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The Role Of Autobiographical Memory In Interpersonal And Intrapersonal Simulation: A Theoretical And Empirical Exploration

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THE ROLE OF AUTOBIOGRAPHICAL MEMORY IN INTERPERSONAL AND INTRAPERSONAL SIMULATION: A THEORETICAL AND EMPIRICAL EXPLORATION

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PREFACE

The study of memory has been called the ultimate "study in social psychology." (Bartlett, 1932). The ability to store, retrieve, and apply previously learned information is vital to human functioning; without it, navigating the myriad physical, cultural, and social contexts in which humans operate would be overwhelming (Schacter & Addis, 2009). A form of memory that is especially critical is *autobiographical memory*—the memories of one's personal past. One's past experiences can serve as important reminders of what to do or not to do, or they can shape predictions about the future (Schacter & Addis, 2009). Thus, understanding the many purposes for which human have developed and use autobiographical memory is an important line of research.

Although autobiographical memory has long been known to support the human action of *reminiscence*—i.e., the act of recollecting a previously experienced event (e.g., Ballard, 1913; Bartlett, 1932)—to suppose that "re-experiencing" (Tulving & Markowitsch, 1998) the past is autobiographical memory's primary purpose is to take a one-dimensional view. Recent theory and evidence from the cognitive, evolutionary, developmental, and neuroscience domains contend that one's personal storehouse of knowledge and experiences are invaluable aids for predicting, navigating, and coping with unknown future situations (Atance & O'Neill, 2005; Barsalou, 1988, 2003; Okuda, Fujii, Ohtake, Tsukiura, Tanji, Suzuki, et al., 2003; Wheeler, Stuss, & Tulving, 1997) or even reframing personal past events (Roese, 1997; Roese & Olson, 1995). Thus, it is unlikely that the human ability to "re-live" past events is for the sole purpose of reminiscence. Rather, it has been argued that memories of an autobiographical nature inform such capacities as *autonoetic consciousness*—the human ability for self-awareness (e.g., Baddeley, Eysenck, & Anderson, 2009; Tulving, 1984, 1985, 2005; Wheeler et al., 1997) that permits one to mentally place one's self within a recollected past event, an envisioned future scenario, or in counterfactual situations (e.g., Atance and O'Neill, 2001; Baddeley et al., 2009; Buckner and Carroll, 2007; Schacter & Addis, 2007; Suddendorf & Corballis, 2007), as well as *mental time travel*—the mental projection of one's self through conceptual time (Suddendorf & Busby, 2003; Tulving, 2002a[1]; Wheeler et al., 1997). Together, these capacities provide a sense of self-continuity across time, and ensure that actual past experience is distinguishable from beliefs, imaginings, and dreams (D'Argembeau & Van der Linden, 2004; Klein, Cosmides, Tooby, & Chance, 2001).

To project one's self back in time for the purpose of reminiscing, or "re-experiencing," a past event requires only that the rememberer activate and recollect a stored autobiographical episode (e.g., Ballard, 1913; Bartlett, 1932). However, when one wishes to travel forward in time, one cannot simply "re-experience" the past as is the case with reminiscence. Instead, autobiographical memory content[2] must be *imaginatively changed* such that a future scenario that has not yet occurred—and thus for which direct autobiographical memory content has not yet been stored—can be "pre-experienced" with details appropriate and relevant to future purposes (Schacter & Addis, 2007; Shanton & Goldman, 2010; Szpunar, 2010). The projecting of one's self forward in time by imaginatively changing autobiographical memory content is referred to as *prospection* (Schacter & Addis, 2007). Similarly, the tendency to go back in time to imaginatively *modify* or *augment* a stored autobiographical episode for the purpose of supposing how things could have turned out differently than what actually occurred—i.e., to

[1] Tulving (2002a) proposed the term *chronesthesia* for the conscious awareness of subjective time possessed by humans. The current paper will refer to this phenomenon as *mental time travel*.

[2] The current paper uses the phrase "memory content" to denote the information, or *internal representation* (Dudai, 2007), that is stored in the brain during encoding. This conceptual understanding, rather than the biophysiological properties of memory content—e.g., "memory trace" or "engram (e.g., Dudai, 2004)—is used throughout.

"reframe"[3] the past—is referred to as *counterfactual thinking* (Roese & Olson, 1995).

How humans actually engage in mental time travel is largely unknown. It has been suggested that mental time travel is not only motivated by current goals, but is shaped and constrained by the past (D'Argembeau & Van der Linden, 2004; Johnson & Sherman, 1990). What is known from brain evidence is that such "experiential" cognitions as self-projection (e.g., Buckner & Carroll, 2006), autobiographical memory retrieval (e.g., Buckner, Andrews-Hanna, & Schacter, 2008), prospection (e.g., Addis, Pan, Vu, Laiser, & Schacter, 2009; De Brigard, Addis, Ford, Schacter, & Giovanello, 2013; De Brigard, Spreng, Mitchell, & Schacter, 2015; Schacter, 2012; Schacter & Addis, 2007; Zheng, Luo, & Yu, 2014), counterfactual thinking (e.g., Addis et al., 2009; De Brigard et al., 2013; De Brigard & Giovanello, 2012; De Brigard et al., 2015; Schacter, Benoit, De Brigard, & Szpunar, in press; Van Hoeck, Ma, Ampe, Vandekerckhove, & Van Overwalle, 2013), and perspective taking (Dodell-Feder, DiLisi, & Hooker, 2014; Knox, 2010; Perry, Hendler, & Shamay-Tsoory, 2011), all share neural circuitry in the default network (e.g., Andrews-Hanna, Smallwood, & Spreng, 2014). This suggests that capacities underlain by the default network evolved together to produce an efficient, synergistic system. However, no single theory has emerged to explain how exactly these functionalities work together and why.

One reason for this may be that the cognitive mechanism that enables autobiographical memory content to be used for mental time travel and counterfactual thinking has not been definitively identified. However, one possible explanation comes by way of *simulation theory.* Simulation theory by Goldman (2006) was originally developed to explain the social behavior of *perspective taking*—the inferring of others' thoughts and feelings. But in light of a growing body

[3] Although the counterfactual thinking literature prefers the term "reconstruct" when describing the alteration of actual memory content (e.g., Roese & Olson, 1995), the current paper uses the term "reframe" so as not to confuse the modifying of actual memory content with the "reconstruction" that occurs to memory content during memory consolidation (e.g., Schacter, 1989).

of brain evidence showing that the brain areas associated with autobiographical memory retrieval, perspective taking, prospection, and counterfactual thinking are neurally connected, Shanton and Goldman (2010) revised simulation theory to explain both perspective taking and mental time travel. Thus simulation, per this revision, has two corresponding forms. When the goal prompting mental simulation is perspective taking—i.e., when the goal of simulation is *other*-directed[4]— the form of simulation employed is *interpersonal*. When the goal prompting simulation is mental time travel—i.e., when the goal is *self*-directed—the form of simulation employed is *intrapersonal*.

Whether one's goal is to perspective take (via interpersonal simulation) or to travel through time (via intrapersonal simulation), simulation theory posits that the simulation process is triggered upon the activation and retrieval of relevant stored information from "background information" (Goldman, 2006; Shanton & Goldman, 2010) that could include content retrieved from storage in long-term memory. *Long-term memory* is a broadly defined, taxonomically superordinate memory form comprising memory content that has been stored for a long period—possibly over the course of one's life (Atkinson & Shiffrin, 1968). Per simulation theory's simulation process model, memory content retrieved in response to a perspective taking or mental time travel goal serves as "input" for interpersonal or intrapersonal simulation, respectively. Yet, despite the wealth of brain evidence linking autobiographical memory retrieval to the actions of perspective taking (e.g., Dodell-Feder et al., 2014; Knox, 2010; Perry et al., 2011), prospection (e.g., Addis et al., 2009; De Brigard et al., 2013; De Brigard et al., 2015; Schacter, 2012; Schacter & Addis, 2007; Zheng et al., 2014), and counterfactual thinking (e.g., Addis et al., 2009; De Brigard et al., 2013; De Brigard & Giovanello, 2012; De Brigard et al.,

[4] Perspective taking can be from a first-person perspective (1PP)—i.e., one's own perspective—or a third-person perspective (3PP)—i.e., from another's perspective. Unless otherwise indicated, this paper is concerned with the 3PP that occurs between a perceiver and a target other.

2015; Schacter et al., in press; Van Hoeck et al., 2013), research asserting the use of autobiographical memory specifically, rather than long-term memory generally, for such purposes is, at least at present, less widespread.

If simulation *is* the mechanism by which autobiographical memory is used for perspective taking, prospection, and counterfactual thinking, then it should reasonably follow that mental time travel is a *function* of autobiographical memory. Such a conclusion would be important to the line of research concerned with *autobiographical memory functions*, which seeks the everyday purposes for which autobiographical memory is used (Baddeley, 1988). A recent study by Ranson and Fitzgerald (in preparation) did find evidence that autobiographical memory is used for the purpose of perspective taking. And although no study of autobiographical memory functions to date has reported direct evidence of the functions mental time travel, prospection, or counterfactual thinking, it has long been assumed that autobiographical memory facilitates such actions as predicting future outcomes (e.g., Williams, Conway, & Cohen, 2008), and coping with past events (e.g., Bluck, Alea, Habermas, & Rubin, 2005; Roese, 1997). As such, the idea that perspective taking, prospection, and counterfactual thinking could be functions of autobiographical memory is plausible enough to warrant further investigation.

To explore whether perspective taking, prospection, and counterfactual thinking are functions of autobiographical memory, the current paper comprises four chapters. Chapter 1 is an independent paper proposing the *Expanded Simulation Model*—an adaptation of the cognitive process models proposed originally by Goldman (2006), and later by Shanton and Goldman (2010). The Expanded Simulation Model is meant to provides a framework by which the existence of the autobiographical memory functions of perspective taking, prospection, and counterfactual thinking are theoretically substantiated. Chapter 1 argues that autobiographical memory specifically, rather than long-term memory generally, is a store from which background information is activated and retrieved in response to a perspective taking, prospection, or counterfactual thinking goal[5]. Chapters 2 and 3 present empirical findings from Study 1 and Study 2, respectively, both of which aimed to substantiate the theoretical claims of Chapter 1. Study 1 was a validation study of a self-report instrument—the *Autobiographical Memory Functions of Simulation* (AMFS) scale—that was developed to measure the extent to which individuals use autobiographical memory for the hypothesized functions of perspective taking, prospection, and counterfactual thinking. Study 2 was an empirical study that used the AMFS to discern the role of autobiographical memory in interpersonal and intrapersonal simulation, and to determine whether perspective taking, prospection, and counterfactual thinking could be considered functions of autobiographical memory. Chapter 4 explores the broader impacts of the ideas and findings presented in Chapters 1, 2, and 3.

[5] Of course, it could be argued that stored memory content that is *not* strictly autobiographical could serve as input for interpersonal and intrapersonal simulation. The current paper acknowledges this possibility, but will not attempt to describe or explain such possibilities. The current paper is concerned *only* with whether or not the claim that autobiographical memory content specifically, rather than long-term memory content generally, can be used for perspective taking, prospection, and counterfactual thinking is plausible.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1 MENTAL SIMULATION AS THE MECHANISM BY WHICH AUTOBIOGRAPHICAL MEMORY INFORMS INTERPERSONAL AND INTRAPERSONAL SIMULATION: A THEORETICAL PERSPECTIVE

1.1 Introduction and Background

Researchers of *autobiographical memory functions*—the purposes for which we use memories of our personal past (Baddeley, 1988)—have long theorized three broad uses: *Social* (the use of autobiographical memory to foster relationships and social bonding), *Self* (the use of autobiographical memory to maintain self-identity and self-continuity), and *Directive* (the use of autobiographical memory to aid emotion regulation, behavioral control, problem solving), (e.g., Baddeley, 1988; Bruce, 1989; Neisser, 1982; Bluck, Alea, Habermas, & Rubin, 2005). Once the Social, Self, and Directive functions were empirically validated (Bluck et al., 2005; Bluck & Alea, 2011), the concern became whether the long-standing focus on the three-function model was inadvertently discouraging the search for other possible functions. Researchers therefore began seeking evidence for an expanded set of functions (e.g., Kulkofsky & Koh, 2009; Ranson & Fitzgerald, in preparation; Webster, 1995, 1997).

A recent study exploring an expanded set of autobiographical memory functions found evidence for a function of "perspective taking" (Ranson & Fitzgerald, in preparation). *Perspective taking* occurs when an individual mentally puts oneself into another's shoes in order to infer the other's thoughts and feelings (e.g., Batson, Early, & Salvarani, 1997; Ickes, 2003). Perspective taking is thought to be essential to social harmony and altruism (Ickes, 2003). Early humans competent in reading and predicting others' mental states are thought to have had the adaptive and selectional advantage (Barresi & Moore, 1996; Decety & Hamm, 2009; Goldman, 2006). Some have postulated that human intelligence itself arose from the need to discern others' intentions and attitudes (Barresi & Moore, 1996; Reader & Laland, 2002; van Schaik &

Burkhart, 2011; Whiten & van Schaik, 2007; Wilson, 1991). This likely explains why perspective taking occurs spontaneously during social interactions, but also why perspective taking occurs in times of solitude, when private thoughts can turn to recollections of past social situations, or imagined predictions about future interactions (Ickes, 2003; Winner, 2000). Perspective taking is thus an everyday behavior and a vital social skill (Ickes, 2003; Winner, 2000). Such factors give weight to substantiating the use of autobiographical memory to facilitate it.

To date, only one study, by Ranson and Fitzgerald (in preparation), has reported an autobiographical memory function of perspective taking. As for why the function of perspective taking emerged in this study but was undetected by others may have to do with the design of the self-report instrument used by Ranson and Fitzgerald to measure autobiographical memory use. The Ranson and Fitzgerald instrument employed the social context of *joint reminiscence*, which was meant to prompt respondents to consider the frequency with which they recall, share, and discuss personal and shared past events with others. As such, instruments lacking a similar social context may not be sensitive enough to detect all the potential functions associated with the use of autobiographical memory for social behaviors and/or interactions—of which perspective taking is an example.

However, the instrument used by Ranson and Fitzgerald was adapted from an existing autobiographical memory functions instrument that did not yield evidence of a perspective taking function. The original instrument, the *Child-Caregiver Reminiscence Scale* (CRS) (Kulkofsky & Koh, 2009), was designed in response to related research indicating that the development of the autobiographical memory system, as well as socialization of autobiographical memory content and use, occurs in early life (Nelson & Fivush, 2002, 2004). The CRS asks parents of young children aged three to seven years to rate the frequency with which they engaged in various reminiscence behaviors with their child. Of interest to Ranson and Fitzgerald was whether the expanded set of autobiographical memory functions found by the CRS to emerge during early childhood were sustained through adulthood. Thus, that the perspective taking function was unique to adults is more likely do to differences in cognitive capacities than in instrument design. The young children to whom the CRS is administered have not yet developed—the understanding that others have mental states—e.g., beliefs intents, desires, perspectives—different from one's own (Beck, Riggs, & Burns, 2011; Saxe & Kanwisher, 2003) As theory of mind does not develop until around the age of four years (Goldman, 2006), and ToM is essential to perspective taking (McHugh & Stewart, 2012), the children targeted by the CRS would not have yet developed the ability to use autobiographical memory for this purpose. And although the social context of joint reminiscence may have enhanced the ability of the self-report instrument used by Ranson and Fitzgerald to detect the perspective taking function, it is more likely that, absent a cohesive theory recommending its existence, researchers simply did not think to look for it.

A crucial first step in theoretically substantiating the existence of the autobiographical memory function of perspective taking is to identify and delineate the mechanism through which autobiographical memory might inform perspective taking. One possible mechanism is *mental simulation* as proposed by simulation theory. *Simulation theory* was developed by Goldman (2006) to explain how individuals infer other minds. Simulation theory posits that to "simulate" for the purpose of perspective taking is to create imagined or pretend states in one's own mind that corresponds to those of the target. Such "pretend" states are informed by "background information," which can include content from past experiences that is activated and retrieved from long-term memory storage in response to a perspective-taking goal. Such background information can serve as "input" for *simulation processing*—i.e., the mingling of memory content with imagination to produce a simulated outcome, such as a target other's inferred thoughts and feelings.

Although simulation theory by Goldman (2006) offers the mechanism of mental simulation as the means by which memory can be used for perspective taking, simulation theory does not explicitly state that the background information drawn from long-term memory stores is autobiographical in form. However, simulation theory does not preclude such an interpretation either. Rather, the fact that "background information" is only superficially defined by simulation theory makes it possible for the current paper to exploit this deficiency and . One, taxonomically speaking, autobiographical memory is a *form* of long-term memory (Tulving, 1972). That is, the long-term memory comprises various memory "systems" that reflect the type of information stored.

One such system is the *autobiographical memory system*, which comprises both *episodic* autobiographical memory (personal past events experienced at particular times and places) and *semantic* autobiographical memory (general knowledge and fact-based information) (Conway, 2001). Because simulation theory postulates only that mental simulation employs memory content drawn from the long-term memory system—but does not explicitly exclude any long-term memory subsystems—simulation theory makes possible the specification of autobiographical memory as the source of simulation input. Two, a growing body of brain evidence indicates that the neural pathways underlying the functions of autobiographical memory retrieval (e.g., Buckner, Andrews-Hanna, & Schacter, 2008) and perspective taking (Dodell-Feder, DiLisi, & Hooker, 2014; Knox, 2010; Perry, Hendler, & Shamay-Tsoory, 2011) are shared. Such findings suggest that these brain areas co-evolved to ensure a functional mutualism. And three, simulation theory was recently augmented to account for both perspective taking and *mental time travel*—the mental projection of one's self through conceptual time (Suddendorf & Busby, 2003; Tulving, 2002a[6]; Wheeler, Stuss, & Tulving, 1997). The revised simulation theory by Shanton and Goldman (2010) addresses the use of memory in mental time travel; specifically; the "re-experiencing" of a personal past event—i.e., the vivid imagining of a prior event in order to subjectively re-live it (e.g., Reber, 2013; Tulving & Markowitsch, 1998)[7]—and the "pre-experiencing" of past experience in order to imaginatively envision future scenario. However, in order to "re-experience" or "pre-experience" a memory, the relevant content must be activated and retrieved from memory storage. That Shanton and Goldman specify the "re-experience" and "pre-experience" of *personal* past events implies the specific activation and retrieval of *autobiographical* memory content. Additionally, Shanton and Goldman's characterization of simulated mental time travel as involving "episodic memory" likewise implies the involvement of the *episodic memory system*—where episodic memory content is stored for later potential activation and retrieval. A subsystem of the episodic memory system is the *autobiographical* episodic memory system, where *autobiographical* episodic memory content is stored (Conway, 2001). Thus, just as simulation theory broadly defined long-term memory, so has it defined the involvement of "episodic memory." As such, simulation

[6] Tulving (2002a) proposed the term *chronesthesia* for the conscious awareness of subjective time possessed by humans. The current paper will refer to this phenomenon as *mental time travel*.

[7] The distinctions between the terms "episodic memory system," "episodic memory content," and "episodic memory"—specifically the connotation of the latter by Shanton and Goldman (2010)—is critical to a full understanding of the arguments of the current paper. The "episodic memory system" comprises memories of past events, a subset of which involve the self—i.e., are "personal"—and which are thus by definition *autobiographical* (Williams et al., 2008) "Episodic memory *content*" is the stored details of an event, including the people, places, object, and its general and specific contexts. A subset of episodic memory content is "personal," and is thus *autobiographical*. Shanton and Goldman (2010) use the term "episodic memory" when referring to the subjective "re-experiencing" of stored episodic memory *content* that has been recalled for re-living. The current paper is ultimately interested in whether autobiographical *content* specifically, rather than long-term memory *content* generally, is used for simulation-based perspective taking, prospection, and counterfactual thinking.

theory does not preclude the specification of *autobiographical* memory content as a form of long-term memory "background information" that could be used in simulation-based perspective taking and mental time travel. Given that this idea is conceptually plausible, but to date, unexplored, further investigation is warranted.

1.2 Goals and Hypotheses

The overarching objective of the current paper is to theoretically substantiate the existence of the autobiographical memory function of perspective taking per the evidence reported by Ranson and Fitzgerald (in preparation). By extension, a secondary objective is to theoretically argue for the existence of the autobiographical memory functions of prospection and counterfactual thinking. To accomplish these objectives, the following four goals and seven hypotheses are extended.

Hypotheses 1.1 and 1.2 in Support of Goal 1.1

Goal 1.1 is to substantiate the functional link between autobiographical memory and perspective taking. To support, Hypothesis 1.1 states that the mechanism by which long-term memory content is used for the purpose of perspective taking is *mental simulation* as defined by *simulation theory* (Goldman, 2006; Goldman & Shanton, in press; Shanton & Goldman, 2010).

Although simulation theory (Goldman, 2006) may be the mechanism by which memory content informs perspective taking, simulation theory only explicitly identifies content from *long-term memory*, rather than content from autobiographical memory, as simulation "input." Hypothesis 1.2 states that autobiographical memory content in particular—rather than long-term memory in general—can be used as simulation output for simulation-based perspective taking. To support, the long-term memory "background information" component of simulation theory's process model will be "unpacked" to show how autobiographical memory content could be preferentially activated and retrieved for this purpose. If it can be shown that autobiographical memory could be a specific form of long-term memory content used for perspective taking, then

Hypotheses 1.3 and 1.4 in Support of Goal 1.2

Goal 1.2 is to “unpack” the long-term memory component of the simulation process to illustrate how autobiographical memory content might be activated and retrieved for simulation-based perspective taking. Exploring possible levels of organization “within” the long-term memory component is necessary because simulation theory does not address two operations vital to the extraction and deployment of memory content for simulation purposes. The first is the operation responsible for the activation and retrieval of memory content for simulation use. The second is how the need to imaginatively simulate extracted memory content—or not—is determined. Regarding the first omission, Hypothesis 1.3 states that the “search and retrieval” procedure that operates “within” the long-term memory component could be explained by the *self-memory system* (SMS) as detailed in Conway (2005) and Conway and Pleydell-Pearce (2000). The SMS will be adapted to comply with the simulation process model operations postulated by simulation theory.

To address the second omission, Hypothesis 1.4 states simulation occurs in response to heightened neural activation of predominantly episodic memory content as predicted by the *source activation confusion* (SAC) model per Reder, Donavos, & Erickson (2002) and Reder, Park, and Kieffaber (2009). When used to support the “search and retrieval” of autobiographical memory content specifically as delineated by the SMS (Conway, 2005; Conway & Pleydell-Pearce, 2000), the SAC can explain how, at the neural level, *autobiographical* episodic memory content specifically, rather than episodic long-term memory content generally, can be used for simulation-based perspective taking. The SAC is a computational model that asserts that memory content is stored in *nodes* within a neural network, the elements of which are activated according to functional equations. As such, the SAC also offers a protocol that illustrates how the retrieval of some memory would lead to simulation, whereas the retrieval of other memory content would not. The SAC will be adapted to conform to both the SMS and the simulation process model per simulation theory.

Hypotheses 1.5 and 1.6 in Support of Goal 1.3

Goal 1.3 is to show that the current paper's adaptation of the simulation process model—the *Expanded Simulation Model*—which has been augmented in the current paper to include the SMS and SAC, has the potential to explain other psychological phenomena. Consistent with a recent revision of simulation theory by Shanton and Goldman (2010), Hypothesis 1.5 states that, in addition to perspective taking, the Expanded Simulation Model can also be used to explain mental time travel. To support, the current paper will operationalize mental time travel in three ways: the "re-experiencing" of (predominantly episodic) autobiographical memory content for the purpose of *reminiscing* (e.g., Casey, 2009); the "pre-experiencing" of (predominantly episodic) autobiographical memory content for the purpose of *prospection* (imagining future scenarios) (Schacter & Addis, 2007); and the "reframing" of (predominantly episodic) autobiographical memory content for the purpose of *counterfactual thinking* (mentally reconstructing memories of past events to include new details and/or outcomes) (Epstude & Roese, 2008; Gavanski & Wells, 1989).

If the Expanded Simulation model can plausibly account for *how* autobiographical memory is used for perspective taking, prospection, and counterfactual thinking, such will justify proceeding to Hypothesis 1.6. Hypothesis 1.6 states that, because perspective taking, prospection, and counterfactual thinking are *purposes* for which autobiographical memory is used, then perspective taking, prospection, and counterfactual thinking are functions of autobiographical memory.

Hypothesis 1.7 in Support of Goal 1.4

Shanton and Goldman (2010) argue that, although simulation theory can explain both perspective taking and mental time travel, these outcomes are behaviorally distinct and driven by different goals. Shanton and Goldman therefore proposed that the simulation processes underlying perspective taking and mental time travel were also distinct, resulting in two hypothesized simulation forms. When the goal is to perspective take, which Shanton and Goldman describe as an *other*-directed goal, the ensuing simulation form is *interpersonal* simulation. When the goal is to mental time travel, which Shanton and Goldman characterize as *self*-directed, the ensuring simulation form is *intrapersonal* simulation. Goal 1.4 is to frame the Expanded Simulation Model accordingly. Hypothesis 1.7 states that, the autobiographical memory function of perspective taking reflects interpersonal simulation, whereas the autobiographical memory functions of prospection and counterfactual thinking reflect *intrapersonal simulation.* Table 1 summarizes Chapter 1's seven hypotheses.

1.3 Expanding the Simulation Model

The next five sections will summarize the following. First, simulation theory will be presented and critiqued. Second, the characteristics, theories, and empirical findings with respect to simulation processes and long-term memory will be reviewed. The third section will present evidence that supports autobiographical memory content as the long-term memory content most applicable to simulation-based perspective taking. The fourth section will describe the SMS, then adapt it to explain the inner workings of the long-term memory component. The fifth section will present the features of the SAC, then propose how it can be integrated into the simulation process model. The SAC will then be mapped onto the SMS to more specifically illustrate the neural activation patterns within the long-term memory component that could explain how simulation is or is not initiated.

Simulation Theory

A *simulator* can be thought of as a mechanism that constructs a variety of conditions and outcomes tailored to situational constraints and goals (Barsalou, 2003). The ability to simulate is considered essential to human evolutionary fitness: Being able to imagine "non-present" situations informs decisions and actions when encountering novel environments and circumstances (Barsalou, 2003, p. 515). Therefore, to simulate proficiently is a skill. It is the ability to successfully integrate contextualized and dynamic "background" (remembered) information with imagination to result in appropriate actions or reactions (Barsalou, 2003, p. 521).

Simulation theory by Goldman (2006) posits that simulation is the mechanism through which perspective taking is accomplished. Simulation as a means of understanding other minds quickly gained traction since it was first proposed by Gordon (1986), and then Heal (1986), and again later by Harris (1989), and Goldman (1989, 1992). Around this same time, rival "observational" approaches arose in response to critics of simulation theory's "experiential" approach. There are currently two leading observational views: "theory-theory" and "rationality-teleology theory." *Theory-theory* (e.g., Carruthers, 1996; Gopnik & Wellman, 1992) is a folk psychology holding that people hypothesize about and logically deduce other minds (Churchland, 1991). Although to engage in theory-theory is to mentally manipulate knowledge, these manipulations are thought not to involve simulation (Goldman & Shanton, in press). *Rationality-teleology theory*, or just *rationality theory*, is also a folk psychology that assumes that people are "rational" agents whose observed behaviors can be rationally explained (e.g., Dennett, 1987). Rationality theory asserts that people infer others' mental states through simulation, but instead deduce other minds based on social facts and other knowledge (Dennett, 1987; Goldman & Shanton, in press). One of the criticisms of both theory-theory and rationality theory is that to engage in either necessitates considerable conscious mental effort (Goldman, 2006). Given that perspective taking is assumed to occur frequently in everyday life, the amount of psychological and metabolic resources needed to carry out multiple successive thoughtful deductions is untenable (Ickes, 2003). Another concern is how and when the "rules and laws" that guide such deductions are initially learned, which neither theory has attempted to fully explain (Goldman & Shanton, in press). Also, a main premise shared by both theory-theory and rationality theory is that *self-experience* is extraneous to understanding other minds (Goldman & Stanton, in press). This assumption is challenged by experimental findings from the developmental literature (Goldman & Shanton, in press). For example, although studies show that young children can and do conduct simple attributional deductions in line with both theory-theory and rationality theory (e.g., Goldman, 2006; Nichols & Stich, 2003; Perner, 1996), other findings suggest the use of simulation. That is, children who have acquired first-person experience in producing a goal behavior are more likely to attribute those same goals to others than are children who have not acquired that first-person experience (Sommerville & Woodward, 2005). Put another way, children who have developed the skill to "re-experience," or reflect upon, a past episode in which he or she met a past goal are more likely to attribute those same goals to others than are children who cannot yet reflect on their past episodes. Children who have developed the ability to take a first-person perspective are also more proficient in theory of mind tasks (Goldman, 2006). However, even though young children are acquiring the skills necessary for simulation—specifically, to self-reflect on past episodes—those younger than four years of age are not yet proficient perspective takers (Fuchs, 2012; Selman, 2003). While this is due to some extent to children's nascent neural development, it has been proposed that it is also due to deficits in language skills (Fuchs, 2012). Per this hypothesis, for children to become skilled at inferring other minds first requires that they engage in real-life interactions—particularly social conversation (Fuchs, 2012).

The neural pathways associated with both simulation (e.g., Buckner, et al., 2008; Spreng & Mar, 2012), autobiographical memory retrieval (e.g., Buckner et al., 2008), and perspective taking (Knox, 2010; Perry et al., 2011) are found in the brain's "default mode network." The *default mode network* is a system of brain regions responsible for dynamic mental simulations that also involve memory and imagination (Buckner et al., 2008; Goldman & Shanton, in press; Shanton & Goldman, 2010; Spreng & Grady, 2010; Spreng, Mar, & Kim, 2009). Neuroimaging studies in which subjects are asked to engage in reminiscing ("re-experiencing" the past), prospection ("pre-experiencing" the future), counterfactual thinking ("reframing" the past with new details), or perspective taking ("recalling" past experiences relevant to inferring an other's mental states), show greater activation across default mode network structures compared to baseline, at which time general daydreaming or "mind-wandering" is assumed to occur (Buckner et al., 2008). But while the default network appears to be the locus of these related functionalities, the recall of event-specific information also activates sensory-response brain areas, especially the visual cortex. Decety and Grèzes (2006) recorded brain activation patterns of participants who were first exposed to an actual visual experience, then were tasked with recollecting a past event. In both cases, the resulting activation patterns in the visual cortex were identical. These findings give weight to the idea that simulating a past event results in a subjective, but nonetheless experientially realistic, re-living of that event (Goldman, 2006; Decety & Grèzes, 2006; Klein, Cosmides, Tooby, & Chance, 2004; Shanton & Goldman, 2010).

To align with recent brain imaging findings, simulation theory posits two experiential forms of simulation-based perspective taking: "low-level mind reading" and "high-level mind reading." *Low-level mind reading* (see Figure 1) is a bottom-up process automatically activated when a target triggers an observer's mirror neuron system, or the human equivalent thereof[8] (Shanton & Goldman, 2010). This preferential activation of motor-perceptual areas reflects the sort of responsivity widely characterized as "emotional" empathy—i.e., emotional concern and personal distress (Davis, 1980, 1983; Decety & Grèzes, 2006; Goldman, 2006). Low-level mind reading thus reflects a mechanism by which to infer others' emotional states, employing stored knowledge, but no incorporation of imagination (Goldman, 2006; Shanton & Goldman, 2010). Because the objective of the current paper is to expound autobiographical memory's role in perspective taking, low-level mind reading will not be further discussed.

In contrast, simulation theory's *high-level mind reading* (Goldman, 2006) aligns with the Davis (1980, 1983) multidimensional empathy model's "cognitive" forms of empathy: fantasy (the transposing of one's self imaginatively into the mental states of a fictional character) and perspective taking (the ability to adopt the mental state of another). Like low-level mind reading, high-level mind reading occurs in response to another or others (Goldman, 2006). However, high-level mind reading is a "top down," rather than "bottom up" process that also involves such executive functions as working memory, planning, and decision-making (Buckner & Carroll, 2006; Decety & Grèzes, 2006; Goldman, 2006). High-level mind reading begins when a perspective-taking goal prompts the retrieval of relevant "background information" in the form

[8] Although some support for human mirror neurons has been reported (e.g., Mukamel, Ekstrom, Kaplan, Iacoboni, & Fried, 2010), evidence for human mirror neuron system is almost exclusively generalized from primate study findings.

of long-term memory content[9] (Goldman, 2006; Shanton & Goldman, 2010). The extracted memory content can be thought of as "input" for *imaginative simulation*[10]—the process by which memory content is "re-experienced" as a "genuine" (of the *self*) state, then as a "simulated" ("of the self *on behalf of another*) state. From there, a decision about the fitness of the simulated state is made, resulting in the attribution (or not) of the simulated state to the other. The completion of this attribution is the behavioral outcome of perspective taking. (Shanton & Goldman, 2010). The simulation process model for high-level mind reading is depicted in Figure 2.

To illustrate[11], let us suppose that Zelda feels that Ziggy has been distant in their relationship lately, but, out of concern that Ziggy might consider her to be overreacting, decides not to bring it up for discussion. Instead, she searches her personal past for episodes in which she herself has felt distant in her relationship with Ziggy or others. Having activated the relevant memory content in response to her goal (to understand why Ziggy might be distant based on her own experiences), the memory is "re-experienced." As Zelda imaginatively considers both her memory and current information about Ziggy's behavior, Zelda then considers whether any of the reasons for which she felt distant and why could also be the source of Ziggy's distance. She realizes that she has most often felt distant in her social relationships when stressed at work. By mingling this information of the self imaginatively with information about Ziggy's behavior,

[9] Figure 2 depicts the retrieval of content from long-term memory as the initial component in the simulation process as proposed by Shanton & Goldman (2010). Because initiation of the simulation process originates from the individual about to simulate, this first component is categorized as a "genuine mental state." In contrast, a "simulated mental state" is one that mingles information from the genuine mental state with imagination.

[10] Although the process components that follow the long-term memory component are collectively referred to as *simulation proper* by Goldman (2006) and Shanton & Goldman (2010), for clarity, this paper will use the term *imaginative simulation* to make clear that the simulation process components that follow the long-term memory component incorporate imagination. This is in contrast to the simulation proper that occurs during low-level mind reading (see Figure 1), which does not make use of imagination.

[11] Note that the narrative example suggests a seriality of events and that are not likely to occur in reality. Rather, one might retrieve, then reject, multiple past events before proceeding to the attribution stage. Thus the example is meant only to illustrate one of several *possible* cognitions that could occur at the various stages of the simulation process.

Zelda has simulated and then attributed a mental state—that he is stressed about work and therefore distant—to Ziggy.

Simulation theory by Goldman (2006) provides a suitable model in support of Hypothesis 1—that the mechanism underlying perspective taking is mental simulation. However, simulation theory only superficially defines the role of long-term memory content in the simulation process. Thus, in order to support Hypothesis 1.2—that autobiographical memory content, a sub-form of long-term memory content, is more specifically used for perspective taking—the long-term memory "component" must be "unpacked" and explained. The following section reviews the characteristics of long-term memory that are relevant to its use in simulation-based perspective taking.

Long-Term Memory Component

Memory content characterized as "long-term" is assumed to be stored for long periods of time (Atkinson & Shiffrin, 1968). Almost from its beginning as a topic of study, long-term memory has been conceptualized as comprising multiple autonomous systems (Willingham & Goedert, 2001). Early studies of long-term memory focused on defining taxonomical subsystems that supported experimental findings. One of the earliest multisystem theories explained why amnesiacs' motor memory remained intact while memories of facts and events were lost (Willingham & Goedert, 2001). The result was the dichotomization of long-term memory into "declarative" and "nondeclarative" systems (Cohen & Squire, 1980; Squire & Zola-Morgan, 1991). *Declarative memory* was said to be located in the medial temporal lobe, the damage of which explained the loss of knowledge-based and episodic memories (Willingham & Goedert, 2001). *Nondeclarative memory*, or "skills" memory, was content stored independent of the medial temporal lobe, which explained why memories for procedural skills, emotion conditioning, and priming effects were retained (Willingham & Goedert, 2001). Declarative memory was later also classified as *explicit memory* to reflect its use of conscious attention (Graf & Schacter, 1985). Nondeclarative memory's unconscious automaticity led to its further classification as *implicit memory* (Graf & Schacter, 1985).

The effects of amnesia prompted other memory researchers to explain the experiential properties of declarative memory (Tulving, Schacter, McLachlan, & Moscovich, 1988). The primary ways in which a memory can be differentially "re-experienced" recommended the "semantic" and "episodic" subsystems (Tulving, 1972, 1983, 1987, 1993, 2002b). Although precise definitions have varied over the years, in general, *semantic* memory content includes decontextualized factual knowledge. *Episodic* memory content includes contextualized information that, when remembered, leads to the "re-experiencing" of that memory content. Thus, episodic memory prompts the "mental reliving," or *recollection* of an event, whereas the fact-based nature of semantic autobiographical memory content leads instead to the identification, or *recognition* of that content (Reder et al., 2009). Recent research suggests that, although semantic autobiographical memory content reflects general, objective information about one's past and one's self, if its neural associations with episodic content is strong enough, its recall can simultaneously elicit the activation of more specific episodic autobiographical memory content (Abrams, Picard, Navarro, & Piolino, 2014).

