitive maps to navigate (Lind et al., 2014). As previously discussed, the hippocampus appears to be central to this process and interfaces with higher order executive functioning to support memory encoding and retrieval. Thus, it is proper that spatial navigation be included in a content-valid measure of ABM.

- **Task Support.** Task support refers to the support required to facilitate memory recall. A variety of different strategies can be used to provide task support such as showing objects or pictures from the event, utilizing prompting or other discourse
strategies, or returning to the geographic location of the memory. When more information about an event is made available, specific populations (e.g., autism) have experienced improvements in recall (Bowler et al., 2015; Hutchins et al., 2022). This finding supports the idea that task support is important for successful recollection and should thus be included in a measure of ABM intended for clinical purposes.

The aspects of ABM described above are well-established components of ABM within the literature. A primary goal of the proposed study was to rationally identify these constructs and develop associated items for caregivers to report on these aspects of their child’s ABM.

2.1.3 Item Structure and Response Arrangement

Survey items took the form of a statement (e.g., ‘My child can spontaneously share memories with ease’) and were accompanied by a 20-point response continuum (see Appendix B) anchored by ‘definitely not’ and ‘definitely’ with a center point of ‘undecided’. This response arrangement allowed participants to indicate more sensitive degrees of certainty between anchors, thus increasing the sensitivity of responses (Hutchins et al., 2012). Additionally, this arrangement is identical to other established caregiver-informant measures reporting on their child’s knowledge and skills (e.g., Hutchins & Prelock, 2016). Retaining the same response continuum in the proposed measure will provide the opportunity to directly compare responses across measures and assessment tools in future studies and will help aid in the interpretation of future results. To enhance clarity of the response arrangements, participants were provided examples of
correct and incorrect response types and were asked to respond to a series of practice items.

Survey items were presented as affirmative statements (e.g., ‘My child can tell me what happened at school’) or were reverse scored (e.g., ‘My child’s memories seem disorganized’). A mix of positively and reverse-scored items was intended to minimize the potential for response sets in which the participant adopts a consistent response to all items (e.g., always indicating ‘definitely’, regardless of the test item’s content).

In alignment with a pilot study design, an extensive number of items were included with the anticipation that items would be eliminated or modified based on the pilot results. Further, different iterations of the same question were included to determine the best wording to gain information about a particular ABM domain. Participants for the pilot study were informed of the purpose of the study (and the preliminary nature of the measure) to explain inherent redundancies across survey items. Participants were also invited to offer (optional) comments about the clarity and appropriateness of the items for tapping the intended constructs by using ‘optional comment’ spaces following each item.

### 2.2 Participants

Eligible participants included caregivers of children ages 5-18. This age range was chosen based on the developmental course of ABM. From the end of the childhood amnesia period, ABM rapidly develops through the preschool years and matures during adolescence, making this age range crucial to ABM development. In the present study, participants were 24 fluent English-speaking primary caregivers of children (9 male, 15 female) between the ages of 6 years, 8 months and 18 years, 11 months ($M = 11;11$, $SD =$
Caregivers were 22 females and 2 males (ages 27-57 years; $M = 45.5$, $SD = 8.1$) with education levels that ranged from 12 (high-school graduate) to 20 (post-graduate degree) completed years of formal education. Gross household incomes ranged from $72,000 to $1 million/year ($M = $234,000; $SD = $208,571) indicating that this sample represented a relatively affluent population.

In terms of developmental status, children with and without formal or suspected diagnoses were sampled. According to caregiver report, children presented with various conditions including developmental delay, intellectual disability, attention deficit hyperactivity disorder (ADHD), learning disorder, clinical levels of anxiety, speech/language impairment, visual impairment, and autism spectrum disorder. Two caregivers noted “other” diagnoses but did not identify the diagnosis. Further specifications, such as level of disability (i.e., mild/moderate/severe) or level of support, were not collected within the demographic survey. These demographic data for each child (age, biological sex, developmental status) are presented in Table 2.

**Table 2: Child Characteristics**

<table>
<thead>
<tr>
<th>Child Age (years; months)</th>
<th>Sex</th>
<th>Received or Suspected Diagnoses</th>
</tr>
</thead>
<tbody>
<tr>
<td>6;8</td>
<td>F</td>
<td>ADHD</td>
</tr>
<tr>
<td>6;9</td>
<td>M</td>
<td>None</td>
</tr>
<tr>
<td>6;9</td>
<td>M</td>
<td>ADHD, Speech/Language Impairment</td>
</tr>
<tr>
<td>6;10</td>
<td>F</td>
<td>ADHD</td>
</tr>
<tr>
<td>7;3</td>
<td>F</td>
<td>None</td>
</tr>
<tr>
<td>7;7</td>
<td>F</td>
<td>Learning Disability</td>
</tr>
<tr>
<td>7;9</td>
<td>M</td>
<td>None</td>
</tr>
<tr>
<td>8;3</td>
<td>M</td>
<td>None</td>
</tr>
<tr>
<td>9;4</td>
<td>M</td>
<td>None</td>
</tr>
<tr>
<td>Age</td>
<td>Gender</td>
<td>Diagnosis(s)</td>
</tr>
<tr>
<td>-----</td>
<td>--------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>9;8</td>
<td>F</td>
<td>None</td>
</tr>
<tr>
<td>10:0</td>
<td>F</td>
<td>None</td>
</tr>
<tr>
<td>10:4</td>
<td>F</td>
<td>Anxiety, Speech/Language Impairment</td>
</tr>
<tr>
<td>12:3</td>
<td>F</td>
<td>ID, ADHD, Learning Disability, Speech/Language Impairment</td>
</tr>
<tr>
<td>13:1</td>
<td>F</td>
<td>Visual Impairment</td>
</tr>
<tr>
<td>13:6</td>
<td>F</td>
<td>Anxiety</td>
</tr>
<tr>
<td>13:10</td>
<td>M</td>
<td>Developmental Delay, ADHD, Anxiety, Speech/Language Impairment</td>
</tr>
<tr>
<td>14:0</td>
<td>F</td>
<td>None</td>
</tr>
<tr>
<td>15:1</td>
<td>F</td>
<td>Anxiety, Other</td>
</tr>
<tr>
<td>16:3</td>
<td>F</td>
<td>Anxiety</td>
</tr>
<tr>
<td>16:6</td>
<td>F</td>
<td>None</td>
</tr>
<tr>
<td>16:10</td>
<td>M</td>
<td>Visual Impairment</td>
</tr>
<tr>
<td>17:1</td>
<td>M</td>
<td>ADHD, Anxiety, Other</td>
</tr>
<tr>
<td>17:3</td>
<td>M</td>
<td>None</td>
</tr>
<tr>
<td>18:11</td>
<td>F</td>
<td>Speech/Language Impairment</td>
</tr>
</tbody>
</table>

### 2.3 Procedure

The measure was administered for pilot testing using an anonymous, secured online platform (Qualtrics). Participants were recruited through online platforms (e.g., Front Porch Forum, Facebook), the Center of Disability and Community Inclusion at the University of Vermont newsletter, Vermont Family Network, a listserv of pediatric providers in Chittenden County, or through informal contact (e.g., other researchers, friends, peers). Participants were recruited via an Institutional Review Board (IRB) approved flyer posted to these forums. Participants were permitted to respond to the pilot survey via a computer or tablet, but not phone. The standard screen on a smartphone restricts the participant from accurately indicating a response on the response continuum.
For this reason, respondents who indicated they were accessing the survey via phone were asked to return to the survey at another time using either a computer or tablet.