Neuroimaging evidence also supports these distinctions. For example, in a study by Rajah and McIntosh (2005), subjects who were tasked to retrieve either semantic or episodic memory content showed differential patterns of activation depending on which task they were performing. However, the interregional correlations between those functional areas were not significantly different. This supports the generally accepted account that semantic and episodic memory systems are not so much discrete as they are the end-points of a semantic-episodic "continuum," which allows them to function *interdependently* (Burianova, McIntosh, & Grady, 2010; Fitzgerald & Broadbridge, 2012; Greenberg & Verfaellie, 2010; Kihlstrom, 1984; Tulving et al., 1988; Tulving, 2001). The interdependence of semantic and episodic memory explains why memories have semantic and episodic content "overlap" (Gilboa, 2004). For example, traditional taxonomies would deem the concept of "coffee cup"—absent any temporal, attributional, or contextual constraints—to be purely semantic information. However, that such retrieved content would be fully decontextualized is unlikely (Greenberg & Verfaellie, 2010). If asked to recall a "coffee cup," a number of episodic properties would likely be elicited. Reasons why corresponding episodic information would be incorporated in the recall include *recency* (e.g., recalling the cup used that morning), *saliency* (e.g., recalling the cup dropped and shattered that morning), and *availability* (e.g., recalling a cup that is always sitting on your desk) (Greenberg & Verfaellie, 2010). Such findings suggest that the semantic-episodic boundaries are blurred.

In terms of what *form* of long-term memory might be activated in response to perspective-taking goals, both theory and research, albeit mostly indirect, implicate a reliance on declarative memory (Spreng et al., 2009). This is largely because declarative memories can be brought into conscious awareness (Suddendorf & Corballis, 1997), where the reliving of such memory content can be imaginatively applied to the inferring of other minds (Hassabis, Spreng, Rusu, Robbins, Mar, & Schacter, 2013). The assumed use of declarative versus nondeclarative memory is also something of a default, given that no known findings to date implicate the use of nondeclarative memory in perspective taking. That is, with the exception of studies that indicate links between perspective taking and implicit attitudes—e.g. that perspective taking can attenuate explicit expressions of implicit racial bias (Todd, Bodenhausen, Richeson, & Galinsky, 2011). However, such findings provide little evidence for the use of nondeclarative memory content to perspective taking for three reasons. One, researchers disagree as to whether implicit attitudes should be even characterized as nondeclarative (Roediger, Nairne, Neath, & Surprenant, 2003). Two, the use of perspective taking as a means of exerting "top-down" control over implicit attitudes gives greater weight to the argument that perspective taking involves consciousness awareness, which suggests a greater dependency on declarative long-term memory. And three, the research that does attempt to understand the relation between perspective taking and memory focuses almost exclusively on the involvement of episodic and semantic memory forms, both of which are sub-forms of declarative memory (e.g., Rajah & McIntosh, 2005; Suddendorf & Corballis, 1997).

Having summarized the leading views on the sub-forms of long-term memory, some of which are with respect to perspective taking specifically, the next section presents and critiques findings from theoretical and empirical research that are used to support Hypothesis 1.2—that autobiographical memory content in particular—rather than long-term memory in general—can be used as simulation output for simulation-based perspective taking.

Autobiographical Memory as a the Long-Term Memory Form

Early researchers recognized the role that memories about the self played in *defining* the self (Tulving, 1972). These self memories, or *autobiographical* memories, when considered in aggregate, serve as "resources" of and about the self (Conway & Pleydell-Pearce, 2000; Robinson, 1986). Because autobiographical memory content can be retrieved for conscious re-experience, it is a sub-function of declarative memory, and thus long-term memory. Developmental studies show that the autobiographical memory system emerges in early childhood concurrent with the development of self, language, and other memory forms (Nelson & Fivush, 2004). Evolutionarily, the capacity for autobiographical memory provided an adaptive advantage (Spreng et al., 2009). Just as selection pressures promoted the evolution of abilities that fostered prosocial behaviors—e.g., perspective taking (e.g., Barresi & Moore, 1996; Decety & Hamm, 2009; Goldman, 2006)—the ability to recall one's personal interactions with others could also be used to cultivate social accord.

Conceptualized initially as something of a "storehouse" for life narratives (Fivush, Habermas, Waters, & Zaman, 2011), early theories presumed that autobiographical memory content was wholly episodic in nature (Tulving, 1983, 1993). However, as the complexities and composition of the self became better understood, it was recognized that autobiographical memories feature the same semantic-episodic overlap that general declarative memories do (Burianova et al., 2010; Tulving, 2001). The modern take on autobiographical memory is less about the taxonomical definitions of semantic versus episodic content, and more about the phenomenal experience of remembering (Baddeley, 2001; Brewer, 1996; Tulving, 2001).

Although autobiographical memory has been comprehensively studied with respect to self, it has been less so with respect to social behaviors (Spreng, 2013). However, interest in this area has grown, as has the body of evidence linking the use of autobiographical memory to *perspectivity*—the ability to take both observational and experiential perspectives of the world (Fuchs, 2012). For example, a variety of brain studies implicate a shared neuroanatomy located within the default network as underlying the capacities of autobiographical memory retrieval and first- and third-person perspectivity (Buckner & Carroll, 2006; Spreng et al., 2009; Spreng & Grady, 2010; Rabin, Gilboa, Stuss, Mar, & Rosenbaum, 2010). Additionally, those same neural pathways are also linked to the ability to mentally integrate the personal (subjective) and interpersonal (objective) information—i.e., the mental simulation of perspectivity (Spreng & Mar, 2012). A recent neuroimaging study by Perry et al., (2011) found compelling evidence that the hippocampus—a default network memory structure linked to the use, encoding, and consolidation of autobiographical memory—is involved in emotional attributions regarding both the self and others. After recalling a personal past event, subjects were asked to ascribe to themselves an ensuing mental state. Subjects were then asked to attribute mental states to first a similar other, then a dissimilar other, both of whom subjects were told also experienced that same event. Results showed greater hippocampus activation when subjects inferred the mental states of a similar other than when inferring the mind of a target who was dissimilar. This not only suggests that perspective takers integrate their internal self-knowledge and personal past experiences with knowledge of others *onto* others, but that a perceived similarity between the self and the other elicits an even greater reliance on autobiographical memory content to inform the mental attribution than if the perspective taker perceives a dissimilarity between him or herself and the target.

Evidence that autobiographical memory and perspective taking share the same neural architecture supports other phenomenological links between self and other. Autobiographical memories can be recalled from a "first-person" or "third-person" perspective. A *first person* or "field" perspective reflects the viewpoint of the individual who *experiences* an event, whereas . A *third-person* or "observer" perspective reflects the viewpoint of the individual who *observes* the event (Berntsen & Rubin, 2006). It is known that rememberers can fluidly move between first- and third-person perspectives within the same recollection either spontaneously or when experimentally compelled (Berntsen & Rubin, 2006; McIsaac & Eich, 2002; Decety & Grèzes, 2006). A brain imaging study by Decety and Hamm (2009) showed that when individuals assume others' perspectives, the neural circuitry underlying both third- and first-person experiences are simultaneously activated. But despite the structural overlap that facilitates this functional mutuality, the two pathways are nonetheless distinct. These findings help to explain how the self "detaches" from simulated states in order to project them onto another (Shanton & Goldman, 2010). If the neural circuitry were one and the same for both first- and third- person experiences, perspective takers would be unable to "quarantine"—i.e., differentiate—their own mental states in order to process those of another (Decety & Hamm, 2009; Shanton & Goldman, 2010). The neural link between first- and third-person perspectivity capacities, however, also suggests that these substrates co-developed (Decety & Hamm, 2009). Such reciprocal functionality allows one to re-experience self-knowledge and past events for the purpose of predicting the states and behaviors of social others (Perry et al., 2011). Evidence from a variety of related literatures shows that a collaborative neural circuitry underlies autobiographical memory retrieval (e.g., Buckner et al., 2008), self-projection (e.g., Buckner & Carroll, 2006), subjective awareness (e.g., Demertzi, Soddu, Faymonville, Bahri, Gosseries, et al., 2011), simulation (e.g., Buckner, et al., 2008; Spreng & Mar, 2012), and perspective taking (e.g., Dodell-Feder et al., 2014; Knox, 2010; Perry et al., 2011). Thus this network of brain regions, which support the recollection of personal past experiences, also facilitates imaginatively simulating the experiences of other people (Hassabis et al., 2013).

The evidence summarized in this section implicating the use of autobiographical memory for perspective taking supports Hypothesis 1.2, that autobiographical memory content particularly, rather than long-term memory content generally, can be used for perspective taking. The current paper has also met Goal 1.1, which was to demonstrate the suitability of mental simulation as the mechanism by which autobiographical memory content could be used for perspective taking. To address Goal 1.2, the next section “unpacks” the long-term memory component of the simulation process model to illustrate how autobiographical memory content might be activated and retrieved for simulation-based perspective taking. Also presented is evidence in support of Hypothesis 1.3, which states that the “search and retrieval” procedure responsible for activating and extracting autobiographical memory content in response to a perspective-taking goal could be explained by an adapted version of the *self-memory system* (Conway, 2005; Conway & Pleydell-Pearce, 2000).

Self-Memory System

For a mechanism to effectively link input to output, its processes must be interlocking and synergistic (Klein et al., 2001). Simulation theory by Goldman (2006) and Shanton and Goldman (2010) proposes that long-term memory content is imaginatively simulated to produce an attribution of another’s mental states. However, simulation theory provides no explanation as to *how* memory content is selected and retrieved in order to serve as simulation input. In support of Hypothesis 1.3, the current paper proposes that the extraction of relevant autobiographical memory content for simulation purposes can be illustrated with the *self-memory system* (SMS) (Conway, 2005; Conway & Pleydell-Pearce, 2000).

The SMS is a conceptual model that was proposed by Conway and Pleydell-Pearce (2000), and later Conway (2005) as a means of elucidating how autobiographical memories maintain the self. The SMS is comprised of two subsystems—the “working self” and the “autobiographical knowledge base.” The *working self* is also a subsystem of *working memory*—the memory system responsible for maintaining transitory mental information until manipulated, consolidated, and/or discarded (Baddeley, 1988). The working self maintains one’s repertoire of self-concepts that ensue from experience. The *autobiographical knowledge base* stores content encoded as “autobiographical” and makes this content available in support of self-related goals. The working self and autobiographical knowledge base are independent, but reciprocal mechanisms. The working self prompts the autobiographical knowledge base to make available those memories associated with a goal-driven, active self-concept. The content of the autobiographical knowledge base in turn informs the self-concepts regarding the working self. This inherent interdependence of the SMS components allows for the self to be both *experiencer* of experience and the *product* of the remembered aspects of experience, making the self a composite of autobiographical memories (Williams, Conway, & Cohen, 2008). Figure 3 illustrates the SMS with respect to traditional long-term, declarative, and autobiographical memory systems.

The subjective evaluation of experience is thought to be the mechanism by which general semantic and episodic information is transformed into autobiographical content (Klein, German, Cosmides, & Gabriel, 2004). Per Conway & Pleydell-Pearce (2000), once transformed, the SMS manages the autobiographical content’s storage and retrieval. Autobiographical memory information is organized in the autobiographical knowledge base according to one of three *levels of specificity*: “lifetime periods,” “general events,” and “event-specific knowledge”. *Lifetime periods* are abstract, thematic, and temporal (e.g., high school years; time worked at “X” company). Lifetime period content is evaluative information that informs various broad self-concepts (e.g., “woman,” “student,” “instructor”) (Williams et al., 2008). *General events* are more specific than lifetime periods but still more thematic than detailed (e.g., “learning to drive a stick shift car”). *Event-specific knowledge* is highly detailed and time specific (e.g., “that sunny afternoon last August when Ziggy tried to teach me how to drive a stick-shift and I could not get the car out of first gear”).

Although levels of specificity is the scheme by which autobiographical content is stored, autobiographical information is retrieved in response to *goals* (Conway, 2005). Goals have been shown in a number of experimental studies to be excellent memory cues (Barsalou, 1988). According to Conway (2005), goals that cue the retrieval of autobiographical memory content are managed by the *goal hierarchy* of the working self. Per the SMS, an active goal triggers the goal hierarchy, which prompts the working self to activate a self-concept that in some way corresponds to that goal. The activation of the self-concept triggers the autobiographical knowledge base to make available for retrieval content consistent with the active self-concept (Williams et al., 2008). Such content may consist of semantic self-knowledge, episodic experiences, or hybrid mixtures of both (Conway, 2005; Williams et al., 2008). For example if an individual has the goal of being a socially acceptable "friend," the goal hierarchy will activate the individual's "friend" self-concept. This will then prompt pertinent semantic and episodic content linked to the "friend" self-concept. In theory, complex goals can elicit multiple self-concepts, each linked to autobiographical content featuring different levels of specificity and myriad semantic-episodic blends (Williams et al., 2008).

Related research suggests that the self-concept activated by a perspective-taking goal might be the product of those experiences that the perspective taker presumes are being experienced by the target other; that is, the perspective taker's perceived *similarity* to the target other will inform self-concept selection. For example, Ickes (2003) reported that men were more accurate perspective takers when the target other was a friend of at least a year *and* was perceived to possess a similar level (low, moderate, or high) of trait *sociability.* Likewise, Perry et al. (2011) found that individuals making emotional attributions of others' mental states had greater hippocampal activation when perspective taker perceived the target other as being similar to him- or herself, and less activation when the target was perceived as dissimilar. It therefore follows that the more similar a perspective taker perceives him- or herself to be to the target other, the more that perspective taker relies on autobiographical memory content to inform attributions. This appears to be the case when the perspective taker perceives the target other to be similar to themselves *characteristically*—as was found by Ickes and Perry et al.—or even *experientially* (Gaesser & Schacter, 2014). Although external factors like social context and knowledge about the other certainly inform perspective-taking goals (Ickes, 2003), simulation-based perspective taking relies preferentially on autobiographical memory content to inform inferences about others' minds.

Thus, in support of Hypothesis 1.3, the current paper argues that the SMS (Conway, 2005; Conway & Pleydell-Pearce, 2000) provides a possible account of what occurs “”within the long-term memory component to both activate and retrieve relevant autobiographical memory content in fulfillment of a perspective-taking goal. Thus, Goal 1.2—the “unpacking” of the long-term memory component to reveal the SMS—has been met. Hypothesis 1.3 is further supported by having demonstrated that the SMS explains how autobiographical memory of various form and detail is preferentially retrieved in service of a perspective-taking goal. The next section further “unpacks” the long-term memory component to reveal the memory activation protocol driving simulation activation or inhibition.

Source Activation Confusion Model

Although never explicitly asserted, simulation theory implies that the retrieval of long-term memory “background information” initiates simulation. The high-level mind reading model (see Figure 2) shows that the simulation process requires content from long-term memory, which is imaginatively reframed such that one's own “re-experience” of that content is, to some degree, then attributed to the target other (Shanton & Goldman, 2010). Because the current paper argues that the most plausible form of long-term memory content used for perspective taking is autobiographical memory content, the SMS (Conway, 2005; Conway & Pleydell-Pearce, 2000), which explains both *how* and *why* autobiographical memory content could be activated and retrieved, was used to support this contention. However, the SMS was not designed to explain the "search and retrieve" procedure that might occur at the neural level: Missing are the cognitive "commands" that could prompt the instigation of simulation upon the extraction of autobiographical memory content. Such commands could be provided by a computational cognitive mode.

The purpose of computational cognitive modeling is to expound the details of conceptual cognitive models via algorithmic descriptions (Sun, 2008). These algorithmic descriptions typically include such elements as variables, mathematical equations, and power functions (e.g., $f(x) = x^a$) (Sun, 2008). Imputing a set of computer-like rules onto a conceptual model enables the quantification of the conditions and constraints that govern the model's operation (Sun, 2008). Computational models are meant to figuratively describe these operations at the neural level (Reder et al., 2009).

Candidate computational models for the current paper needed to be able to explain *how* the extraction of autobiographical memories relevant to a perspective-taking goal could be extracted by the SMS to instigate (or not instigate) the simulation process. An effective exemplar for this purpose is the *source activation confusion* (SAC) model as proposed in Reder et al. (2002) and Reder et al. (2009). The SAC is a *nodal network* model of memory encoding and retrieval. Originally designed to explain the interdependence between explicit and implicit memory systems, it has also been used to model a variety of memory phenomena driven by neural activation (e.g., Buchler & Reder, 2007; Cary & Reder, 2003; Diana, Peterson, & Reder, 2004; Diana & Reder, 2005; Reder, Angstadt, Cary, Erickson, & Ayers, 2002; Reder et al., 2002; Reder, Oates, Dickison, Anderson, Gyulai, Quinlan, & et al., 2007; Reder, Nhouyvanisvong, Schunn, Ayers, Angstadt, & Hiraki, 2000; Reder & Ritter, 1992; Reder & Schunn, 1996; Schunn, Reder, Nhouyvanisvong, Richards, & Stroffolino, 1997). Especially important to the current paper is the SAC's ability to account for the functional interdependence known to occur between semantic and episodic memory systems.

Reder et al. (2002) and Reder et al., (2009) posit that, based on the subjective experience at the time of encoding, memory content is neurally instantiated in either a *concept* (semantic) node or an *episode* node. Each concept node contains the features and qualities—i.e., *content*—of a single concept (e.g., "dog"), whereas each episode node contains content about a single event (e.g., "purchasing Rover from the pound"). Every episode node is connected to both "general" or "specific" context nodes. *General context* nodes contain generic, gist-like information common to multiple events (e.g., "school," "home"). General context nodes are bound to multiple episodes. The array of bindings attached to any single episode nodes is referred to as that episode node's *contextual fan*. *Specific context* nodes embody high detail and emotional valence; but because their content is unique to a single event, they are bound only to its corresponding episode node. Concept and episode nodes can also be bound such that semantic-episodic overlap can occur. However, no direct connections occur between concept and context nodes, even if the content of the concept node is relevant to the content housed in a connected episode node. Rather, episode nodes serve as *intermediaries* through which concepts and contexts are linked. Although concept and context nodes have no direct connections, they can influence the activation of one another by way of *spreading activation* through the intermediary episode nodes—but only if the spreading activation is strong enough to facilitate such.

Reder et al. (2002) and Reder et al. (2009) posit that the activation of a network's nodes and bindings can be predicted by three equations meant to computationalize the SAC's primary processes. Equation 1 ($B = B_W + cN\Sigma t_i^{-dN}$) reflects the activation strength or activation decay from the baseline activation of the implicated nodes and bindings. According the SAC, B = baseline activation, B_W = base-level activation of the node; cN = strength of node; dN = decay of activation of node (by constant); and t_i = time since the *i*th presentation. Equation 1 states that nodal activation is the summation of both the strength of the direct activation and the strength of the node's baseline level. Factors that can impact baseline activation include the repetition of an experience or a recall of the memory over time.

Equation 2 ($S_{s,r} = cL\Sigma t_i^{-dL}$) reflects the *binding strength* or *binding decay* of the connections between nodes over time. Per the SAC, $S_{s,r}$ = strength of link from node *s* to node *r*; t_i is time since *i*th association between the two nodes; cL = strength of link; and dL = decay of link strength. Similar to what occurs with the activation of nodes, binding strength increases with repeated experiential exposure, but decays from disuse as a function of time. Equation 2 asserts that, even if nodal baseline and direct activation levels are high, binding strength can promote or inhibit subordinate activation. The strength of the network's spreading activation is dictated by

Equation 3 ($\Delta A_r = \Sigma(A_s \times S_{s,r}/\Sigma S_{s,I})$. Per the SAC, ΔA_r = change in activation of the receiving node; A_s = activation of each source node *s*; $S_{s,r}$ = strength of the link between nodes *r* and *s*; and $\Sigma S_{s,I}$ = sum of strengths of all links emanating from the node *s* (the *fan*). Thus the more radiating bindings a general context node has, the more its attendant episode nodes will "compete" for subordinate activation. For example, if the general context is "school," multiple and varied episodes such as, "having taken the stats test last week," having lunch with classmate Zelda yesterday," and "riding the bus to campus" are linked. Per spreading activation (Equation 3), episode nodes that have higher baseline activation levels (per Equation 1) and/or stronger bindings (per Equation 2), will be preferentially activated.

The SAC (Reder et al., 2002; Reder et al., 2009) equations permit predictions about *what* memory content will be activated, and thus whether or not a memory will be "re-experienced." Per Reder et al. (2009), the SAC posits that nodal activation elicits one of two *assessment processes* leading to either "recognition" or "recollection." When a goal necessitates the activation of factual, knowledge-based, conceptual (semantic) content, a *concept* node is preferentially activated, which results in the assessment process of *recognition*. The recognition assessment process leads to such outcomes as *identification*, *knowing,* or *believing*. Because the nature of a concept node's content is informational, recognition does not lead to "re-experience"—for example, one cannot "re-experience" a friend's name.

However, when a goal requires that memory content be "re-experienced" for its event and contextual properties—for example, to "re-experience one's own mental states during the arranging of a funeral in order to understand a target other's grief during a similar event—an *episode* node is preferentially activated. The assessment process that ensues from the activation of an episode node is called *recollection*. The recollection assessment process results in the outcomes related to *remembering*—or what the current paper has termed elsewhere as *reminiscence*. The computational rules of the SAC ensure that the triggering of an assessment processes is a result of either direct, or predominant, activation of the relevant node type. That is, if the activation of a concept node containing a friend's name information has, as a result of experience (for example, having recently helped the friend through a crisis), also caused the development of strong bindings to particular episode nodes, the activation of the "name" concept node could prompt activation of the episode node. If a goal then became a need to understand the friend's mental states, the activated episode node could result in recollection. In this way, the SAC model and equations account for the occurrence of semantic-episodic overlap. Figure 4 depicts the elemental components of the SAC's nodal network.

In addition to the SAC explaining the semantic-episodic overlap known to occur with respect to the "re-experience" of autobiographical memory content (Burianova et al., 2010; Gilboa, 2004; Fitzgerald & Broadbridge, 2012; Greenberg & Verfaellie, 2010; Kihlstrom, 1984; Tulving, 2001; Tulving et al., 1988), the current paper argues that the SAC's assessment processes align with the need for imaginative simulation in order to fulfill a goal—or not. Simulation theory by Goldman (2006) and Shanton and Goldman (2010) for perspective taking posits that extracted memory content serves as "input" for the "re-experiencing" of a "genuine" (of the *self*) state, which is then as a "simulated" ("of the self *on behalf of another*) state. When the goal is identification—e.g., remembering someone's name—the nature of the relevant memory content is *semantic*. Thus the *concept* node housing the relevant semantic memory content is activated, which prompts the assessment process of *recognition*. The current paper argues that recognition does not necessitate the use of imagination because semantic information cannot be "re-experienced"—thus such goals do not utilize imaginative simulation. Rather, the extraction of the semantic information results in such non-experiential behavioral outcomes as *identification*, *knowing*, or *believing*. Figure 5 illustrates the simulation process model (into which the SMS and SAC have been incorporated) when an identification goal triggers the assessment process of recognition.

Contrarily, when a goal is to use one's past experiences in the service of understanding another's mental states, the memory content needed is *episodic*, which is required in order to "re-experience" a past experience. Because episodic memory content is housed in an *episode* node (and its corresponding *context* nodes), the assessment process that ensues, according to the SAC, is *recollection*. The current paper posits that recollection in response to a perspective-taking goal *does* require simulation, thus employing imaginative simulation. Figure 6 illustrates the simulation process model (with the SMS and SAC components) when a perspective-taking goal triggers the assessment process of recollection. The current paper specifies the recollection process further by arguing that, when perspective taking is the goal, the *specific* form of episodic long-term memory content subject to the recollection assessment process—and thus the memory content that undergoes simulation—is autobiographical. As argued in the previous section, the search and retrieval of autobiographical memory content in response to a perspective-taking goal follows the procedures outlined by the SMS (Conway, 2005; Conway & Pleydell-Pearce, 2000).

Although no other known study has adapted the SAC (Reder et al., 2002; Reder et al., 2009) for a purpose similar to that of the current paper, indirect evidence from related lines of research advocates its integration into the simulation theory process model (Goldman, 2006; Shanton & Goldman, 2010) for perspective taking. For example, a recent observational study by Gaesser and Schacter (2014) investigated the cognitive mechanisms underlying prosocial tendencies, perspective taking, semantic retrieval, episodic remembering, and episodic simulation (constructive imagining). Results showed a link between the willingness to infer the thoughts and feelings of others and episodic remembering and simulation, but not to semantic retrieval. Although this study did not examine the role of memory in the facilitation of perspective taking explicitly, it aligns with brain data showing these same cognitions are underlain by shared neural systems (Buckner et al., 2008; Decety & Hamm, 2009; Saxe & Kanwisher, 2003; Shanton & Goldman, 2010). Additionally, in a study by Saxe and Kanwisher (2003), participants were tasked to infer a target other's thoughts and feelings. Brain scans of the participants showed concurrent neural activation in the overlapping pathways associated with episodic memory retrieval and theory of mind. However, during a task in which participants were asked to retrieve strictly semantic memory content, the pathway associated with memory retrieval was again activated, but the pathway associated with theory of mind was not. Although these studies do not rule out the use of semantic episodic memory content in fulfillment of a perspective-taking goal, findings do suggests a predominance episodic memory content.

Thus in support of Hypothesis 1.4—that simulation occurs in response to heightened neural activation of predominantly episodic memory content as predicted by the SAC—the augmentation of the simulation process model with the incorporation of the SAC can be used to explain how episodic memory content is activated and retrieved in response to a goal necessitating the "re-experience" of a personal past event. When used to support the "search and retrieval" of autobiographical memory content specifically as delineated by the SMS (Conway, 2005; Conway & Pleydell-Pearce, 2000), the SAC can explain how, at the neural level, *autobiographical* episodic memory content specifically, rather than episodic long-term memory content generally, can be used for simulation-based perspective taking.

1.4 Expanded Simulation Model

Figure 6 illustrates the integration of simulation theory's simulation process model, the SMS, and the SAC, which together yields the current paper's proposed *Expanded Simulation Model* of perspective taking. (see Figure 6). The Expanded Simulation Model was developed for the current paper to demonstrate how autobiographical memory content specifically, rather than long-term memory content generally, could be used for perspective taking. In so doing, the Expanded Simulation Model provides a potential theoretical framework for the *autobiographical memory function of perspective taking*, for which empirical evidence was reported by Ranson and Fitzgerald (in preparation). The development of the Expanded Simulation Model was necessary because, although indirect evidence implicating the use of autobiographical memory for perspective taking has been reported in a variety of related literatures, to date, no direct theoretical model predicting the existence of the autobiographical memory function of perspective taking has been extended. The Expanded Simulation Model proposes that the mechanism by which autobiographical memory is used for perspective taking is mental simulation as presented by simulation theory (Goldman, 2006; Shanton & Goldman, 2010).

A recent revision to simulation theory for perspective taking by Shanton and Goldman (2010) posited that simulation could also serve as the mechanism by which long-term memory content is used for mental time travel. If, by extension, the Expanded Simulation Model could be adapted to show how autobiographical memory content could be used for mental time travel, then the Expanded Simulation Model would provide theoretical justification for the existence of the *autobiographical memory function of mental time travel*. The following sections explore the utility of the Expanded Simulation Model by using it to explain how autobiographical memory content could be used for simulation-based mental time travel.

Using the Expanded Simulation Model to Explain Other Simulation Phenomena

Shanton and Goldman (2010) recently proposed a revision to simulation theory to include not only the "re-experience" of long-term memory content for the purpose of perspective-taking, but to posit that the "re-experiencing" of long-term episodic memory content was itself was a form of *mental time travel*. That is, when one simulates episodic memory content in order to "re-experience" that content, one is essentially traveling *back* through conceptual time to subjectively re-live that memory. Contingently, in keeping with theory and findings from various literatures regarding mental time travel (e.g., Schacter & Addis, 2007; Schacter & Addis, 2009; Schacter, Addis, & Buckner, 2008), Shanton and Goldman also posited that simulation is the mechanism by which long-term episodic memory content is "pre-experienced." That is, when one uses episodic memory content in order to imagine a future scenario, one is subjectively projecting oneself *forward* through conceptual time.

As such, simulation theory appears to explicitly support three simulation-based behavioral outcomes: *reminiscence* (to "re-experience" long-term episodic memory content in order to give the remember the sense that the past events are veridical accounts of the original experience) (Tulving & Markowitsch, 1998), *perspective taking* (to "re-experience" long-term episodic memory content in order to imaginatively reframe it to reflect another's perspective), and *prospection* (to "pre-experience" long-term episodic memory content for the purpose of imagining future scenarios) (e.g., Schacter & Addis, 2007; Schacter et al., 2008). However, the current paper posits that a fourth behavioral outcome occurs as a result of imaginatively simulating episodic long-term memory content: counterfactual thinking. *Counterfactual thinking* is the act of imaginatively "reframing" past episodes such that the conditions and outcomes of the simulated counterfactual are contrary to those that actually occurred (Gavanski & Wells, 1989; Roese & Olson, 1995).

In addition to proposing a fourth behavioral outcome of the simulation of long-term episodic memory content, Hypothesis 1.5 of the current paper states that *autobiographical* episodic memory content specifically, rather than long-term episodic memory content generally, can also be used when the goal is to mentally travel back through time to reminisce and generate counterfactuals, and forward through time when engaging in prospection. Thus the incorporation of the procedures outlined by the SMS (Conway, 2005; Conway & Pleydell-Pearce, 2000) and the SAC (Reder et al., 2002; Reder et al., 2009) for the simulation process of perspective taking can be likewise incorporated when the simulation process results in reminiscence, prospection, and counterfactual thinking.

Further, just as evidence of the use of autobiographical memory content for perspective taking supports the existence of an *autobiographical memory function of perspective taking*, Hypothesis 1.6 states that, should autobiographical memory content be shown to inform prospection and counterfactual thinking, then such would be evidence for the existence of the *autobiographical memory function of prospection* and the *autobiographical memory function of counterfactual thinking*. Because research on autobiographical memory functions has, to date, focused largely on the various *reminiscence* behaviors believed to be reflected in autobiographical memory functions (e.g., Bluck et al., 2005; Bluck & Alea, 2001; Kulkofsky & Koh, 2009; Ranson & Fitzgerald, in preparation; Webster, 1995, 1997), the current paper is not concerned with yielding evidence *for an autobiographical memory function of reminiscence*.

The contention that mental time travel involves the mental simulation of autobiographical memory content is well supported by brain evidence. For example, neuroimaging studies show that the default network is activated during autobiographical episodic memory retrieval (reminiscence) tasks (e.g., Buckner et al., 2008; Ino, Nakai, Azuma, Kimura, & Fukuyama, 2011), as well as during prospection tasks (Schacter & Addis, 2009) and counterfactual thinking tasks (e.g., De Brigard, Addis, Ford, Schacter, & Giovanello, 2013; Epstude & Roese, 2008). The default network has also been broadly implicated in such directly related "experiential" cognitions as perspective taking (e.g., Dodell-Feder et al., 2014; Hassabis et al., 2013), perspectivity (e.g., Spreng & Mar, 2012), self-projection (e.g., Buckner & Carroll, 2006); subjective awareness (e.g., Demertzi et al., 2011), and mental simulation (e.g., Buckner & Carroll, 2006; Spreng et al., 2009).

Figure 7 illustrates a possible simulation process model for mental time travel (reminiscence, prospection, and counterfactual thinking) adapted from simulation theory's process for high-level mind reading (perspective taking). The proposed simulation process model for mental time travel assumes that the simulation process would behave similarly to that of perspective taking, with the two primary differences. The first would be the goal—for example, to imagine a future scenario rather than infer another's mental states. The second would be the behavioral outcome—for example, prospection. This assumption is plausible given related research. For example, studies on *autobiographical planning*—the planning and anticipation of personally relevant future goals—show that autobiographical memory is vital to this task (Baird, Smallwood, & Schooler, 2011). Multiple studies exploring the neural substrates involved in future thinking have found extensive evidence for default network activation consistent with that for autobiographical memory (Buckner, 2009; D'Argembeau, Renaud, & Van der Linden, 2009; Schacter, Addis, & Buckner, 2007; Spreng & Grady, 2010; Suddendorf & Corballis, 2007; Tulving, 2005). In fact, no argument countering the use of autobiographical memory for prospection could be found. With respect to counterfactual thinking, a recent study by De Brigard et al. (2013) tasked participants to generate counterfactuals while undergoing functional magnetic resonance imaging (fMRI). Results showed that the more *realistic* the counterfactual, the more likely that the areas of the brain associated with autobiographical memory were co-activated with brain areas associated with counterfactual thinking. This suggests that, the less realistic the counterfactual, the more that the counterfactual depended upon, and was thus a product of, imaginative simulation.

With respect to the "unpacking" of the Expanded Simulation Model's long-term memory component to show the SMS (Conway, 2005; Conway, Pleydell-Pearce, 2000) and the SAC (Reder et al., 2009), the current paper contends that the procedures responsible for activating and retrieving autobiographical memory content relevant to a perspective- taking goal would be applicable when the goal is mental time travel. If the goal is prospection, the activation of the goal prompts the activation of the self-concept most applicable to reimagining a particular future scenario. The autobiographical memory content form (episodic and semantic), and level of specificity (lifetime period, general event, and event-specific knowledge) made available by the autobiographical knowledge base would be that which is associated with both the activated self-concept and in fulfillment of the prospection goal. The retrieved content thus becomes the input for the simulation of an imagined future scenario. The SAC then provides the equations necessary to predict what form of autobiographical memory content would be preferentially activated for prospection or counterfactual thinking at the neural level in response to the prospection goal (Reder et al., 2009).

To illustrate: If the goal necessitated the remembering of "future facts" (e.g., what a woman's last name *might become* after marriage), or "counterfactual facts" (e.g., what a woman's last name would have been if she had married James Dean), the relevant concept (semantic) node would be preferentially activated. The assessment process that ensued would be recognition. Because semantic information cannot be "re-experienced," simulation would not ensue; rather, the behavioral outcome would be identification. If, however, "pre-experiencing" a future event (e.g., my friend's upcoming wedding), the autobiographical memory content required would be episodic, thus the prospection goal would activate the episode node(s) within which experiences of other attended weddings would be predominately activated. This would prompt the assessment process of recollection, which requires simulation. Figure 8 shows the complete Expanded Simulation Model, which comprises the SMS and SAC, and shows the shared and independent pathways of the simulation process that result in the simulation-based behavioral outcomes of perspective taking, reminiscence, prospection, and counterfactual thinking.

Just as evidence from the literature supports the Expanded Simulation Model, the Expanded Simulation Model could be used to explain other phenomena. For example, it is known that the phenomenological richness of memory outputs is a function of time. That is, greater detail is reported in recollections of the autobiographical past events when the distance between that past event and the present is short (D'Argembeau & Van der Linden, 2004). This same effect is seen with prospection in that distant future scenarios feature lower degrees of specificity and valence than do imaginings about near-future events (D'Argembeau & Van der Linden, 2004). The principles of the SMS in the context of the Expanded Simulation Model predict that specific events and their details are forgotten over time unless they remain relevant to a goal and/or its associated self-concept (Conway, 2005). Unless repeatedly re-experienced, details of past events will be lost, even if the general or lifetime period details remain (Conway, 2005). As autobiographical memory content informs both the imaginative "re-experiencing" and "pre-experiencing" of events, the attenuated level of specificity of the distant memories themselves, which would then become simulation input, would be reflected in the simulated inferred outcomes of mental time travel. The SAC dictates that the episode node in which the event content is stored is activated predominately, followed by attendant context nodes. If activation is sufficient, linked concept nodes will be subordinately activated. If the bindings between the activated episode node and its attendant concept and context nodes have decayed from disuse over time, the autobiographical knowledge base will have fewer detail-containing nodes to make available for retrieval.

The current paper has therefore shown how the Expanded Simulation Model might be used to explain not only perspective taking, but also three forms of mental time travel—reminiscence[12], prospection, and counterfactual thinking. This then supports Hypothesis 1.6—that, because prospection and counterfactual utilize content from autobiographical memory, prospection and counterfactual thinking are *functions* of autobiographical memory.

Finally, the current paper contends that the Expanded Simulation Model supports the Shanton and Goldman (2010) assertion that perspective taking and mental time travel are served by two distinct forms of simulation. That is, because the goal of perspective taking is *other*-directed, the form of simulation used in service of that goal is *interpersonal* simulation. Contrarily, because the goal of mental time travel is *self*-directed, the form of simulation used to meet that such goals is *intrapersonal* simulation. By extension, because the current paper has demonstrated the theoretical plausibility of the autobiographical memory functions of perspective taking, prospection, and counterfactual thinking, the Expanded Simulation Model therefore supports Hypothesis 1.7: that the autobiographical memory function of perspective taking reflects interpersonal simulation, whereas the autobiographical memory functions of prospection and counterfactual thinking reflect *intrapersonal simulation*. Figure 8 illustrates the interpersonal and intrapersonal simulation pathways within the complete Expanded Simulation Model. Table 1 provides a summary of Chapter 1’s seven hypotheses.

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[12] As stated earlier, because reminiscence behaviors have been established elsewhere as being functions of autobiographical memory, the current paper is not concerned with hypothesizing the existence of an autobiographical memory function of reminiscence. Its inclusion is only to make clear it was not overlooked.

1.5 Discussion

In Support of Goals and Hypotheses

The primary objective of the current paper was to theoretically substantiate the existence of the autobiographical memory function of perspective taking, for which empirical evidence was reported by Ranson and Fitzgerald (in preparation). To accomplish, four goals and seven hypotheses were extended in support of that objective. In support of Hypothesis 1.1, the mechanism by which autobiographical memory content could be used for the purpose of perspective taking was posited to be mental simulation according to simulation theory (Goldman, 2006; Shanton & Goldman, 2010). Because simulation theory stipulates only that *long-term* memory content is the “input” for the simulation process, the current paper argued that *episodic autobiographical* memory content specifically, rather than long-term memory content generally, can be used for perspective taking.

The current paper proposed that the simulation process model by Goldman (2006) and Shanton and Goldman (2010) be integrated with two conceptual models in order to explain the use of autobiographical memory content for perspective taking at finer levels of organization. Hypotheses 1.3 was supported through the incorporation of the SMS (Conway, 2005; Conway & Pleydell-Pearce, 2000) offered a possible explanation for how episodic autobiographical memory content could be activated and retrieved in response to a perspective-taking goal. The incorporation of the SAC (Reder et al., 2002; Reder et al., 2009) computational model supported Hypothesis 1.4 by providing a potential account of how the activation of episodic autobiographical memory content occurs at the neural level.

The result was the proposed Expanded Simulation Model, which was then used to explain the current paper’s Hypothesis 1.5, that use of episodic autobiographical memory content for mental time travel—operationalized herein as prospection and counterfactual thinking—in keeping with recent revisions to simulation theory by Shanton and Goldman. This argument supported the current paper's Hypothesis 1.6, that, in addition to perspective taking, prospection and counterfactual thinking are also *functions* of autobiographical memory. Finally, in alignment with Shanton and Goldman's contention that perspective taking involves interpersonal simulation, whereas mental time travel involves intrapersonal simulation, the current paper demonstrated how the Expanded Simulation Model accounts for this dual-path simulation process hypothesis. This supported Hypothesis 1.7, which states that the autobiographical memory function of perspective taking reflects interpersonal simulation, and that the autobiographical memory functions of prospection and counterfactual thinking reflect intrapersonal simulation.

Novel Findings and Future Directions

That the Expanded Simulation Model supports the existence of the autobiographical memory function of perspective taking (Ranson & Fitzgerald, in preparation) is important for a number of reasons. Perspective taking is known to be a critical social skill from both evolutionary (Barsalou, 2003; Barresi & Moore, 1996; Decety & Hamm, 2009) and everyday perspectives (Goldman, 2006; Ickes, 2003; Winner, 2000). Therefore, having a clear understanding of the specific form of memory content used as simulation input may guide efforts to determine the factors that lead to successful versus unsuccessful perspective taking. It may also inform theoretical investigation into the extent to which these capacities co-evolved.

The Expanded Simulation Model is also important in that it addresses possible remedies to some key deficiencies of simulation theory by Goldman (2006) and Shanton and Goldman (2010). For example, to provide better descriptive and explanatory power to the superficially defined "background information" component of simulation theory's simulation process model, the current paper proposed the integration of two conceptual models. The current paper then supported the incorporation of these models with examples from such related literatures as neuroimaging, cognitive neuroscience, and cognitive, social, and developmental psychology. As a result, the current paper has offered novel applications of the SMS (Conway, 2005; Conway & Pleydell-Pearce, 2000) and the SAC (Reder et al., 2002; Reder et al., 2009), which may also inspire other researchers to seek innovative ways to adapt and use these conceptual models.

The extension of simulation theory by Shanton and Goldman (2010) to explain mental time travel made possible the current paper's theoretical substantiation of new everyday uses of autobiographical memory by way of the Expanded Simulation Model. This suggests there may be other simulation-based phenomena—whether informed by autobiographical memory content specifically or not—for which the Expanded Simulation Model might serve as a theoretical framework.

The current paper could also encourage quests for new autobiographical memory functions. The CRS-A, which was the instrument with which the autobiographical memory function of perspective taking was found, situates its items within the social context of joint reminiscence. It is therefore possible that the detection of the perspective taking function necessitated such a context. That the scale from which the CRS-A was adapted—the CRS (Kulkofsky & Koh, 2009)—also employed the joint reminiscence context, but did not detect the perspective taking function. This is likely due to developmental differences between the target population for the CRS (young children) versus the target population of the CRS-A (adults), the former of which have yet acquired the ability to infer others' mental states (e.g., Beck et al., 2011; Fuchs, 2012; McHugh & Stewart, 2012; Saxe & Kanwisher, 2003; Selman, 2003). Thus future studies should develop functions scales that differentially operationalize perspective taking—e.g., without the joint reminiscence context—in order to discern the influence of situating items within a social, or other, settings.

There are also related lines of research that the Expanded Simulation Model might inform. One example is *empathic accuracy*—the proficiency with which one infers another's thoughts and feelings (Ickes, 2003). Of interest might be whether the frequency with which individuals use autobiographical memory content for perspective taking predicts empathic accuracy. If yes, such results would suggest that the more individuals rely on their own past experiences to infer other minds, the better their chances of successful perspective taking. However, if results showed that people were more empathically accurate when using autobiographical memory for the purpose of perspective taking less frequently, such would imply that too much reliance on past experience precludes the ability to consider a target other's unique circumstances, personality, and response to situations experienced by the perspective taker.

Future research might also consider the cultural effects of simulation. For example, it is known that the development of autobiographical memory is socialized differentially across cultures (Nelson & Fivush, 2002). It is also known that sharing memories with others is a prime social activity that varies among cultures (Nelson, 1988; Wang, 2013). Thus differences in the capacity or proficiency to perspective take may be influenced by memory processes and content, each of which varies across cultural contexts.

Limitations

Although the primary objective, goals, and hypotheses of the current paper were met, gaps in the relevant literatures limited the support available for the Expanded Simulation Model, potentially impacting both the validity of the model and the viability of the conclusions drawn from it. For one, besides the evidence for the perspective taking function reported by Ranson and Fitzgerald (in preparation), no other direct theoretical or empirical evidence corroborating the perspective taking function's existence has been reported. Likewise, although some research characterizes the broad Directive autobiographical memory function as concerning *the directing of present and future thoughts and actions* (Williams et al., 2008)—a definition that foreshadows the existence of the autobiographical memory function of prospection—no study to date has established prospection as a self-contained function. And while some existing autobiographical memory functions scales measure the use of autobiographical memory for the explicit functions of emotion regulation and behavioral control (e.g., Kulkofsky & Koh, 2009; Ranson & Fitzgerald, in preparation), none specifically address the use of autobiographical memory for the emotion coping strategy of counterfactual thinking. As such, evidence used to support the Expanded Simulation Model, and thus the autobiographical memory functions of perspective taking, prospection, and counterfactual thinking, is indirect.

Secondly, given the extent to which indirect evidence was necessarily used to support the Expanded Simulation Model, some conceptual leaps were necessary. In particular, simulation theory posits that simulation is triggered by the retrieval of memory input, but does not explain how this occurs. This seems a rather considerable omission, given that not all content retrieved from long-term memory is appropriate for simulation, nor is all appropriate content necessarily subjected to simulation. Thus the current paper attempted to address this explanatory deficiency with the activation protocols of the SMS (Conway, 2005; Conway & Pleydell-Pearce, 2000) and SAC (Reder et al., 2002; Reder et al., 2009), primarily by implicating the activation of *episodic* autobiographical memory content—in response to a perspective taking or mental time travel goal—as the simulation trigger. However, both the SMS and SAC models are themselves largely supported by indirect evidence, and had not been previously used to describe the finer levels of organization within a superordinate system as was done in the current paper. Thus the argument could be made that adaptation of either model for novel applications might attenuate the explanatory power of either model's supporting evidence.

Another possible criticism could be that, while the SMS supports a *constructivist* approach (Conway, 2005; Conway & Pleydell-Pearce, 2000), the SAC (Reder et al., 2002; Reder et al., 2009), which the current paper incorporates into the SMS, does not. That is, the SMS is founded on the idea that past episodes and their contextual details are organized as coherent narratives that result from the *co-constructions* of past events (Holland & Kensinger, 2010)—first in early childhood with primary caregivers (Fivush & Reese, 1992; Fivush, Haden, & Reese, 1996; Nelson & Fivush, 2002, 2004), then later through reflection and social interaction (Habermas & Bluck, 2000). However, although the SAC does not explicitly address episodic memory "co-construction," no evidence in support of the SMS or SAC suggested a manifest incompatibility. But the current paper's incorporation of the SMS and SAC into paradigms like the Expanded Simulation Model should prompt developers to consider other frameworks within which these models might be used, and expand their adaptability accordingly.

Finally, the Expanded Simulation Model is but a single theoretical argument for the existence of the perspective taking function; alternative explanations are possible. making empirical replication vital.

1.6 Next Steps

Having demonstrated the theoretical plausibility of the Expanded Simulation Model, the next step is to test its empirical integrity. Chapter 2 of the current paper details the first of two studies designed to empirically validate Chapter 1's Hypotheses 1.2 and 1.5—that autobiographical memory content in particular, rather than long-term memory content in general, can be used for perspective taking, prospection, and counterfactual thinking. Study 1 was a validity study in which a 10-item self-report *Autobiographical Memory Functions of Simulation* (AMFS) scale was developed and validated. Study 2 (Chapter 3) will utilize the validated AMFS scale to glean more conclusive evidence for the use of autobiographical memory content for the interpersonal simulation phenomenon of perspective taking, and the intrapersonal simulation phenomena of prospection ("pre-experiencing" the future with elements from autobiographical memory content) and counterfactual thinking ("re-constructing" the past with elements from autobiographical memory content). Evidence in support of Chapter 1's Hypotheses 1.2 and 1.5 will be regarded as substantiating Chapter 1's Hypothesis 1.6—that perspective taking, prospection, and counterfactual thinking are therefore *functions* of autobiographical memory—and Chapter 1's Hypothesis 1.7—that the autobiographical memory function of perspective taking reflects interpersonal simulation, and that the autobiographical memory functions of prospection and counterfactual thinking reflect intrapersonal simulation.

CHAPTER 2 EMPIRICALLY SUBSTANTIATING THE EXPANDED SIMULATION MODEL: VALIDATION OF THE AUTOBIOGRAPHICAL MEMORY FUNCTIONS OF SIMULATION (AMFS) SCALE

2.1 Introduction & Background

The autobiographical memory system in humans is thought to have evolved in order to provide an adaptive advantage—i.e., individuals adept at retrieving and applying prior experience to novel situations should have a better chance of survival (Atance & O'Neill, 2001, 2005; Barsalou, 1988, 2003; Brown & Kulik, 1977; Suddendorf & Busby, 2003). However, given that the direct investigation of autobiographical memory's evolutionary basis is empirically untenable (Kihlstrom, 2009), one of the foci of autobiographical memory research became the identification of the theoretical reasons, or *functions*, for which autobiographical memory is used in everyday life (e.g., Baddeley, 1988).

Beginning in the 1980s, a theoretical model was proposed that featured three broad functions: Social, Self, and Directive (e.g., Baddeley, 1988; Bruce, 1989; Neisser, 1982). The *Social* function was said to reflect the use of autobiographical memory to promote and maintain social bonds, and to provide content for conversation (Bluck et al., 2005; Bluck & Alea, 2011). The use of autobiographical memory for self-knowledge, self-continuity, and self-identity was reflected by the *Self* function (Bluck et al., 2005). Finally, the *Directive* function was thought to concern the use of past experience for the purpose of teaching, informing, guiding future thoughts and behaviors, and shaping attitudes and beliefs (Bluck et al., 2005).

Because of its utility, the three-function model was widely accepted for several years despite its lack of empirical verification (Bluck et al., 2005; Bluck & Alea, 2011). It was not until 2005 that an instrument was developed to validate the model: The *Thinking About Life Experiences* (TALE) scale. The TALE is a self-report questionnaire featuring items informed by the theoretical autobiographical memory literature (Bluck et al., 2005). Although validation of the TALE confirmed the existence of the Social, Self, and Directive functions, concerns were raised that the long-time focus on the three-function model may have precluded the search for additional functions that lay beyond the scope of established theory.

Research seeking an expanded set of functions began soon after. Investigators considered such frameworks as life stage and contexts, within which previously overlooked functions might emerge. One example is the *Reminiscence Functions Scale* (RFS): a seven-function instrument that measures reminiscence behaviors relevant to adults—especially those in the later stages of life (Webster, 1995, 1997). Another example is the *Child-Caregiver Reminiscence Scale* (CRS), which Kulkofsky and Koh (2009) developed to capture the functions vital to autobiographical memory system development. The CRS was therefore designed to elicit the social context of *joint reminiscence*—i.e., the sharing of "past talk" with another or others. Kulkofsky and Koh argued that, by situating the CRS in the a context reflective of that within which autobiographical memory is socialized in early life—around the ages of 3–4 years (Nelson & Fivush, 2004)—and expanded set of developmentally relevant functions could be discerned. Results of the CRS validation study revealed its own set of seven functions, six of which mapped as sub-functions onto the TALE's broad Social, Self, and Directive functions.

In a recent study by Ranson and Fitzgerald (in preparation), the CRS was adapted for use with adults to determine whether the seven CRS functions associated with early development held into later life. The resultant *Child-Caregiver Reminiscence Scale for Adults* (CRS-A), which retained the CRS's social context of joint-reminiscence, replicated six of the seven CRS functions and displayed only slight structural differences (see Figure 9). However, it also yielded evidence for the previously undetected autobiographical memory function of *perspective taking*.

Because no other study had reported such a function, nor had its discovery been predicted by any single theory, the *Expanded Simulation Model* was developed to theoretically substantiate it. The Expanded Simulation Model, which was adapted from the simulation process model of perspective taking according to simulation theory (Goldman, 2006; Shanton & Goldman, 2010), offers a paradigm for how autobiographical memory content could be the specific long-term memory form of "background information" that serves as simulation input in response to a perspective taking goal. Because the Expanded Simulation Model therefore illustrates the use of autobiographical memory in service of perspective taking, perspective taking can be thought of as a *function* of autobiographical memory. Contingently, it was argued that the Expanded Simulation Model could also explain the use of autobiographical memory for mental time travel—specifically, prospection and counterfactual thinking—which suggests that prospection and counterfactual thinking are also functions of autobiographical memory. The case for the viability of the Expanded Simulation Model was presented in Chapter 1.

Chapter 2 concerns the current paper's Study 1, the first of a program of studies aimed at empirically validating Chapter 1's Expanded Simulation Model. The purpose of Study 1 was to develop an instrument for measuring the use of autobiographical memory for perspective taking, prospection, and counterfactual thinking. The instrument will then be used in Study 2 (Chapter 3) to yield evidence in support of four of Chapter 1's hypotheses (1.2, 1.5, 1.6, and 1.7). The following section details Study 1's objectives and goals.

2.2 Objectives and Goals

Primary Objective

Autobiographical memory functions are, by definition, the purposes for which autobiographical memory is needed or used (e.g., Baddeley, 1988, Bruce, 1989; Neisser, 1982).

Per the Expanded Simulation Model, which was adapted for the current paper from simulation theory by Goldman (2006) and Shanton and Goldman (2010), simulation that occurs in response to a perspective taking or mental time travel goal uses "background information" drawn from long-term memory stores. The simulation process gives rise to the rememberer's "re-experience" of that content. As discussed in detail in Chapter 1, when memory content is "re-experienced" for its own sake, the behavioral outcome is *reminiscenc*e. When memory content is used to plan, predict, or imagine a future scenario, the behavioral outcome that results from the "pre-experience" of that content is *prospection*. And when memory content is "re-experienced" and "reframed" with different details than what actually occurred, the behavioral outcome is *counterfactual thinking*. from autobiographical memory content is contained in the long-term memory component to be preferentially activated, retrieved, and applied when engaging in interpersonal and intrapersonal simulation. If it can be shown that the specific form of long-term memory used as simulation's "background information" is autobiographical, then perspective taking, prospection, and counterfactual thinking would be *functions* of autobiographical memory. The primary objective of Study 1 was to construct and validate an instrument for measuring the use of autobiographical memory for those functions.

In keeping with the established tradition of empirically substantiating autobiographical memory functions via self-report scales (Bluck et al., 2005; Kulkofsky & Koh, 2009; Ranson & Fitzgerald, in preparation; Webster, 1995, 1997, 1998), the overarching objective of Study 1 was to validate a self-report instrument designed to measure the frequency with which individuals use autobiographical memory to inform the three simulation-based behavioral outcomes of perspective taking, prospection, and counterfactual thinking. The result was the 10-item *Autobiographical Memory Functions of Simulation* (AMFS) scale.

The format of the AMFS was modeled on the CRS-A (Ranson and Fitzgerald, in preparation). However, the social context of joint reminiscence—which was employed for both the CRS-A and the scale from which the CRS-A was adapted, the CRS (Kulkofsky & Koh, 2009)—was omitted from the AMFS. One reason was for instructional coherence. The joint reminiscence context is elicited in the CRS-A (and CRS) by instructing respondents to consider the extent to which they engage in "past-talk" with others when estimating the frequency with which they use autobiographical memory for various purposes. The elicitation of this context is reasonable for perspective taking—an inherently social behavior that occurs in response to the *other*-directed goals (Shanton & Goldman, 2010). However, although mental time travel can occur in the presence of and in response to "past-talk," it occurs in response to *self*-directed goals (Shanton & Goldman, 2010), and is not necessarily a social behavior. Thus, instructions asking respondents to consider "past-talk" when estimating the frequency with which they use autobiographical memory for prospection and counterfactual thinking seemed incompatible with the construct, and therefore potentially confusing to respondents. Another reason was that, although the joint reminiscence context was important to the objective of the CRS—which was to determine whether the functions found by Kulkofsky and Koh (2009) as essential to autobiographical memory system emergence in early childhood were retained and used in adulthood—no previous findings were available with which to compare the adult use of prospection and counterfactual thinking versus use during early life. This is not to say that the manner in which autobiographical memory is socialized in early childhood does not influence individual differences in prospection and counterfactual thinking. Rather, such differences would be neither measureable nor discernable by the AMFS. Likewise, because it has not yet been empirically established that prospection and counterfactual thinking are functions of autobiographical memory, to attempt to assess individual differences in the socialization of autobiographical memory for such purposes would be premature. Thus the current paper saw no need for eliciting the joint reminiscence context.

A series of statistical procedures were performed on the AMFS to validate its structure and assess its reliability. Given that no previous research on which to inform specific outcomes exists, Study 1 was largely exploratory. As such, four goals were set in lieu of hypotheses.

Goals

Goal 2.1 was to use exploratory factor analysis (EFA) to verify the three-function structure of the AMFS. It was expected that all 10 items of the AMFS would load onto their respective factors to demonstrate structural validity, and that the factors would meet or exceed an acceptable level of reliability. Although two of the four items included in the Perspective $\text{Taking}_{\text{AMFS}}$[13] factor were taken from the CRS-A (Ranson & Fitzgerald, in preparation), it was expected that the two CRS-A items and the two new items generated for the AMFS would "hang together" on a single factor[14].

Goal 2.2 was to use confirmatory factor analysis (CFA) with a structural equation modeling approach to verify the structure found in the EFA. It was expected that the structure would hold and that indices would verify sufficient fit.

[13] From this point forward and unless otherwise noted, the current paper will use the convention of tacking "AMFS" in subscript notation to every use of "Perspective Taking" that references the AMFS Perspective Taking function or subscale. Likewise, when referencing the Perspective Taking function or subscale of the AMFJR, the subscript "AMFJR" will be used.

[14] The validation of the CRS-A yielded evidence that the Perspective $\text{Taking}_{\text{AMFJR}}$ function mapped on to the broad Social function measured by the TALE (Bluck & Alea, 2011). It will be an objective of Study 2 is to examine whether the Perspective $\text{Taking}_{\text{AMFS}}$ function also maps onto the TALE's Social function, or if this association is dependent on the social context of joint reminiscence.

Goal 2.3 was to show construct validity by way of associations[15] between the three autobiographical memory functions and the two dimensions of the Emotion Regulation Questionnaire (ERQ) (Gross & John, 2003). Convergent validity was tested using the ERQ's *Cognitive Reappraisal* dimension, which reflects how individuals "change" their thinking about emotion events by imagining different outcomes, details, and scenarios. Like perspective taking, prospection, and counterfactual thinking, cognitive reappraisal is characterized as a *simulation-based* behavior (Lindeman & Abraham, 2008). This functional similarity between the three AMFS factors and the Cognitive Reappraisal dimension made it a suitable correlate for testing the convergent validity of the AMFS. However, despite this overlap, the AMFS and the ERQ nonetheless measure different constructs: The AMFS is concerned with the use of autobiographical memory whereas the ERQ is concerned with emotion coping strategies. As such, it was expected that the correlation coefficients between the three AMFS factors and Cognitive Reappraisal would be, although positive and significant, low to moderate in magnitude. Results supporting this expectation would suggest that, although the two scales' items had mental simulation in common, the two scales were in other important ways characteristically distinct. It was also expected that the second of the ERQ's two dimensions, *Expressive Suppression*—which reflects the degree to which people change their outward behavior in response to emotional events—would provide evidence of discriminant validity. Because Expressive Suppression is not a simulation-based behavior—at least not to the extent that Cognitive Reappraisal is thought to be—correlations between it and the three AMFS factors should be weak and nonsignificant.

[15] Although construct validity (comprised of convergent and discriminant validity) would ideally be conducted using and SEM approach to MTMM procedures (Campbell & Fiske, 1959), Study 1's small sample size made such analyses untenable. Therefore, assessing correlation coefficients between the factors being validated and theoretically similar constructs is considered an acceptable alternative (Carlson & Herdman, 2012).

In addition to the evaluation of construct validity, a provisional multiple regression analysis was run to test the functional relation between the two ERQ dimensions and the functions measured by the AMFS. One of two outcomes was considered likely. The first was that only one of the AMFS functions would account for variance in Cognitive Reappraisal, supporting the contention that the AMFS functions and Cognitive Reappraisal dimension all reflect simulation-based behaviors. The second possible outcome aligns with Shanton and Goldman's (2010) contention that perspective taking, being *other*-directed, reflects *interpersonal* simulation, whereas prospection and counterfactual thinking, being *self*-directed, reflect *intrapersonal* simulation. Support for this claim would be reflected by Perspective Taking (interpersonal simulation) accounting for a significant amount of variance in Cognitive Reappraisal, while *either* Prospection (interpersonal simulation) *or* Counterfactual Thinking (intrapersonal simulation)—but not both—would account for a significant amount of variance in Cognitive Reappraisal. Because this analysis is provisional (i.e., extraneous to scale validation), results will be re-verified in Study 2.

Goal 2.4 was to look for potential associations between the AMFS factors and personality dimensions as measured with the six-trait, 60-item HEXACO personality inventory (Ashford & Lee, 2007). The HEXACO is unique in that, along with the traditional Big Five dimensions (Extraversion, Openness to New Experience, Agreeableness, Conscientiousness, and Emotionality/Neuroticism), the self-report instrument measures the dimension of Honesty-Humility. People high on the Honesty-Humility trait tend to be humble, averse to manipulating others, non-materialistic, and non-status seeking. Contrarily, individuals low in the Honesty-Humility trait have a tendency toward manipulation, entitlement, dishonesty, and deception. Of interest to the current paper was whether the Honesty-Humility dimension would shed light on whether the use of autobiographical memory for counterfactual thinking led to counterfactuals that were *upward* (i.e., engender positive outcomes like relief and satisfaction), or *downward* (i.e., engender negative outcomes such as bias, blame, and dysfunction) (e.g., Roese, 1997). However, no known study of autobiographical memory functions has employed the HEXACO, thus it was important to test its practicality (e.g., could respondents complete it in the estimated allotted time), as well as its suitability as an alternative to the standard Big Five indices.

Testing for associations between personality and autobiographical memory functions in general, and the AMFS functions in particular, is also important given that much of the evidence with respect to personality and autobiographical memory functions is inconsistent (Rasmussen & Berntsen, 2010), Thus, efforts to verify known relations and to search for new ones are warranted. And although some research exists concerning personality and the *behaviors* of perspective taking, prospection, and counterfactual thinking, it is unclear if these effects will replicate with respect to the use of autobiographical memory for those behaviors.

Because the Study 1 analyses conducted using the HEXACO were both extraneous to the validation of the AMFS, and were run using the same data with which the AMFS was validated, all analyses using the HEXACO are provisional, necessitating replication before conclusions are drawn[16]. Thus any findings yielded from these analyses in Study 1 will be investigated more fully in Study 2.

Goal 2.5 was to get a sense of whether individuals grasp the idea that autobiographical memory can be used for perspective taking, prospection, and counterfactual to the extent that they can then reasonably estimate the frequency with which they use it for such behaviors. Respondents were presented with a series of mental time travel completion tasks that involved

[16] It is considered inappropriate to use the same data employed for scale validation to then measure and draw conclusions about individuals (Boslaugh, 2007).

the recollection, written synopsis, and phenomenological descriptions of a past event (reminiscence condition), an imagined future scenario (prospection condition), and reframing of an actual past event (counterfactual thinking condition) (see the Instruments section for details). The intention of this task was to test an implicit assumption common to all autobiographical memory functions self-report scales: That respondents grasp the idea that they use autobiographical memory for various behaviors to the extent that they can then estimate the frequency with which they use autobiographical memory *for* those behaviors. However, it is also possible that respondents are simply estimating the frequency with which they engage in the behaviors *themselves*. While the mental time travel conditions task could not definitively rule out the latter, it was thought that completion of the mental time travel conditions tasks would be evidence that respondents 1) understood the ways in which autobiographical memory might be used for reminiscence, prospection, and counterfactual thinking; and 2) could therefore reasonably estimate their use of autobiographical memory in the service of such behaviors when completing the AMFS. Because the nature of Goal 2.5 was exploratory, and because the data collected for the mental time travel conditions qualitative, no formal analyses were conducted.

2.3 Methods

Participants

Participants were recruited through Amazon.com's on-demand recruitment and survey management service, Mechanical Turk (MTurk) (www.MTurk.com). Through MTurk, eligible participants accessed the Study 1 online questionnaire, which was developed using Qualtrics (2015, Provo, UT) research software. A total of 144 participants enrolled in Study 1. However, a review of survey metrics after the first 34 participants had completed the survey showed that it was taking participant an average of 45 minutes to complete the survey. Because the questionnaire's introduction had stated an estimated survey completion time of approximately 30 minutes, the survey was suspended until the introduction could be revised to reflect the increased time estimate and to increase the compensation for completed surveys to $2.00 per respondent[17]. Because there was a concern that the change in compensation could draw a systematically different kind of participant, data for the first 34 participants was not used. Of the remaining 110 participants (*F* = 60, 54.5%), most were young to middle-aged adults (*M* = 39.06 years, *SD* = 12.96), who ranged in age from 18 to 67 years. The ethnicity/race frequencies and proportions were as follows: Sixty-four participants identified as Caucasian (58.2%); 29 as African-American/Black (26.4%); seven as American Indian/Alaskan Native (6.4%); three as Other (2.7%); two as Asian (1.8%); two as Multiracial (1.8%); one as Arab/Middle Eastern (0.9%); and one as Hawaiian/Pacific Islander (0.9%). One participant (0.9%) chose "prefer not to answer." No participants identified as Hispanic. A summary of the Study 1 demographics can be found in Table 2.

Instruments

The Study 1 online questionnaire consisted of the following six "blocks" of survey items: demographics, self-descriptions of current self, mental time travel components (reminiscence, counterfactual thinking, and prospection), the AMFS scale, the Emotion Regulation Questionnaire (ERQ), and the HEXACO-60 personality index.

Block 1: Demographic Items. Respondents were asked to answer three demographic items consistent with previous work in autobiographical memory functions (Bluck & Alea, 2011; Kulkofsky & Koh, 2009; Ranson & Fitzgerald, in preparation). The items and their options (presented in drop-down menus) were gender (male, female, prefer not to answer); age (18 to

[17] At the time the Study 1 survey was administered, MTurk metrics indicated that the average compensation across all studies was $1.00 for up to 30 minutes of participant time, and $2.00 for between 30 minutes and 1 hour (www.MTurk.com).

65+, prefer not to answer); and ethnicity/race (African-American/Black, American Indian/Alaska Native, Arab/Middle Eastern, Asian, Caucasian, Hawaiian/Pacific Islander, Hispanic, Multiracial, Other, prefer not to answer).

Block 2: Self-Descriptors of Current Self. Following the completion of the demographics block, respondents were presented with the following instruction: "Take a moment to consider what traits and characteristics describe who you are at this point in your life. For example, are you ambitious? A good friend? Shy? Think of 5 one- or two word descriptions that best reflect these characteristics and enter them in the spaces below." The space below featured five open fields preceded by the statement, 'I _______________.' Each field allowed a total of 60 characters. The item was adapted from the paradigms used by Wang (2001) and Shao, Yao, Ceci, and Wang (2010), both of which were adapted from the Kuhn and McPartland (1954) Twenty Statements Test (TST).

The purpose of the self-descriptor component was two-fold. One, it was intended to acclimate the respondents to the conceptual time that corresponded to the mental time travel condition (i.e., the past for the reminiscence and counterfactual thinking conditions; the future for the prospection condition) by anchoring the respondent in the self-concept that corresponded with that point in time (Briggs, Cheek, & Buss, 1980; Conway, 2005). Two, it was thought that the act of listing semantic autobiographical information about the self would facilitate activation of the SMS (Conway, 2005; Conway & Pleydell-Pearce, 2000) and SAC (Reder et al., 2009) as proposed in Chapter 1. As a result, the self-descriptors could serve as primes to the activation and retrieval of the episodic memory content needed to complete the mental time travel conditions.

Block 3: Mental Time Travel Conditions. All respondents completed three mental time travel tasks in the order listed below. The language for all three conditions was adapted from the paradigm established by D'Argembeau & Van der Linden (2004). The purpose of the mental time travel conditions was to glean whether respondents understood the concept of applying autobiographical memory content for the purposes of "re-experiencing" a past episode, "reframing" a past episode with new details, and "pre-experiencing" an imagined future event. If so, the properties that respondents identified as elements of their autobiographical memories should align with their descriptive narratives of the mental time travel event.

Condition 1: Reminiscence ("Re-Experiencing" One's Personal Past). Respondents were presented with the following introduction: "This next section of questions is about how people 're-experience' personal past events recalled from memory. Take a few moments to recall any POSITIVE[18] event from your personal past that you have thought about at least once since it occurred, and which has had some consequence to your life since. This event should have lasted at least a few minutes but not more than a day. As you mentally re-experience the event, try to recall as much detail as possible. Think about such characteristics as *where* it occurred, the *course of events* as they happened, the *people* and *objects* present and your *interactions* with them, and *how you felt* during the event. When you're ready, click the NEXT button to continue." Upon clicking the NEXT button, respondents were presented with the following two tasks.

Narrative Description of Re-Experienced Past Event. Respondents were next presented with the statement, "In the space below, please give a brief description of the positive personal

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[18] The reason for requesting that respondents consider a POSITIVE past event was in response to evidence that the recollection of negative memories can upset psychological wellbeing (Takarangi & Strange, 2010). As such, there was a risk that asking participants to recall a negative memory, or allow participants the option to recall a negative memory, could encourage some participants to ruminate and/or experience cognitive impairment as negative affect increased (Takarangi & Strange, 2010). Such psychological upsets could then impede respondents' ability to complete subsequent memory tasks and/or their ability to estimate the frequency with which they engage in AMF behaviors.

past event that you re-experienced for this study." This statement was followed by an open field in which respondents were asked to enter a 2- to 4-sentence (up to 500 characters) description of the recalled event.

Self-Descriptors of Past Self. Respondents were presented with the following: "Take a moment to consider what traits and characteristics you remember yourself to have shown at the time of the event. Come up with 5 one- or two word descriptions that best reflect who you were at the time of this past event and enter them in the spaces below." The format of this item is otherwise identical to that of the current self-description section. As before, the objective of this item is to activate the self-memory system and verify that respondents have a self-awareness of themselves at a time other than the present.

Condition 2: Counterfactual Thinking ("Reconstructing" One's Personal Past). The purpose of this condition was to examine whether respondents were able to grasp the idea of and answer questions about the ways in which they mentally change the details about actual past events. Specifically, of interest was whether individuals can understand and then narratively describe which actual memory events were reimagined, and in what particular ways. Participants were tasked first with recalling and describing an actual past event that they had "reframed" as having different details and/or a different outcome, then recalling, describing, and listing the details that were changed during reframing. The corresponding self-descriptors were included to determine if respondents could describe characteristics of the self in each counterfactual thinking task. For example, if the actual memory concerned the rememberer failing a math test, and the narrative either explicitly or suggestively indicated that this event was perceived as negative, the self-descriptors should have reflected characteristics consistent with both the memory and the rememberer's perception of it—e.g., "I feel stupid," "I am ashamed," etc. If, contrarily, the "reframed," counterfactual was of having studied and then passing that test, which the descriptive narrative implied was a positive outcome, then the corresponding self-descriptors should have been likewise consistent—e.g., "I am happy," "I am smart," etc.

Participants were presented with the following section introduction: "It's also common for people to 'reconstruct'[19] a past event. For example, sometimes people recall an unpleasant past event and imagine saying or doing something differently to produce a different outcome. Sometimes people will reconstruct such events to create a pleasant memory and incorporate imagined details that would have led to a poor outcome. Reconstructed memories are a combination of actual details from a personal past event and completely imagined details. Take a moment to recall a personal past event that you have reconstructed in some way. Recall a reconstructed memory that reflects an event that was personally meaningful to you or that continues to stand out in your mind. When you are ready, click the NEXT button to continue." Note that, for the counterfactual thinking condition, respondents were not explicitly asked to recall a positive memory, as was the case for the reminiscence condition, for two reasons. One, the literature on counterfactual thinking reports that individuals tend to reconstruct negative memories more frequently than they do positive memories (Epstude & Roese, 2008; Roese & Olson, 1995). Two, counterfactual thinking research shows that, during reconstruction, negative memories are often given a positive spin, whereby counterfactual thinking serves as a coping mechanism (Epstude & Roese, 2008; Roese & Olson, 1995). Hence it was thought that respondents may struggle to recall a positive past event that was reframed. Further, because negative past events are often ameliorated during reframing (Roese & Olson, 1995), it was thought that the risk of causing psychological upset was lower for the counterfactual thinking

[19] Although the current paper is using "reframing" rather than "reconstructing" to describe the changing of autobiographical memory content for counterfactuals, the Study 1 survey instructions used "reconstruct."

task than for the reminiscence task (which, as an online survey item provided no subsequent means of assuaging any potentially negative affect).

Narrative Description of Actual and Reconstructed Past Events. Respondents were presented with the statement, "In the space below, please give a brief synopsis of the ACTUAL past event." This statement was followed by an open field into which 2- to 4-sentence (up to 500 characters) descriptions were to be entered. Respondents were then shown the statement, "In the space below, please describe the characteristics of past event after RECONSTRUCTING the past event." This statement was also followed by an open field for entering a 2- to 4-sentence (up to 500 characters) description.

Self-Descriptors of Past Self for Actual and Reconstructed Past Events. For this section, respondents were asked to provide self-descriptions of their self with respect to both the ACTUAL past event and the RECONSTRUCTED past event. For the former, respondents saw the statement, "First, consider what traits and characteristics you remember yourself to have had at the time of the ACTUAL event. Come up with 5 one- or two-word descriptions that best reflect who you were during the ACTUAL event and enter them in the spaces below." For the latter, respondents were given the instruction, "Now, consider what traits and characteristics you remember yourself to have had in the RECONSTRUCTED version of this memory. Come up with 5 one- or two-word descriptions that best reflect who you were during the RECONSTRUCTED event and enter them in the spaces below." Each statement was followed by five spaces within which to complete the statement, 'I ____________.'

Condition 3: Prospection ("Pre-Experiencing" One's Potential Future Events). Respondents were presented with the following instruction, "This next section concerns how people 'pre-experience' a personal future by imagining possible future events. Take a few moments to imagine with as much detail as possible a future event or scenario that you have not previously experienced but which could realistically occur. This imagined event should be one that could last at least a few minutes but not more than a day. As you mentally imagine this future event, pay attention to such characteristics as where it will occur, the course of events that will happen, the people and objects present and your interactions with them, and how you imagine you will feel during the future event. An example of an imagined future scenario: 'Zelda wants to hold a yard sale in her back yard next summer. She imagines how she'll organize her lush, sunny, back yard: She sees herself putting kitchenware and knick-knacks on the blue picnic table that sits on her patio. She pictures hanging items of clothing on a rope that she'll string between her two large oak trees at the back edge of the yard. She also imagines pleasantly interacting with neighbors as well as strangers. Zelda also imagines what might happen if it were raining on the day of the yard sale. She thinks about how she might organize her garage in case the weather forecast predicts rain. Overall, she believes the sale could be a fun event for everyone, and feels happy as she looks forward to it.' When you are ready, click the NEXT button to continue."