Participants could complete the survey more than once in the case of multiple eligible children (ages 5-18). For each survey completed, participants had the option of providing their email address to enter a raffle to win a $100.00 prize. All research procedures were governed by and in accordance with the research policies set forth by the University of Vermont, IRB for the protection of human subjects.

2.4 Data Analytic Plan

Data were collected from a small sample to gain insights on potential improvements to the survey and deployment procedures. In light of the small sample, statistical analyses were limited. Preliminary (small n) comparisons were conducted using correlational analyses for ABMI composite score and age. It was expected that ABMI scores would correlate with child age. One between-group comparison (children with and without DD) was also conducted with the expectation that scores for the non-DD group would be higher than scores for the DD group. Due to the small sample size, statistical analyses were underpowered. Consequently, although significance levels are reported, scrutiny of means and effects size were most important for informing our conclusions. Finally, qualitative data were reviewed to inform survey modifications.
CHAPTER 3: RESULTS

The present results are based on a total of 24 survey responses from caregivers who indicated that they agreed or strongly agreed with the statement that they were ‘knowledgeable about reporting on their child’s memory’. These 24 responses were taken from a larger set of 45 responses that were initially obtained from the pilot survey. Of the total 45 responses, one was excluded due to age-exclusion criteria (i.e., child under 5) and one was excluded based on the caregiver’s low confidence in reporting on their child’s memory (i.e., indicating ‘strongly disagree’ to feeling knowledgeable on reporting). Data for an additional 19 cases were omitted due to suspicion of fraudulent and/or careless reporting (described more fully below).

3.1 Descriptive, Inferential, and Qualitative Analyses

3.1.1 Descriptive Analyses

ABMI composite (i.e., mean) scores ranged from 11.14 to 18.85 ($M = 15.55$, $SD = 2.12$; possible range = 0 - 20). Table 3 presents child characteristics and the ABMI composite score for each child.

Table 3. Child Characteristics and Associated Composite Score

<table>
<thead>
<tr>
<th>Child Age (years; months)</th>
<th>Sex</th>
<th>Received or Suspected Diagnoses</th>
<th>Assigned Group</th>
<th>ABMI Composite Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>6;8</td>
<td>F</td>
<td>ADHD</td>
<td>DD</td>
<td>14.32</td>
</tr>
<tr>
<td>6;9</td>
<td>M</td>
<td>None</td>
<td>Non-DD</td>
<td>16.9</td>
</tr>
<tr>
<td>6;9</td>
<td>M</td>
<td>ADHD, Speech/Language Impairment</td>
<td>DD</td>
<td>15.6</td>
</tr>
<tr>
<td>6;10</td>
<td>F</td>
<td>ADHD</td>
<td>DD</td>
<td>14.82</td>
</tr>
<tr>
<td>Age</td>
<td>Sex</td>
<td>Diagnosis</td>
<td>Status</td>
<td>IQ</td>
</tr>
<tr>
<td>------</td>
<td>-----</td>
<td>-----------------------------------------------</td>
<td>-----------</td>
<td>-----</td>
</tr>
<tr>
<td>7;3</td>
<td>F</td>
<td>None</td>
<td>Non-DD</td>
<td>16.5</td>
</tr>
<tr>
<td>7;7</td>
<td>F</td>
<td>Learning Disability</td>
<td>Non-DD</td>
<td>11.14</td>
</tr>
<tr>
<td>7;9</td>
<td>M</td>
<td>None</td>
<td>Non-DD</td>
<td>17.55</td>
</tr>
<tr>
<td>8;3</td>
<td>M</td>
<td>None</td>
<td>Non-DD</td>
<td>14.59</td>
</tr>
<tr>
<td>9;4</td>
<td>M</td>
<td>None</td>
<td>Non-DD</td>
<td>15.77</td>
</tr>
<tr>
<td>9;8</td>
<td>F</td>
<td>None</td>
<td>Non-DD</td>
<td>17.25</td>
</tr>
<tr>
<td>10;0</td>
<td>F</td>
<td>None</td>
<td>Non-DD</td>
<td>16.77</td>
</tr>
<tr>
<td>10;4</td>
<td>F</td>
<td>Anxiety, Speech/Language Impairment</td>
<td>Non-DD</td>
<td>13.59</td>
</tr>
<tr>
<td>12;3</td>
<td>F</td>
<td>ID, ADHD, Learning Disability, Speech/Language Impairment</td>
<td>DD</td>
<td>11.58</td>
</tr>
<tr>
<td>13;1</td>
<td>F</td>
<td>Visual Impairment</td>
<td>Non-DD</td>
<td>16.12</td>
</tr>
<tr>
<td>13;6</td>
<td>F</td>
<td>Anxiety</td>
<td>Non-DD</td>
<td>14.95</td>
</tr>
<tr>
<td>13;10</td>
<td>M</td>
<td>Developmental Delay, ADHD, Anxiety, Speech/Language Impairment, Autism</td>
<td>DD</td>
<td>12.49</td>
</tr>
<tr>
<td>14;0</td>
<td>F</td>
<td>None</td>
<td>Non-DD</td>
<td>17.31</td>
</tr>
<tr>
<td>15;1</td>
<td>F</td>
<td>Anxiety, Other</td>
<td>Non-DD</td>
<td>18.85</td>
</tr>
<tr>
<td>16;3</td>
<td>F</td>
<td>Anxiety</td>
<td>Non-DD</td>
<td>17.06</td>
</tr>
<tr>
<td>16;6</td>
<td>F</td>
<td>None</td>
<td>Non-DD</td>
<td>17.7</td>
</tr>
<tr>
<td>16;10</td>
<td>M</td>
<td>Visual Impairment</td>
<td>Non-DD</td>
<td>17.57</td>
</tr>
<tr>
<td>17;1</td>
<td>M</td>
<td>ADHD, Anxiety, Other</td>
<td>DD</td>
<td>12.04</td>
</tr>
<tr>
<td>17;3</td>
<td>M</td>
<td>None</td>
<td>Non-DD</td>
<td>17.26</td>
</tr>
<tr>
<td>18;11</td>
<td>F</td>
<td>Speech/Language Impairment</td>
<td>Non-DD</td>
<td>15.39</td>
</tr>
</tbody>
</table>
3.1.2. Inferential Analyses

The pilot data allowed for two inferential analyses to probe for signal in the data. It is important to note that inferential statistics were completed prior to item elimination, discussed in more detail below. We reasoned that a construct valid measure of child ABMI should demonstrate 1) a positive relationship between ABMI scores and age and 2) a difference between groups on the basis of child developmental status.

For both analyses, the ABMI performed as expected: first, composite ABMI scores positively correlated with child age (conducted on the non-DD group only), albeit the effect was not significant ($r = .36, p = .13$). A calculation of $r^2$ (effect size) indicated that 13% of the variance in ABMI scores was explained by the variance in age which is considered a small to moderate effect size.

Two groups were formed to contrast ABMI scores for children with a developmental disability (DD group; $n = 6$) and without a developmental disability (non-DD group; $n = 18$). The literature has shown differences in ABM profiles based on the presence of developmental disability (among other conditions) whereas there is no such indication for risk for those with diagnoses such as speech/language impairment, anxiety, and learning disability (but for rare exception see: McNamara & Wong, 2003). As such, diagnoses of autism, ADHD, developmental delay, and intellectual disability were organized into the DD group while all others were placed in the non-DD group. When assigning groups, it was determined that the term “visual impairment” was unclear and that caregivers may have interpreted this as corrected visual impairment (e.g., wears glasses), as opposed to uncorrected visual impairment or blindness. For this reason, these
participants were assigned to the non-DD group. No children with hearing impairment, traumatic brain injury, or trauma history were included in this sample. A comparison based on the presence of a DD was explored with the expectation that a construct-valid indicator of child ABM would distinguish these groups. Data were submitted to an independent samples t-test. As expected, ABMI composite scores were higher for the non-DD group ($M = 16.24; SD = 1.81$) compared to the DD group ($M = 13.48; SD = 1.65$), $t = 3.30(22), p < .01$. Partial Eta Squared ($\eta^2 = .04$) revealed that this was a small to moderate effect size. Figure 4 compares the composite scores between groups.