Note that here, as with the counterfactual thinking condition, respondents were not instructed to generate an imagined future scenario of a specific emotional valence. It was thought that omitting this instruction would allow respondents to imagine either a positive or negative future as desired. However, because research shows that people tend to predict that their lives will inevitably take a positive turn (De Brigard et al., 2015), it was expected that most future imaginings would be optimistic, and the risk of upsetting respondents was low.

Narrative Description of Re-Experienced Past Event. Respondents were presented with the statement, "Use the space below to briefly describe the imagined future event." The statement was followed by an open field into which a 2- to 4-sentence (up to 500 characters) description could be entered.

Self-Descriptors of Future Self. Respondents were asked to “Consider who you are in this future scenario; enter the 5 most relevant one- or two-word descriptions and enter them in the spaces below.”

Elements from the Past that Inform the Future. Respondents were presented with the following: “Regarding the imagined future scenario you just pre-experienced, take a moment to consider which aspects of it are based on information or elements from actual past events. For example, say your imagined future scenario was about the yard sale that your friend wants the two of you to plan for next summer. You envision, for example, that, this time, you're going to do things differently. You first envision you and your friend meeting at your favorite coffee shop to discuss details. You see yourself suggesting to the friend that the sale be held at the friend's home this time. You mentally picture the bright blue picnic table that sits in your friend's back yard as a sales station. You compose a script of what you'll say, being careful to avoid what you did last time. You see yourself being more assertive but fair. You feel certain that, if this scenario plays out the way you imagine it, you'll feel much better than you did last year. Past information that informs your ‘pre-experiencing’ of the future event might include such things as details from last year's yard sale; your friend's yard; your friend's bright blue picnic table; your friend's behavior last year; your behavior last year; your feelings last year; other situations in the past which you've asserted yourself and felt good for doing so. In the spaces below, please list up to 12 characteristics, elements, or aspects of your IMAGINED FUTURE SCENARIO that are based on characteristics, elements, or aspects of one or more actual past event[20]. Try to be as detailed as possible."

Block 4: Autobiographical Memory Functions of Simulation (AMFS) Scale. The AMFS scale is comprised of 10 items intended to measure the three hypothesized autobiographical memory function of Perspective Taking (interpersonal simulation), the two mental time travel functions (intrapersonal simulation) of Prospection and Counterfactual Thinking. If validated, the AMFS could be used as a complement to the previously validated CRS-A scale (Ranson & Fitzgerald, in preparation), the functions of which represent the autobiographical memory functions that emerge in the social context of joint reminiscence. The Prospection and Counterfactual Thinking factors each include three items, whereas the Perspective Taking function comprises four items: the two items Perspective Taking items from the CRS-A, plus two new items. Table 3 lists the AMFS items and their respective factors. The two Perspective Taking items from the previously validated CRS-A are denoted by asterisks.

To lessen the risk skewed response data, which is a common problem with Likert-type scales (Jamieson, 2004; Sheng & Sheng, 2012), and which can lead to misleading factor analysis results (French-Lazovik & Gibson, 1984), the AMFS featured a 6-point Liker-type rating scheme with labels at the anchors only (i.e., 1 = almost never; 6 = almost always) (Dawes, 2008; French-Lazovik & Gibson, 1984). This was a change from the CRS-A, which featured a 7-point Likert scale modeled after that used by Kulkofsky and Koh (2009), and the labeling of which was based on recommendations by Bass, Cascio, & O'Connor (1974).

Upon entering the AMFS block, respondents were presented with the instruction, "The following section features a series of statements about the reasons why you might think about the

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[20] Note that that the survey setup prohibited respondents from navigating back to previously completed sections. As such, respondents were not able to refer back to their narrative descriptions while listing the event's properties.

past. On a scale of 1 to 6 (1 = Almost Never, 6 = Almost Always), please rate how frequently you engage in each of the following recollection-related behaviors and activities." All items within the AMFS block were randomly ordered.

Block 5: Emotion Regulation Questionnaire (ERQ). The Emotion Regulation Questionnaire (ERQ) (Gross & John, 2003) is a 10-item scale that assesses individual differences in the use of two emotion regulation strategies. The Cognitive Reappraisal dimension evaluates individuals' strategies with respect to the internal emotional experience, while the Expressive Suppression dimension captures strategies that are externalized as talk, gestures, and behaviors (Gross & John, 2003). Because the Cognitive Reappraisal dimension is thought to involve mental simulation (Lindeman & Abraham, 2008), whereas the Expressive Suppression dimension does not, these two dimensions were used to evaluate convergent and discriminant construct validity, respectively. The most recent validation study of the ERQ yielded a Cronbach's *alpha* for the Cognitive Reappraisal dimension of .79, and an *alpha* of .73 for Expressive Suppression.

Respondents were presented with the following instruction: "We would like to ask you some questions about your emotional life, in particular, how you control (that is, regulate and manage) your emotions. The questions below involve two distinct aspects of your emotional life. One is your emotional experience, or what you feel like inside. The other is your emotional expression, or how you show your emotions in the way you talk, gesture, or behave. Although some of the following questions may seem similar to one another, they differ in important ways." Respondents were then asked to rate how strongly they agreed (or disagreed) with each statement on a 6-point scale (1 = Strongly Disagree; 6 = Strongly Agree). The 10 items of the ERQ can be found in Table 4.

Block 6: HEXACO-60 Personality Inventory. The HEXACO-60 Personality Inventory (Ashton & Lee, 2009), a shortened version of the full 100-item HEXACO-PI (Lee & Ashton, 2004), assesses the six HEXACO personality dimensions of Honesty-Humility, Emotionality/Neuroticism, Extraversion, Agreeableness, Conscientiousness, and Openness to Experience[21]. Results of the HEXACO-60 validation study yielded Cronbach's *alpha* reliabilities ranging from .73 to .80 for adults. The dimensions of the HEXACO-60 were found to be strongly correlated with their counterparts in the NEO-FFI (Costa & McCrae, 1992). The six dimensions of the HEXACO are further subdivided into four facets each, although facets were not examined for Study 1 due to the provisional nature of the Study 1 inferential analyses.

Respondents were presented with the instruction, "The following section addresses various personality traits. On a 1 to 6 scale, please rate the extent to which you agree (or disagree) with each statement as it describes your personality." For the online administration of the Study 1 instruments, the HEXACO-60 featured an attention check (see Procedures for details). The 60 items plus attention check can be found in Table 5.

Procedures

Study 1 items (see Instruments section, above) were featured in a single online questionnaire-type survey developed using the Qualtrics Research Survey Suite (Qualtrics, Co., 2015, Provo, UT). The Qualtrics survey was distributed via Amazon.com's participant recruitment and compensation service, Mechanical Turk or "MTurk" (www.MTurk.com). MTurk was chosen for the following five reasons. One, research shows that its samples tend to be more culturally diverse, feature equivalent proportions of men and women, and are comprised of a wider age range than those recruited through conventional university resources (Buhrmester,

[21] The 100-item HEXACO-PI, which will be used for Study 2, also includes the interstitial facet scale of Altruism (with the inverse Antagonism), the items of which are included in Table 17.

Kwang, & Gosling, 2011). Two, MTurk gives researchers the opportunity to compensate participants, whereas survey systems managed by universities and other educational institutions often do not. Participants earn a monetary credit equal to the compensation amount that is posted to their Amazon.com account. This service removes the burden of acquiring, issuing, and managing an alternative form of payment (e.g., checks, gift certificates) from the researcher. Additionally, researchers do not need to have participant names, contact information, or tax identification details on file, ensuring that participation in an MTurk survey is fully anonymous. Three, MTurk guarantees quality data by allowing researchers to decline compensating any participant who is suspected of providing fraudulent or poor quality responses. All MTurk participants must, before enrolling in any study, sign a “Worker’s Agreement” (see Appendix A), which stipulates that researchers have the right to refuse compensating any participant whose responses do not meet MTurk’s quality requirements. Four, the researcher can indicate in advance the number and characteristics of participants desired. Only completed surveys are counted toward this total. Once the designated total has been reached, the survey closes automatically, thus freeing the researcher from the need to closely monitor activity. And five, MTurk’s 400,000-plus pool of potential participants, of whom 50,000–100,000 are available at any one time (Ross, Irani, Silberman, Zaldivar, & Tomlinson, 2010), makes for extremely quick data collection.

Study 1 approval was obtained from the conducting university’s Institutional Review Board (IRB protocols 15050114057–8, 6/17/16). The instrument blocks were combined into a single online questionnaire that appeared on the MTurk website as the “Everyday Memory Study.” The listing was accompanied by a link that, when clicked, led to a brief introduction about the study, instructions on how to submit the compensation code to be displayed at the end of the completed survey, and a link to the Qualtrics survey (see Appendix B). Upon clicking the Qualtrics survey link, participants were presented with an Information Sheet[22] (see Appendix C). After reading and agreeing to the terms of the Information Sheet, participants were instructed to click the CONTINUE button if he or she wanted to enroll in the study and begin the survey. Participants were informed that clicking the CONTINUE button also served as their electronic signature. Participants who chose not to participate could click the EXIT button. No data were collected for participants who chose to exit the survey at that time.

Participants who chose to proceed were next presented with the Study 1 items, beginning with the demographics block (see Instruments section for details). Items were all forced choice to ensure no missing data. However, participants who did not wish to provide demographic information were offered the option, “prefer not to answer.” For subsequent item blocks, participants who did not wish to provide responses could exit the study at any time by clicking the EXIT button embedded at the bottom of every online survey page.

An “attention check” item was included in each the AMFS and HEXACO survey blocks (see Tables 3 and 5 for details). Participation in the survey was terminated for any participant who failed to answer an attention check item as instructed. As was disclosed in the Information Sheet, participants who failed an attention check were not eligible for compensation.

Upon survey completion, each participant received a unique, five-digit Qualtrics-issued compensation code (see Appendix D). Participants were instructed to enter the code in the field provided in their MTurk survey screen. Submission of the code prompted a notification to the researcher that compensation had been requested. A list of participants (identified only by an MTurk generated “Worker ID” number) with their compensation codes was posted to the

[22] At the conducting university, online surveys provide Information Sheets rather than Informed Consent, as the latter is meant to be signed in person by the participant.

researcher's MTurk account. The researcher then initiated compensation by checking an "Approve" box next to each listed participant. If the researcher chose to "Not Approve" a participant, the researcher was required to provide a full explanation as to why compensation was being denied, which was then forwarded to the participant. If approved, MTurk would apply the compensation to the participant's Amazon.com account within 24 hours. All submitted surveys were approved. A total of 144 participants enrolled in the study. The first 34 received a credit to their Amazon.com account of $1.00 (US dollars) while the final 110 received a $2.00 credit. A 10% fee was assessed on total compensation issued by MTurk to bring the total cost of Study 1 to $279.40.

Data Analysis

Data screening, descriptive statistics, and inferential analyses were conducted using SPSS version 22 (IBM Corp, 2014). An exploratory factor analysis (EFA)[23] using principal axis factoring (PAF) was run to validate the AMFS scale. Because the data were Likert-type, ordinal alpha reliability analyses were performed. The PAF and reliability analyses were run using *R-Factor for Ordinal Data* (Basto & Pereira, 2012a)[24], an interface program for SPSS and the open-source statistical software program R (R Core Team, 2015). The R-Factor procedures used for Study 1 were per Basto & Pereira (2012b) and Courtney (2013). Results of the EPAF were subjected to confirmatory factor analysis (CFA) with robust unweighted least squares (RULS) estimation[25] using LISREL v9.2 (Jöreskog, & Sörbom, 2015).

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[23] A PAF was chosen for the validation of the AMFS over another popular scale validation method, principal components analysis (PCA). The objective of the PCA is to account for as much variance as possible with as few factors, or components, as possible (Warner, 2012). Contrarily, the PAF evaluates the shared variance in a set of X measurements (items) underlain by a set of latent variables, or factors, which reflect the hypothesized constructs underlying the items (Warner, 2012).
[24] Details on the use of R-Factor for ordinal factor analysis have been covered in full in Ranson & Fitzgerald (in preparation).
[25] Per Forero, Maydeu-Olivares, and Gallardo-Pujol (2009), the typical default method of maximum likelihood

Given Study 1's small sample size, which precluded multitrait-multimethod (MTMM) construct validity analysis, correlation analyses were run between the AMFR's factors and the ERQ's Cognitive Reappraisal dimension (for convergent construct validity) and Expressive Suppression dimension (for discriminant construct validity). Additionally, multiple regression was used to test the functional relation between the AMFS and ERQ. Simple regression analyses were run to test whether personality predicts the three simulation-based autobiographical memory functions. Type I error risk was limited to 5% (α = .05); thus, results yielding $p \leq .05$ were considered statistically significant.

Power Analysis. Because funding for Study 1 data was limited, popular guidelines were consulted to ensure that the planned collection of 100–150 cases would adequately power the EFA, CFA, and inferential statistics. Two common guidelines—the determination of *minimum N*, and the determination of the *minimum N to p ratio* (where *p* is the number of items), were employed. First, the "100 rule," which recommends that samples be no less than 100 (Gorsuch, 1983; Kline, 1979), was used, as was the widely used ratio rule of five cases per item (Bryant & Yarnold, 1995; Everitt, 1975). Study 1's N = 110 met both guidelines (as 5 cases × 10 items = 50 cases)[26].

Of the 110 completed surveys, eight were missing data on the HEXACO. Therefore, all analyses using the HEXACO data were N = 102. An achieved power analysis using G*Power (Erdfelder, Faul, & Buchner, 1996) indicated that, for a sample of that size using α = .05, Power = .80, and $R^2 \geq .07$, regression analyses were sufficiently powered.

(ML) assumes normality and continuous data, so is inappropriate when evaluating ordinal and/or nonnormal data. The optimal estimation method for ordinal and/or nonnormal data that underlie a polychoric correlation matrix is robust ULS (RULS) (Morata-Ramírez & Holgado-Tello, 2013).

[26] Note that the main objective of Study 1 was to validate the items generated to measure the hypothesized Perspective Taking$_{AMFS}$, Prospection, and Counterfactual Thinking functions of autobiographical memory for later incorporation into an augmented CRS-A. However, because the CRS-A, which has already been validated, features 41 items alone, the minimum sample size needed to sufficiently power the validation of an augmented CRS-A (N = at least 255 per the *N:p* rule) was prohibitively expensive for Study 1.

2.4 Results

Self-Descriptions and Mental Time Travel Conditions

The self-descriptions and mental time travel conditions were reviewed for indications that participants understood the instructions, could mentalize and articulate examples of each of the requested mental time travel scenarios, and could relate to the idea a self that was consistent with the actual and reconstructed memory descriptions. No respondent appeared to have difficulty with this task; in fact, most elaborated as much as possible given the space allowed. No analyses were run on this data. Examples of five participants' responses to each of the three mental time travel conditions are listed in Table 6.

Data Screening

AMFS data were screened prior to scale validation procedures using SPSS v22 (IBM Corp, 2014). Results of the univariate (UV) normality analyses showed that 9 out of 10[27] items (90%) demonstrated negative UV skew, with 3 of 10 (30%) significantly negatively UV skewed at the .05 level ($Z \geq |1.96|$) or greater. A total of 9 out of 10[28] items (90%) demonstrated negative UV kurtosis (platykurtosis), two (20%) of which were significantly so. As expected, results of the multivariate normality[29] tests showed significant MV skew ($Z = 45.43$, $p < .001$) and MV kurtosis ($Z = 96.55$, $p < .001$). This nonnormality, along with the ordinal nature of the scale items, recommended the use of polychoric[30] correlation matrices for the EPAFs. Factor means (standard deviations) were, for Perspective Taking$_{\text{AMFS}}$, 3.97 (1.08); for Prospection, 4.05 (1.06),

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[27] The exception, as seen in Table 3, is the Counterfactual Thinking item number 8: "I spend time imagining specific past events with different details or outcomes than what actually occurred," $Z_{Skew} = 0.96$, *n.s.*

[28] The exception here is the Prospection item number 6: "I think about my own past experiences when I believe that doing so can help guide my future," $Z_{Kurtosis} = 0.43$, *n.s.*

[29] Multivariate (MV) normality is an assumption of MV analyses, of which principal axis factoring is an example. MV normality is specified by means and covariances (Lubke & Muthèn, 2004), the computation of which requires continuous data. However, the inability of ordinal data to pass tests of MV normality justifies the use of MV techniques designed specifically for ordinal data.

[30] Polychoric correlation is a technique designed specifically for ordinal-level variables.

and for Counterfactual Thinking, 3.70 (1.33). AMFS item descriptives, including item and factor means and standard deviations, can be found in Table 7.

Item Generation

Potential items for the AMFS were written to reflect the general and specific properties of the construct under investigation: simulation-based autobiographical memory functions of perspective taking, prospection, and counterfactual thinking. Because the construct is relatively straightforward, and somewhat constrained in terms of the various characteristics that comprise each function, it was thought that three to four good items per function would suffice. For perspective taking, two items from the previously validated CRS-A (Ranson & Fitzgerald, in preparation) were included, as well as two new items. Resources for the generation of the two new Perspective $\text{Taking}_{\text{AMFS}}$ items were the Davis (1980, 1983) *Interpersonal Reactivity Index* (IRI), a self-report instrument that measures empathy on four dimensions, including perspective taking, and the empathic accuracy paradigm by Ickes (2003). For the Prospection items, literature on the phenomena of future thinking, as well as research on the Directive function of autobiographical memory—which has been hypothesized to include the use of autobiographical memory for future planning and prediction (e.g., Williams et al., 2008)—was consulted, as was the TALE (Bluck et al., 2005; Bluck & Alea, 2011), which includes Directive items concerning the use of autobiographical memory for such purposes as future planning and guiding decisions about which path to take. As there was no scale-like Counterfactual Thinking self-report available, the literature regarding the definitions, characteristics, and phenomena of counterfactual thinking (e.g., Leithy, Brown, & Robbins, 2006; MacLeod & Byrne, 1996; Roese & Olson, 1993; Sanna, 1996) informed the Counterfactual Thinking items.

Exploratory Principal Axis Factoring (EPAF) Analyses

In support of Goal 2.1, EFAs using the principal axis factoring (PAF) procedure were conducted. All 10 potential items generated for the AMFS were found to fit the model, suggesting that all 10 items were "good," and that no additional items were needed.

Although the assumption in behavioral science research is that multidimensional constructs are best represented by oblique structures, the data may bear evidence for orthogonality (Hancock & Mueller, 2010). Therefore, although the conceptual structure of the multidimensional AMFS suggests that factors be allowed to correlate (as all three functions are simulation-based), it is recommended that the true nature of the structure be tested first before choosing an oblique or orthogonal rotation method (Tabachnick & Fidell, 2007). Thus two EPAFs were run: The first to test the oblique nature of the AMFS, and the second to investigate orthogonality.

EPAF1: Testing for an Oblique Structure

Per the procedure recommended by Tabachnick and Fidell (2007, p. 646)[31], EPAF1 was run to test the strength of the correlations between the three hypothesized factors using the oblique rotation method geomin Q-Q (Yates, 1987). Geomin was designed for use with, and has been shown to be especially suitable for, structures that are complex[32] (Browne, 2001). Because structural complexity is to be expected with behavioral science EFA data (Hancock & Mueller, 2010), cross-loadings were expected here as well.

Results of the factor correlations (see Table 8) showed that only one of three correlations (between Perspective Taking$_{AMFS}$ and Counterfactual Thinking, $r = .56$, $r^2 = 31.02\%$), were $\geq .32$

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[31] Tabachnick and Fidell (2007, p. 646) contend that, from a statistical standpoint, the use of orthogonal versus oblique rotation should depend on the degree to which factors are correlated. Correlations $\geq .32$ indicate that at least 10% of the variance between factors is shared to recommends the use of oblique rotation. Factor correlations < .32 suggest that the solution is orthogonal. Per Tabachnick and Fidell's recommendation, the PAF should be run using oblique rotation and forcing the hypothesized number of conceptual factors in order to obtain the factor correlations.

[32] In this context, "complex" refers to structures that feature a high degree of "cross-loadings"; i.e., loadings whose sums across factors are > 1 (Browne, 2001).

(i.e., overlapping variance > 10%) to suggest slightly more orthogonality than overlap. However, other results of EPAF1 supported the hypothesized model.

A series of extraction diagnostics[33] were run to verify the hypothesized three functions. Results of the Fit to Comparison test and Kaiser rule indicated that the 10 items as a set belonged to three factors. Results of the acceleration factor (AC), optimal coordinates (OC), parallel analysis (PA), scree plot, and Velicer's minimum average partial (MAP)[34] were inconclusive, as each recommended two to three factors (see Figure 10). However, several other results supported the three-factor solution. The total variance explained by three factors was an acceptable 60.75%. However, the variance accounted for with only two factors was 53.97%—thus the three-factor model resulted in a nearly 7% improvement in variance explained. Because overextraction tends to result in less error than does underextraction (Wood, Tataryn, & Gorsuch, 1996), EPAF1 proceeded on the assumption of three factors.

Model fitness was demonstrated via several goodness-of-fit indices. The root mean square residual (RMSR) was, at .037, well below the more stringent cutoff of .05 to indicate a low amount of squared error in the model[35]. The root mean partial correlation controlling factors (RMSP)[36] was, at .11, good, as smaller values indicate better fit (Basto & Pereira, 2012b). The goodness of fit index (GFI)[37] and the adjusted GFI (AGFI)[38], both of which tend to be large

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[33] Details of the formulas that inform each of R-Factor's extraction diagnostics can be found in Basteo and Pereira (2012b).

[34] For more information, see Velicer & Fava (1998).

[35] The RMSR reflects the squared difference (squared error) between the original covariance matrix and the covariance matrix generated from the factor loadings. By convention, an RMSR of < .08 is considered acceptable, while a RMSR < .05 is considered excellent.

[36] The RMSP is computed on the partial correlations between variables; i.e., after the effects of all factors have been removed. The RMSP reflects how much of the variance each pair of variables share that is not explained by the extracted factors (Basto & Pereira, 2012b).

[37] The goodness of fit (GFI) index reflects the proportion of observed covariances explained by covariances implied by the model. It deals with error in reproducing the variance-covariance matrix (Westland, 2015).

[38] The AFGI is a GFI adjusted by degrees of freedom (Westland, 2015).

within their bounds of 0 to 1, should meet or exceed a value of .95. Results of EPAF1 showed that both were > .99 to indicate excellent fit. As the GFI and AGFI are also highly sensitive to large samples (Kenny, 2015), Study 1's modest *N* of 110 suggests that these high values reflect excellent model fit rather than inflation due to sample size. Other indications of model fitness: Communalities[39] were all ≥ .40, with 63.64% > .50, which is acceptable for the social sciences (Osborne & Costello, 2005). The Keyser Meyer Olkin (KMO)[40], at .75 was slightly below the ideal cutoff of .80 to indicate sampling adequacy (Cerny & Kaiser, 1977). However, the per-item measures of sampling adequacy (MSA)[41] were all > 0.60, well over the minimum cutoff of .40 to indicate that factor analysis can proceed without dropping items (Basto & Pereira, 2012b). The EPAF1 per-item communalities and MSA values are featured with other item descriptives in Table 7.

Table 9 summarizes the geomin Q-Q pattern matrix loadings. Because Study 1's sample size was ≈ 100, loadings of .30 or higher were considered salient (Osborne & Costello, 2004) and statistically significant (Kline, 2002, p. 52). Complexity was defined as loadings ≥ .40 on two or more factors (Osborne & Costello, 2004). Results showed that all 10 items loaded saliently and significantly on their hypothesized factors, with no salient cross-loads (≥ .40). Figure 11 illustrates the obtained factor structure, which was then evaluated for reliability.

Because Study 1 data were both Likert-type and nonnormal, ordinal reliability alphas[42]

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[39] Communalities reflect the amount of variance in the item that is explained by its extracted factor(s).

[40] The KMO measure (Cerny & Kaiser, 1977) reflects the degree to which items share factor variance, and is therefore computed based on partial correlations. The more overlap that exists, the smaller the partial correlations, thus the closer the KMO is to 1. By convention, adequacy is obtained when KMO ≥ .80; i.e., that the items are fit to remain in the model. The KMO can also be an indication that the sample is underpowered.

[41] The MSA values are the per-item KMO measures (Cerny & Kaiser, 1977). Values ≥ .40 indicate item adequacy.

[42] The Cronbach's coefficient alpha (Cronbach, 1951) measure of internal consistency (reliability) is inappropriate for data that is continuous and/or skewed, both of which are features of Likert data (Jamieson, 2004; Sheng & Sheng, 2012). Ordinal reliability alpha (Zumbo, Gadermann, & Zeisser, 2007) have been shown to provide better estimates of theoretical reliability than coefficient alpha when data are Likert-type, as the latter yields negatively biased reliability estimates under these conditions. Thus, although the lower bound of ordinal alpha is, like

were run. Ordinal alpha for all three factors were > .70 (Perspective Taking$_{AMFS}$ = .85; Prospection = .76; and Counterfactual Thinking = .84) to indicate that the items per factor demonstrated sufficient internal consistency. The EPAF1 ordinal reliability α values can be found on the diagonals of Table 8.

EPAF2: Testing for an Orthogonal Structure

That two of the three AMFS factor correlations when using oblique rotation had < 10% overlap suggests that the AMFS structure may be orthogonal (Tabachnick & Fidell, 2007). Thus EPAF2 was conducted to investigate this possibility. Additionally, because orthogonal rotation produces more cross-loads than do oblique methods (Hancock & Mueller, 2010), a second objective to EPAF2 was to test the stability of the AMFS structure when factors were not allowed to correlate.

Table 10 displays the results of EPAF2, which employed the popular orthogonal rotation varimax[43]. As was found with the EPAF1 oblique model, no cross-loads were > .40, resulting in all items loading saliently and significantly on their hypothesized factors. Loadings values were similar to those in EPAF1[44]. rotation. Likewise, the EPAF2 ordinal reliabilities were identical to those of EPAF1: Perspective Taking$_{AMFS}$ = .85; Prospection = .76; and Counterfactual Thinking = .84. The EPAF2 varimax rotated structure is illustrated in Figure 12.

Confirmatory Factor Analysis (CFA)

In support of Goal 2.2, an SEM CFA was run to verify the EFA structure. The CFA was

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coefficient alpha, .70, ordinal alpha values will likely be higher than Cronbach's for the same data (Basto & Pereira, 2012b). The formula for ordinal reliabilities can be found in Appendix E.

[43] Varimax rotation (Kaiser, 1958) was designed to simplify structure interpretation by finding a solution featuring many small loadings and few large loadings, as items should ultimately have large loadings with a single factor (Basto & Pereira, 2012b).

[44] The largest difference between any EPAF1 and EPAF2 loading was a negligible .07 on the Counterfactual Thinking item 8, "I spend time imagining specific past events with different details or outcomes than what actually occurred."

conducted using robust ULS estimation (RULS) in LISREL v9.2 (Jöreskog, & Sörbom, 2015). CFA factors were allowed to correlate in keeping with the oblique rotation validated in EPAF1. Scale was set at 1.0 in the psi matrix per convention (Raykov & Marcoulides, 2006). Data were treated as ordinal. To accommodate the nonnormality present in the data, the C3 (Satorra-Bentler) model chi-square was used. Because LISREL computes fit indices on the Maximum Likelihood Ratio (C1) chi-square (Hu & Bentler, 1999), the absolute and relative fit indices of interest to Study 1—the root mean square error of approximation (RMSEA), Tucker-Lewis non-normed fit index (NNFI), and the comparative fit index (CFI)—were computed by hand using the formulas detailed in Appendix E.

Data screening confirmed aspects of the distribution found in EPAF1. The data displayed nonsignificant negative univariate skew ($Z_{Skew} = –0.57$, $p = .572$) and significant platykurtosis ($Z_{Kurtosis} = –5.15$, $p < .001$). The test of MV normality showed that both skew ($Z_{Skew} = 6.25$, $p < .001$) and kurtosis ($Z_{Kurtosis} = 143.47$, $p < .001$) were significant, as was the skewness and kurtosis chi-square ($\chi^2 = 70.25$, p < .001) to further recommend use the C3 model (Forero et al., 2009). The condition number (CN) [45] of 5.41 was well below cutoff of 15 to indicate no multicollinearity. Of the 110 total response sets, 109 (99.1%) represented unique patterns. Mardia's Index of Relative Multivariate Kurtosis was, at 1.20, below the *Z*-cutoff of 1.96 (for $\alpha = .05$, two-tailed distribution) (Mardia, 1970).

Per the C3 (Satorra-Bentler) test statistic, $\chi^2(32) = 47.40$, $p = .039$. That the C3 was significant at the .05 level is less likely due to poor model fit than the sample being slightly

[45] The condition number (CN) was originally used as evidence of multicollinearity (i.e., when two or more variables are highly correlated) if ≥ 30. However, a more conservative index recommends that the CN be below 15. The CN is equal to the square root of the maximum eigenvalue divided by the minimum eigenvalue. (Belsley, 1991)

overpowered, as Hoelter's Critical N[46] indicated that samples greater than 70.82 could be inappropriate for the chi-square test (Hu & Bentler, 1995). The RMSEA = .066 indicated acceptable fit; however, both the NNFI (.96) and the CFI (.97) indicated excellent fit. The Standarized Root Mean Residual (SRMR) was at the upper cutoff of .05, which also indicated excellent fit (Hu & Bentler, 1999).

Table 11 summarizes the squared multiple correlations, factor means, and standard deviations for the three-function, 10-item CFA. Squared multiple correlations were stable, with the lowest R^2 = .46 and the highest R^2 = .75. Factor correlations were significant and acceptable, ranging from .35 to .67 (see Table 12). All factor loadings, disturbances (psi matrix), and factor variances (theta-epsilon matrix) were significant and positive (see Table 13). The path diagram is displayed in Figure 13.

Results also showed the residuals to be reasonably normally distributed. The median value for both the fitted and standardized residuals were 0, which is optimal, with residuals clustered fairly symmetrically about the median (Jöreskog, 1993). The normal probability (Q-Q) plot showed that residuals kept close to the diagonal line, with the exception being some slight departure on either end. Such patterns are typical when data are significantly kurtotic (Raykov & Marcoulides, 2006), as was the case with the Study 1 data.

Structural equation modeling (SEM) reliability calculations for each of the six factors all exceeded the .70 cutoff to demonstrate high internal validity (Nunnally & Bernstein, 1994; Werts, Rock, Linn, & Jöreskog, 1978): Perspective-Taking = .91; Prospection = .86; and Counterfactual Thinking = .94. The reliabilities per factor can also be found in Table 12. The formula for computing SEM reliabilities can be found in Appendix E.

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[46] The Critical N (Hoelter, 1983) value reflects the sample size needed to yield a model appropriate for an adequate chi-square test. Samples > than the Critical N may yield significant chi-square results (Hu & Bentler, 1995).

Construct Validity Using the Emotion Regulation Questionnaire (ERQ)

In support of Goal 2.3, bivariate correlations yielding Pearson's coefficients were run on the factors of the AMFS and factors of the ERQ (Gross & John, 2003) to test for convergent and discriminant validity. As expected, results showed that the ERQ dimension of Expressive Suppression was negligibly and not significantly associated with any of the three AMFS factors to support the AMFS's discriminant validity (Perspective Taking$_{\mathrm{AMFS}}$, r = .13; Prospection, r = .08; Counterfactual Thinking, r = –.01). Also as expected, Cognitive Reappraisal was significantly (p < .001) correlated to Perspective Taking$_{\mathrm{AMFS}}$ (r = .38), Prospection (r = .35), and Counterfactual Thinking (r = .49), to show moderate support for the AMFS's convergent validity. That is, although the coefficients were lower than the recommended .50 cutoff to indicate convergence (Carlson & Herdman, 2012), moderate coefficients were expected given that Cognitive Reappraisal, which measures a simulation-based behavior, is not a direct conceptual correlate for the use of autobiographical memory for simulation-based behaviors. Thus, the overlap shared between AMFS functions and Cognitive Reappraisal should reflect only their common characteristic of simulation. As such, smaller coefficients were expected, and therefore convergent validity was considered attained; however, these effects will be re-verified in Study 2. The bivariate correlations between the AMFS and EQR factors can be found in Table 14.

Provisional Analyses

In addition to the analyses conducted to test the validity and reliability of the AMFS, two sets of additional analyses were conducted to get a better understanding of the AMFS functions, and to inform potential hypotheses to be tested in Study 2. These analyses were considered provisional because the same data used to validate the AMFS was also used for these analyses.

Thus, caution was taken in the interpretation of the results and utility of the conclusions drawn, as data used to validate a scale that is then used to assess properties of the construct at the individual level is likely to produce biased results (Boslaugh, 2007). Findings from provisional analyses will be verified in Study 2.

The Functional Relation Between the AMFS Functions and Cognitive Reappraisal. A provisional analysis was run to test Chapter 1's Hypothesis 1.7, which stated that the autobiographical memory function of Perspective $Taking_{AMFS}$, which is an *other*-directed behavior (Shanton & Goldman, 2010), is underlain by *interpersonal* simulation, whereas Prospection and Counterfactual Thinking, which are *self*-directed behaviors (Shanton & Goldman, 2010), are underlain by *intrapersonal* simulation. Thus a provisional multiple regression analysis was conducted to garner the functional relations between the simulation-based ERQ dimension of Cognitive Reappraisal (Gross & John, 2003), and the three AMFS functions. The idea was that, if Perspective $Taking_{AMFS}$ and one of the two mental time travel functions significantly explained variance in Cognitive Reappraisal, such would be evidence for the two forms of mental simulation proposed. If only one of the three AMFS functions significantly accounted for variance in Cognitive Reappraisal, such would be evidence the AMFS functions are underlain by a single form of simulation. If all three AMFS functions significantly accounted for variance in Cognitive Reappraisal, then attempts to understand why would be undertaken in Study 2.

Results showed that the multiple regression model was significant, $R = .55$, $F(3, 106) = 15.62$, $p < .001$, with the three AMFS functions significantly accounting for 30.6% of the variance in Cognitive The coefficients analyses showed that, when holding the other predictors constant, Perspective $Taking_{AMFS}$ significantly accounted for 3.4% of the unique variance in

Cognitive Reappraisal (b = 1.14, $t(106) = 2.28$, $p = .025$), and that Counterfactual Thinking significantly accounted for 12.9% of the unique variance in Cognitive Reappraisal (b = 1.66, $t(106) = 4.44$, $p < .001$). Prospection was not a significant predictor of Cognitive Reappraisal (b = .46, $t(106) = .88$, $p = .380$, $sr^2 = .05\%$), and was therefore expelled from the model. Table 15 summarizes the results of multiple regression analysis. These functional relations will be re-verified in Study 2.

Exploring Associations Between AMFS Factors and HEXACO Factors. Simple linear regression analyses were run to explore whether the frequency with which individuals engage in simulation-based autobiographical memory behaviors was predicted by personality as measured with the 60-item, six-dimension HEXACO (Ashton & Lee, 2005, 2009). Results showed that Perspective $\text{Taking}_{\text{AMFS}}$ was significantly predicted by Emotional Stability (the inverse of Emotionality/Neuroticism), ($R = .28$, $b = .30$, $t(100) = 2.93$, $p = .004$), Extraversion (R = .22, $b = .22$, $t(100) = 2.21$, $p = .030$), Conscientiousness ($R = .26$, $b = .37$, $t(100) = 2.70$, p = .008), and Openness ($R = .36$, $b = .33$, $t(100) = 3.91$, $p < .001$). That is, the more emotionally stable, conscientious, and open one is to new experiences, the more frequent the use of autobiographical memory for Perspective $\text{Taking}_{\text{AMFS}}$. With respect to Prospection, results indicated that Emotionality/Neuroticism ($R = .22$, $b = .18$, $t(100) = 2.21$, $p = .029$), Openness (R = .44, $b = .40$, $t(100) = 4.84$, $p < .001$), and Conscientiousness ($R = .36$, $b = .37$, $t(100) = 3.45$, p = .001) were significant predictors. The significant predictors of Counterfactual Thinking were Emotionality/Neuroticism ($R = .37$, $b = .54$, $t(100) = 4.00$, $p < .001$), and Introversion (the inverse of Extraversion) ($R = .21$, $b = –.30$, $t(100) = –2.17$, $p = .032$). Counterfactual thinking was also predicted by the inverse of Honesty-Humility $R = .34$, $b = –.53$, $t(100) = –3.66$, $p <$ .001, which indicates that people who use autobiographical memory with greater frequency for the purpose of counterfactual thinking tend be deceptive, manipulative, and feel a strong sense of entitlement. Table 16 summarizes the bivariate correlations between the AMFS and HEXACO factors.

2.5 Discussion

The primary objective of Study 1 was to validate the *Autobiographical Memory Functions of Simulation* (AMFS) scale, a 10-item self-report instrument intended to measure individuals' use of autobiographical memory content when engaging in interpersonal and intrapersonal simulation-based behaviors. Goals 2.1 and 2.2, which were to validate the three-factor structure of the AMFS, were supported by the results of two EPAFs and an SEM CFA. As such, the items of the AMFS were found to reliably measure the proposed autobiographical memory functions of Perspective Taking$_{\text{AMFS}}$, Prospection, and Counterfactual Thinking.

Evidence for Goal 2.3, that the AMFS functions would demonstrate construct validity when compared to a related simulation-based measure, was obtained via positive, significant correlations between all three AMFS factors and the Cognitive Reappraisal dimension of the ERQ (Gross & John, 2003). The ERQ's second dimension, Expressive Suppression, which measures outward, observable coping strategies, was found to be nonsignificantly correlated to the three AMFS factors, thus showing discriminant validity. Cognitive Reappraisal has also recently been linked with the *reflective* autobiographical memory function, which encompasses "intellectual attentiveness, epistemic curiosity about the self, and self-focused attention motivated by interest in ones' self and behavior" (Harris, Rasmussen, & Berntsen, 2014, p. 8; Trapnell & Campbell, 1999). These traits align with the idea of *autonoetic consciousness*—i.e., one's sense of self in the past, present, and future (e.g., Baddeley, Eysenck, & Anderson, 2009; Tulving, 1984, 1985, 2005; Wheeler et al., 1997). Autonoetic consciousness is thought to be a capacity essential to both mental time travel (Tulving, 1985, 2005) and the ability to use personal experience (i.e., autobiographical memory content) for mental simulation (Spreng et al., 2009). These considerations therefore suggest that Cognitive Reappraisal is a cogent correlate with which to assess the role of simulation in the autobiographical memory functions of Perspective $\text{Taking}_{\text{AMFS}}$, Prospection, and Counterfactual Thinking.

A second objective of Goal 2.3 was to provisionally test the functional relation between the three AMFS functions and Cognitive Reappraisal in support of Chapter 1's Hypothesis 1.7. Results showed that two of the three functions—Perspective $\text{Taking}_{\text{AMFS}}$ and Counterfactual Thinking—significantly accounted for variance in Cognitive Reappraisal. This suggests that, as proposed by Shanton and Goldman (2010), there are two forms of simulation that underlie perspective taking and mental time travel: interpersonal and interpersonal, respectively. However, given that Study 1 results were attained using data on which the AMFS was also validated, these findings will be re-verified in Study 2.

Goal 2.4 was to provisionally explore associations between the three AMFS functions and personality traits as measured using the HEXACO 60 (Ashton & Lee, 2005). Study 1 results showed that individuals who estimate the frequency with which they use autobiographical memory for Perspective $\text{Taking}_{\text{AMFS}}$ also rate themselves low in Emotionality/Neuroticism (calm, emotionally autonomous and stable), Conscientiousness (responsible, dependable, methodical), Extraversion (vivacious, loquacious, and assertive), and Openness (independent, curious, adventurous). Examples that support the link between high trait neuroticism and behavioral perspective taking come from research on sensitivity to social cues, which shows links between neuroticism and the diligent attendance during social interactions for clues about the other's mental states (e.g., Denissen & Penke, 2008). Additionally, the literature on *attachment style*—which concerns how one forms, and behaves in, close relationships (Ickes, 2003), indicate that attachment style can be predicted by trait personality (Shaver & Brennan, 1992). *Attachment theory* (Bowlby, 1958) states that individuals fall within one of three attachment categories: *secure* (reliable, communicative, proactive), *anxious* (insecure, hypervigilant, clingy), or *avoidant* (distant, independent, emotionally detached (Ickes, 2003). Studies show that anxious attachment and neuroticism predict the use of perspective taking in response to social threats (e.g., Crawford, Shaver, & Goldsmith, 2007. Research suggests that, because anxiously attached individuals fear others' negative impressions, they hypervigilantly watch for evidence of the other's disapproval during social interactions (Vrtička, Andersson, Grandjean, Sander, Vuilleumier, Zak, 2008). Thus individuals attempting to cope with fear of social rejection, disapproval, and non-inclusion may rely more heavily on the use of autobiographical memory to aid their assessments of social others.

Research in empathy may inform Study 1 findings that Conscientiousness predicted Perspective $\text{Taking}_{\text{AMFS}}$. Per the Davis (1980, 1983) empathy model, on which the IRI self-report scale measuring the four dimensions of perspective taking, fantasy, empathic concern, and personal distress is based, perspective taking is characterized as a form of "cognitive," rather than "emotional" empathy. Research shows that people who are both sensitive to other's states of mind and high in conscientiousness tend to strive to "get things right," and are thus highly motivated to accurately understand another's point of view (Howe, 2012). Study 1 results therefore suggest that people high in conscientiousness draw more upon personal past experience in their attempt to achieve empathic accuracy.

The link between Extraversion and the use of autobiographical memory for perspective taking may reflect the increased opportunities to infer other minds, due to the extended social network characteristically possessed by extraverts (Kessler, Creem-Regehr, Hamilton, 2015). Further, both Extraversion and Openness have been found to predict social self-efficacy (Cavanaugh, 2013), which has also been linked with social perspective taking (e.g., Gehlbach, Brown, Ioannou, Boyer, Hudson, Ni-Solomon, et al., 2008). Thus people who are open and willing to explore the thoughts and feelings of social others may depend more heavily on information from their personal pasts to facilitate affinity and understanding.

Emotionality/Neuroticism, Openness, and Conscientiousness were also found to significantly predict the use of autobiographical memory for prospection. Related research shows that Neuroticism predicts an increase in negatively biased future imaginings (e.g., MacLeod & Byrne, 1996; MacLeod, Tata, Tyrer, Schmidt, Davidson, & Thompson, 2005), suggesting that, with respect to autobiographical memory functions, the higher the individual is on trait neuroticism, the more frequently he or she uses autobiographical memory for downward biased prospection. However, related research also indicates that the inverse of Emotionality/Neuroticism, Emotional Stability, has no apparent influence on the number of positive future imagining (MacLeod & Byrne, 1996; MacLeod et al., 2005). Curiously, an informal review of the responses given for the prospection mental time travel condition did not reveal this negativity bias. But because the same data used to validate the AMFS was then used to for the provisional personality analyses, some results may be distorted. Study 2 will therefore attempt to verify these findings.

Related studies have also reported a link between behavioral prospection and Openness to Experience (e.g., Allen et al., 2014; Furey & Fortunato, 2014). This association has been attributed to the creativity and adventurousness that are characteristic of those high in Openness, thus encouraging musings and predictions about future possibilities (Allen, Greenlees, & Jones, 2014). Results of Study 1 may suggest that creative tendencies may facilitate the "pre-experience" of imagined future scenarios constructed from autobiographical memory. Also, although related research shows that Extraversion predicts behavioral prospection (Allen et al., 2014; Furey & Fortunato, 2014), Study 1 results did not support this relation[47]. This may be because, although Extraversion predicts the behavior of prospection, it may not predict the use of autobiographical memory for the behavior of prospection. Likewise, the provisional nature of the personality data, or the small sample size, may have produced misleading results. As such, the relation between Extraversion and the function of Prospection will be retested in Study 2.

Study 1 also found that Emotionality/Neuroticism, Introversion, and the inverse of Honesty-Humility (vengefulness, insincerity, Machiavellianism) significantly predicted Counterfactual Thinking. Related research reports that individuals high in neuroticism tend to produce downwardly biased counterfactuals more often than do individuals low in neuroticism (Allen et al., 2014). As was the case with the Study 1 finding that Emotionality/Neuroticism predicted the use of autobiographical memory content for Prospection, this finding suggests that the counterfactuals reported for the mental time travel condition should have been negatively biased. While a review of the Counterfactual Thinking mental time travel task did reveal a tendency to recall negatively toned actual events, most of the corresponding, "reframed" counterfactuals were comparatively upwardly biased.

That the use of autobiographical memory content for counterfactual thinking was inversely predicted by Extraversion may be due to findings indicating that introversion is related to *emotional intensity*—the tendency to experience extreme, complex, shifting emotion, and high sensitivity to others' emotions (e.g., Aron, 1996). However, given that counterfactual thinking is

[47] $R^2 = .4\%$; $p = .550$.

known to be is often used a strategy for coping with emotionally charged memories (e.g., Allen et al., 2014; Lindeman & Abraham, 2008; Ruiselová, Kresánek, & Prokopcáková, 2009; Ruiselová & Prokopcáková, 2010), engaging in counterfactuals may be a employed more frequently be people low in trait extraversion. As such, results suggest that individuals high in Introversion are activating and retrieving autobiographical memory content with greater frequency than extraverted individuals for both the "re-experience" of the actual, emotionally charged events, as well as their imaginative "re-framing." And finally, although related research (e.g., Allen et al., 2014) shows that Openness[48] and Agreeableness[49] are predictive of Counterfactual Thinking, Study 1 did not find these effects.

Finally, Goal 2.5 was to informally review responses to the mental time travel conditions and accompanying self-descriptors to discern whether respondents understood how autobiographical memory content informs counterfactual thinking and future thinking. Although not formally analyzed, results suggested that respondents grasped the idea that autobiographical memory content informs mental time travel, as responses were consistent with the given instructions, and the properties of personal past episodes that were described were sensible and aligned with the corresponding self-descriptors. For example, as shown in Table 6, when the actual past event was that the respondent's "cat knocked over the plant and dirt was everywhere. I got mad and yelled at her," the corresponding self-descriptors were, "irate," "helpless," "hurt," impatient," "ashamed." Such descriptors are intuitively consistent with the described event. The counterfactual was then, "instead of getting mad I just cleaned up and realized the cat wasn't doing it to make me mad." This description indicates that the respondent understood the instruction to describe both an actual past event, as well as a counterfactual "reframing" of that

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[48] R^2 = .8%; p = .383.
[49] R^2 = .8%; p = .360.

actual past event. The corresponding self-descriptors also changed accordingly, to "calm, "strong," "rational," "empathetic," and "articulate." That respondents understood the use of autobiographical memory for the three mental time travel conditions also implies that respondents are reasonably able to estimate the frequencies with which they use autobiographical memory content for such purposes.

2.6 Conclusion

The AMFS was developed as an instrument for the overarching objective of Chapter 1—that autobiographical memory content specifically, rather than long-term memory content specifically, informs perspective taking and mental time travel, which has been operationalized in the current paper as prospection and counterfactual thinking. Study 2 will use the AMFS to support Chapter 1's Hypothesis 1.2 (autobiographical memory content specifically, rather than long-term memory content generally, can inform perspective taking), Hypothesis 1.5 (autobiographical memory content specifically, rather than long-term memory content generally, can inform mental time travel), Hypothesis 1.6 (the use of autobiographical memory content for perspective taking, prospection, and counterfactual thinking is evidence that all three are *functions* of autobiographical memory), and Hypothesis 1.7 (the autobiographical memory function of perspective taking reflects interpersonal simulation, and the autobiographical memory functions of prospection and counterfactual thinking reflect intrapersonal simulation). Together, such findings would empirically elucidate the role of autobiographical memory in interpersonal and intrapersonal simulation.

CHAPTER 3 STUDY 2: EMPIRICALLY VALIDATING THE LONG-TERM MEMORY COMPONENT OF THE EXPANDED SIMULATION MODEL

3.1 Introduction

Per simulation theory by Goldman (2006) and later Shanton and Goldman (2010), perspective taking and mental time travel are informed by "background information" activated and retrieved from long-term memory storage. The current paper has argued that a specific form of long-term memory content that could be used for these purposes is autobiographical memory content. To theoretically support, Chapter 1 proposed the *Expanded Simulation Model*, which aimed to explain how autobiographical memory could be used for perspective taking and mental time travel. Chapter 2 (Study 1) and Chapter 3 (Study 2) concern the empirical testing some of Chapter 1's claims.

The primary objective of Study 2 was to test four of Chapter 1's hypotheses: 1) Hypothesis 1.2, that autobiographical memory content specifically, rather than long-term memory content generally, can be used for perspective taking; 2) Hypothesis 1.5, that autobiographical memory content specifically, rather than long-term memory content generally, can be used for mental time travel; 3) Hypothesis 1.6, that because autobiographical memory content is used for perspective taking, prospection, and counterfactual thinking, they are therefore *functions* of autobiographical memory; and 4) Hypothesis 1.7, that the autobiographical memory function of perspective taking reflects interpersonal simulation, and the autobiographical memory functions of prospection and counterfactual thinking reflect intrapersonal simulation.

Justification and Background: Empirically Validating the Existence of, and Functional Relations Between, Autobiographical Memory Functions

In order to validate the existence of the autobiographical memory functions of perspective taking, prospection, and counterfactual thinking, Study 1 (Chapter 2) detailed the validation of the *Autobiographical Memory Functions of Simulation* (AMFS) scale, a self-report instrument designed to measure the use of autobiographical memory content for these purposes. The format of the AMFS was modeled on the *Autobiographical Memory Functions of Joint Reminiscence* (AMFJR) scale[50], another self-report scale that measures rated frequency of functional use of autobiographical memory for an expanded set of reminiscence behaviors for adults (see Figure 9). The AMFJR was adapted from the *Child-Caregiver Reminiscence Scale* (CRS) (Kulkofsky & Koh, 2009), which concerns the use of autobiographical memory for a collection of reminiscence behaviors thought to be essential to the socialization and development of the autobiographical memory system (Nelson & Fivush, 2004). Like the CRS, the AMFJR is situated in the social context of joint-reminiscence, a setting within which autobiographical memory develops (Nelson & Fivush, 2004). The purpose of adapting the CRS for adults was to establish the extent to which functions that emerge in early childhood as a result of socialization are used in later life. Results of the AMFJR validation suggested that, although a core set of functions are used throughout life, some early-life functions either later coalesce or diverge into new functions, presumably in response to acquired cognitive abilities, language, understanding of time and self, and social interaction (Nelson & Fivush, 2004). This finding implies that perceived distinctions between autobiographical memory functions could be more relative than absolute.

Thus, of interest to Study 2 was whether or not the functions of the AMFS and AMFJR would remain independent when examined collectively. However, it was assumed that the

[50] The *Child-Caregiver Reminiscence Scale for Adults* (Ranson & Fitzgerald, in preparation), or "CRS-A," has been renamed the *Autobiographical Memory Functions of Joint Reminiscence* (AMFJR) scale, to make clear the similarities and differences between it and the *Autobiographical Memory Functions of Simulation* (AMFS) scale.

common construct of "perspective taking" measured by both the Perspective Taking$_{AMFS}$ and Perspective Taking$_{AMFJR}$ subscales would be evident in respondents' equivalent estimations of their use of autobiographical memory content for this purpose. This assumption was made despite structural differences between the Perspective Taking$_{AMFS}$ and Perspective Taking$_{AMFJR}$ subscales (the AMFS features two items in addition to the two that comprise the AMFJR), and contextual differences between the AMFS and AMFJR scales (the AMFS is "simulation-based" whereas the AMFJR is "socially situated"). It was expected that the constructual similarities of the Perspective Taking$_{AMFS}$ and the Perspective Taking$_{AMFJR}$ functions would supersede the structural differences to compel equivalent estimations of autobiographical memory content use for the subscales concerning "perspective taking" behavior.

Also of interest to Study 2 was whether the functions of the AMFS would be empirically linked to the broad functions of the TALE (Bluck & Alea, 2011), as was the case for all six functions of the AMFJR (Ranson & Fitzgerald, in preparation) and the six corresponding functions of the CRS (Kulkofsky & Koh, 2009). Although Ranson and Fitzgerald found that the Perspective Taking$_{AMFJR}$ function mapped onto the TALE's broad Social function, it was assumed that the Perspective Taking$_{AMFS}$ function would do likewise. But given the novelty of the Prospection and Counterfactual Thinking functions, no direct evidence was available to recommend associations with the TALE. However, because theory indicates that an objective of the Directive function is *the directing of present and future thoughts and actions* (Williams et al., 2008), it was reasonable to expect that the Prospection function would be broadly Directive. Because counterfactual thinking can be used as an emotion regulation strategy (e.g., Allen et al., 2014; Lindeman & Abraham, 2008; Ruiselová et al., 2009; Ruiselová & Prokopcáková, 2010), and because Ranson and Fitzgerald found that the AMFJR function of Emotion Regulation mapped as Directive, it was also possible that Counterfactual Thinking would be broadly Directive. Alternatively, Shanton and Goldman (2010) characterized simulated mental time travel as a *self*-directed behavior, implying that Prospection and Counterfactual Thinking could be broadly Self. Thus Study 2 explored whether the functions of Prospection and Counterfactual thinking are primarily Directive, Self, a combination of both, or, altogether independent of the broad functions of the TALE.

Justification and Background: Individual Differences in Autobiographical Memory Use

In addition to validating the existence of, and associations between, the autobiographical memory functions measured by the AMFS, AMFJR, and TALE, it was also important to the current paper to discern who uses which autobiographical memory functions and why. Thus Study 2 examined individual differences in the rated frequency of functions use of autobiographical memory as measured by the AMFS, AMFJR, and TALE. Specifically Study 2 tested for effects of personality, age, gender, and culture.

Although little direct evidence was available to inform expected results, the following summarizes related research on how person characteristics influence autobiographical memory and rated frequency of its functional use, as well as behavioral perspective taking, prospection, and counterfactual thinking.

Personality Effects. Research shows that personality traits measured by Five Factor (Emotionality/Neuroticism, Extraversion, Agreeableness, Conscientiousness, and Openness to Experience) inventories can predict the experience and use of autobiographical memory (Rasmussen & Berntsen, 2010). Because personality traits inform conceptual self-knowledge, they are considered constituents of *semantic* autobiographical memory (Abram et al., 2014; Conway, 2005; Conway & Pleydell-Pearce, 2000). Yet, self-identity is also said to arise from the life story or narrative, which consists of autobiographical memory content accumulated over one's lifetime, as well as previously imagined and stored future scenarios and the person one predicts he or she might be in such situations (e.g., McAdams, 2001). As such, links have been found between the content of one's life-narrative and personality traits (McAdams, Anyidoho, Brown, Huang, Kaplan, & Machado, 2004; Woike, Gersekovich, Piorkowski, & Polo, 1999).

Although the literature on autobiographical memory functions has grown in recent years, only a small portion of functions studies have examined personality effects, and of those, results have been inconsistent (Rasmussen & Berntsen, 2010). Although Bluck and Alea (2009, 2011) found that Extraversion predicted the broad Social function (i.e., the more extraverted an individual, the more that that individual is likely to use autobiographical memory for the purpose of fostering and maintaining social relationships), Neuroticism—the only other trait evaluated in that study—was unrelated to any of the TALE functions. This was unexpected given previous findings that Neuroticism predicts both Self (Cappeliez & O'Rourke, 2002; Rasmussen & Berntsen, 2010) and Directive (Rasmussen & Berntsen, 2010) functions. In an extensive study of personality and autobiographical memory, Rasmussen and Berntsen (2010) not only replicated the relation between Extraversion and the broad Social function reported by Bluck and Alea, but also found that Openness to Experience predicted the Social, Self, and Directive functions. However, Rasmussen and Berntsen found no significant associations between the three TALE functions and the personality traits of Agreeableness or Conscientiousness. And although Ranson and Fitzgerald did not assess personality effects in their validation of the AMFJR, it was reasonable to expect that those personality traits shown by previous research to predict the broad Social, Self, and Directive functions would be "inherited" by the broad functions' corresponding AMFJR functions.

Thus, in an attempt to replicate previous findings and fill gaps in the literature, Study 2 tested for trait-level personality effects on the AMFS, AMFJR, and TALE. Additionally, facet-level effects were sought for the functions of the AMFS. Study 2 also aimed to yield evidence of the HEXACO-100's fitness and utility within the context of autobiographical memory functions research, especially given that Study 1 of the current paper is the only known autobiographical memory functions study to date that has incorporated it. Finally, because the AMFJR has not previously been assessed for personality effects, Study 2 also sought to document the relationship between personality factors and the rated frequency of its six "socially situated" functions of Conversation, Perspective $\text{Taking}_{\text{AMFJR}}$, Relationship Maintenance, Teaching/Problem Solving/Behavioral Control, Emotion Regulation, and Self.

Age Effects. Research shows that autobiographical memories change over the life span in response to their integration with old and new memories and re-experience for various purposes over time (Bluck & Habermas, 2001). As such, the differential use of autobiographical memory as a function of age has informed such instruments as the *Child-Caregiver Reminiscence Scale* (CRS) (Kulkofsky & Koh, 2009)—which concerns those functions essential to the socialization and development of the autobiographical memory system—and the *Reminiscence Functions Scale* (RFS) (Webster, 1995, 1997), which is especially focused on functions used later in life.

Thus, although research examines rated frequency of functional use of autobiographical memory within isolated life stages, other studies have investigated the impact of age in general. For example, Bluck and Alea (2009) found that older adults tend to use autobiographical memory for the TALE's broad family of Self functions less frequently than do younger adults. This result was attributed to the hypothesis that older adults have, over time, acquired a clear self-concept that can be sustained with little need to consult stored autobiographical information.

In contrast, younger individuals discuss or contemplate autobiographical memories more often than do older adults in order to facilitate the development of their still-forming self-concepts. Bluck and Alea also found that age predicted the broad Directive function, claiming that young adults may rely more heavily on autobiographical memory to direct future actions (i.e., engage in prospection) because their sense of time ahead is greater than that of older adults. That Bluck and Alea found no age effects for the broad Social function is surprising; both the CRS and RFS—which were designed in response to known age effects in rated frequency of functional use of autobiographical memory—feature items specifically intended to assess autobiographical memory use for social purposes. Note that none of the studies of age effects have employed the gold standard of longitudinal design, and none have possessed sufficient power to assess small effects.

Related research also suggests possible age effects for the AMFS and AMFJR. With respect to the AMFS, age is known to influences the behaviors of perspective taking, prospection, and counterfactual thinking. For example, skillfulness in perspective taking progresses in stages that aligns with the course of normal cognitive development—a trajectory that begins with the emergence of theory of mind capacity at three to four years of age (Selman, 2003). By the age of 15, normally developed adolescents have acquired proficiency in third-person perspective taking, with "societal perspective-taking"—the ability to grasp, forecast, and coordinate various perspectives—developing into adulthood from about the age of 14 (Selman, 2003). However, evidence that perspective taking abilities decline as a function of age has been inconsistent. Some research indicates age-related deficiencies in perspective taking may be due to age-related cognitive deficiencies (e.g., Helson, Jones, & Kwan, 2002; Maylor, Moulson, Munson, & Taylor, 2002; Ruffman, Henry, Livingston, & Phillips, 2008). However, other studies show no decline in perspective taking abilities, surmising that the uptick in the number of satisfying social relationships that individuals tend to acquire later life help to keep social-cognition skills sharp (Kilpatrick, Bissonnette, & Rusbelt, 2002). Likewise, meaningful social interaction may motivate individuals to not only engage in, but become proficient in, perspective taking (Zhang, Feng, Stanley, & Isaacowitz, 2013).

A study by Abram et al. (2008) reports that, during the early years of cognitive development—when the autobiographical memory system is just beginning to emerge—children have difficulty with both past and future episodic remembering—challenges that are typically overcome by early adulthood. Other studies have found that older adults tend to generate more *semantic* autobiographical memory details than *episodic* autobiographical memory details when asked to imagine future events (Addis et al., 2009; Cole, Morrison, & Conway, 2013, Schacter, Gaesser, & Addis, 2013). This finding somewhat contradicts the assumption that the primary form of autobiographical memory content used during the "re-experiencing" of past events and the "pre-experiencing" of future scenarios is episodic (e.g., Tulving, 2002b; Shanton & Goldman, 2010).

Like perspective taking and prospection, individuals develop the ability to engage in counterfactual thinking concurrent with the acquisition of theory of mind (Beck et al., 2011; Bosaki, 2008; Epstude & Roese, 2008; Saxe & Kanwisher, 2003). However, children for whom this capacity is just beginning to emerge have more difficulty with counterfactual tasks than they do with imagining possible future realities (Riggs, Peterson, Robinson, & Mitchell, 1998). This may be because children of this age are inexperienced in processing and expressing those complex emotions associated with counterfactual thinking: relief (Guttentag & Ferrell, 2004), disappointment (e.g., Coricelli & Rustichini, 2010), envy (Coricelli & Rustichini, 2010), and especially, regret (e.g., Connolly & Zeelenberg, 2002; Roese, Pennington, Coleman, Janicki, Li, and Kenrick, 2008; Roese, & Summerville, 2005; Tykocinski & Pittman, 1995). Research on adulthood finds that, once the ability to generate counterfactuals has been instantiated, the emotional valence of counterfactuals changes as a function of age. Specifically, older adults tend to engage in more positive counterfactuals than do young people (Mather & Carstensen, 2005).

Gender Effects. Although gender effects with respect to various properties of autobiographical memory have been widely reported (e.g., Grysman & Fivush, 2016; Grysman & Hudson, 2012; St. Jacques, Conway, & Cabeza, 2011), other studies have been unable to detect such effects (Rubin, Schulkind, & Rahhal, 1999). Such is the case with the broad functions of the TALE, for which no gender effects have been found to date (Bluck & Alea, 2009). Thus, it could be assumed that gender would play no role in rated frequency of functional use of autobiographical memory as measured by the AMFJR, the functions of which were found by Ranson and Fitzgerald (in preparation) to map onto the TALE. However, although the AMFJR was shown to be structurally invariant across gender (i.e., the scale performed equivalently for both men and women), mean gender differences were not tested.

Despite the lack of gender differences with respect to the TALE, gender effects in rated frequency of functional use of autobiographical memory content are nonetheless plausible given related research. For example, studies show that men and women differ in the recollection of early personal emotional events (Davis, 1999), the socialization of autobiographical memory (Nelson & Fivush, 2002, 2004), the degree of detail recalled (Pillemer, Wink, Di Donato, & Sanborn, 2003; Ross & Holmberg 1992; Seidlitz & Diener 1998), and the frequency of reflecting on the past (Webster, 1995).

Culture Effects. There is much evidence indicating that the development of the autobiographical memory system, as well as the nature of autobiographical memory content, are differentially socialized according to culture (Nelson & Fivush, 2002, 2004). Likewise, previous research shows that culture can impact rated frequency of functional use of autobiographical memory (Ranson, 2014), as well as the behaviors of perspective taking (e.g., Rasmussen & Sieck, 2012), imagining future scenarios (e.g., Moore, 2006), and counterfactual thinking (e.g., Gilbert, 2012). Thus it was important for Study 2 to glean whether the cultural variation found in such contexts are reflected in the use of autobiographical memory for the functions measured by the AMFS, AMFJR, and TALE.

Few autobiographical memory functions studies have had the opportunity to investigate cultural variations, as obtaining ethnically diverse samples large enough for statistical evaluation is challenging. However, Ranson (2014) tested the functions of the AMFJR for possible cultural effects between the Caucasian and African-American/Black ethnic groups. Results showed that that people who identify as Caucasian use of autobiographical memory with greater frequency for the purpose of Conversation (thinking or talking about the past to promote social interaction; i.e., engage in "small talk" about the past) than do people who identify as African-American/Black. Related research shows that "small-talk" can be perceived as an informal, light-hearted means of increasing social intimacy, or contrarily, as superficial and manipulative (Goldsmith & Baxter, 1996). Thus, the Ranson findings may suggest that "small-talk past-talk" is a more widely accepted practice in Caucasian ethnic groups, whereas it is thought by African-American/Black cultures to be undesirable and something to be avoided (Goldsmith & Baxter, 1996).

Ranson (2014) also found that African-American/Blacks used autobiographical memory content more often than Caucasians for Teaching/Problem Solving/Behavioral Control (thinking or talking about the past in an attempt to resolve everyday difficulties). Related research shows that talking about the challenges one is facing and engaging in problem-solving with others may facilitate decision-making, provide needed instruction, and prompt others to offer advice (Goldsmith & Baxter, 2006), which would promote the Ranson finding. Such interactions may occur more frequently when individuals' real-life circumstances—whether real or perceived—require resolution or repair. For example, research shows that, compared to Caucasians, the life experiences of African-American/Blacks reflect more chronic negativity and hardship, that aligns with other factors known to be associated with this ethnic group, such as poverty/low socioeconomic status, feelings of oppression, actual and perceived discrimination, and loss of control (Coleman, 2012). If considered with the other Ranson finding, African-American/Blacks may engage in less Conversation "past-talk" than Caucasians because they tend to reminisce with others instead about more serious matters.

Related research may also inform possible culture effects for the functions measured by the AMFS. For example, there is evidence that the behaviors of perspective taking and prospection are differentially influenced by culture. With respect to perspective taking, a recent study found that perspective-taking accuracy is severely impaired when the perceiver has little to no experience with the target other's culture (Rasmussen & Sieck, 2012). Although such conclusions emphasize the importance of cultural experience for developing a *proficiency* in understanding others, it also implies that individuals will simulate whatever "background information" they have available—however mismatched for the task—rather than not make an attempt to infer the minds of unfamiliar others. While this may suggest that perspective taking, as an everyday phenomenon (Ickes, 2003; Winner, 2000), may be engaged in equivalently regardless of culture, no studies were found that specifically tested this possibility.

With respect to prospection, research shows that different cultures perceive and plan for the future for different purposes and with different expectations of what is possible. For example, a study by Moore (2006) posited that, because American culture is future-oriented, it sees the future as something that can be anticipated and controlled. As such, Americans tend to imagine future scenarios in which desired short- and long-term outcomes are planned for and achieved. Contrarily, because Hindu culture is past-oriented, its members believe that the future is unalterably determined by past action. As such, their imagined future scenarios concern short-term outcomes constrained by past occurrences.

Research exploring cultural effects in counterfactual thinking have found that the content of counterfactuals differs between individualistic and collectivist cultures (e.g., Gilbert, 2012; White & Lehman, 2005). Likewise, cultural priorities can inform the nature and frequency of the counterfactuals generated. For example, Chen, Chiu, Roese, Tam, & Lau (2006) found that, in response to negative life events concerning schoolwork, romance, family, and friendship, collectivist participants were more likely to generate *subtractive* counterfactuals—i.e., "reframing" the negative event such that the actual outcome did *not* occur—than *additive* counterfactuals—i.e., "reframing" the negative event such that the actual event is augmented to make something new occur. Results also showed that collectivist cultures engaged in more counterfactuals for schoolwork and family events than did participants from individualist cultures. However, it is currently unknown if, in general, there are cultural differences in the frequency with which collectivist versus individualistic cultures engage in counterfactual thinking.

3.2 Objective, Hypotheses, and Goals

Primary Objective

The primary objective of Study 2 was to provide empirical evidence for the Expanded Simulation Model proposed in Chapter 1. Specifically, Study 2 sought evidence that autobiographical memory content can be used for simulation-based perspective taking (Chapter 1, Hypothesis 1.2) and mental time travel (Chapter 1, Hypothesis 1.5), the latter of which was operationalized in the current paper as prospection. and counterfactual thinking. Establishing that autobiographical memory is used for these purposes will empirically support Chapter 1's Hypothesis 1.6, that perspective taking, prospection, and counterfactual thinking are therefore *functions* of autobiographical memory. Study 2 also sought evidence in support of Chapter 1's Hypothesis 1.7, that the form of simulation that underlies perspective taking is interpersonal, whereas the form of simulation that underlies mental time travel is intrapersonal.

In pursuit of these objectives, Study 2 was designed to evaluate six new hypotheses and three goals. Hypotheses were stated when either direct evidence or strongly related previous findings were available to recommend particular outcomes. Goals were stated in lieu of hypotheses when gaps in the literature precluded prediction, or when available evidence was too conceptually distal to make prediction plausible. The provisional analyses of Study 1 were also rerun in Study 2, with the expectation that Study 1 results would be replicated.

Hypotheses

Hypothesis 3.1. It was assumed that, despite structural differences between the Perspective $\text{Taking}_{\text{AMFS}}$ and Perspective $\text{Taking}_{\text{AMFJR}}$ subscales (i.e., the AMFS subscale featured two additional items in addition to the two items comprising the AMFJR subscale), the use of autobiographical memory content for perspective taking, regardless of the instrument on which it was measured, would be relatively equivalent. The result would be a single "autobiographical memory functions" second-order construct indicated by eight distinct constructs comprising the following subscales: the AMFS's Prospection and Counterfactual Thinking subscales; the AMFJR's Conversation, Relationship Maintenance, Teaching/Problem Solving/Behavioral Control, Emotion Regulation, and Self subscales; and a single Perspective Taking$_{S\&JR}$[51] subscale. The expected eight-function, second-order structure was in lieu of a single-order, oblique structure, the latter of which had no reasonable conceptual basis (e.g., there was no reason why such simulation-based functions as Counterfactual Thinking would be directly inter-correlated with such socially situated functions as Conversation). As such, the hypothesized second-order model was not only more parsimonious, but more interpretable (Chen, Sousa, & West, 2005; Judge, Erez, Bono, & Thoresen, 2002). The predicted eight-function structure is depicted in Figure 14.

Hypothesis 3.2 The six autobiographical memory functions measured by the AMFJR would map onto the three autobiographical memory functions measured by the TALE (Bluck & Alea, 2011), in replication of results by Ranson & Fitzgerald (in preparation). However, to extend the research by Ranson and Fitzgerald, Hypothesis 3.2 tested whether the TALE functions could be characterized as higher-order functions of the AMFJR. It was also hypothesized that the Perspective Taking$_{AMFS}$ function, as an *other*-directed phenomenon underlain by interpersonal simulation (Shanton & Goldman, 2010), would be predicted by the TALE's broad Social function. Contrarily, it was predicted that Prospection and Counterfactual Thinking, as *self*-directed phenomena underlain by intrapersonal simulation (Shanton & Goldman, 2010), would map onto the broad Self function. Also, given related research that

[51] Unless otherwise noted, from this point forward, the current paper will use the convention of tacking the subscript notation "S&JR" to all references to the subscale comprising both the Perspective Taking$_{AMFS}$ and Perspective Taking$_{AMFJR}$ subscales.

characterizes the Directive function as involving the use of autobiographical memory for future planning (e.g., Bluck et al., 2005; Williams et al., 2008), Study 2 tested whether the Prospection function was broadly Directive. Likewise, because counterfactual thinking can be used as an emotion control strategy (e.g., Allen et al., 2014; Lindeman & Abraham, 2008; Ruiselová et al., 2009; Ruiselová & Prokopcáková, 2010; Williams et al., 2008), which renders it conceptually similar to the broadly Directive Emotion Regulation function of the AMFJR, Study 2 tested whether the Counterfactual Thinking function was therefore also broadly Directive.

Assuming confirmation of the Hypothesis 3.2, of interest to Study 2 was whether the AMFS and AMFJR functions would "inherit" significant individual difference effects from their corresponding broad functions of the TALE. It was thought that, if the personality, age, gender, and/or culture effects found for the functions of the TALE then manifested in the lower-order functions of the AMFS and AMFJR, such would be additional support for the second-order structure predicted in Hypothesis 3.2.

Hypothesis 3.3. Study 2 will replicate Study 1 findings regarding associations between the AMFS functions and the ERQ's (Gross & John, 2003) Cognitive Reappraisal dimension, which reflects a simulation-based process (Lindeman & Abraham, 2008).

Hypothesis 3.4. Perspective Taking$_{\text{AMFS}}$ would emerge as the primary significant predictor reflecting the *interpersonal* form of simulation proposed by the Shanton and Goldman (2010) to underlie behavioral perspective taking. Likewise, it was expected that Counterfactual Thinking would emerge as the second significant predictor of Cognitive Reappraisal and would reflect the *intrapersonal* form of simulation posited by Shanton & Goldman to underlie mental time travel.

There are two arguments as to why Counterfactual Thinking, rather than Prospection, was expected to significantly predict Cognitive Reappraisal on behalf of intrapersonal simulation. One, Study 1 results indicated that Counterfactual Thinking accounted for almost four times the variance in Cognitive Reappraisal than did Perspective Taking$_{AMFS}$, and more than 25 times the variance accounted for by Prospection—a pattern of effects that was expected to be replicated in Study 2. Two, related research (e.g., Allen et al., 2014) implies that behavioral counterfactual thinking is more emotion-based than either behavioral prospection or perspective taking. Because Cognitive Reappraisal assesses emotion-control strategies (e.g., Allen et al., 2014; Lindeman & Abraham, 2008; Ruiselová et al., 2009; Ruiselová & Prokopcáková, 2010), it is thus conceptually plausible that the function most predictive of Cognitive Reappraisal would be Counterfactual Thinking. However, given that the results of Study 1 were provisional and thus potentially biased, it was possible that Study 2 effects would be comparatively smaller in magnitude. Additionally, it was possible that, given that Study 2's sample was substantially larger than Study 1's, Study 2 would yield significant results where Study 1 did not.

Hypothesis 3.5. An association would be found between the AMFJR's function of Emotion Regulation and the ERQ's Expressive Suppression (Gross & John, 2003). The Expressive Suppression dimension concerns the management of outward behaviors that can be socially observed (Gross & John, 2003). Likewise, the AMFJR's Emotion Regulation function involves the use of "past-talk" to understand or obtain emotion control (Ranson & Fitzgerald, in preparation). That Study 1 showed no relation between Expressive Suppression and the three AMFS functions was attributed to the fact that Expressive Suppression is more likely to be elicited by social situations (i.e., where one's emotional behavior is observed, and to which others may react), whereas the AMFS functions, which are simulation based, have been posited herein as being comparatively more subjective. Examples of Emotion Regulation items that reflect their objectiveness include, “I think or talk about the past to emphasize or clarify appropriate emotional responses”; and “I think or talk about the past to help me or another control emotions” (see Table 18 for all AMFJR Emotion Regulation items). As the AMFJR’s Emotion Regulation function thus concerns strategies played out in the social sphere, it was anticipated that this and Expressive Suppression would be correlated.