**Figure 4: Comparison of Composite Scores Between Groups**
3.1.3 Qualitative Analyses

Appendix C summarizes the qualitative feedback provided by participants. Participants’ comments captured the need for adjustments of item construction or elimination of confusing or unclear items. For example, item 95 states “My child is as good as other people their age when it comes to locating themselves on a map”. For this item, multiple caregivers expressed that their children were not exposed to nor frequently used maps, suggesting that this item may not be particularly effective for targeting the intended construct.

In another example, item 43 states “When remembering a past experience, people usually view it from their own perspective: as if seeing it again through their own eyes. Other times, people see themselves as objects in the scene. My child sees memories from their own perspective as opposed to seeing themselves as objects in the scene.” One participant stated that they were not sure of the interpretation of the item whereas another explained that it might be highly influenced by what motivates the child. It was expected that this item may have been challenging for parents to report on because it asks the caregiver to infer the psychological orientation of their child. The concept is also challenging to describe which is expected to lead to measurement error. In a related vein, item 24, “My child feels they are a valuable part of a wider community”, was intended to target self-concept but the relevance of that item for the goals of assessing memory may have confused respondents (e.g., one caregiver commented “I hope so!” indicating that this item may not have addressed the construct as effectively as other self-concept items).
The qualitative data obtained by participant comments was highly influential in item elimination or modification.

3.2 Survey Item Adjustments

As previously mentioned, several iterations of similar questions were included to determine the best way to construct an item to assess a particular ABM dimension. As such, it was assumed that many items would be eliminated or modified to consolidate the item pool to best-performing items for future studies. Decisions to eliminate or modify items were supported by qualitative data or poor face validity as determined by the research team. The research team eliminated items that were, in their opinion, ineffective for targeting their intended construct or those seemingly misinterpreted by participants. Changes were made to wording on certain items to increase clarity and decrease error as guided by participant’s comments (see Appendix C for notations on item editing). This process resulted in the elimination of 12 items and modification of 3 items (see Appendix B). Further adjustments to items were postponed until appropriately-powered statistics may confirm item validity and response trends.

Following these adjustments, survey items were reexamined for their content coverage. It was determined that the domain of “self-concept” was lacking appropriate representation as several self-concept items were eliminated; therefore, additional items were developed to target self-concept. The following items were developed for future versions of the survey based on existing measures of self-concept:

- My child can tell people about the things they like or that interest them.
• My child is as good as others their age when it comes to knowing who they are (e.g., knowing their own likes/dislikes; motivations/drives).

• As children grow, they gradually form a self-concept and personal identity. My child is as developed as others their age when it comes to forming their identity.

• My child is as good as others their age when it comes to recalling personal facts about themselves.

• My child is as good as others their age when it comes to recalling important personal details, like their home address or home phone number.

• When reflecting on past experiences, my child focuses on specific facts (e.g., the name of the restaurant, the place we stayed) moreso than the things they did.

   It is inevitable that survey adjustments will continue as more data become available; however, this study took the first step in eliminating questionable and redundant items to improve the survey based on the available data.
CHAPTER 4: DISCUSSION

The purposes of this study were to develop and pilot a broadband caregiver-informant measure of children’s ABM that has promise for use in a clinical setting. No prior research has examined the utility of such a tool, yet caregivers are known to possess expert knowledge of their child’s abilities across situational contexts and developmental domains. Further, caregivers can provide accurate and valid information that has been confirmed through examinations of convergent validity (e.g., MacArthur-Bates Communicative Development Inventories; Fenson et al., 2006). It follows that caregivers may be accurate informants of their children’s ABM: a skill that is used across situations and problem-solving contexts and is critical to healthy social cognitive development. Consistent with this interpretation, a comprehensive qualitative study (Brien & Hutchins, in preparation) of ABM in parents of children with autism supports the validity of caregiver report in children with developmental disabilities. This ongoing research is revealing that caregivers can richly describe their child’s memory strengths and challenges, and their impressions of the quality of their children’s memory closely aligns with the empirical literature on ABM in autism.

Development of the ABMI required an extensive literature review to inform item content. Items were also adapted from previously developed assessments and organized into theoretically-related subscales. Factor analysis of survey items could not be performed due to the small sample size. Thus, it is not yet determined whether, or to what degree, our rationally derived items will conform to the dimensionality of ABM that
appears in the literature (and indeed, some other measures of ABM; e.g., spatial navigation, semantic vs. episodic recall, personal narrative development).

The small-group comparisons made using available data indicated expected performance. As noted in this paper’s introduction, ABM abilities increase in the preschool, school-age, and adolescent years and ABM performance decrements have been observed in several clinical conditions. The present results are consistent with this literature: ABMI scores correlated with age and distinguished DD and non-DD groups. Moreover, effects were in the ‘small to moderate’ range suggesting preliminary evidence for the convergent construct validity of the ABMI.

An important purpose of a pilot study is the ability to gain advance warning about methodological pitfalls and to make necessary modifications to the measure prior to larger-scale studies (Connelly, 2008; van Teijling & Hundley, 2001). The current pilot revealed several necessary modifications not only to ABMI survey content (i.e., specific items and wording) but also the demographic questionnaire. In the present study, participants were not asked to provide the severity or level of support regarding the diagnostic label. Further, caregivers were not requested to specify "other" diagnoses. This information would have aided in the interpretation of results for populations with heterogenic phenotypes such as intellectual disability and autism. As previously discussed, the term “visual impairment” may have been misinterpreted by caregivers, leading to the misinformed selection of the diagnosis. As such, the following recommendations may improve the data collected by the demographic questionnaire: 1) secondary to a selection of "intellectual disability", participants can indicate “level of
disability” (i.e., mild/moderate/severe/profound), 2) secondary to a selection of “autism”, participants can indicate “level of support” (i.e., requiring support, requiring substantial support, requiring very substantial support), 3) participants will be asked to specify a designation of “other” diagnosis, and 4) the term “visual impairment” should be changed to “uncorrected visual impairment (i.e., blindness)” to enhance clarity.

4.1 Limitations and Future Directions

There is a clear limitation in the diversity of the present sample. As a group, participants tended to over-represent an affluent population and had relatively high levels of education (all participants obtained at least a high school diploma). Further, the sample was not diverse in clinical presentation. Several diagnostic groups known to have deficits in ABM (e.g., TBI, trauma) were not included in the present study. Further efforts could be made to target specialty organizations that include individuals with these diagnoses, as this was not pursued in the current study. Efforts to recruit a larger, and more diverse sample are necessary to test item content and identify further changes to the survey: immediate efforts should focus on the elimination of items to create a version of the ABMI that is not only maximally sensitive for discerning different ABMI profiles but also slimmer and that can be administered in a much shorter amount of time.

The present survey is intentionally long; however, it is worth consideration that surveys of great lengths inherently require more sustained effort and often result in fatigue effects from participants (Meade & Craig, 2012). Appropriately powered statistical analyses should foremost guide the elimination of specific items to improve the caregiver’s ability to provide high-quality responses to every item. Upon recruitment of a
larger sample, item performance across groups can be evaluated, the measure can be shortened, and the dimensionality of the scale can be explored via factor analysis and measures of internal consistency (Costello & Osborne, 2005; McCauley, 2001).

A primary concern of this study is the need to address the potential of fraudulent responding. As described above, this survey was administered online, and participants were entirely anonymous. During the data cleaning process, it became clear that 19 responses were not valid and required omission. The problematic cases were detected by carefully inspecting responses: sometimes letters or text were entered where a numerical response was called for, sometimes special characters appeared in open-text responses, and sometimes every diagnosis listed in the demographic questionnaire was endorsed. Consultation with Qualtrics was inconclusive but two possibilities emerged: 1) these responses were the result of a malicious computer algorithm (i.e., a ‘bot’) or 2) responses were entered by one (or a few) people who entered the system multiple times (presumably in an effort to increase chances for winning the participation lottery prize).

Fraudulent responses can have significant psychometric implications that attenuate correlations, reduce internal consistency and reliability, and impact factor structure (Meade & Craig, 2012). As such, all responses were scrutinized during the data cleaning process to ensure that the sample included only true respondents. Immediate steps were taken upon the discovery of these problematic responses. To address the first potential threat (i.e., a computer algorithm), we added a required “I’m not a robot” check box to the beginning of the survey to prevent potential ‘bot’ entries.
With regard to the second potential threat, a lottery-style prize may have negatively affected response quality or encouraged fraudulent responding. A study by Zhang, Lonn, and Teasley (2017), concluded that respondents who participated in a survey with the primary motivation to win a gift card provided responses of lower quality than those who participated with the primary motivation to help the community. Although the motivations of the respondents in the present study are unclear, the presence of a monetary prize in conjunction with the protection of anonymity may have been contributing factors. It is also worthwhile to note that a monetary prize has been found to increase the responding of people from lower socioeconomic strata (Zhang et al., 2017): an important consideration since this population was underrepresented in the present study.

Data cleaning is an inherent part of obtaining a high-quality data set; however, the presence of potentially fraudulent responses also raises awareness of less detectable, (but also problematic, albeit not malicious) careless responding. One way that some well-regarded measures have identified a lack of care or fidelity in responding and care is by utilizing a ‘care warning’ which directly asks that respondents be thoughtful when taking the survey (Meade & Craig, 2012). A care warning might read, “Your honest and thoughtful responses are important to us and to the study. Please pay careful attention to each response, responses that appear careless will not be considered.” A statement like this aims to communicate the seriousness of the research study, by initially deterring respondents who may be completing the responses carelessly or too expeditiously.
An alternative approach has been to detect careless (or fake) responses through the inclusion of so-called ‘lie’ items (e.g., “My child has been to every country in the world”) by which researchers and test developers might identify survey responses to be excluded from data analysis (Meade & Craig, 2012). Of course, one drawback of this approach is that the inclusion of such non-face-valid items may lead truthful and careful respondents to conclude that the survey was intentionally deceitful, thus losing faith that survey participation was worthwhile.

In future recruitment for this measure, several adjustments will be made in an effort to mitigate limitations and their effect on data collection. A check box indicating agreement with the care warning (e.g., “Yes, I agree to take care when responding”) will be implemented into future recruitment cycles to be utilized as an inclusion criterion in addition to the device (i.e., only laptop or tablet) and child age inclusion criteria. Additionally, the research team will actively monitor survey responding to identify whether the “I’m not a robot” check box was sufficient to deter similarly styled responses. Although there was speculation about the effect of the lottery-style incentive, this will be retained to attract the maximum number of respondents, including those from lower socioeconomic strata as this is crucial for the representativeness of the sample (Zhang et al., 2017).

4.2 Summary and Conclusions

Content-valid, clinically useful assessments of children’s ABM are lacking, despite the critical importance of ABM for social and cognitive development. This study addressed an important gap in the research by developing a potential tool to measure
children’s developing ABM abilities. This tool will be refined to improve survey content, which may indirectly impact participant recruitment and the quality of participant responses. A next step in development is to explore the tool’s psychometric properties on a larger, more diverse sample so that appropriately powered statistics can be conducted to assess the measure’s internal consistency, content validity, and test-retest reliability. However tentative, the present study offers promise of a caregiver-informant tool to assess ABM and justifies further development and validation efforts.
CHAPTER 5: REFERENCES


Hutchins, T., & Prelock, P. (2016). *Theory of mind inventory-2 (ToMI-2).*


APPENDIX A
Participant Demographic Information

If you are a caregiver of a child between the ages of 5 and 18, you are eligible to complete this survey. If you have more than one child, you can complete a separate survey for each child. After completing the survey, you will be provided the option to enter your email into a drawing for a $100 gift card. If you complete the survey more than once, you can register an entry for this drawing for each survey that you complete.

All of the information you provide will be completely anonymous (can never be linked back to you). There are two parts to this questionnaire. The first part asks information about you and your child, and we will use this information to understand our research sample. The second part is a questionnaire that asks you to report on the quality of your child's memory. Before taking the survey, please answer the following questions to determine eligibility for participation.

1 – Are you a fluent speaker of English?
Yes
No

2 – Are you taking this survey on a phone?
Yes
No

If you have answered “No” to either of the questions above, please stop here and start again on a computer.

Primary Caregiver:

3 – How many hours on average do you spend with your child per day (excluding the time when they are sleeping)?

4 – Please rate the following statements.
I feel knowledgeable on reporting on the quality of my child’s memory.
Strongly Disagree    Disagree    Neutral    Agree    Strongly Agree
I reminisce with my child on individual and shared experiences.
Not At All | Rarely | Sometimes | Often | All The Time

5 – Your age (in years):

6 – What is your biological sex?
   - Male
   - Female

7 – Highest level of education completed:
   - Some high school
   - High school graduate
   - Trade/technical/vocational training
   - Some college
   - College graduate
   - Some post-graduate work
   - Post-graduate degree

8 – What is your country of residence?
   - U.S.
   - Non U.S.

9 – If you are a resident of the United States, what is your state of residence?

10 – What is your combined annual household income (before taxes)? (Please enter whole numbers only, for example, if your income is $45,600.00, enter 45600)

11 – Are you fluent in more than one language?

12 – Is your child exposed to more than one language in the home?

13 – Do you currently live in either an urban, rural, or suburban area?
   - Urban
   - Rural
   - Suburban
Child’s Information:

14 – What is the child’s date of birth? Please write as: MM/DD/YYYY
For example the birthday of February 16, 2006 would be written as 02/16/2006

15 – What is your child’s biological sex?
   o Male
   o Female

16 – What is your child’s current grade level?

17 – Has your child ever received one of the following diagnoses or suspected they may have any of the following diagnoses? (please check all that apply):

<table>
<thead>
<tr>
<th>Received Diagnosis</th>
<th>Suspected Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developmental delay</td>
<td></td>
</tr>
<tr>
<td>Intellectual disability</td>
<td></td>
</tr>
<tr>
<td>Attention deficit hyperactivity disorder</td>
<td></td>
</tr>
<tr>
<td>Autism spectrum disorder</td>
<td></td>
</tr>
<tr>
<td>Learning disorder</td>
<td></td>
</tr>
<tr>
<td>Anxiety disorder</td>
<td></td>
</tr>
<tr>
<td>Speech/language impairment</td>
<td></td>
</tr>
<tr>
<td>Visual impairment</td>
<td></td>
</tr>
<tr>
<td>Hearing impairment</td>
<td></td>
</tr>
<tr>
<td>Traumatic Brain Injury</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX B
Autobiographical Memory Inventory (ABMI) Pilot Survey

INSTRUCTIONS: The purpose of this measure is to learn about caregiver’s ideas regarding children’s memory for their past experiences. Please read each statement carefully and indicate the degree to which you believe each statement is true for your child. Sometimes, you may feel that you don’t know for sure whether a statement is true of not. When you feel this way, reflect upon your experiences with your child and try to decide, given everything you know about this child, how certain you are that the statement is true or not true. There are no right or wrong answers so try to respond as honestly and thoughtfully as possible. To indicate your response, click on the appropriate point on the continuum. If you feel undecided as to the most appropriate answer, mark your selection somewhere underneath ‘undecided’ but keep in mind that you can lean toward either end of the continuum.