Hypothesis 3.6. Results from previous studies regarding associations between Five Factor inventory dimensions and the functions of the TALE were expected to be replicated. Specifically, it was hypothesized that Openness to Experience would predict the broad Directive function (Rasmussen & Berntsen, 2010; Webster, 1993), the broad Self function (Cappeliez & O’Rourke, 2002; Rasmussen & Berntsen. 2010), and the broad Social function (Rasmussen & Berntsen, 2010). Additionally, it was expected that Emotionality/Neuroticism would predict both the broad Self function (Cappeliez & O’Rourke, 2002; Rasmussen & Berntsen, 2010), and the broad Directive function (Rasmussen & Berntsen, 2010) Finally, it was hypothesized that Extraversion would predict the broad Social function (Rasmussen & Berntsen, 2010). Also of interest was whether personality effects would be found for the Agreeableness and Conscientiousness dimensions, as no known autobiographical memory functions study to date has reported associations between these dimensions and TALE functions (Rasmussen & Berntsen, 2010).

With respect to the AMFS, the associations found in Study 1 between the personality dimensions of the HEXACO-60 (Ashton & Lee, 2009) were expected to be replicated in Study 2 when using the 100-item HEXACO-PI-R (Ashton & Lee, 2005, 2009). Specifically, it was hypothesized that Perspective Taking$_{AMFS}$ would be predicted by Emotional Stability (the inverse of Emotionality/Neuroticism), Extraversion, Conscientiousness, and Openness to Experience; that Prospection would be predicted by Emotionality/Neuroticism, Conscientiousness, and Openness to Experience; and that Counterfactual Thinking would be predicted by Emotionality/Neuroticism, Introversion (the inverse of Extraversion), and the inverse of Honesty-Humility. Also of interest was whether personality would differentially predict the simulation-based Perspective $\text{Taking}_{\text{AMFS}}$ function compared to the socially situated Perspective $\text{Taking}_{\text{AMFJR}}$ function. The results should help elucidate the Rasmussen and Berntsen (2010) contention that the stability of the relation between the TALE Social function (and thus its lower-order functions) and Extraversion is dependent on the Social function's operationalization.

Because there was no previous research on which to base specific hypotheses, Study 2 explored the relations between AMFS functions and the 24 HEXACO facets, as well as the HEXACO's interstitial dimension, Altruism (the inverse of which is Antagonism). Given the extensive small, but significant findings that could not be corroborated by related research, results of the facet analyses and a discussion of findings can be found in Appendix F.

Goals

Goal 3.1. To replicate the age effects previously reported for the TALE, and to test whether age predicted the use of autobiographical memory for the functions of the AMFS and AMFJR[52]. Although related research has reported cognitive development-related age effects for behavioral perspective taking (Selman, 2003) and behavioral prospection (Abrams et al., 2008), and because the functions of the AMFJR were adapted from a scale concerned with the functions that emerge in early childhood but are presumed to be used in some form throughout the life

[52] Age effects were not tested during validation of the AMFJR. The survey system (SONA) used to collect data for that study featured a standard prescreen that asked respondents to indicate only if he/she was over 18 years of age or not.

span, it was unknown if such effects would impact the rated frequency of functional use of autobiographical memory content for the functions measured by the AMFS and AMFJR.

Goal 3.2. To test for possible gender effects in the functions of the TALE, AMFS, and AMFJR. Although no study to date has found gender differences in rated frequency of functional use of autobiographical memory as measured by the TALE, differences in the processing, experiencing, and properties of autobiographical memory are widely reported to occur between men and women could plausible influence gender effects on autobiographical memory functions.

Goal 3.3. To examine differences in the frequency with which autobiographical memory is used for the functions of the TALE, AMFS, and AMFJR across ethnic groups. Although no culture effects have been reported for the TALE, Study 2 aimed to replicate findings by Ranson (2014) that showed differential use of autobiographical memory for the AMFJR functions of Conversation and Teaching/Problem Solving/Behavioral Control by Caucasians and African-American/Blacks. Additionally, because related research indicates that there are cultural differences in the use of behavioral perspective taking (e.g., Rasmussen & Sieck, 2012), prospection (e.g., Moore, 2006), and counterfactual thinking (e.g., Chen et al., 2006; Gilbert, 2012; White & Lehman, 2005), Study 2 tested whether or not such influences impact the use of autobiographical memory for the functions measured by the AMFS.

3.3 Methods

Participants

A total of 903 participants, who were recruited online through MTurk (www.MTurk.com), completed a survey administered by Qualtrics (2015, Provo, UT). Enrollment in Study 1, which was also conducted through MTurk, prohibited enrollment in Study 2 to ensure that all cases were unique across the two studies.

Participant ages ranged from 18 to 66+ (M = 34.92 years, SD = 11.21), with the majority (n = 382, 42.4%) being slightly older than college-aged (ages 25–34). As was the case for Study 1, the gender split was nearly equal (F = 449, 49.7%, M = 450, 49.8%), with three participants (0.3%) identifying as transgender, and one (0.1%) preferring not to answer. As for ethnicity/race, because the Native American and Hawaiian/Pacific Islander ethnicity/race groups had representation of < 1% of the total sample for both Study 1 and the AMFJR validation study by Ranson and Fitzgerald (in preparation), those groups were omitted from Study 2. Instead, to align with more recent recommendation by the U.S. Census Bureau (e.g., Hoeffel, Rastogi, Kim, & Shahid, 2012), "Asian" was split into "East Asian" and "South Asian." The frequencies and proportions of the ethnic/race groups were as follows (from high to low): Five hundred eighty-four participants identified as Caucasian (64.7%); 157 as South Asian (17.4%); 51 as African-American/Black (5.6%); 43 as East Asian (4.8%); 35 as Hispanic (3.9%); 14 as Other (1.6%); 10 as Multiracial (1.1%); and two as Arab/Middle Eastern (0.2%). Seven participants (0.8%) chose "prefer not to answer." Study 2 demographics are summarized in Table 20.

Compensation for the 903 participants who passed all attention checks and satisfactorily completed the survey was an Amazon credit worth $1.60[53], and which was posted to their Amazon.com account within 24 hours of survey submission.

Instruments

The seven blocks (181 total items) that comprised the online survey are detailed below. Except for the demographics and self-descriptors blocks, all items were rated on a 1 to 6 Likert-type scale. All items within each block were randomly ordered, and all blocks except the

[53] The Study 2 proposal indicated that participant compensation would be $2.00 per survey. However, due to an increase in January 2-16 in the MTurk fee from 10% to 40% of total participant compensation, the $2.00/participant fee was reduced to $1.60/participant. This rate, however, was still over MTurk's guideline of $1.00/30 minutes, as survey test metrics indicated that the average completion time was no more than 30 minutes.

information sheet/introduction block, demographic items, and self-descriptors were also randomly ordered. Blocks that included attention check items have been indicated below and in their corresponding tables.

Block 1: Demographics. Study 2 included three demographic items: age (drop-down list of ages 18 through 66+ and prefer not to answer); gender (male, female, transgender, prefer not to answer); and ethnicity (Caucasian, South Asian, Arab/Middle Eastern, Hispanic, East Asian, African-American/Black, Multiracial, Other, prefer not to answer).

Block 2: Self-Descriptors of Current Self. As per Study 1, respondents were primed to activate the Self-Memory System (Conway, 2005; Conway & Pleydell-Pearce, 2000) by providing five self-descriptors. Respondents were presented with the following instruction: "Take a moment to consider what traits and characteristics describe who you are at this point in your life. For example, are you ambitious? A good friend? Shy? Think of 5 one- or two word descriptions that best reflect these characteristics and enter them in the spaces below." The item will feature five open fields preceded by the statement, 'I _______________.' Each field permitted a total of 60 characters. This item was adapted for Study 2 from the *Twenty Statement Test* (TST), Kuhn & McPartland (1954).

Block 3: Autobiographical Memory Functions of Simulation (AMFS) scale. The 10-item AMFS that was validated in Study 1 was included in Study 2. The 10 AMFS items and their corresponding functions, as well as the attention check item, can be found in Table 3.

Block 4: Emotion Regulation Questionnaire (ERQ). The 10-item ERQ (Gross & John, 2003) used in Study 1 was included in Study 2. The 10 items of the ERQ are listed in Table 4.

Block 5: HEXACO Personality Inventory-Revised. The HEXACO-PI-R (Lee & Ashton, 2008) features 100 items to assess the same six dimensions as the HEXACO-60, but with the addition of the interstitial facet scale of Altruism (inverse: Antagonism). Additionally, all six dimensions are further subdivided into four facets each for a total of 24 facets. Results of the HEXACO-PI-R validation study yielded Cronbach's *alpha* reliabilities ranging from .78 to .84.

Respondents were presented with the instruction, "The following section addresses various personality traits. On a 1 to 6 scale, please rate the extent to which you agree (or disagree) with each statement as it describes your personality." As with the Study 1 HEXACO survey block, Study 2's HEXACO survey block included an attention check item. The HEXACO-PI-R's 100 items, dimensions, facets, and attention check item can be found in Table 17.

Block 6: Autobiographical Memory Functions of Joint Reminiscence (AMFJR). The 36-item AMFJR (Ranson & Fitzgerald, in preparation), formerly called the CRS-A, comprises the two Perspective Taking items that are now also included in the AMFS. The AMFJR was found during validation to measure six autobiographical memory functions that mapped onto the three broad TALE (Bluck & Alea, 2011) functions of Social, Self, and Directive. The six functions of the AMFJR are: Conversation (Social: engaging in past-talk to promote and sustain conversation); Relationship Maintenance (Social: engaging in past-talk to establish and strengthen social bonds); Perspective Taking$_{AMFJR}$ (Social: engaging in past-talk to understand/infer others' minds); Teaching/Problem Solving/Behavioral Control (Directive: engaging in past-talk to make informed decisions and attitudes); Emotion Regulation (Directive: engaging in past-talk to cultivate and encourage appropriate emotional responses); and Self (Self: engaging in past-talk to develop and maintain one's self-identity) The factors of the CRS-A were shown during validation to have reliabilities ranging from .89 to .95 (Ranson & Fitzgerald, in preparation).

Respondents were presented with the instruction, “We are interested in how and why people engage in *past-talk*. Past-talk is conversation about events that you have experienced with the person(s) you are speaking to or that you have experienced but your conversational partner(s) have not. Please keep past-talk conversations in mind when rating how often you engage in each of the situations below using a 1 to 6 scale (1 = almost never; 6 = almost always). Please click the NEXT button to continue.” Items are in response to the stem statement, “I engage in past-talk with another or others in order to...” The AMFJR items and corresponding factors are summarized in Table 18.

Block 7. Thinking About Life Experiences (TALE) scale. The TALE (Bluck et al., 2005; Bluck & Alea, 2011) was the first instrument with which the three broad autobiographical memory functions of Social, Self, and Directive were empirically validated. Study 2 used the 15-item TALE (Bluck & Alea, 2011), which has been validated for use with adult populations. The internal consistency reported for the TALE ranges from .74 for the Social subscale; .83 for the Self subscale; and .78 for the Directive subscale (Bluck & Alea, 2011).

Respondents were presented with the instruction, “Sometimes people think back over their life or talk to other people about their life: It may be about things that happened quite a long time ago or more recently. We are not interested in your memory for a particular event, but more generally in how you bring together and connect the different events and periods of your life. Please rate how often you do the following on a 1 to 6 scale (1 = Almost Never; 6 = Almost Always). Please click the NEXT button to continue.” Items then followed the stem statement, “I think back over or talk about my life or certain periods of my life...” The TALE items and corresponding functions can be found in Table 19.

Procedures

Study 2 approval was obtained from the conducting university's Institutional Review Board (IRB protocol 1604014867, 5/19/16). The Study 2 online questionnaire followed the protocol already detailed for Study 1 with the exception of the following four modifications: 1) Except for the current self-descriptors, the mental time travel components and accompanying self-descriptors conditions were omitted; 2) the 36-item AMFJR was included; 3) the 15-item TALE was included; and 4) the HEXACO-100 was used instead of the HEXACO-60. The online questionnaire featured 179 items plus two attention check items for a total of 181 items. Items and blocks—except for the informed consent, demographics, and self-descriptors blocks—were randomly ordered.

MTurk metrics indicated that all 903 surveys were completed in about a five-hour time period, with the average time spent on each survey reported as 21.52 minutes. Respondents who passed all attention checks and satisfactorily completed the survey were compensated with a $1.60 credit posted to their personal Amazon.com account. This rate was consistent with average rate of $1.00 that MTurk participants earn per 30 minutes (www.MTurk.com). The total value of the Amazon credits issued as compensation to respondents was $1,440 (900 × $1.60). The total fee assessed by MTurk on participant compensation was $576 (40% × $1440), which brought the total payout to $2,016. The $16 overage was paid out-of-pocket by the Study 2 Principal Investigator.

Because MTurk keeps the survey open until the requested number of surveys (here, 900) have been *completed* rather than started, three additional participants' submissions were submitted but missed the MTurk cutoff. As a result, only 900 participants were compensated, as only the first 900 Worker IDs flagged as completing the survey appear in the researcher's compensation queue. Because the MTurk de-identification process makes impossible the discernment of which three participants' surveys were uncompensated, there was no way to know which surveys were paid versus unpaid; nor was there any way to issue compensation to the three extra participants. However, MTurk does disclose this possibility, instructing respondents to monitor how close a survey is to being closed or risk being uncompensated for their work.

Data Analyses

The Study 2 data analysis protocol was similar to that of Study 1. Data screening, descriptive statistics, and regression analyses were conducted using SPSS v23 (IBM Corp, 2015), LISREL v9.2 (Jöreskog, & Sörbom, 2015), and AMOS v22 (Arbuckle, 2014). Type I error risk was limited to 5% (α = .05); thus results that featured $p \leq .05$ were considered statistically significant.

For all non-SEM inferential tests, composite "scale score" variables comprising the items for each function, dimension, and facet were generated. Only the HEXACO-100 (Ashton & Lee, 2005) featured reverse-scored items, which were recoded prior to composite score generation.

The associations between AMFS functions and the ERQ (Gross & John, 2003) predicted by Hypothesis 3.3, as well as the association between the AMFJR function of Emotion Regulation and the ERQ predicted by Hypothesis 3.5, were tested using bivariate correlation analyses. Hypothesis 3.4, which predicted the functional relation of the AMFS factors with respect to interpersonal and intrapersonal simulation, was tested using simultaneous multiple linear regression. Simple linear regression was used to test whether personality predicts the use of autobiographical memory for the functions measured by the TALE, AMFS, and AMFJR (Hypotheses 3.6). Simple linear regression was also used to test for age and gender effects per

Goals 3.1 and 3.2, respectively. Kruskal-Wallis *W* chi-square comparison tests with Bonferroni corrected Mann-Whitney *U* post-hocs (using α_{ADJ} = .0167 to reflect three pairwise comparisons per each Kruskal-Wallis model) were used for Goal 3.3, which sought differences in the use of autobiographical memory for the functions of the AMFS, AMFJR, and TALE across Study 2's three largest ethnic groups (Caucasian, *n* = 582; African-American/Black, *n* = 51; South Asian, *n* = 157). The Kruskal-Wallis and Mann-Whitney *U* tests were used due to both the nonnormality of the data, and the differences in subgroup sample size, which can impair results when tested parametrically (Helsel, 1992). The effect size for the Mann-Whitney *U*, $r = |Z|/\sqrt{N}$, is interpreted similar to a Cohen's *d*, where effects of .10 = small, .30 = moderate, and .50 = large (Fields, 2005; Rosenthal, 1994). The effect size *r* was computed using the following total sample sizes: for Caucasian versus South Asian comparisons, *N* = 741; for Caucasian versus African-American/Black comparisons, *N* = 635; and for African-American/Black versus South Asian comparisons, *N* = 208.

Power Analyses. The target sample size of 900 was sufficient for the most complex SEM configuration tested. An SEM power analysis based on power = .80, α = .05, minimum effect size of .10[54], number of observable variables = 61 (10 AMFS + 36 AMFJR + 15 TALE), and number of latent variables = 12 (3 AMFS, 6 AMFJR, 3 TALE) yielded a minimum sample of 766 (see Figure 16). However, given that a number of Study 2's hypotheses and goals included strictly exploratory components, *N* = 900 was obtained to ensure that inferential tests using simple and multiple regression were sufficiently powered, especially given that some of the

[54] The current paper used the *A-priori Sample Size Calculator for Structural Equation Models*, an online power analysis program by Soper (2016). The calculator requires an effect size as specified by Westland (2010), who states that the approach for determining *N* for SEM is analogous to that for standard univariate calculations (e.g., 0.1 = smallest minimum effect; 0.3 = moderate; 0.5 = large) (Cochran 1977; Kish 1955; Lohr 1999; Snedecor & Cochran 1989, Westland & See, 2007), but which employs a formulation for variance customized for SEM.

effects that Study 2 aimed to replicate were expected to be very small ($r^2 < 2\%$)[55]. Figure 17 shows the power analysis results for a general multiple regression analysis using power = .80, α = .05, minimum effect size (squared multiple correlation) of approximately .10, and two predictors.

Several post-hoc power analyses were also conducted to get a sense of how overpowered the bivariate correlation, simple regression, and multiple regression models of Study 2 were. Results showed that, even for effect sizes smaller than 10% (e.g., $R^2 = 6.5\%$), achieved power was > .99, with a minimum N needed to detect a significant effect = 118, which was way below the actual $N = 903$. Because significance is largely driven by the sample size, it is helpful to consider p-values in the context of effect size and achieved power in order to determine how relevant and/or meaningful a significant result is. Thus, because nearly all tests for Study 2 were overpowered, and because many effects were small, Study 2 effect sizes have also been reported for all analyses.

3.4 Results

Data Screening

Data from all Study 2 survey blocks were screened prior to all planned analyses. As expected there were no missing data. Data were evaluated for UV normality using $Z \geq |1.96|$ as an indicator of significant nonnormality at the .05 level; $Z \geq |2.58|$ at the .01 level; and $Z \geq |3.29|$ at the .001 level. Results indicated a high amount of skew and moderate kurtosis at the item level, as well as in the scale scores used to test Hypotheses 3.3–3.7 and Goals 3.1–3.3. Specifically, of the 20 scale scores (three from the AMFS, two from the ERQ, six from the HEXACO, six from the AMFJR, and three from the TALE) that were evaluated, all but five

[55] Effect sizes < 2% were reported by Ranson & Fitzgerald (in preparation) when analyzing cultural effects.

(75%) were significantly negatively UV skewed. Results also showed that 11 of the 20 (55%) scale scores were significantly UV leptokurtic, and that three of the 20 (11%) were significantly UV platykurtic. Scale score means, standard deviations, and UV skew and kurtosis *Z*-scores for the dimensions of the AMFS, ERQ, HEXACO, AMFJR, and TALE are detailed in Table 21.

Other preliminary analyses included bivariate correlations of and regressions on the items that comprise each of the functions of the AMFS, AMFJR, and TALE. Assessed were potential problems, such as high inter-item correlations. As can be seen in Table 22, results showed that inter-item correlations for items of each scale were within a desired range of .39–.77, with nine out of 61 (~85%) between .40 and .69. However, two of the three inter-item correlations for Counterfactual Thinking were higher than .80 (.87, and .89) to suggest either item redundancy or that the construct measured was "too specific" (Briggs & Cheek, 1986, p. 114). This was surprising given that the Study 1 inter-item correlations for Counterfactual Thinking were much lower (.54, .57, and .68). Likewise, the mean inter-item correlation for the AMFS scale using the Study 2 data was .39—which was a bit higher than the inter-item correlation mean of .30 for Study 1—but which is still within the optimal range of .20–.40 (Briggs & Cheek, 1986, p. 115) to suggest both sufficient coverage of various construct characteristics (i.e., perspective taking, prospection, and counterfactual thinking), and the faithful encapsulation of the overarching construct (e.g., use of autobiographical memory content). Thus, although the cause of the higher-than-expected Counterfactual Thinking inter-item correlations was unknown, their values were below the .90 threshold that can portend unstable matrices or inadmissible solutions for CFA (Tabachnick & Fidell, 2007, p. 90). Therefore, the performance of these items in the testing of Study 2 hypotheses was monitored for possible issues, and caution was taken when interpreting results.

Individual CFAs were then conducted on the AMFS, AMFJR, and TALE to verify their expected structures prior to running the series of confirmatory factor analyses (CFA) used to test Study 2's Hypotheses 3.1 and 3.2, as well as using the AMFS, AMFJR, and TALE scale scores for the inferential tests of Hypotheses 3.3–3.7 and Goals 3.1–3.3. Individual CFAs were conducted in LISREL v9.2 using robust ULS estimation on polychoric correlation matrices with the asymptotic covariance matrices to yield Satorra-Bentler nonnormal-adjusted chi-square values. The fit indices of RMSEA, NNFI, and CFI, which, by default, LISREL computes using the ML Ratio chi-square rather than the Satorra-Bentler, were manually recomputed according to the formulas detailed in Appendix E, and using the Satorra-Bentler chi-square and degrees of freedom values as recommended (Hu & Bentler, 1999). Results supported all three scales' expected structures, thus hypothesis and goal testing proceeded. Summaries of the three scales' individual CFA results can be found in Table 23. The factor correlations for each individual scale can be found in Table 24.

Hypothesis 3.1 Analyses

Overcoming Data Analysis Issues. Although results of the data screening procedures verified the structures and properties of the variables to be used to test Hypothesis 3.1 (as well as Hypothesis 3.2), there were problems in getting the models to converge when using LISREL v9.2 (Jöreskog & Sörbom, 2015). This was likely mostly due to the fact that LISREL computes each pairwise correlation of the polychoric correlation matrix—which is used to generate the asymptotic covariance matrix on which the Satorra-Bentler adjusted chi-square is derived) one at a time. Because model convergence is assessed as the polychoric matrix is being built, there is a risk of yielding "not positive definite" errors, which halts the analysis before the entire matrix has been completed (Lee, Poon, & Bentler, 1992). However, even for those statistical programs that generate matrices simultaneously[56], the processing burden can cause the program to crash with as few as 10 variables (Hox, 1995), but is more likely to occur for models with more than 30 variables, especially with sample sizes > 500 (Muthèn & Kaplan, 1992). Because the Study 2 sample size was almost twice this limit (*N* = 903), and because each model featured a large number of variables from multiple scales (25–61, depending on the model), the models could not be run in LISREL. Finally, the highly correlated Counterfactual Thinking items could have compelled inadmissible solutions. However, if the Counterfactual Thinking items were the root cause of the LISREL issues, alternate software programs and/or statistical approaches would yield the same nonconvergence problems.

As both a workaround to the model complexity issues, and to determine the utility of the Counterfactual Thinking for the planned CFAs, models for Hypothesis 3.1 (and Hypothesis 3.2) were configured in AMOS v22 (Arbuckle, 2014) using robust maximum likelihood (ML) estimation with bias corrected bootstrapping for ML and the Bollen-Stine correction (Bollen & Stine, 1992). Using AMOS[57] to conduct Bollen-Stine bootstraps of 2,000 iterations is recommended for models that would otherwise employ the asymptotic covariance matrix approach, but that fail to converge due to a large number (> 25) of model variables (Muthèn & Kaplan, 1992; Nevitt & Hancock, 2001). In fact, under such conditions, the modified Bollen-Stine bootstrap has been shown in Monte Carlo studies to produce results that are commensurate with, if not slightly more accurate than, those based on the Satorra-Bentler adjustment (e.g., Byrne, 2000; Cheung & Lau, 2008; Hox, 1995; Ichikawa & Konishi, 1995; Yuan & Bentler, 2000; Yung & Bentler, 1996; Zhu, 1997). One caveat to the Bollen-Stine bootstrap, however, is that its use can result in a slight loss of power (Nevitt & Hancock, 2001). However, a power

[56] ESQ (Multivariate Software, Inc., 2014) conducts simultaneous polychoric correlation matrix generation, but this program was not available for use for Study 2.
[57] The Bollen-Stine correction (Bollen & Stine, 1992) is not available in LISREL v9.2.

analysis run prior to the recruitment of Study 2 participants indicated that a sample of 766 (137 cases fewer than the actual sample size) was sufficient for yielding significant small effects in the planned CFAs (see Figure 16). Therefore, there was little risk that conducting the Bollen-Stine would unduly underpower the models used to test Hypotheses 3.1 and 3.2. As such, the Hypothesis 3.1 and 3.2 models were excellent candidates for Bollen-Stine bootstrapping available in AMOS.

In order to ensure that results from the Bollen-Stine bootstrap in AMOS were similar to those produced using the polychoric correlation and asymptotic covariance matrices in LISREL, three independent CFAs, with the same configurations used during data screening, were run in AMOS on the AMFS, AMFJR, and TALE. Results of the AMOS CFAs were then compared to those obtained from the individual structure validation CFAs run in LISREL—which were the only models from Study 2 that would converge. Results showed that key estimates and fit indices were commensurate for all three individual scales (see Table 25). However, increased chi-square values, which can occur under ML estimation when data are nonnormal and/or the model features a large number of variables (e.g., Cook, Kallen, & Amtmann, 2009; Jöreskog, 2005), was evident when comparing the Satorra-Bentler to the ML Ratio chi-square test statistics. Although the LISREL- and AMOS-generated χ^2s for the AMFS were similar (74.74 vs. 67.13, respectively), the increase in the AMOS versus the LISREL χ^2 tests statistics became more pronounced as the number of model variables increased (see Table 24). Thus, it was likely that, as the models increased in complexity, the fit indices generated for Hypothesis 3.1 (and Hypothesis 3.2)—which were designed to follow null model logic—would reflect a somewhat poorer fit than would have been attained had the polychoric-based approach been possible. As such, the objective was to find a sufficiently fitting model that both theory and statistical results suggested was the most likely to be replicable (e.g., Cudeck & Henly, 1991; Meehl, 1991; Tanaka, 1993). With that caveat, Study 2 proceeded with the testing of Hypotheses 3.1 and 3.2 using AMOS and the Bollen-Stine bootstrap.

CFA: Eight-Function Structure. A second-order CFA was conducted to test whether a second-order "autobiographical memory functions" construct was indicated by eight first-order latent variables comprising the AMFS subscales of Prospection and Counterfactual Thinking; the AMFJR subscales of Conversation, Relationship Maintenance, Teaching/Problem Solving/Behavioral Control, Emotion Regulation, and Self; and the combined Perspective $\text{Taking}_{S\&JR}$ subscale, comprising items from both Perspective Taking_{AMFS} and Perspective Taking_{AMFJR} (see Figure 14). A second-order model was used to reflect the idea that, contextually, although the AMFS functions were "simulation-based," whereas the AMFJR functions were "socially situated," all ultimately reflect rated frequencies of functional use of autobiographical memory. Thus it made more conceptual sense to take a second-order approach than to correlate the simulation-based functions with each other, and correlate the socially situated functions together, then employ the Perspective $\text{Taking}_{S\&JR}$ function as a common source of shared variance between the AMFS and AMFJR scales. Such modeling would also indicate the integrity of the combined Perspective $\text{Taking}_{S\&JR}$ subscale in the presence of the other two AMFS subscales and the other five AMFJR subscales.

Results showed that, as expected, the large sample compelled a significant Bollen-Stine bootstrap-adjusted chi square test statistic, $\chi^2(981) = 4071.98$, $p < .001$. The RMSEA (.059) was above the optimal cutoff of .05, but below the acceptable cutoff of .08, to indicate adequate model fit (Hu & Bentler, 1999). However, both the NNFI (.86) and CFI (.82) were $\leq .90$ to indicate less than adequate model fit (Hu & Bentler, 1999).

Estimates results showed that the squared multiple correlations (SMCs) were mostly stable (R^2 = .31–.98), with the exception of the first-order Counterfactual Thinking latent, which, at R^2 = .10, was below the recommended lower-bound cutoff of .20 to signify that the indicator (or first-order factor) is explaining a reasonable amount of variance in its factor (or second-order factor) (Tabachnick & Fidell, 2007). As this was the only SMC outside the recommended bounds, it may have been reflecting the high inter-item correlations of the Counterfactual Thinking items (see Data Screening section), rather than model instability. This latter explanation seemed reasonable given that all standardized regression coefficients, disturbances, and error variances were positive and significant ($p < .001$). Likewise, all standardized regression coefficients were > .30 (λ = .31–.99), with ~98% over .50 and ~93% over .60. Structural equation modeling (SEM) reliabilities for all eight first-order latent variables exceeded the .70 cutoff to demonstrate high internal validity (Nunnally & Bernstein, 1994; Werts et al., 1978): Perspective-Taking$_{S\&JR}$ = .87; Prospection = .82; Counterfactual Thinking = .99; Conversation = .85; Relationship Maintenance = .83; Teaching/Problem Solving/Behavioral Control = .78; Emotion Regulation = .89; and Self = .82. The formula for computing SEM reliabilities can be found in Appendix E. Table 26 summarizes the first- and second-order standardized regression coefficients, squared multiple correlations, and SEM reliabilities of the eight-factor model.

"Simulation-Based" Versus "Socially Situated" Perspective Taking. Given that the eight-function structure yielded an overall "adequate," rather than "good," fit, additional analyses were conducted to test the Hypothesis 3.1 assumption that Perspective Taking$_{AMFS}$ and Perspective Taking$_{AMFJR}$ were functionally and conceptually equivalent enough to warrant their being combined as a single Perspective Taking$_{S\&JR}$ function. To start, two multiple regression models were run to test the functional relation between the two Perspective Taking functions and the dimensions of the ERQ (Gross & John). In the first model, the Cognitive Reappraisal scale score variable served as the dependent variable, with the Perspective Taking$_{AMFS}$ and Perspective Taking$_{AMFJR}$ scale scores variables as predictors. Results showed that the model was significant, $R = .31$, $F(2, 900) = 49.39$, $p < .001$, with 9.9% of the variance in Cognitive Reappraisal accounted for by Perspective Taking$_{AMFS}$ and Perspective Taking$_{AMFJR}$ together. The coefficients analysis indicated that Perspective Taking$_{AMFS}$ and Perspective Taking$_{AMFJR}$ were each significant predictors, with Perspective Taking$_{AMFS}$ uniquely accounting for 2.9% of the variance in Cognitive Reappraisal ($b = .19$, $t(900) = 5.40$, $p < .001$), and Perspective Taking$_{AMFJR}$ uniquely accounting for 1.7% of the variance in Cognitive Reappraisal ($b = .13$, $t(900) = 4.16$, $p < .001$). However, a one-tailed *Z*-test for the differences between correlations (Preacher, 2002) indicated that the amount of variance in Cognitive Reappraisal that was uniquely accounted for by Perspective Taking$_{AMFS}$ was not significantly greater than the amount of variance uniquely accounted for by Perspective Taking$_{AMFJR}$ ($Z = .69$, $p = .246$) to suggest that, regardless of scale context (AMFS versus AMFJR), the use of autobiographical memory for perspective taking is a simulation-based phenomenon.

To test whether, in contrast, Perspective Taking$_{AMFJR}$ was more socially oriented than Perspective Taking$_{AMFS}$, a second multiple regression model was run using the Expressive Suppression scale score variable as the dependent variable, again with Perspective Taking$_{AMFS}$ and Perspective Taking$_{AMFJR}$ as predictors. Results showed that this model was also significant, $R = .34$, $F(2, 900) = 58.15$, $p < .001$, with 11.4% of the variance in Expressive Suppression accounted for by Perspective Taking$_{AMFS}$ and Perspective Taking$_{AMFJR}$ together. Results of the coefficients analysis indicated that, as before, Perspective Taking$_{AMFS}$ and Perspective Taking$_{AMFJR}$ were each significant predictors, with Perspective Taking$_{AMFJR}$ uniquely accounting for 5.6% of the variance in Expressive Suppression (b = .36, $t(900) = 7.59$, $p < .001$), and Perspective Taking$_{AMFS}$ function uniquely accounting for 0.6% of the variance in Expressive Suppression (b = .13, $t(900) = 2.40$, $p = .016$). A *Z*-test indicated that the unique variance of Perspective Taking$_{AMFJR}$ was significantly greater than the unique variance of Perspective Taking$_{AMFS}$ ($Z = 6.16$, $p < .001$), to suggest that, although both Perspective Taking$_{AMFJR}$ and Perspective Taking$_{AMFS}$ reflect rating frequency of functional use of autobiographical memory content for the social behavior of perspective taking, Perspective Taking$_{AMFJR}$ is more *socially situated* than Perspective Taking$_{AMFS}$.

To test the degree of direct association between Perspective Taking$_{AMFS}$ and Perspective Taking$_{AMFJR}$, a Pearson's coefficient correlation and a Spearman's rho correlation were run on the scale scores of the two functions. The Spearman's—which evaluates the rank-order monotonic relation between two ordinal-level variables, and is thus less biased by nonnormality (e.g., Hauke & Kossowski, 2011)—was included to determine if the UV nonnormality present in the data was overly upwardly biasing the regression coefficients. The Pearson's correlation analysis showed that Perspective Taking$_{AMFS}$ and Perspective Taking$_{AMFJR}$ function were significantly, but only moderately positively related, $r = .54$, $p < .001$, with 29.2% overlapping variance. Results of the Spearman's correlation analysis showed the same relation, $\rho = .51$, $p < .001$, with 26.0% overlapping variance. A one-tailed *Z*-test run on the difference between the coefficients (Preacher, 2002) showed that the r and the ρ (rho) were statistically equivalent, $Z = .88$, $p = .189$, which suggested that the nonnormality of the data was not overly upwardly biasing the Pearson's coefficient. Furthermore, results of the bivariate correlations between Perspective Taking$_{AMFS}$ and the remaining functions of the AMFS and AMFJR (see Table 27) showed that the only correlation coefficient that was higher[58] was between Perspective $Taking_{AMFS}$ and Prospection, $r = .64$, $p < .001$ (41.0% overlap). This suggests that Perspective $Taking_{AMFS}$ and Perspective $Taking_{AMFJR}$ are no more statistically, and therefore conceptually, equivalent than are any of the AMFS or AMFJR functions with each other.

Because Perspective $Taking_{AMFS}$ featured two new items in addition to the two items comprising Perspective $Taking_{AMFJR}$, Pearson's and Spearman's correlation analyses were also run on the scale score variable for the two-item Perspective $Taking_{AMFJR}$ and a Perspective $Taking_{AMFS(2)}$ scale score comprising only the two Perspective $Taking_{AMFS}$ items that directly corresponded to those comprising Perspective $Taking_{AMFJR}$. Results showed that the Perspective $Taking_{AMFJR}$ and Perspective $Taking_{AMFS(2)}$ were only moderately positively, but significantly correlated, $r = .51$, $p < .00$, and $\rho = .48$, $p < .001$. Results of a one-tailed *Z*-test (Preacher, 2002) to determine whether the difference between the Pearson's *r* coefficient of .51 was significantly stronger than the Spearman's ρ coefficient of .48 showed that the two coefficients were also statistically equivalent, $Z = .84$, $p = .201$. Because the Pearson's *r* of .51 between Perspective $Taking_{AMFJR}$ and Perspective $Taking_{AMFS(2)}$ was slightly weaker than the Pearson's *r* of .54 between Perspective $Taking_{AMFJR}$ and Perspective $Taking_{AMFS}$, a one-tailed *Z*-test was run to test the difference between these coefficients. Although results showed that the two coefficients were statistically equivalent, $Z = .88$, $p = .189$, the only moderate, rather than strong, association between Perspective $Taking_{AMFS}$ and Perspective $Taking_{AMFJR}$ suggested that they are independent, and should not be combined into a single "Perspective $Taking_{S\&JR}$" function. Table 28 summarizes the results of the functional multiple regression and correlation models run to test

[58] Note that some of the bivariate correlations between items *within* the same scale were stronger, as can be seen in Table 27.

the "simulation-based" Perspective Taking$_{AMFS}$ versus the "socially situated" Perspective Taking$_{AMFJR}$.

Finally, to determine the extent to which respondents differed in their rated frequency of functional use of autobiographical memory content for perspective taking as a function of the measurement instrument (i.e., the simulation-based AMFS vs. the socially situated AMFJR), a Wilcoxon paired-samples *T*-test[59] was conducted. Results showed that respondents rate their use of autobiographical memory as statistically significantly more frequent for simulation-based perspective taking (M = 4.31, SD = 1.02) compared to socially situated perspective taking (M = 4.19, SD = 1.18), $Z = -3.26$, $p < .001$. However, when comparing the mean ranks of Perspective Taking$_{AMFS(2)}$ to Perspective Taking$_{AMFJR}$, effects were significant, but reversed. Results showed that respondents rate the frequency with which they use autobiographical memory content for Perspective Taking$_{AMFS(2)}$ (M = 4.05, SD = 1.26) as lower than for socially situated Perspective Taking$_{AMFJR}$ when using the AMFJR subscale, $Z = -4.85$, $p < .001$.

Given these results, Hypothesis 3.1 was next tested as a nine-factor model with each the simulation-based Perspective Taking$_{AMFS}$ and socially situated Perspective Taking$_{AMFJR}$ functions.

CFA: Nine-Function Structure. An additional second-order CFA was conducted, this time treating Perspective Taking$_{AMFS}$ and Perspective Taking$_{AMFJR}$ as independent of one another (i.e., not combined as Perspective Taking$_{S\&JR}$) (see Figure 18). Results showed that, again, as expected, the Bollen-Stine bootstrap-adjusted chi square test statistic was significant, $\chi^2(980) = 3441.92$, $p < .001$. The RMSEA (.052) was still above, but closer to the optimal cutoff of .05 than was the RMSEA of the eight-factor structure to indicate that the nine-function structure

[59] Although the Wilcoxon *T* evaluates differences between mean ranks, such values are less intuitive than subscale means; therefore, the subscale means (with standard deviations) have been provided here.

demonstrated adequate to good model fit. The NNFI (.91), which met the cutoff for adequate fit, was an improvement over the .86 of the eight-function model. However, the CFI (.89) was still a low, but also an improvement over the eight-function CFI of .82. Also examined was the Akaike Information Criterion (AIC). The AIC is useful when two or more models are being estimated and compared. Because lower AICs indicate better fit, the model with the lowest AIC is considered the better fitting model (Kenny, 2015). Results of the nine-function CFA showed that the AIC of 3735.917 was quite a bit lower than the eight-function model's AIC of 4363.983, to suggest that that the nine-function model was the better fitting of the two.

Estimates showed that the squared multiple correlations were similar to that of the eight-function model (R^2 = .31–.98). Again, however, the Counterfactual Thinking latent was, at R^2 = .10, still below the optimal lower-bound cutoff of .20. Standardized regression coefficients were also similar to those of the eight-function model (λ = .31–.99; ~98% > .50; ~93% > .60), with all regression coefficients, disturbances, and error variances positive and significant at the $p < .001$ level. SEM reliabilities for all nine first-order latent variables were above the .70 cutoff; likewise, the Perspective $\text{Taking}_{\text{AMFS}}$ and Perspective $\text{Taking}_{\text{AMFJR}}$ latents demonstrated higher reliability than did Perspective $\text{Taking}_{\text{S\&JR}}$ (.87). Specifically, the computed reliabilities were, Perspective $\text{Taking}_{\text{AMFS}}$ = .94; Prospection = .82; Counterfactual Thinking = .99; Conversation = .85; Perspective $\text{Taking}_{\text{AMFJR}}$ = .94; Relationship Maintenance = .83; Teaching/Problem Solving/Behavioral Control = .78; Emotion Regulation = .89; and Self = .82. The formula used to compute the SEM reliabilities can be found in Appendix E. The first- and second-order standardized factor loadings, squared multiple correlations, and reliabilities of the nine-factor model can be found in Table 29. In all, results of the nine-function CFA appeared to support the independence of Perspective $\text{Taking}_{\text{AMFS}}$ and Perspective $\text{Taking}_{\text{AMFJR}}$.

Hypothesis 3.2 Analyses

To replicate associations between the functions of the AMFJR (Ranson & Fitzgerald, in preparation) and the broad functions of the TALE (Bluck & Alea, 2011), and to explore associations between the TALE and AMFS functions, Hypothesis 3.2 was tested with three second-order CFAs: 1) The mapping of the AMFJR onto the TALE; 2) the mapping of the AMFS onto the TALE; and 3) the mapping of the AMFS and AMFJR onto the TALE.

Mapping the AMFJR onto the TALE: Replicating previous findings and exploring additional associations. The purpose of first second-order CFA (with the broad Social, Self, and Directive functions as second-order latents indicated by AMFJR functions; see Figure 19) was to replicate previous findings by Ranson and Fitzgerald (in preparation). Specifically, it was expected that the AMFJR functions of Conversation, Perspective Taking$_{\text{AMFJR}}$, and Relationship Maintenance would map onto the broad Social function; that Teaching/Problem Solving/Behavioral Control and Emotion Regulation would map onto the broad Directive function; and that Self$_{\text{AMFJR}}$[60] would map onto the broad Self$_{\text{TALE}}$.

Results supported Hypothesis 3.2, such that the AMFJR (Ranson & Fitzgerald, in preparation) functions mapped onto the TALE (Bluck & Alea, 2011) functions as expected. The large sample size compelled a significant ML Ratio chi-square, $\chi^2(1215) = 3331.76$, $p < .001$. The RMSEA (.043) was below the optimal cutoff of .05, to indicate excellent model fit. The NNFI = .92 indicated an adequate model fit, where as the CFI = .88 was below the acceptable cutoff of .90. However, taken in aggregate, the fit indices suggested that the CFA model was acceptable.

[60] From this point forward, the current paper will notate the AMFJR Self function as "Self$_{\text{AMFJR}}$," and the broad TALE function as "Self$_{\text{TALE}}$" unless otherwise noted.

Estimates also confirmed that the model was acceptable. The squared multiple correlations for both the first-order AMFJR indicators (R^2 = .31–.70) and second-order latents (R^2 = .50–.85) were stable, as were SMC's for the TALE items (R^2 = .39–.69) Standardized regression coefficients for the first-order AMFJR indicators were all above .50 (λ = .57–.83), whereas the second-order AMFJR standardized coefficients were also strong (λ = .70–.92). Loadings for the TALE indicators were also strong (λ = .63–.83) All regression coefficients, disturbances, and error variances were positive and significant at the $p < .001$ level. SEM reliabilities (see Appendix E for the formula) for the first-order AMFJR functions were above the .70 cutoff: Conversation = .85; Perspective $\text{Taking}_{\text{AMFJR}}$ = .94; Relationship Maintenance = .83; Teaching/Problem Solving/Behavioral Control = .78; Emotion Regulation = .89; and $\text{Self}_{\text{AMFJR}}$ = .82. The factor correlations for the TALE were all > .30 to support the TALE's assumed oblique structure: Social × Directive = .85; Social × $\text{Self}_{\text{TALE}}$ = .64; and Directive × $\text{Self}_{\text{TALE}}$ = .77. A summary of the factor correlations, first- and second-order standardized factor loadings, squared multiple correlations, and reliabilities of the AMFJR-TALE second-order CFA can be found in Table 30.

Mapping the AMFS onto the TALE. A second-order CFA was also run to explore the associations between the AMFS functions and the broad functions of the TALE (Bluck & Alea, 2011). It was expected that Perspective $\text{Taking}_{\text{AMFS}}$ would map onto the TALE's Social function, but it was unknown whether the mental time travel functions of Prospection and Counterfactual Thinking would map as broadly Directive, broadly $\text{Self}_{\text{TALE}}$, or both.

Although a number of model configurations were run, the best-fitting model ($\chi^2(269)$ = 1225.93, $p < .001$) indicated that, as expected, Perspective $\text{Taking}_{\text{AMFS}}$ was broadly Social, whereas the Prospection function was broadly Directive, and the Counterfactual Thinking function was broadly $Self_{TALE}$ (see Figure 20). The RMSEA (.063) was a bit above the optimal cutoff of point .05, but below the upper cutoff of .08 to indicate that the fit was adequate. The NNFI (.92) and CFI (.93) also indicated adequate fit, falling above the .90 lower-bound cutoff, but a bit short of the optimal .95 cutoff.

Estimates indicated that the model was stable, with all regression coefficients, disturbances, and error variances positive and significant ($p < .001$). Standardized regression coefficients for the first-order AMFS indicators were all above .60 (λ = .66–.98), with the Counterfactual Thinking indicators, ranging the highest (λ = .88–.98), which was foreshadowed by these three items' high inter-item correlations discussed previously in the Data Screening section. Loadings for the TALE indicators were similar to those found in the AMFJR mapping CFA (λ = .66–.84). The second-order standardized coefficients for the AMFS functions were more widely varied than those of the AMFJR-TALE CFA, but within a desirable range (λ = .36–.62). The squared multiple correlations were very stable (R^2 = .38–.71), with the expected exception of the SMC for the Counterfactual Thinking indicators (R^2 = .78–.98), which were reflective of the high inter-item correlations discovered at data screening. Likewise, the SMCs of the second-order Perspective $Taking_{AMFS}$ (R^2 = .38) and Prospection (R^2 = .34) latents were good, while Counterfactual Thinking latent, at R^2 = .13, accounted for less than the recommended lower bound cutoff of .20. The SEM reliabilities remained above .70: Perspective $Taking_{AMFS}$ = .94; Prospection = .82, and Counterfactual Thinking = .99. The TALE's factor correlations were as expected for an assumed oblique structure: Social × Directive = .65; Social × $Self_{TALE}$ = .52; and Directive × $Self_{TALE}$ = .71. A summary of the factor correlations, first- and second-order standardized factor loadings, squared multiple correlations, and reliabilities of the AMFS-TALE CFA can be found in Table 31.

Mapping the AMFJR and AMFS onto the TALE. To fully test Hypothesis 3.2, and to add support to the nine-function model that emerged from the testing of Hypothesis 3.1, a third second-order CFA was conducted to verify whether the associations between the functions of the AMFJR (Ranson & Fitzgerald, in preparation) and TALE (Bluck & Alea, 2011), and the AMFS and TALE, would hold when all three scales were examined together.

As before, a series of model configurations were run, but the best fitting model (see Figure 21) confirmed previous results. The ML Ratio chi-square was again significant, $\chi^2(1757) = 5008.367$, $p < .001$), most likely due to the large Study 2 sample size. The RMSEA (.045) was excellent, falling below the optimal .05 cutoff. However, as was the case for all Study 2 CFAs, the NNFI (.90) was merely adequate, while the CFI (.85) fell short of the lower acceptable cutoff of .90.

Estimates showed that, as with all previous models, all regression coefficients, disturbances, and error variances positive and significant ($p < .001$). Other results suggested a fairly stable model, with most erratic performance again stemming from the Counterfactual Thinking function. The squared multiple correlations for the AMFJR indicators ranged from .32 to .76; the AMFS indicators ranged from .43 to .98; and the TALE indicators ranged from .39 to .69. For the AMFJR latents, the range of SMCs was .50–.85, and for the AMFS, .13–.41. Standardized regression coefficients for the first-order AMFJR indicators were all above .50 (λ = .57–.81); the AMFS loadings were above .60 (λ = .66–.99); as were the TALE loadings (λ = .62–.83). The second-order standardized coefficients were λ = .71–.92 for the AMFJR, and λ = .37–.64. There were no changes to the SEM reliabilities. For the AMFJ: Conversation = .85; Perspective $\text{Taking}_{\text{AMFJR}}$ = .94; Relationship Maintenance = .83; Teaching/Problem Solving/Behavioral Control = .78; Emotion Regulation = .89; and $\text{Self}_{\text{AMFJR}}$ = .82. For the

AMFS: Perspective Taking$_{AMFS}$ = .94; Prospection = .82, and Counterfactual Thinking = .99. The TALE's factor correlations were similar to those yielded from the AMFJR-TALE CFA: Social × Directive = .87; Social × Self$_{TALE}$ = .65; and Directive × Self$_{TALE}$ = .77. A summary of the factor correlations, first- and second-order standardized factor loadings, SMCs, and reliabilities of the AMFS-AMFJR-TALE CFA can be found in Table 32.

Hypothesis 3.3 Analyses

Hypothesis 3.3 stated that, because the ERQ's dimension of Cognitive Reappraisal assesses individuals' use of *simulation-based* emotion-control strategies (Lindeman & Abraham, 2008), the AMFS functions would be moderately and significantly related to indicate that simulation was a common property of Perspective Taking$_{AMFS}$, Prospection, and Counterfactual Thinking. Thus bivariate correlation analyses were conducted to show this relation and to replicate the provisional results of Study 1. Results showed that all three AMFS functions were significantly associated with Cognitive Reappraisal: Perspective Taking$_{AMFS}$ (r = .29, p < .001, with 8.20% variance explained), Prospection (r = .24, p < .001, with 5.52% variance explained), and Counterfactual Thinking (r = .15, p < .001, with 2.40% variance explained). However, although all three AMFS functions were, as expected, significantly associated with Cognitive Reappraisal to support Hypothesis 3.3, the magnitude of each of the correlations was lower than expected per the provisional results of Study 1.

To more thoroughly assess whether simulation was the common property of the AMFS functions, a second set of bivariate correlations were run on the three AMFS functions and the ERQ dimension of Expressive Suppression. Because Expressive Suppression measures individuals' tendency to use outward, behavior-based emotion-control strategies, it is not considered a simulation-based emotion control strategy (Lindeman & Abraham, 2008).

Therefore, it was hypothesized that the magnitude of the correlations between Expressive Suppression and the three AMFS functions would be weak and nonsignificant. Results showed that the magnitude of correlation coefficients were, as expected, smaller than those between the AMFS functions and Cognitive Reappraisal, but results also showed that all three correlations were significant: For Perspective Taking$_{AMFS}$, r = .24, Prospection, p < .001, with 5.70% of variance explained; for Prospection, r = .20; p < .001, with 4.00% of variance explained; and for Counterfactual Thinking, r = .12, p < .001, with 1.40% of variance explained.

The significant results that were not predicted for the Expressive Suppression correlations are likely due to the highly powered model. To establish whether the coefficients from the Cognitive Reappraisal associations were significantly stronger than the coefficients from the Expressive Suppression correlations, one-tailed Z-tests for differences between correlations were conducted (Preacher, 2002). Results showed that none of the Cognitive Reappraisal correlations were significantly greater than those for Expressive Suppression: Perspective Taking$_{AMFS}$ (r = .29 versus r = .24), Z = 1.14, p = .127; Prospection (r = .24 versus r = .20), Z = .89, p = .187; and Counterfactual Thinking (r = .15 versus r = 12), Z = 1.08, p = .140. As such, in terms of magnitude—i.e., the correlations between the AMFS functions were stronger when correlated with Cognitive Reappraisal than with Expressive suppression, results supported Hypothesis 3.3. However, the pattern and differential magnitude of effects were not faithfully replicated. The bivariate correlations between the AMFS and EQR scale scores can be found in Table 33.

Hypothesis 3.4 Analyses

The purpose of Hypothesis 3.4 was to obtain empirical support for Hypothesis 1.7, which stated that the form of simulation underlying the autobiographical memory function of Perspective Taking$_{AMFS}$ is *interpersonal* simulation, whereas the form of simulation underlying the autobiographical memory functions of mental time travel—Prospection and Counterfactual Thinking—is *intrapersonal* simulation. Hypothesis 3.4 evaluated the consistency of the current data and the evidence presented in Study 1. Simultaneous multiple linear regression was used to determine the amount of variance in Cognitive Reappraisal dimension of the ERQ (Gross & John, 2003) that was explained by the three AMFS functions. It was predicted that, if Perspective $\text{Taking}_{\text{AMFS}}$ is an example of a purpose for which autobiographical memory is used for *other*-directed, simulation-based behaviors, then Perspective $\text{Taking}_{\text{AMFS}}$ would be a significant predictor of simulation-based Cognitive Reappraisal. Additionally, if Prospection and Counterfactual Thinking are examples of purposes for which autobiographical memory is used for *self*-directed simulation behaviors, then only one of these two mental time travel behaviors would emerge as a significant predictor of Cognitive Reappraisal. Given that results of Study 1 showed Counterfactual Thinking to be the AMFS function representing intrapersonal simulation, the same was expected for Study 2.

Results showed that the multiple regression model was significant, $R = .30$, $F(3, 899) = 29.86$, $p < .001$, with the three AMFS functions significantly accounting for 9.1% of the variance in Cognitive Reappraisal. When holding the other predictors constant, as hypothesized, both Counterfactual Thinking ($b = .06$, $t(899) = 2.11$, $p = .035$, .45% unique variance) and Perspective $\text{Taking}_{\text{AMFS}}$ ($b = .21$, $t(899) = 5.31$, $p < .001$, 2.86% unique variance) were significant predictors of Cognitive Reappraisal, but Prospection was not ($b = .07$, $t(899) = 1.67$, $p = .094$, .28% unique variance). Thus Hypothesis 3.4 was supported by Study 2 results. A summary of the Hypothesis 3.4 functional multiple regression results can be found in Table 34.

Hypothesis 3.5 Analyses

Because the Expressive Suppression dimension of the ERQ (Gross & John, 2003) concerns emotion regulation strategies that can be socially observed, and are likely precipitated by social pressures and interactions (Gross & John, 2003), Hypothesis 3.5 predicted that Expressive Suppression would be significantly and moderately associated with the AMFJR's *socially situated* Emotion Regulation function. The Emotion Regulation function is grounded in the social context of joint reminiscence, a characteristic of which is the use of "past-talk" with another or others in order to obtain, or an attempt to understand how to obtain, emotion control.

Results showed that Hypothesis 3.5 was supported. The bivariate correlation between the AMFJR function of Emotion Regulation and the ERQ's dimension of Expressive Suppression was significant, $r = .45$, $p < .001$, with 20.3% of the variance in Expressive Suppression accounted for by Emotion Regulation. In comparison, the bivariate correlation between the AMFJR function of Emotion Regulation and Cognitive Reappraisal was significant, but weaker in magnitude, $r = .26$, $p < .001$, with 6.5% of the variance in Cognitive Reappraisal explained by Emotion Regulation. A *Z*-test for the difference between correlations (Preacher, 2002) showed that the coefficient for Emotion Regulation and Expressive Suppression ($r = .45$) was significantly greater than the coefficient for Emotion Regulation and Cognitive Reappraisal ($r = .26$), $Z = 4.64$, $p < .001$. However, because Emotion Regulation, Cognitive Reappraisal, and Expressive Suppression all concern emotion control, it is reasonable that all three would share variance; yet, as expected, more variance was shared between the two explicitly social factors: Emotion Regulation and Expressive Suppression. The bivariate correlations between the AMFJR Emotion Regulation scales score and ERQ scale scores summarized in Table 35.

Hypothesis 3.6 Analyses[61]

[61] All descriptions of HEXACO dimensions and facets provided with respect to the Hypothesis 3.6 Analyses sections are by Lee & Ashton (2009).

Hypothesis 3.6 was extended for the purpose of replicating the personality effects previously reported with respect to the TALE (Bluck & Alea, 2011) as well as the effects found for the AMFS in Study 1. Because no previous study had tested for personality effects on the functions of AMFJR (Ranson & Fitzgerald, in preparation), Study 2 explored the idea that those personality traits predictive of the broad TALE functions would be inherited by their corresponding subordinate functions according to the confirmed Hypothesis 3.2 mapping. Additionally, the idea of inheritance was also explored with respect to the lower-order AMFS functions and their higher-order TALE correlates. All Study 2 personality dimensions were measured using the HEXACO-PI-R (Ashton & Lee, 2005; 2009).

The following personality-effects subsections includes only those results that were significant at $p < .05$ or less. Because effects were small, only effect sizes in the form of squared semi-partial coefficients (i.e., the amount of variance that the predictor uniquely explains in the outcome) have been reported. The customary statistics reported for regression analyses (e.g., zero-order correlation coefficient, *t*-statistic, unstandardized regression coefficients, and *p*-value (* = .05, ** = .01, and *** = .001) are detailed in the accompanying tables.

Personality and the TALE. To support the replication of findings reported elsewhere, Study 2 results showed that, as expected, the TALE (Bluck & Alea, 2011) function of Openness to Experience was significantly predictive of the broad Directive function (R^2 = 3.7%) and $\text{Self}_{\text{TALE}}$ (R^2 = 1.1%). Also as expected, Extraversion significantly predicted the broad Social function (R^2 = 5.4%).

Study 2 results also showed a number of other personality effects for the functions of the TALE (Bluck & Alea, 2011) not previously reported in the literature. For the Social function, Emotionality/Neuroticism (R^2 = 6.2%), Conscientiousness (R^2 = 1.8%), Openness to Experience

(R^2 = 4.6%), and the interstitial facet of Altruism (R^2 = 4.9%) were all significant predictors. With respect to the Directive function, results showed that all HEXACO dimensions except for Honesty-Humility were significant predictors: Emotionality/Neuroticism (R^2 = 6.8%), Extraversion (R^2 = 3.2%), Agreeableness (R^2 = 1.7%), Conscientiousness (R^2 = 3.7%), and Altruism (R^2 = 6.9%). Finally, for $\text{Self}_{\text{TALE}}$, the inverse of Honesty-Humility (R^2 = 1.2%), Emotionality/Neuroticism (R^2 = 6.7%), Extraversion (R^2 = 0.8%), and Altruism (R^2 = 1.0%) were significant predictors. A summary of the regression analysis results for the TALE functions can be found in Table 36.

Personality and the AMFS. In support of Study 1 findings, results showed that Perspective $\text{Taking}_{\text{AMFS}}$ was significantly predicted by Extraversion (R^2 = 2.7%), Conscientiousness (R^2 = 1.4%), and Openness to Experience (R^2 = 3.7%). Not supported was the Study 1 finding that the function of Perspective $\text{Taking}_{\text{AMFS}}$ is predicted by Emotional Stability (the inverse of Emotionality/Neuroticism). Rather, results of Study 2 showed that Emotionality/Neuroticism predicted the function of Perspective $\text{Taking}_{\text{AMFS}}$ (R^2 = 3.9%). Although not found in Study 1—most likely due to the small effects—Study 2 found that Perspective $\text{Taking}_{\text{AMFS}}$ was significantly predicted by both the dimension of Agreeableness (R^2 = 0.5%) and Altruism (R^2 = 2.5%). Table 37 summarizes the significant results of the AMFS personality effects tests (dimensions and facets).

With respect Prospection, as expected per Study 1 results, the dimensions of Emotionality/Neuroticism (R^2 = 2.5%), Conscientiousness (R^2 = 0.7%), and Openness to Experience (R^2 = 4.8%) were significant predictors. In addition, although not foreshadowed by Study 1 results, the inverse of the Honesty-Humility dimension (R^2 = 0.5%), Extraversion (R^2 = 0.6%), and Altruism (R^2 = 0.8%) significantly predicted the function of Prospection.

All three of the HEXACO (Ashton & Lee, 2005; 2009) dimensions expected to significantly predict the function of Counterfactual Thinking based on Study 1 provisional results were confirmed: The inverse of Honesty-Humility (R^2 = 3.7%), Emotionality/Neuroticism (R^2 =1.6%), and the inverse of Extraversion, also thought of as Introversion (R^2 = 0.5%). Two of the remaining three HEXACO dimensions were also significant predictors of the function of Counterfactual Thinking: the inverse of Agreeableness—i.e., a tendency toward criticism and argumentativeness (R^2 = 0.5%), and the inverse of Conscientiousness—i.e., tending to be impulsive, non-reflective, and careless (R^2 = 1.3%).

Personality and the AMFJR. Regression analyses were also run to test for possible personality effects on the functions of the AMFJR (Ranson & Fitzgerald, in preparation). It was hypothesized that those AMFJR functions that had been shown in previous research by Ranson and Fitzgerald to map onto the TALE (Bluck & Alea, 2011) would inherit the personality effects of their corresponding higher-order TALE functions. Results supported that expectation for all AMFJR functions except for Conversation, which was not predicted by Agreeableness although the TALE Social function was.

With respect to those TALE personality effects that were replicated from previous findings, Openness to Experience predicted the AMFJR Directive Functions of Teaching/Problem Solving/Behavioral Control (R^2 = 3.3%) and Emotion Regulation (R^2 = 3.6%). As was found for $\text{Self}_{\text{TALE}}$, $\text{Self}_{\text{AMFJR}}$ (R^2 = 2.8%) was also significantly predicted by Openness to Experience. Also supported was the expectation that Extraversion would predict the broadly Social AMFJR functions of Conversation (R^2 = 5.9%), Perspective $\text{Taking}_{\text{AMFJR}}$ (R^2 = 5.9%), and Relationship Maintenance (R^2 = 10.0%).

Of the other personality effects inherited by the AMFJR (Ranson & Fitzgerald, in preparation) functions from their corresponding TALE (Bluck & Alea, 2011) functions, results showed the following. In addition to Extraversion, the Social function of Conversation was significantly predicted by Emotionality/Neuroticism (R^2 = 3.7%), Conscientiousness (R^2 = 3.1%), Openness to Experience (R^2 = 3.4%), and Altruism (R^2 = 4.6%). For the broadly Social Perspective Taking$_{AMFJR}$, additional significant predictors were Emotionality/Neuroticism (R^2 = 4.0%), Agreeableness (R^2 = 1.7%), Conscientiousness (R^2 = 2.5%), Openness to Experience (R^2 = 4.7%), and Altruism (R^2 = 3.9%). For the remaining AMFJR Social function of Relationship Maintenance, in addition to Extraversion, Emotionality/Neuroticism (R^2 = 9.8%), Agreeableness (R^2 = 1.3%), Conscientiousness (R^2 = 1.9%), Openness to Experience (R^2 = 2.9%), and Altruism (R^2 = 6.0%) were all significant predictors.

With respect to the broadly Directive AMFJR functions, the HEXACO (Ashton & Lee, 2005; 2009) dimensions that were, in addition to Openness to Experience, significant predictors of Teaching/Problem Solving/Behavioral Control were Emotionality/Neuroticism (R^2 = 4.8%), Extraversion (R^2 = 6.2%), Agreeableness (R^2 = 0.5%), Conscientiousness (R^2 = 2.9%), and Altruism (R^2 3.6%). The HEXACO dimensions that, in addition to Openness to Experience, significantly predicted the AMFJR Emotion Regulation function were Emotionality/Neuroticism (R^2 = 10.9%), Extraversion (R^2 = 4.6%), Agreeableness (R^2 = 0.8%), Conscientiousness (R^2 = 1.4%), and Altruism (R^2 = 5.3%).

Finally, as was prefigured by the significant personality effects for the Self$_{TALE}$ function, Self$_{AMFJR}$ was predicted by the inverse of Honesty-Humility (R^2 = 2.6%), Emotionality/Neuroticism (R^2 = 4.9%), Extraversion (R^2 = 5.2%), Openness to Experience (R^2 =

2.8%), and Altruism (R^2 = 0.7%). Table 38 summarizes the significant results of the regression analyses run to test personality effects of AMFJR functions.

Goal 3.1 Analyses

Results of the Goal 3.1 analyses yielded two significant age effects. Age predicted the use of autobiographical memory for the broad $\text{Self}_{\text{TALE}}$, with 0.8% of the variance in $\text{Self}_{\text{TALE}}$ significantly accounted for by age. The obtained regression equation ($Y = 4.292 - .010X$) indicated that individuals use autobiographical memory with less frequency on average for the $\text{Self}_{\text{TALE}}$ function as they get older, with the average frequency of autobiographical memory use of broad $\text{Self}_{\text{TALE}}$ of 4.11 (on a 1 to 6 Likert Scale) at 18 years of age decreasing to an average frequency of 3.63 by the age of 66+.

In keeping with the idea that age effects are inherited by the lower-order functions that map onto their higher-order TALE "parent" function, age predicted the use of autobiographical memory for the broadly Self Counterfactual Thinking function, with 1.7% of the variance in the function of Counterfactual Thinking significantly accounted for by age. Consistent with effect found for $\text{Self}_{\text{TALE}}$, per the obtained regression equation ($Y = 4.586 - .015X$), as individuals age, they use autobiographical memory content with less frequency on average for the purpose of counterfactual thinking, with an average frequency of 4.32 at 18 years of age, which declines to an average frequency of 3.60 by the age of 66+. Table 39 summarizes the results of the Goal 3.1 regression analyses.

Goal 3.2 Analyses

As expected, the gender split for Study 2 was equivalent (M = 49.8%; F = 49.7%; Transgender or Prefer Not to Answer, 0.4%), making gender comparisons across males and females tenable. However, given that very little direct evidence was available to inform hypotheses, Goal 3.2 was instead to explore the TALE (Bluck & Alea, 2011), AMFS, and AMFJR (Ranson & Fitzgerald, in preparation) functions for possible gender effects.

Although no previous findings regarding gender effects for the TALE have been reported, Study 2 results showed that females use autobiographical memory content for the broad Social purposes with significantly greater frequency on average (*M* = 4.40, *SD* = 1.04) than men (*M* = 4.19, *SD* = 1.04), with 1.0% of the variance in the broad Social significantly accounted for by gender. However, none of the lower-order AMFS and AMFJR functions that Hypothesis 3.2 found to map onto the broad Social function were significantly predicted gender.

Although not inherited as gender effects from their corresponding Directive or $\text{Self}_{\text{TALE}}$ functions, results showed that gender predicts Counterfactual Thinking (R^2 = 1.0%), such that men use autobiographical memory for counterfactual thinking significantly more frequently on average (*M* = 4.20, *SD* = 1.32) than do females (*F* = 3.95, *SD* = 1.18). It was also found that gender predicted the frequency with which autobiographical memory is used for the AMFJR function of Emotion Regulation (R^2 = 0.5%), whereby females use autobiographical memory with significantly greater frequency on average (*M* = 4.08, *SD* = 1.05) than do men (*M* = 3.93, *SD* = 1.04). Goal 3.2 regression analyses are summarized in Table 39

Goal 3.3 Analyses

Goal 3.3 was to examine differences in the frequency with which individuals from Study 2's three largest ethnic groups (Caucasian, *n* = 584; South Asian, *n* = 157; and African-American/Black, *n* = 51) use autobiographical memory for the functions measured by the TALE (Bluck & Alea, 2011), AMFS, and AMFJR (Ranson & Fitzgerald, in preparation). Of primary interest to Study 2 was the replication of results found by Ranson (2014), such that Caucasians (*M* = 4.53, *SD* = 1.01) were found to use autobiographical memory with greater frequency than

African-American/Blacks (M = 4.40, SD = 1.07) for the AMFJR function of Conversation, and that Caucasians (M = 3.97, SD = .93) were found to use autobiographical memory with less frequency than African-American/Blacks (M = 4.12, SD = 1.02) for the AMFJR function of Teaching/Problem Solving/Behavioral Control. Also consistent with the Ranson findings were the size of the Study 2 effects, where, for Conversation, r = .039 (compared to R^2 < 2%[62] for Ranson, 2014); and for Teaching/Problem Solving/Behavioral Control, r = .041 (compared to R^2 < 2% for Ranson, 2014). However these effects did not reach significance given the unexpectedly small African-American/Blacks sample. A post-hoc power analysis confirmed that these two comparisons were underpowered, showed that, based on the smallest of the two effect sizes, r = .039[63], achieved power was only .20 (where ≥ .80 considered the lowest amount of power needed to obtain significance). Thus, had the African-American/Black subsample been commensurate with the Ranson study subsample (n = 451), the Study 2 effects would have been fully replicated.

Goal 3.3 analyses also yielded evidence for a number of novel culture effects across various functions of the TALE (Bluck & Alea, 2011), AMFS and AMFJR (Ranson & Fitzgerald, in preparation). For the TALE, culture predicted $\text{Self}_{\text{TALE}}$ (r = .24), but not Social or Directive. Specifically, results showed that South Asians (M = 4.48, SD = .92) use autobiographical memory more for $\text{Self}_{\text{TALE}}$ than do Caucasians (M = 3.78, SD = 1.25).

The $\text{Self}_{\text{TALE}}$ subordinate function of Counterfactual Thinking was also significantly predicted by culture (r = .15) to suggest that the culture effects were inherited by Counterfactual Thinking from $\text{Self}_{\text{TALE}}$. Results of the Mann-Whitney U post-hoc comparison tests showed that individuals who identify as South Asian use autobiographical memory with greater frequency (M

[62] Ranson (2014) evaluated culture effects using multiple regression, whereas the current paper used Kruskal-Wallis comparison tests to better accommodate the unequal sample sizes.
[63] From a Mann-Whitney U comparison test, where $r = |Z|/\sqrt{N}$ (Field, 2005).

= 4.43, *SD* = 1.08)[64] for Counterfactual Thinking than do individuals who identify as Caucasian (*M* = 3.97, *SD* = 1.29). However, although not foreshadowed by the culture effects found for the higher-order $Self_{TALE}$, results also showed that South Asians (*M* = 4.43, *SD* = 1.08) use autobiographical memory or the purpose of Counterfactual Thinking with significantly greater frequency (*r* = .20) than individuals who identify as African-American/Black (*M* = 3.82, *SD* = 1.43).

Also implying that the culture effect found for $Self_{TALE}$ was inherited by its AMFJR subordinate function, $Self_{AMFJR}$ was significantly predicted by culture (*r* = .25), such that South Asians use autobiographical memory content with greater frequency (*M* = 4.39, *SD* = .86) than do Caucasians (*M* =3.77, *SD* = 1.08). However, results also showed that South Asians use autobiographical memory with greater frequency than African-American/Blacks (*M* = 3.80, *SD* = 1.11; *r* = .25). Thus, while results support the inheritance from $Self_{TALE}$ of differential use of autobiographical memory content between Caucasians and South Asians, the differential use of autobiographical memory content between South Asians and African-American/Blacks was not prefigured by culture effects for $Self_{TALE}$.

Although no significant culture effects were found for the broad Social function, small but significant individual differences in the rated frequency of functional use of autobiographical memory content across the evaluated culture groups were found for all functions the AMFJR functions except Conversation (*p* = .223). Specifically, for Perspective $Taking_{AMFJR}$ (*r* = .172), post-hoc Mann-Whitney *U* tests showed that South Asians (*M* = 4.52, *SD* = 1.05) use autobiographical memory with greater frequency than Caucasians (*M* = 4.06, *SD* = 1.18). With respect to Relationship Maintenance, South Asians use autobiographical memory more

[64] Table 40 lists the group mean ranks on which each reported Mann-Whitney *U Z*-score was computed. However, mean scale scores are featured here, given that they are more representative of the range of possible scores, and thus more intuitively interpretable than group mean ranks.

frequently (M = 4.52, SD = .79) than do both Caucasians (M = 4.00, SD = 1.02), r = .21, or African-American/Blacks (M = 4.01, SD = 1.14), r = .20.

Finally, no culture effects were found for the broad Directive function, but culture effects were found for the broadly directive AMFJR function of Teaching/Problem Solving/Behavioral Control (r = .21), whereby Caucasians (M =3.97, SD = .93) report using autobiographical memory content with less frequency for this purpose than do South Asians (M =4.41, SD = .77). The same pattern was found for the broadly Directive Emotion Regulation function of the AMFJR (r = .18), such that Caucasians (M = 3.88, SD = 1.07) reporting less frequent use of autobiographical memory content for this function than South Asians (M =4.35, SD = .83). For a summary of the significant results of the culture effects analyses, see Table 40.

3.5 Discussion

In Support of Hypotheses and Goals

The following sections address the results of Study 2's six hypothesis tests and the exploration of its three goals. The broader merits, limitations, implications, and future directions of Study 2 (Chapter 3) as it pertains to the current paper (i.e., Chapters 1–3) will be discussed in Chapter 4.

Hypothesis 3.1. The first of Study 2's six hypotheses was meant to establish that the Perspective Taking$_{\text{AMFS}}$, Prospection, and Counterfactual Thinking functions of autobiographical memory were viable in their own right, thus demonstrating structural and functional integrity when combined with a set of previously validated autobiographical memory functions measured by a separate scale. Results showed that the AMFS functions were distinct and independent from the functions of the AMFJR (Ranson & Fitzgerald, in preparation).

However, Hypothesis 3.1 predicted an eight-function model consisting of Prospection, Counterfactual Thinking, Conversation, Relationship Maintenance, Teaching/Problem Solving/Behavioral Control, Emotion Regulation, Self, and the "Perspective $\text{Taking}_{S\&JR}$" function, which consisted of the combined items of the Perspective Taking_{AMFS} and Perspective Taking_{AMFJR} subscales. Study 2 assumed that the "perspective taking" construct, regardless of autobiographical memory functions scale to which it belonged, or within which context (simulation-based or socially situated) its items were embedded, could be viewed as a single purpose for which autobiographical memory content could be used. However, results did not support this assumption. Rather, additional analyses run to investigate differential patterns of effects across the Perspective Taking_{AMFS} and Perspective Taking_{AMFJR} functions showed that the use of autobiographical memory for perspective taking is *both* simulation-based *and* socially situated. When examined with respect to simulation—i.e., using both Perspective Taking_{AMFS} and Perspective Taking_{AMFJR} as predictors of the ERQ (Gross & John, 2003) dimension of simulation-based Cognitive Reappraisal—both Perspective Taking_{AMFS} and Perspective Taking_{AMFJR} explained significant variance in Cognitive Reappraisal. Likewise, although not statistically significant, Perspective Taking_{AMFS} function uniquely explained more variance in Cognitive Reappraisal than did Perspective Taking_{AMFJR}. This finding suggests that, although the mechanism of simulation is common to the behavior of perspective taking, regardless of whether measured using the AMFS or AMFJR, Perspective Taking_{AMFS}, as a simulation-based measure of perspective taking, yields the stronger association with simulation-based Cognitive Reappraisal. When Perspective Taking_{AMFS} and Perspective Taking_{AMFJR} were tested as predictors of the socially oriented Expressive Suppression dimension of the ERQ, both Perspective Taking_{AMFS} and Perspective Taking_{AMFJR} accounted for significant variance in

Expressive Suppression. However, that the socially situated Perspective Taking$_{AMFJR}$ uniquely explained a significant amount of this variance above and beyond that explained by Perspective Taking$_{AMFS}$ to imply that, although perspective taking as measured by either scale is a social behavior (e.g., Ickes, 2003; Malle & Hodges, 2005), the social aspect is enhanced when measured using the Perspective Taking$_{AMFJR}$ subscale.