The continuum response arrangement.

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Intended Construct</th>
<th>SM/EM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. My child likes to reminisce about the past.</td>
<td>General EM</td>
<td>EM</td>
</tr>
<tr>
<td>2. My child can easily recall past personal experiences.</td>
<td>Accessibility</td>
<td>EM</td>
</tr>
<tr>
<td>3. My child describes their past experiences accurately (for example, when, what, where something happened).</td>
<td>Accuracy</td>
<td>EM</td>
</tr>
<tr>
<td>4. My child is as good as other people their age at remembering people’s names.</td>
<td>Social</td>
<td>SM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>5. My child’s memory seems to work differently than most other people’s memory.</td>
<td>General EM</td>
<td>EM</td>
</tr>
<tr>
<td>6. My child can navigate group dynamics and work well as part of a team.*</td>
<td>General Item</td>
<td></td>
</tr>
<tr>
<td>7. My child is as good as other people their age when it comes to learning from their mistakes.</td>
<td>Episodic Foresight</td>
<td>EM</td>
</tr>
<tr>
<td>8. My child accurately recalls visual details associated with a past experience (for example, “The flowers were orange” or “The window was cracked in the corner).</td>
<td>Accuracy: Visual Details</td>
<td>EM</td>
</tr>
<tr>
<td>9. My child needs a lot of prompting or questioning to recall past experiences.</td>
<td>Task Support</td>
<td>EM</td>
</tr>
<tr>
<td>10. My child tells stories about the past to entertain people (for example, for fun or to make people laugh).</td>
<td>Sharing/Social</td>
<td>EM</td>
</tr>
<tr>
<td>11. When my child tells a story about a past experience, they elaborate and give lots of detail.</td>
<td>Personal Narrative: Elaboration</td>
<td>EM</td>
</tr>
<tr>
<td>12. When my child is asked about something they have forgotten, they admit that they have forgotten.</td>
<td>Confabulation</td>
<td>SM/EM</td>
</tr>
<tr>
<td>13. My child has a good memory but only for things that really interest them (a hobby or favorite pastime).</td>
<td>General EM</td>
<td>EM</td>
</tr>
<tr>
<td>14. My child can remember familiar people’s names with ease.</td>
<td>Social</td>
<td>SM</td>
</tr>
<tr>
<td>15. My child can tell me about something that happened to them recently (for example, going to the park last week).</td>
<td>Recency/Remoteness</td>
<td>EM</td>
</tr>
<tr>
<td>16. My child quickly recognizes changes in their surroundings (for example, if the furniture gets moved around a bit).</td>
<td>Spatial Navigation Detail: Sensory</td>
<td>EM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>17. If my child learns a route to get somewhere (for example, walking home from school), they will stick to that route every time, whether it is the most efficient path.</td>
<td>Spatial Navigation</td>
<td>EM</td>
</tr>
<tr>
<td>18. My child understands and uses the terms yesterday, today, and tomorrow appropriately.</td>
<td>Temporal Distance Personal Narrative</td>
<td>EM</td>
</tr>
<tr>
<td>19. My child can tell you about a past experience from their own perspective (what they thought, what they felt, what they saw).</td>
<td>Perspective Personal Narrative Detail</td>
<td>EM</td>
</tr>
<tr>
<td>20. When my child remembers a past event involving other people, they can recall the names of the people who were there.</td>
<td>Social Scene Construction</td>
<td>SM</td>
</tr>
<tr>
<td>21. When my child tells a story about a past experience, they can evaluate that event or experience (for example, “The movie was scary” or “The fair was fun!”).</td>
<td>Personal Narrative: Evaluation</td>
<td>EM</td>
</tr>
<tr>
<td>22. When I provide additional details to describe a past event, my child can remember the event better.</td>
<td>Task Support</td>
<td>EM</td>
</tr>
<tr>
<td>23. My child is as good as other people their age when it comes to reading and using maps.*</td>
<td>Spatial Navigation</td>
<td>EM</td>
</tr>
<tr>
<td>24. My child feels that they are a valuable member of a wider community.*</td>
<td>Agency</td>
<td>EM</td>
</tr>
<tr>
<td>25. My child sometimes confuses different events that then get mixed up or blended in memory.</td>
<td>Organization Accuracy</td>
<td>EM</td>
</tr>
<tr>
<td>26. My child is just as good as other people their age when it comes to accurately judging the passage of time (for example, knowing when 5 minutes, 30 minutes, or 2 hours has gone by).</td>
<td>Recency/Remoteness: Temporal Distance</td>
<td>EM</td>
</tr>
<tr>
<td>27. My child is as good as other people their age when it comes to finding a new shortcut to get somewhere.*</td>
<td>Spatial Navigation</td>
<td>EM</td>
</tr>
<tr>
<td>28. My child understands that different people can recall the same event very differently.</td>
<td>Perspective/Subjectivity</td>
<td>EM</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>ABM Mental State Terms</strong></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---------------------------</td>
</tr>
<tr>
<td>29.</td>
<td>My child understands and uses the terms ‘remember’ and ‘forget’ appropriately.</td>
<td></td>
</tr>
<tr>
<td>30.</td>
<td>If I asked my child, “Hey, how was your day?”, my child would answer vaguely or not at all (they might say “I don’t know” or “nothing”).</td>
<td>Accessibility</td>
</tr>
<tr>
<td>31.</td>
<td>When my child tells a story about a past experience, they talk about why people did things (for example, “She left early because she felt sick”).</td>
<td>Personal Narrative</td>
</tr>
<tr>
<td>32.</td>
<td>When my child tells a story about a past experience, they include information about where it occurred (for example, at the store; in the front of the classroom).</td>
<td>Personal Narrative</td>
</tr>
<tr>
<td>33.</td>
<td>When my child tells a story about a past experience, they include information about when it occurred (for example, yesterday; last summer; when I was at my old school).</td>
<td>Personal Narrative</td>
</tr>
<tr>
<td>34.</td>
<td>My child can describe their typical daily routines (for example “What do you do to get ready for school?”).</td>
<td>General EM</td>
</tr>
<tr>
<td>35.</td>
<td>When my child remembers a past experience, they tend to focus on or talk about objects as opposed to people.</td>
<td>Social</td>
</tr>
<tr>
<td>36.</td>
<td>My child comments on their abilities when describing past success (for example, “I tried my best and I knew I would be good at it”).*</td>
<td>Agency</td>
</tr>
<tr>
<td>37.</td>
<td>My child can connect their own experiences with other people’s experiences (for example, if someone shared a story about their likes or dislikes, my child could connect to that story and share something about their own likes/dislikes).</td>
<td>Sharing</td>
</tr>
<tr>
<td>38.</td>
<td>My child can predict how they would feel in certain situations (for example, whether they would be happy or sad that something happened).</td>
<td>Episodic Foresight</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>39. My child can recall a past event without taking a long time to think about or formulate a response.</td>
<td>Accessibility</td>
<td>EM</td>
</tr>
<tr>
<td>40. My child can remember facts they learned long ago (for example, states and capitals).</td>
<td>Recency/Remoteness</td>
<td>SM</td>
</tr>
<tr>
<td>41. My child understands the concept of time and frames their experiences in terms of past, present, and future.</td>
<td>ABM Mental State Terms</td>
<td>EM</td>
</tr>
<tr>
<td>42. My child accurately recalls perceptual details (what they heard, felt, or saw) associated with a past experience (for example, “It was so hot outside” or “the hamster was squealing”).</td>
<td>Accuracy Detail: Sensory</td>
<td>EM</td>
</tr>
<tr>
<td>43. When remembering a past experience, people usually view it from their own perspective: as if seeing it again through their own eyes. Other times, people see themselves as objects in the scene. My child sees memories from their own perspective as opposed to seeing themselves as objects in the scene.*</td>
<td>Perspective</td>
<td>EM</td>
</tr>
<tr>
<td>44. My child can imagine hypothetical scenarios (for example, “What if I had forgotten my helmet when I fell off my bike?”).</td>
<td>Counterfactual Thinking</td>
<td>EM</td>
</tr>
<tr>
<td>45. My child has a good memory for concrete, factual things.</td>
<td>General SM</td>
<td>SM</td>
</tr>
<tr>
<td>46. My child accurately remembers where events took place.</td>
<td>Accuracy Spatial Navigation</td>
<td>EM</td>
</tr>
<tr>
<td>47. I am surprised at some of the things my child forgets.</td>
<td>General EM</td>
<td>EM</td>
</tr>
<tr>
<td>48. My child describes what they physically did in past experiences (for example, running; jumping).</td>
<td>Agency</td>
<td>EM</td>
</tr>
<tr>
<td>49. My child can predict what could happen and adapt as necessary (for example, “If I fill the glass</td>
<td>Episodic Foresight</td>
<td>EM</td>
</tr>
</tbody>
</table>
to the very top, it could easily spill and make a mess so I won’t fill the glass to the very top”).*

<table>
<thead>
<tr>
<th>50. Generally speaking, my child can memorize facts that they need to know for school (for example, vocabulary terms or historical facts).*</th>
<th>General SM</th>
<th>SM</th>
</tr>
</thead>
</table>

When recalling a past experience, my child remembers and can report on their emotions.

| 51. When recalling a past experience, my child remembers and can report on their emotions. | Emotional Valence Detail: Affective | EM |

My child can imagine what people would look like in the past or future (for example, “What did grandma look like as a youngster?”).

| 52. My child can imagine what people would look like in the past or future (for example, “What did grandma look like as a youngster?”). | Episodic Foresight Social | EM |

When recalling a past experience, my child remembers and can report on their emotions.

| 53. After an emotional experience, my child can reflect on what happened and how it made them feel. | Emotional Valence Detail: Affective Temporal Distance | EM |

My child can imagine their future, including what they will do (for example, “When I go to college, I’m going to major in history.” or “Next week, I’m going to Bryce National Park and I’ll take a lot of pictures.”).

| 54. My child can imagine their future, including what they will do (for example, “When I go to college, I’m going to major in history.” or “Next week, I’m going to Bryce National Park and I’ll take a lot of pictures.”). | Episodic Foresight | EM |

My child can easily answer an open-ended question about their past experiences (for example, “What did you do for fun last week?”).

| 55. My child can easily answer an open-ended question about their past experiences (for example, “What did you do for fun last week?”). | Accessibility | EM |

When my child is asked about something and they can’t remember, they fill in the blanks with inaccurate/false details.

| 56. When my child is asked about something and they can’t remember, they fill in the blanks with inaccurate/false details. | Accuracy Confabulation | EM |

When my child tells a story about a past experience, they include details about what other people thought or felt (for example, “She was scared;” “He wanted to have lots of friends;” “She was surprised.”).

| 57. When my child tells a story about a past experience, they include details about what other people thought or felt (for example, “She was scared;” “He wanted to have lots of friends;” “She was surprised.”). | Personal Narrative: Mental States | EM |

When my child tells a story about a past experience (for example, their last vacation), they can connect it to their sense of identity (for example, “I’m someone who likes travel”).

<p>| 58. When my child tells a story about a past experience (for example, their last vacation), they can connect it to their sense of identity (for example, “I’m someone who likes travel”). | Personal Narrative: Identity Self-concept | EM |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>59. When my child talks about a past experience, the story is disorganized and hard to follow.</td>
<td>Organization</td>
<td>EM</td>
</tr>
<tr>
<td>60. When my child tells a story about a past experience that has many parts, they use words like “then” to clarify the order of events (for example, “First we added the flour, then the eggs, then the sugar”).</td>
<td>Organization</td>
<td>EM</td>
</tr>
<tr>
<td>61. My child can form visual images in their head.</td>
<td>Aphantasia</td>
<td>EM</td>
</tr>
<tr>
<td>62. My child tells stories about their past experiences to persuade people (for example, if someone didn’t like cats, my child could try to change their mind by talking about a positive experience they had with a cat).</td>
<td>Sharing</td>
<td>EM</td>
</tr>
<tr>
<td>63. My child’s memories for past experiences are sometimes overly detailed (for example, being able to describe lots of details that most people would never notice).</td>
<td>Detail</td>
<td>SM/EM</td>
</tr>
<tr>
<td>64. My child uses the word &quot;we&quot; when talking about past experiences we shared together.</td>
<td>Agency: Communion</td>
<td>EM</td>
</tr>
<tr>
<td>65. My child spontaneously shares memories about their past experiences.</td>
<td>Accessibility Sharing</td>
<td>EM</td>
</tr>
<tr>
<td>66. When talking about a past experience, my child leaves out main ideas/details that are important to the story.</td>
<td>Organization Personal Narrative</td>
<td>EM</td>
</tr>
<tr>
<td>67. My child accurately remembers the spatial arrangement of objects (for example, “The refrigerator was across from the oven,” or “The pool table was in between the TV and the sofa”).</td>
<td>Spatial Navigation Accuracy</td>
<td>EM</td>
</tr>
<tr>
<td>68. My child can imagine how the physical world could look different from how it looks now (for example, “What would it look like to have a new soccer field at school?”; “What would it look like if a forest burned down?”).</td>
<td>Episodic Foresight: Counterfactual Thinking</td>
<td>EM</td>
</tr>
<tr>
<td>69. My child sometimes confuses imaginary events with actual past events (for example, saying they used to have a pet alligator when they really never did).</td>
<td>Accuracy Confabulation Organization</td>
<td>EM</td>
</tr>
<tr>
<td>70. My child remembers events in the correct order that they happened (for example, “We went to the grocery store, then got gas, then went to the post office”).</td>
<td>Organization</td>
<td>EM</td>
</tr>
<tr>
<td>71. When most people remember a past event, they mentally travel back in time and re-experience the event. My child does this too.</td>
<td>ABM Mental State Terms General EM</td>
<td>EM</td>
</tr>
<tr>
<td>72. My child can tell me about something that happened to them a while ago (for example, going on a vacation last year).</td>
<td>Recency/Remoteness</td>
<td>EM</td>
</tr>
<tr>
<td>73. I am surprised at some of the things my child remembers.</td>
<td>General EM/SM</td>
<td>EM/SM</td>
</tr>
<tr>
<td>74. When my child talks about a past experience, they struggle to find the main point or gist of the story.</td>
<td>Organization Personal Narrative</td>
<td>EM</td>
</tr>
<tr>
<td>75. My child tells stories about their past experiences to empathize with people (for example, if someone said they didn’t like waiting in line, my child could share a story about one time they had a hard time waiting in line).</td>
<td>Sharing</td>
<td>EM</td>
</tr>
<tr>
<td>76. When my child is recalling an emotional event, they re-experience that emotion.</td>
<td>Emotional Valence Intensity</td>
<td>EM</td>
</tr>
<tr>
<td>77. When my child remembers a sad event, they reexperience sadness during recollection.</td>
<td>Emotional Valence Intensity</td>
<td>EM</td>
</tr>
<tr>
<td>78. When my child remembers a happy event, they re-experience happiness during recollection.</td>
<td>Emotional Valence Intensity</td>
<td>EM</td>
</tr>
<tr>
<td>79. My child can recall the thoughts they had during a past experience (for example, “I thought the roller coaster was going to be scary”).</td>
<td>Detail: Cognitive</td>
<td>EM</td>
</tr>
<tr>
<td>80. My child’s memories often seem fragmented or incomplete.</td>
<td>Organization</td>
<td>EM</td>
</tr>
<tr>
<td>81. When my child reflects on past experiences, they include details about smells when appropriate (for example, “That bakery smelled like chocolate!”).</td>
<td>Detail: Sensory</td>
<td>EM</td>
</tr>
<tr>
<td>82. When my child reflects on their past experiences, they include details about sounds as appropriate (for example, “The helicopter was so loud!”).</td>
<td>Detail: Sensory</td>
<td>EM</td>
</tr>
<tr>
<td>83. When my child reflects on their past experiences, they include details about tastes as appropriate (for example, “That tasted sour!”).</td>
<td>Detail: Sensory</td>
<td>EM</td>
</tr>
<tr>
<td>84. My child is as good as others their age when it comes to giving directions to a place.</td>
<td>Spatial Navigation</td>
<td>EM</td>
</tr>
<tr>
<td>85. My child learns from their past experiences to solve new problems (for example, “Last time I put a plastic bowl in the dishwasher it melted; This time I will wash the plastic bowls by hand”).</td>
<td>Episodic Foresight: Problem Solving</td>
<td>EM</td>
</tr>
<tr>
<td>86. After visiting a place, my child could find their way around the second time they visited.*</td>
<td>Spatial Navigation</td>
<td>EM</td>
</tr>
<tr>
<td>87. My child accurately remembers what objects were in an environment.</td>
<td>Accuracy Spatial Navigation</td>
<td>EM</td>
</tr>
<tr>
<td>88. My child seems to have a photographic memory.</td>
<td>General EM/SM</td>
<td>EM/SM</td>
</tr>
<tr>
<td>89. My child accurately recalls what other people were thinking or feeling.</td>
<td>Accuracy Detail: Cognitive</td>
<td>EM</td>
</tr>
<tr>
<td>90. My child is as good as other people their age when it comes to remembering things about people they know (for example, where someone works; whether they have kids).</td>
<td>Social</td>
<td>SM</td>
</tr>
<tr>
<td>91. When my child tells a story about something that happened in the past, they can connect it to what might happen to them in the future (for example, “Last time I went to Disney my favorite ride was the teacups. Now that I’m bigger, I think I’ll like the rollercoasters more than the teacups.”).</td>
<td>Episodic Foresight Sharing</td>
<td>EM</td>
</tr>
<tr>
<td>92. My child can tell me ‘how’ they know or remember something (for example, they might say something like, “I know we ordered sausage pizza because I remember being mad that we didn’t get mushrooms too!”).</td>
<td>General EM: autonoetic consciousness</td>
<td>EM</td>
</tr>
<tr>
<td>93. After meeting someone, my child remembers the person’s face and what they looked like.</td>
<td>Social Detail: Sensory</td>
<td>EM</td>
</tr>
<tr>
<td>94. When my child recalls a past experience, the order of events is clear to the listener (in other words, what happened, first, next, so on).</td>
<td>Organization Personal Narrative</td>
<td>EM</td>
</tr>
<tr>
<td>95. My child is as good as other people their age when it comes to locating themselves on a map.*</td>
<td>Spatial Navigation</td>
<td>EM</td>
</tr>
<tr>
<td>96. My child has a good visual memory (for example, remembering what they saw).</td>
<td>Detail: Visual Accuracy</td>
<td>EM/SM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>97. My child has a good auditory memory (for example, remembering what they heard).</td>
<td>Detail: Auditory Accuracy</td>
<td>EM/SM</td>
</tr>
<tr>
<td>98. My child has positive feelings about their social relationships.*</td>
<td>Self-Concept</td>
<td>EM</td>
</tr>
<tr>
<td>99. My child recalls memories with vivid detail.</td>
<td>Vividness</td>
<td>EM</td>
</tr>
<tr>
<td>100. When my child remembers a past event involving other people, they can remember what people looked like or what they were wearing.</td>
<td>Social Mental Scene Construction</td>
<td>EM</td>
</tr>
<tr>
<td>101. My child could easily point to a specific place outside the building (for example, where the car is parked) without being able to see it from the inside.</td>
<td>Spatial Navigation</td>
<td>EM</td>
</tr>
<tr>
<td>102. My child can predict what other people will think or do in certain circumstances.</td>
<td>Episodic Foresight Social Theory of Mind</td>
<td>EM</td>
</tr>
<tr>
<td>103. My child can recall the names of famous people or characters they are familiar with.</td>
<td>General SM</td>
<td>SM</td>
</tr>
<tr>
<td>104. My child remembers a past event better if they have artifacts or mementos from the event (for example, holding the seashells you collected when remembering a trip to the beach).</td>
<td>Task Support</td>
<td>EM</td>
</tr>
<tr>
<td>105. My child learns better by watching people do things compared to actually doing it themselves.</td>
<td>Social</td>
<td>EM</td>
</tr>
<tr>
<td>106. My child can think outside the box to solve problems in a new way.</td>
<td>Episodic Foresight: Problem Solving</td>
<td>EM</td>
</tr>
<tr>
<td>107. When traveling through a familiar place (for example, our home town) my child will recognize the shops/buildings they had previously passed.</td>
<td>Spatial Navigation</td>
<td>EM</td>
</tr>
<tr>
<td>108. My child is as good as others their age when it comes to drawing a map of their neighborhood.</td>
<td>Spatial Navigation</td>
<td>EM</td>
</tr>
<tr>
<td>109. Unlike most people, my child tends to recall the exact date or time that something happened (for example, “We saw the Avengers movie on April 13, 2020”).</td>
<td>Accuracy Detail</td>
<td>EM</td>
</tr>
<tr>
<td>110. When my child talks about a past experience, the listener has trouble taking away the important points.</td>
<td>Organization Personal Narrative</td>
<td>EM</td>
</tr>
<tr>
<td>111. My child has rich memories for their past experiences (when recalling something my child remembers where they were, when something happened, who else was there, what they were thinking/feeling).</td>
<td>Detail Mental Scene Construction Organization Accessibility</td>
<td>EM</td>
</tr>
<tr>
<td>Item</td>
<td>Description</td>
<td>Domain/Category</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>112</td>
<td>My child is as good as other people their age when it comes to finding their way around (for example, getting from point A to point B at school or in the grocery story; finding the car in the parking lot).</td>
<td>Spatial Navigation</td>
</tr>
<tr>
<td>113</td>
<td>My child can remember specific events from their past (for example, telling you about the day they got their braces off).</td>
<td>Specificity</td>
</tr>
<tr>
<td>114</td>
<td>My child seeks and likes praise from others.*</td>
<td>Agency</td>
</tr>
<tr>
<td>115</td>
<td>My child is as good as other people their age when it comes to using landmarks to figure out how to get somewhere.</td>
<td>Spatial Navigation</td>
</tr>
<tr>
<td>116</td>
<td>My child gets lost easily, even in familiar places.</td>
<td>Spatial Navigation</td>
</tr>
<tr>
<td>117</td>
<td>My child can remember when events generally took place (for example, summertime; last year; during recess; in 4th grade).</td>
<td>Temporal Distance Accuracy</td>
</tr>
<tr>
<td>118</td>
<td>When reading a book or being told a story, my child is able to visualize what is happening, even without any pictures.</td>
<td>Aphantasia</td>
</tr>
<tr>
<td>119</td>
<td>If my child were given a map for a treasure hunt, they would turn the map so it aligned with their point of view.</td>
<td>Perspective Spatial Navigation</td>
</tr>
<tr>
<td>120</td>
<td>My child uses the words “I” and “You” and “me” correctly.</td>
<td>General: Deictic Terms</td>
</tr>
<tr>
<td>121</td>
<td>My child uses the words “here” and “there” and “this” and “that” correctly.</td>
<td>General: Deictic Terms</td>
</tr>
<tr>
<td>122</td>
<td>My child uses the words “now” and “then” and “before” and “after” correctly.</td>
<td>Organization General: ABM Terms</td>
</tr>
</tbody>
</table>

*Item marked for removal.
APPENDIX C  
Qualitative Data and Responses

The following qualitative data was collected in the form of comments from respondents. Items were marked for removal or modification (i.e., wording changes) based on commentary. These changes are indicated by item.

Q1.5: My child likes to reminisce about the past.
   - She also likes to hear me tell stories about my past, over and over again!

Q2.5: My child can easily recall past personal experiences.
   - He has an incredible memory.
   - It depends on the experience. Some things he remembers vividly, others not at all.

Q3.5: My child describes their past experiences accurately (for example, when, what where something happened)
   - Sometimes her memory is a little off but I attribute that to her age at the time of the memory.

Q5.5: My child’s memory seems to work differently than most other people’s memory.
   - She does have dyslexia and this affects her memory with learning to read.

Q6.5: My child can navigate group dynamics and work well as part of a team. – MARKED FOR REMOVAL
   - Can be quiet and shy with others
   - Sometimes he has conflict with group activities because he thinks he knows best and is very chatty and talks more than listens.
   - She works well as part of a team of peers. Not as much with her four siblings

Q7.5: My child is as good as other people their age when it comes to learning from their mistakes.
   - Yes, she learns from her mistakes, but she has been peer pressured in to repeating the same behavior.

Q8.5: My child accurately recalls visual details associated with a past experience (for example, “The flowers were orange” or “The window was cracked in the corner”)
   - I can't really think of a specific time when she provided visual details. Mostly she remembers relationships/connections and warm feelings associated with them.
Q11.5: When my child tells a story about a past experience, they [can] elaborate and give lots of detail [if they want to].

- Inconsistently, but most of the time.
- depends on the purpose or if it was volunteered information or asked for and who was asking.
- She often gives details that are not relevant to the story

Q18.5: My child understands and uses the terms yesterday, today, and tomorrow appropriately

- Most of the time, but sometimes gets them mixed up. For example the other day she asked me "which one is for things that haven't happened yet?" (i.e., the future)

Q22.5: When I provide additional details to describe a past event, my child can remember the event better.

- often her account is better than mine

Q23.5: My child is as good as other people their age when it comes to reading and using maps. **MARKED FOR REMOVAL**

- Hasn't really been exposed to maps.

Q24.5: My child feels that they are a valuable member of a wider community. **MARKED FOR REMOVAL**

- I hope so!

Q27.5: My child is as good as other people their age when it comes to finding a new shortcut to get somewhere. **MARKED FOR REMOVAL**

- She's not really old enough to explore on her own much, so not sure about this question.

Q28.5: My child understands that different people can recall the same event very differently.

- sometimes he has trouble understanding if someone elses memory does not line up with what actually happened. He will say "that's not true."

Q30.5: If I asked my child, “Hey, how was your day?”, my child would answer vaguely or not at all (they might say “I don’t know” or “nothing”).

- Usually he says "good" or "fine"
- usual responses are "it was good" or "it was ok" with some prompting, she may talk about an event that happened that day
Q36.5: My child comments on their abilities when describing past success (for example, I helped my team win the relay race. I'm a really fast runner). **MARKED FOR REMOVAL**

- sometimes but not often
- I think the scale would make more sense if it ranged from "never to always." I'm using "probably" to indicate "some of the time."

Q38.5: My child can predict how they would feel in certain situations (for example, whether they would be happy or sad if something happened).

- As good as anyone else!

Q43.5: When remembering a past experience, people usually view it from their own perspective: as if seeing it again through their own eyes. Other times, people see themselves as objects in the scene. My child sees memories from their own perspective as opposed to seeing themselves as objects in the scene. **MARKED FOR REMOVAL**

- Really not sure about this one
- Here I'm using "undecided" to mean sometimes yes and sometimes no. It depends on what the memory is about (e.g., how cute she was when she was little or how she felt when something happened).

Q47.5: I am surprised at some of the things my child forgets.

- but only because I am pretty sure she doesn't forget she just wasn't listening!

Q49.5: My child can predict what could happen and adapt as necessary (for example, If I fill the glass to the very top, it could easily spill and make a mess so I won’t fill the glass to the very top). **MARKED FOR REMOVAL**

- Not sure - we think she has ADHD and often I feel like she doesn't think about the consequences of her actions. But not sure if that's her young age or ADHD (or both).

Q50.5: Generally speaking, my child can memorize facts that they need to know for school (for example, vocabulary terms or historical facts). **MARKED FOR REMOVAL**

- She memorizes facts for a test, but does not always retain the information

Q53.5: After an emotional experience, my child can reflect on what happened and how it made them feel.
• often doesn't want to re-live the emotional experience, "I don't want to talk about it"
• She doesn't like to but she can

Q56.5: When my child is asked about something and they can’t remember, they [might] fill in the blanks with inaccurate/false details.
• Doesn't answer

Q59.5: When my child talks about a past experience, the story is disorganized and hard to follow.
• It's not so much disorganized as it is VERY detailed and it takes a long time for that reason so...sometimes the story exceeds my attention span!

Q63.5: My child’s memories for past experiences are sometimes overly detailed (for example, being able to describe lots of details that most people would never notice).
• Sometimes I'm surprised at the details she remembers. For instance, she'll remember what she was wearing and include that in the memory.
• As mentioned previously, the details are not always relevant

Q69.5: [In the past, my child has sometimes] confused imaginary events with actual past events (for example, saying they used to have a pet alligator when they never did).
• I'm using "probably" as "possibly." I can imagine her doing this for very distant memories about her younger years.

Q76.5: When my child is recalling an emotional event, they re-experience that emotion.
• she is more empathetic than others her age and quite sensitive, she is likely to cry if someone else is crying too or if someone is sad, she feels it too

Q77.5: When my child remembers a sad event, they reexperience sadness during recollection.
• She will cry when retelling a sad story
• Again, it could happen. Some of the time.

Q83.5: When my child reflects on their past experiences, they include details about tastes as appropriate.
• She is gluten free so often food tastes different. She frequently refers to the way foods taste.
Q86.5: After visiting a place, my child could find their way around the second time they visited. **MARKED FOR REMOVAL**

- I don't think she pays too much attention to directions at this stage in her life!

Q88.5: My child seems to have a photographic memory.

- I do, I am not sure if he does.

Q95.5: My child is as good as other people their age when it comes to locating themselves on a map. **MARKED FOR REMOVAL**

- not much experience
- Not sure I understand this question.
- kids don't really use maps anymore!

Q98.5: My child has positive feelings about their social relationships. **MARKED FOR REMOVAL**

- sometimes he does and sometimes he says kids don't understand him
- Most recently because she changed schools. This is new!
- most of the time, this is a difficult part of being 15
- Depends on the relationship.

Q106.5: My child can think outside the box to solve problems in a new way.

- We call her the "problem-solver!"

Q114.5: My child seeks and likes praise from others. **MARKED FOR REMOVAL**

- Likes more than seeks