Also evaluated were individual differences in the estimated use of autobiographical memory content for simulation-based Perspective Taking$_{AMFS}$ versus socially situated Perspective Taking$_{AMFJR}$. When the mean estimated use of autobiographical memory content for the four-item Perspective Taking$_{AMFS}$ subscale was compared to the mean use for the two-item Perspective Taking$_{AMFJR}$ subscale, results showed that people use autobiographical memory content more frequently for simulation-based Perspective Taking$_{AMFS}$. However, when comparing the two-item Perspective Taking$_{AMFJR}$ subscale to the Perspective Taking$_{AMFS(2)}$ subscale, which featured only the same two items comprising Perspective Taking$_{AMFJR}$, the opposite effect was found. With the random ordering of survey blocks eliminating the possibility of order effects, other than the different contexts within which the AMFS and AMFJR are situated, there were no other measures in Study 2 that would help explicate why respondents differentially estimated their use of autobiographical memory content for Perspective Taking$_{AMFJR}$ and Perspective Taking$_{AMFS(2)}$.

Because these myriad discrepancies endorsed the treatment of Perspective Taking$_{AMFS}$ and Perspective Taking$_{AMFJR}$ as independent, rather interdependent (e.g., Perspective Taking$_{S\&JR}$), functions, the Hypothesis 3.1 model was revised to include nine, rather than eight, functions. And although the modified CFA showed that, overall, the nine-function model demonstrated better fit than the eight-function model, there were minor issues with the

Counterfactual Thinking subscale that may have undermined an even better fit. However, results implied that any compromised estimates were likely limited to the Counterfactual Thinking subscale, as estimates for the remaining subscales were stable. That the fit indices implied an adequate, rather than excellent, fit was likely due to the Counterfactual Thinking items' high inter-item correlations—an occurrence known to produce inflated chi-square statistics that in turn attenuate the value of fit indices (Clark & Watson, 1995)—rather than misspecification of the nine-function model.

Hypothesis 3.2. The first objective of Hypothesis 3.2 was to use second-order CFA modeling to replicate the associations between the functions of the (Bluck & Alea, 2011) and the AMFJR as reported by Ranson and Fitzgerald (in preparation). As expected, results showed that the AMFJR Conversation, Perspective Taking$_{\text{AMFJR}}$, and Relationship Maintenance functions mapped onto the broad Social function of the TALE; the Teaching/Problem Solving/Behavioral Control and Emotion Regulation functions of the AMFJR mapped onto the TALE's broad Directive function, and Self$_{\text{AMFJR}}$ mapped onto Self$_{\text{TALE}}$. Although, to be thorough, several other configurations, including cross-loadings between functions, were explored, none were backed by compelling theoretical evidence, nor did any yield a better fit than that based on findings by Ranson and Fitzgerald.

The second objective of Hypothesis 3.2 was to explore associations between the AMFS functions and the broad functions of the TALE (Bluck & Alea, 2011), also using second-order modeling. As expected, CFA results showed that Perspective Taking$_{\text{AMFS}}$ mapped onto the broad Social function. However, theory and related research were somewhat ambiguous in terms of how the two mental time travel functions would definitively map—accordingly, either or both could have been broadly Directive, Self$_{\text{TALE}}$, or some combination thereof. Results showed that

Prospection was strongly broadly Directive, Counterfactual Thinking was moderately broadly Self, with neither cross loading onto other TALE functions. That the Prospection function was found to be broadly Directive was best supported by theory: It has long been hypothesized elsewhere that one of the Directive uses of autobiographical memory content is the predicting of and planning for the future (e.g., Bluck et al., 2005; Bluck & Alea, 2011; Williams et al., 2008). This purpose is reflected in two explicitly "future thinking-oriented" Directive items (numbers 7 and 9), which ask respondents to estimate their use of autobiographical memory content for "guiding one's future" and "deciding which path to take." Thus, the conceptual alignment of these two TALE items and the three items of the Prospection subscale likely fostered the mapping indicated by CFA results. That Study 2 found no association between the Prospection function and $\text{Self}_{\text{TALE}}$ was fairly unsurprising: Although research shows that self-continuity—which is an *overarching* purpose of $\text{Self}_{\text{TALE}}$ by definition (Bluck & Alea, 2011)—is a phenomenon that concerns the extending of self forward (and backward) in time (e.g., Benoit, Gilbert, & Burgess, 2011; Buckner & Carroll, 2007; Hershfield, 2011), no $\text{Self}_{\text{TALE}}$ items explicitly reflect the use of autobiographical memory for such a purpose.

Although behavioral counterfactual thinking is arguably conceptually Directive—i.e., it is known to be a strategy for regulating behavior (e.g., Epstude & Roese, 2008) and emotions (e.g., Allen et al., 2014; Lindeman & Abraham, 2008; Ruiselová et al., 2009; Ruiselová & Prokopcáková, 2010)—results yielded no association between the AMFS's Counterfactual Thinking function and the Directive function of the TALE (Bluck & Alea, 2011). Rather, results showed the Counterfactual Thinking function to be broadly, albeit moderately, Self. One possible explanation as to why a seemingly conceptually Directive phenomenon like Counterfactual Thinking would be $\text{Self}_{\text{TALE}}$ rather than Directive may be due to the content of the

Directive function subscale items. Although the TALE's Directive items address the expected practical use of autobiographical memory content for Directive purposes (e.g., "learning from past mistakes" and "remembering lessons learned"), these items are not in any way aligned with the idea of "reframing" one's past—for any reason, much less counterfactual thinking specifically. But nor do the items of $\text{Self}_{\text{TALE}}$ reflect the "reframing" of autobiographical memory content; rather, $\text{Self}_{\text{TALE}}$ concerns the self-reflective use of autobiographical memory content to establish self-concept and maintain self-continuity (e.g., "still the type of person I was"; determining "how I have changed"). However, the literature indicates that counterfactual thinking is motivated by a number of *self*- (and perhaps therefore *Self*-) directed goals and phenomena, such as ego-involvement (Anderson & Slusher, 1986), self-evaluation (Tyser, McCrea, & Knüpfer, 2012), self-motives (Sanna, Chang, & Meier, 2001), self-esteem (Roese & Olson, 1993), self-efficacy and self-confidence (Roese, 1999), and self-referencing (e.g., Burnkrant & Unnava, 1989; Roese & Olson, 1993). Thus, although counterfactual thinking clearly has a Directive-like utility—i.e., it can highlight one's actions and prompt alternative responses—it is the *self*—its efficacy, motivation, confidence, and consistency—that Study 2 results, and to some extent, related theory, suggest is ultimately being served by counterfactual thinking.

The third and final objective of Hypothesis 3.2 was to test whether mappings found for the TALE and AMFJR, and the TALE and AMFS, would hold when combined. It was thought that stability in this model would be additional support for the autonomy of the AMFS and AMFJR functions found in the testing of Hypothesis 3.1. Results of this second-order CFA showed that the best-fitting model confirmed the mappings of the previous two CFAs, such that the broadly Social functions were Perspective $\text{Taking}_{\text{AMFS}}$, Perspective $\text{Taking}_{\text{AMFJR}}$, AMFJR

Conversation, and AMFJR Relationship Maintenance. The three functions that were broadly Directive were AMFS Prospection, AMFJR Teaching/Problem Solving/Behavioral Control, and AMFJR Emotion Regulation. And finally, AMFS Counterfactual Thinking $\text{Self}_{\text{AMFJR}}$ were broadly $\text{Self}_{\text{TALE}}$.

Hypothesis 3.3. In order to test the construct validity of the AMFS, Study 1 evaluated the associations between the three AMFS functions and the two ERQ (Gross & John, 2003) dimensions of Cognitive Reappraisal (to establish convergent validity) and Expressive Suppression (to establish discriminative validity). Significant, moderate correlations between Cognitive Reappraisal and the three AMFS functions suggested that simulation was the source of the association, whereas weak, nonsignificant correlations between the AMFS functions and the socially oriented Expressive Suppression further supported that line of reasoning. Thus Study 2's Hypothesis 3.3 aimed to replicate the Study 1 findings with respect human behavior rather than the psychometric properties of the AMFS. Hypothesis 3.3 results supported the predicted associations; however, the expected associations between the AMFS functions and Cognitive Reappraisal were only slightly larger than the associations between the AMFS functions and Expressive Suppression. Further, all Hypothesis 3.3 correlations were significant, even when effect sizes were small—an outcome compelled by Study 2's large sample size. Yet, results implied that people who use autobiographical memory content with greater frequency for perspective taking, prospection, and counterfactual thinking are more likely to employ subjective, thought-restructuring emotion control strategies than outward, behavior-regulating strategies—i.e., those that can be socially observed and/or are likely to be prompted by social pressures and interactions (Gross & John, 2003).

Another difference between the Study 1 and Study 2 findings was that, for Study 1, Counterfactual Thinking accounted for the most variance in Cognitive Reappraisal. This was a plausible outcome given that both Cognitive Reappraisal and behavioral counterfactual thinking concern simulation-based strategies for controlling emotional responses. As such, it was assumed for Study 2 that some of the variance shared between Cognitive Reappraisal and the Counterfactual Thinking would be, above and beyond that attributable to simulation, attributable to their use as emotion control strategies. Study 2 therefore expected to replicate not only direction, but magnitude, of Study 1 effects. However, results showed that the function explaining the most variance in Cognitive Reappraisal was Perspective Taking$_{AMFS}$—not Counterfactual Thinking—the latter of which shared the *least* amount of variance with Cognitive Reappraisal. As for why the Study 2 assumptions were not supported, one or more of the following reasons are possible. One, as was discovered during Study 2 data screening, the three Counterfactual Thinking items were more highly correlated in Study 2 than in Study 1. As redundancy can attenuate the magnitude of effects (e.g., Loevinger, 1954), if the high inter-item correlations are due to redundancy (although there was no evidence of redundancy in Study 1), such would explain the reduced association between Counterfactual Thinking and Cognitive Reappraisal. Two, Study 1 results may reflect order and/or priming effects. The Study 1 AMFS block, which preceded the ERQ block, was itself preceded by the mental time travel conditions. Thus, the mental time travel conditions—which included a counterfactual thinking condition but not a perspective taking condition (see the Chapter 2 Instruments section for details)—may have compelled respondents to estimate their use of autobiographical memory for the AMFS items differently in Study 1 than in Study 2. Order effects were not possible in Study 2 because the mental time travel conditions were omitted, and because, with the exception of the demographics and self-descriptor blocks, all subsequent survey blocks were randomly ordered. And three, the Study 1 results that correspond to those of Hypothesis 3.3 were *provisional*, as the same data used to validate the AMFS was then used for further inferential testing using the validated AFMFS. Consequently, Study 1 results may have been biased whereas Study 2 results were not. If both bias and order effects were an issue in Study 1, then the Study 1 effects may have been excessively inflated and therefore unreplicable.

Hypothesis 3.4. Hypothesis 3.4 tested the functional relation between the AMFS functions and Cognitive Reappraisal to determine if simulation was a source of shared variance as found in Study 1. Results replicated the Study 1 findings, thus supporting the Hypothesis 3.4 prediction that Perspective Taking$_{\text{AMFS}}$ and Counterfactual Thinking would significantly explain variance in Cognitive Reappraisal but Prospection would not. That Study 2 replicated these findings from Study 1 had additional utility in results provided empirical support for Chapter 1's Hypothesis 1.7—that the autobiographical memory function of perspective reflects *interpersonal* simulation, whereas the autobiographical memory functions of mental time travel—here, prospection and counterfactual thinking—reflect *intrapersonal* simulation.

That said, although the testing of Hypothesis 3.4 confirmed the expected functional relation between the AMFS functions and Cognitive Reappraisal, Study 1 findings were not replicated as faithfully as expected. Specifically, Study 1 found that the Counterfactual Thinking function uniquely explained the most variance in Cognitive Reappraisal, but Study 2 found that the strongest predictor of Cognitive Reappraisal was instead Perspective Taking$_{\text{AMFS}}$. That these incongruous patterns of effects were prefigured in the results of Hypothesis 3.3 imply that Hypothesis 3.4 results could have been prejudiced by the same psychometric issues as detailed for Hypothesis 3.3—i.e., high inter-item correlations within the Counterfactual Thinking function, Study 1 order effects, and/or bias in Study 1's provisional results.

Hypothesis 3.5. Hypothesis 3.5 predicted that, because the ERQ (Gross & John, 2003) dimension of Expressive Suppression concerns emotion control strategies that involve more social, externally observable behavior, the Expressive Suppression subscale would be more strongly associated with the Emotion Regulation subscale of the socially situated AMFJR than it would with simulation-based Cognitive Reappraisal. Findings supported the prediction, with results showing that the amount of variance shared by Emotion Regulation and Expressive Suppression was significantly greater than the amount of overlapping variance shared by Emotion Regulation and Cognitive Reappraisal. These results suggest that, as expected, individuals who use autobiographical memory content with greater frequency for Emotion Regulation reminiscence behaviors are also more likely to employ Expressive Suppression-type emotion control strategies, which presumably help them to regulate outward behavior.

Hypothesis 3.6. A main objective of Hypothesis 3.6 was to replicate previous results concerning the personality dimensions of the HEXACO (Ashton & Lee, 2005, 2009) and the autobiographical memory functions of the TALE (Bluck & Alea, 2011). However, all HEXACO dimensions were tested as predictors of the three TALE functions in order to either confirm previous reports that certain personality traits were not predictive of the Social, $\text{Self}_{\text{TALE}}$, and Directive functions, or to discover new associations that previous studies may have been too underpowered to detect. Hypothesis 3.6 also sought to replicate the personality effects found for the AMFS functions during Study 1, and to explore whether those personality effects found for the TALE would be inherited by the AMFS and AMFJR functions onto which the TALE functions correspondingly mapped.

Personality and the TALE: The Social Function. Study 2 replicated results from previous studies (Cappeliez & O'Rourke, 2002; Rasmussen & Berntsen, 2010; Bluck & Alea, 2009) of the TALE (Bluck & Alea, 2011) functions to confirm that Openness to Experience was predicted the Social, $\text{Self}_{\text{TALE}}$, and Directive functions; Emotionality/Neuroticism predicted the Directive and Self functions; and Extraversion predicted the Social function.

A number of novel personality effects with respect to the broad functions of the TALE (Bluck & Alea, 20110 were also obtained in Study 2. In addition to Extraversion and Openness to Experience, results showed that the broad Social function was predicted by Emotionality/Neuroticism, Agreeableness, Conscientiousness, and the interstitial facet of Altruism. Although Rasmussen and Berntsen (2010) reported that the relation between the Social function and Emotionality/Neuroticism was positive, it was nonsignificant. However, given the small effect (5.4% variance in the Social subscale accounted for by Emotionality/Neuroticism) yielded in Study 2, it may be that the Rasmussen and Berntsen sample of 136 was not statistically powerful enough to detect it. There is also something of a contradiction in this effect when compared to Extraversion; a number of studies report that trait Extraversion and Emotionality/Neuroticism tend to produce differential and often contrasting effects, especially when assessed with respect to social behaviors (e.g., Costa & McCrae, 1980; Hamburger & Ben-Artzi, 2000; Larsen & Ketelaar, 1980; Magnus, Diener, Fujita, & Pavot, 1983). Yet Study 2 results suggest that the use of autobiographical memory for Social purposes is equally high for extraverts (i.e., low in introversion) and people high in neuroticism. Studies by Hamburger and Ben-Artzi (2000) and Hamburger, Wainapel, and Fox (2004) show that, whereas people high in Extraversion are naturally social and therefore seek out social situations, people high in Introversion are less comfortable in social settings, and thus become anxious or experience other negative emotions as a result. However, introverts demonstrate a level of sociability similar to extraverts in the online setting. As such, it may be individuals consider both face-to-face and online settings when estimating their rated frequency of functional use of autobiographical memory for Social purposes.

Rasmussen and Berntsen (2010) found no significant associations between the three TALE (Bluck & Alea, 2011) functions and Agreeableness or Conscientiousness. However, Study 2 found both personality dimensions to predict the broad Social function, albeit with very small effects (0.7% and 1.6%, respectively), which could explain the Rasmussen and Berntsen results. However, the direction of the Rasmussen and Berntsen effects were opposite that found in Study 2, the latter of which suggested that rated frequency of functional use of autobiographical memory content for reminiscence behaviors of a Social nature are cooperative, willing to compromise, disciplined, and careful (Lee & Ashton, 2009)—all traits that would plausibly facilitate social interactions. This also aligns with the Study 2 finding that the Social function is predicted by Altruism—the tendency to be sympathetic and empathetic toward others (Lee & Ashton, 2009).

Finally, of note with respect to personality and the broad Social function of the TALE (Bluck & Alea, 2011) is that the significant personality effects found for the TALE corresponded to those found for Perspective Taking$_{\text{AMFS}}$. The relevance to this to Study 2's conclusions, is that the Perspective Taking$_{\text{AMFS}}$ was shown in the testing of Hypothesis 3.2 to map broadly onto the TALE Social function. Thus, that personality effects can seen as flowing from the higher-order functions (such as the broad Social function) to the lower-order functions to which they are empirically linked (such as Perspective Taking$_{\text{AMFS}}$ function) is vital to Study 2 conclusions.

Personality and the TALE: The Directive Function. Study 2 also confirmed previous findings by Rasmussen and Berntsen (2010) with respect to Directive function of the TALE (Bluck & Alea, 2011), such that the broad Directive function Emotionality/Neuroticism and Openness to Experience. In addition, Study 2 found that the broad Directive function was predicted by Extraversion, Agreeableness, Conscientiousness, and Altruism. Although no previous association between Extraversion and the broad Directive function have been reported, it is a plausible link considering that there is a social component to the TALE, including its Directive subscale. For example, that the TALE items are prefaced with instructions to consider the extent to which they think about or "talk to other people about their life." (Bluck et al., 2005; Bluck & Alea, 2011). As such, it is likely that the TALE elicits estimations of individuals' rated frequency of functional use of autobiographical memory for Directive purposes that facilitate or even require explicit social interaction—e.g., talking about the past with others to "help solve a problem"; talking about the past with others to "remember something that someone else said or did that might help me now." That Study 2 found Agreeableness to predict the Directive function contradicts the Rasmussen and Berntsen finding that, although nonsignificant, showed an inverse association. However, the Study 2 results is more in line with the idea that, in order to discuss problems or past scenarios with others requires some degree of cooperation and tendency not to judge that are characteristic of high levels of trait Agreeableness (Lee & Ashton, 2009). Yet, the Rasmussen and Berntsen finding is mirrored in the personality effect between the Prospection function—which Hypothesis 3.2 testing indicated is a Directive subscale—and the Flexibility facet of Agreeableness. Thus, the inconsistency of the Agreeableness function across autobiographical memory function studies as observed by Rasmussen and Berntsen appears to be confirmed by Study 2. However, it may be that such inconsistency reflects instead adaptability:

Being well intentioned, nonjudgmental, and warm could facilitate socially oriented Directive reminiscence behaviors and the reduces risk of criticism or rejection; but being too agreeable could encourage others to take advantage or call the shots on one's behalf—the latter of which would reduce one's need to use of personal past information for Directive purposes. That Altruism predicts the Directive function implies that empathy toward others facilitates the use of brainstorming past-talk with others.

Finally, in support of the Hypothesis 3.2 results, the personality effects found for the higher-order Directive function corresponded to those found in the AMFS Prospection. This corroborates the Hypothesis 3.2 conclusion that the broad Directive function is empirically linked to the Prospection function such that Prospection can be thought to have inherited the effects from the broad Directive function onto which it maps.

Personality and the TALE: The Self$_{TALE}$ Function. Findings by Rasmussen and Berntsen (2010) that Emotionality/Neuroticism and Openness to New Experience predict Self$_{\mathrm{TALE}}$ were replicated in Study 2. Additionally, Self$_{\mathrm{TALE}}$ was found for the first time in Study 2 to be predicted by Extraversion, Altruism, and the inverse Honesty-Humility. As with the Directive function, that Extraversion is predictive of Self$_{\mathrm{TALE}}$ may be influenced by the social dimensions of the TALE, such that talking about the past with others to understand and maintain the self may align with trait sociability. However, the effect found in Study 2 was very small (with Extraversion explaining only 0.8% of the variance in Self$_{\mathrm{TALE}}$), thus being low in Extraversion is not likely to diminish one's use of autobiographical memory content for Self$_{\mathrm{TALE}}$ purposes. The empirical link with Altruism may also be tapping into the social aspects of the Self$_{\mathrm{TALE}}$ function, such that empathy toward others, as well as toward one's self, should help foster the personal dialog beneficial to the understanding of one's self and others. Self$_{\mathrm{TALE}}$ was the only TALE function to be predicted by the Honesty-Humility dimension—and here, inversely so—thus no previous research exists to support this result. However, that this effect appears to have been inherited by the $\text{Self}_{\text{TALE}}$ subordinate function of AMFS Counterfactual Thinking, which was found in Hypothesis 3.2 analyses to moderately map onto $\text{Self}_{\text{TALE}}$ gives it a bit more weight, and is discussed further in the subsection that addresses personality effects for the Counterfactual Thinking function.

Personality and Simulation-Based Perspective Taking $\boldsymbol{_{AMFS}}$**.** Study 2 results replicated the Study 1 findings that Perspective $\text{Taking}_{\text{AMFS}}$ was predicted by Extraversion, Conscientiousness, and Openness to Experience. The Study 1 finding that Perspective $\text{Taking}_{\text{AMFS}}$ was predicted by Emotional Stability was not replicated; however, Perspective $\text{Taking}_{\text{AMFS}}$ was found in Study 2 to be predicted by the inverse of Emotional Stability, Emotionality Neuroticism. Related research suggests that extraverts may have more opportunities to engage in perspective taking given their characteristically large social circles (Kessler et al., 2015).

That Study 2 results showed that Emotionality/Neuroticism predicted rated frequency of functional use of autobiographical memory content for Perspective $\text{Taking}_{\text{AMFS}}$ is more strongly supported by the literature than is the Study 1 finding Perspective $\text{Taking}_{\text{AMFS}}$ is predicted by Emotional Stability. For example, research shows that proficiency in perspective taking, which is referred to as empathic accuracy, is enhanced in women whose are insecurely, or "anxiously" attached (Ickes, 2003). Because anxiously attached women, who tend also to be high in Emotionality/Neuroticism (e.g., Crawford et al., 2007; Mikulincer & Shaver, 2007), tend also to be insecure in close relationships, they become hypervigilant about reading their romantic partner's thoughts and feelings, which enhances their perspective taking accuracy (Simpson, Ickes, & Grich, 1999). This effect can be even further amplified by trait Conscientiousness (Crawford, 2007). Other research shows that relationships need not be romantic for perspective taking acuity to be heightened; attachment and neuroticism are also linked to an increased tendency to engage in perspective taking in response to any perceived social threat (e.g., Crawford et al., 2007). Because anxiously attached persons fear social others' disapproval, they become hypervigilant about inferring the others' mental states (Vrtička et al., 2008). Not only do these related findings align strongly with the HEXACO dimensions found in Study 2 to predict simulation-based Perspective $\text{Taking}_{\text{AMFS}}$, but also the Study 2 evidence that Perspective $\text{Taking}_{\text{AMFS}}$ is predicted by the Emotionality/Neuroticism facets of Anxiety, Dependence, and Sentimentality. Such individuals may use simulation-based Perspective $\text{Taking}_{\text{AMFS}}$ as a means of coping with perceived social rejection, condemnation, or abandonment. Contrarily, people high Emotionality/Neuroticism (as well as the facets of Anxiety and Dependence) whose rated frequency in functional use of autobiographical memory content for Perspective $\text{Taking}_{\text{AMFS}}$ is *low* may be more inclined toward "motivated inaccuracy"—the intentional attempt to not correctly infer another's mental states (Cuperman, Howland, Ickes, & Simpson, 2011). Research shows motivated inaccuracy serves as a coping mechanism for individuals who believe that *not* understanding another's mind will mitigate potential hurt. Contingently, perspective taking may be used to assuage *social status anxiety*—whereby individuals use one another as "social looking glasses" through which to glean one's social status compared to another or others (Schwartz, 1967, p. 7). Thus, for people high in Emotionality/Neuroticism, as well as Anxiety, the motive to perspective take may involve a need to determine others' perceptions of the perspective taker's place in the immediate or broader social circle. This may explain the Study 2 finding that people whose rated frequency of functional use of autobiographical memory content for Perspective

Taking is high are also low in Greed-Avoidance—a concern over and tendency to pursue social status (Lee & Ashton, 2009). For full coverage of facets, see Appendix F.

In addition to replicating Study 1 personality effects, Study 2 also found evidence that, like the broad Social function onto which it mapped, Perspective $\text{Taking}_{\text{AMFS}}$ was predicted by Agreeableness and the interstitial facet of Altruism. Research in intercultural communication shows that Agreeableness predicts motivation to engage in and be accurate in perspective taking (Cavanaugh, 2013); most likely because Agreeableness is largely a social trait (Graziano & Tobin, 2009). Agreeableness is also associated with *social affiliation*—the motive to seek interpersonal relationships (Digman, 1990)—which also aligns with altruistic tendencies (Ashton, Paunonen, Helmes, & Jackson, 1998; MacDonald & Messinger, in press; Buss, 1991, 1996). As such, people who use of autobiographical memory content with high frequency for simulation-based Perspective $\text{Taking}_{\text{AMFS}}$ may be calling on their own past experiences to understand others to meet prosocial goals.

Personality and Prospection. Study 2 also replicated results from Study 1 whereby the autobiographical memory function of Prospection was predicted by the personality dimensions of Emotionality/Neuroticism, Openness to Experience, and Conscientiousness—all of which were also predictive of the broad Directive function onto which Prospection mapped. As to how the inherited effects manifest at the subordinate Prospection level, related research may provide insight. For example, much of the related research regarding Emotionality/Neuroticism and Prospection concerns the emotional valence of imagined future scenarios. For example, Emotionality/Neuroticism has been found to predict a greater tendency to form negatively biased future imaginings (e.g., MacLeod & Byrne, 1996; MacLeod et al, 2005). However, it is unknown if the autobiographical memory content that is activated and retrieved for the purpose of "pre-experiencing" downwardly biased prospective imaginings is itself of a negative nature, or if positive and/or emotionally neutral memory content is being so modified during simulation.

That both Study 1 and Study 2 found a link between the Prospection function and Openness to Experience is supported by related research. Related research attributes the adventurousness and creativity that are characteristic of the Openness trait as prompting individuals to imagine future scenarios (e.g., Allen et al., 2014; Prenda & Lachman, 2001). Study 2 also replicated the Study 1 finding that Conscientiousness predicted the Prospection function. Related research aligns with these findings, indicating that Conscientiousness predicts behavioral perspective taking to suggest that, because people high in Conscientiousness are goal-oriented, non-impulsive, and reflective (Lee & Ashton, 2009), they may engage in prospection as a way of shepherding and optimizing both ongoing or future success (Prenda & Lachman, 2001). That both traits—Openness to Experience and Conscientiousness—were also predictive of the broad Directive function, further supports the Hypothesis 3.2 second-order configurations.

Although Study 1 results did not yield personality effects between Prospection and the personality dimension of Extraversion, Study 2 did. Extraversion has been found in related research to predict future thinking (e.g., Allen et al., 2014; Furey & Fortunato, 2014), but some studies report no association (e.g., Prenda & Lachman, 2001). Given the small effect size found in Study 2 (< 1.0%), it may be that the apparent inconsistency of this association is due to underpowered analyses rather than lack of association. However, Extraversion did significantly predict the broad Directive function, which helps to substantiate this effect, however small, given evidence that it was inherited.

Personality and Counterfactual Thinking. Study 2 confirmed the Study 1 findings that the autobiographical memory function of Counterfactual Thinking is predicted by

Emotionality/Neuroticism, the inverse of Extraversion (i.e., Introversion), and the inverse of Honesty-Humility. People high in Emotionality/Neuroticism are known to generate more downwardly biased counterfactuals than people who demonstrate trait emotional stability (Allen et al., 2014), often as a coping mechanism (e.g., Allen et al., 2014; Lindeman & Abraham, 2008; Ruiselová et al., 2009; Ruiselová & Prokopcáková, 2010) or means of avoiding regret (e.g., Tykocinski & Pittman, 1995). This corresponds to research showing that trait procrastination predicts downward-biased counterfactuals (Sirois, 2004, p. 279). People high in trait-procrastination tend to also be neurotic (Schouwenburg & Lay, 1995), highly anxious (Sirois, 2004), low in Conscientiousness (Schouwenburg & Lay, 1995), and possess a tendency to self-enhance in order to improve their social image (Sirois, 2004, p. 271).

Study 2 replicated the Study 1 finding that Introversion predicted the function of Counterfactual Thinking. However, there was no evidence in the counterfactual thinking literature to substantiate this finding, as the examination of Big Five personality effects with respect to counterfactual thinking is both sporadic (Ruiselová & Prokopcáková, 2011), and often unfruitful (e.g., Sirois, 2004). Thus, the fact that Study 2 found the Counterfactual Thinking function to be predicted by the facets of Sociability, as well as the inverse of both Social Self-Esteem—i.e., the tendency to see oneself as worthless and unpopular (Lee & Ashton, 2009) and Liveliness—i.e., characterized by pessimism and dampened mood—may provide insight. Research by Roese and Olson (1993) investigating associations between counterfactual thinking and self-esteem found that, although individuals with high and low self-esteem engage in counterfactual thinking, the counterfactuals people with low self-esteem are self-critical following one's own failure, whereas the counterfactuals of people with high self-esteem focused more on one's success following the failure of others. This aligns with Study 2 links between the

Counterfactual Thinking function and both pessimism (the inverse of Liveliness) and Introversion, such that introverts tend to internalize (e.g., Brenner, 1996) and reflect upon their experiences (e.g., Feist, 1998; Verhaegen, Joormann, & Khan, 2005). Thus, not only may people high in trait Introversion use autobiographical memory content with greater frequency for Counterfactual Thinking compared to people low in trait Extraversion.

Consistent with the personality effect found for $\text{Self}_{\text{TALE}}$, the inverse of Honesty-Humility dimension was found in both Study 1 and Study 2 to predict the function of Counterfactual Thinking. These associations may imply that people who use autobiographical memory content with the greatest frequency for Counterfactual Thinking have a tendency to be manipulative, self-important, inveigling, fraudulent, status-seeking, pompous, and have a strong sense of entitlement (Lee & Ashton, 2009). Indirect support for these findings may come from the revenge motive literature, which indicates that the magnitude of perceived injustices occur as a result of having considered how things should have gone instead (e.g., Beugré, 2005; Folger & Cropanzano, 1998; Hardman & Hardman, 2009). Given the relation between revenge motive and such personality traits as vindictiveness, superiority, manipulativeness (e.g., Gurtman, 1992)., it may be that the Study 2 findings reflect a tendency to use autobiographical memory content for the purpose of generating alternative scenarios in response to perceived slights. This may also tie in with the literature on fairness theory (Folger and Cropanzano, 1998), which posits that individuals contrastively consider what *could* have occurred instead of what actually occurred; what *should* have occurred; and what *would* have ideally occurred had the negative event played out as alternatively imagined (McColl-Kennedy & Sparks, 2003, p. 254).

Allen et al. (2014) also reported an inverse relation between counterfactual thinking and Conscientiousness—such that low trait Conscientiousness predicted negative emotionality, which corresponded to the generation of downward-biased counterfactuals. Although Study 1 findings did not support these related findings, Study 2 findings did, with the inverse of Conscientiousness significantly predicting Counterfactual Thinking. As such, people whose rated frequency of functional use of autobiographical memory content for counterfactual thinking tend to be impulsive, unstructured, haphazard, and have little concern over potential consequences of their actions (Lee & Ashton, 2009).

With respect to the inheritance argument, the effect of Extraversion Counterfactual Thinking contradicted the effect on $\text{Self}_{\text{TALE}}$, such that the association was negative for Counterfactual Thinking and positive for $\text{Self}_{\text{TALE}}$. However, there was alignment in that the Extraversion facet of Sociability was also positive for Counterfactual Thinking. Although it is unknown whether the Sociability facet of Extraversion would have produced the strongest effect on $\text{Self}_{\text{TALE}}$ to bring these effects into greater alignment, it is likely that the positive effect of Extraversion of $\text{Self}_{\text{TALE}}$ is also enhanced by the social dimensions of the socially situated TALE. Likewise, Study 2 found Openness to Experience to be predictive of $\text{Self}_{\text{TALE}}$; and although the direction of the effects were consistent with those for Counterfactual Thinking, the association was not significant. The inverse of Conscientiousness was also found to predict Counterfactual Thinking, but no corresponding relation was found between Conscientiousness and $\text{Self}_{\text{TALE}}$. One of the strongest personality effects for Counterfactual Thinking was with the inverse of Agreeableness; however, Study 2 did not find that trait to be associated with the broad function of $\text{Self}_{\text{TALE}}$. However, also of note is that the empirical link between the $\text{Self}_{\text{TALE}}$ and the subordinate Counterfactual Thinking was the weakest of the associations between the TALE and AMFS functions, which may explain why not all $\text{Self}_{\text{TALE}}$ effects were faithfully inherited.

Personality and the AMFJR: The (Social) Conversation Function. Also explored in Study 2 were, for the first time, personality effects with respect to the functions of the AMFJR (Ranson & Fitzgerald, in preparation). As such, because no previous findings were available to replicate, the objective of Hypothesis 3.6 with respect to the AMFJR was to verify the assumption that the personality effects of the higher-order TALE (Bluck & Alea, 2011) functions are inherited by the lower-order functions of the AMFJR.

With the exception of Agreeableness, all personality effects found for the broad Social function of the TALE (Bluck & Alea, 2011) were also found for the Conversation function of the AMFJR (Ranson & Fitzgerald, in preparation). The Conversation function was found in Study 2 to map onto the higher-order Social function. That there was no personality effect of Agreeableness on Conversation may be an issue of power; although the effects of Agreeableness on Conversation were directionally aligned to those of the broad Social function, it was nonsignificant. This is unsurprising given that the magnitude of the effect on Social was itself weak (0.7%), which, conceptually, may have been too unsubstantial to impact the subordinate function of Conversation. This may also be in keeping with the Rasmussen and Berntsen (2010) assertion that the relation between Agreeableness and autobiographical memory functions across studies has been inconsistent, suggesting that varying degrees of agreeableness serve different purposes in different social settings (e.g., Digman, 1990; Graziano, Jensen-Campbell, & Hair, 1996).

Personality and the AMFJR: The (Social) Perspective Taking$_{AMFJR}$ Function. Results showed that all personality effects found for the broad Social function of the TALE (Bluck & Alea, 2011) were inherited by Perspective Taking$_{AMFJR}$; i.e., Emotionality/Neuroticism, Extraversion, Agreeableness, Conscientiousness, Openness to Experience, and Altruism. Thus the only HEXACO (Ashton & Lee, 2005; 2009) dimension that predicted neither Perspective Taking_{AMFJR} nor the broad Social function was the Honesty-Humility dimension.

Also of interest to Hypothesis 3.6 was whether the personality effects for simulation-based Perspective Taking_{AMFS} versus those found for socially situated Perspective Taking_{AMFJR} would coincide. Both Perspective TakingAMFS and Perspective Taking_{AMFJR} mapped onto the broad Social function, but were shown in supplementary analyses (see results of Hypothesis 3.1) to be independent functions from one another. Study 2 results showed that Perspective Taking_{AMFS} and Perspective Taking_{AMFJR} were positively predicted by Emotionality/Neuroticism, Extraversion, Agreeableness, Conscientiousness, Openness to Experience, and Altruism. However, only simulation-based Perspective Taking_{AMFS} was predicted by the inverse of the Honesty-Humility facet of Greed Avoidance—a preoccupation with social status (Lee & Ashton, 2009). This inconsistency across Perspective Taking_{AMFS} and Perspective Taking_{AMFJR} may be a product of their contextual differences. For example, the social context of joint reminiscence—within which Perspective Taking_{AMFJR} subscale items are situated—may have elicited a stronger sense of social obligation and cooperation, which influenced rated frequencies of functional use of autobiographical memory content for items in the Perspective Taking_{AMFJR} subscale. This may have resulted in the rated frequencies on Perspective Taking_{AMFJR} being less aligned with the use of social situations to gain an advantage against a perceived social rival. Or there may have been something about the content of the two Perspective Taking_{AMFS} subscale items that are not included in the Perspective Taking_{AMFJR} subscale (i.e., “I use my own past experiences as examples of why others might do what they do”; and “I refer to my own past experiences when trying to figure out another’s behaviors”) that inadvertently led respondents to consider their rated frequency of functional use of autobiographical memory content for these items from a "social competition" framework, which may explain why only Perspective Taking$_{AMFS}$, and not Perspective Taking$_{AMFJR}$, was predicted by the Greed-Avoidance facet.

Personality and the AMFJR: The (Social) Relationship Maintenance Function. As was the case with Perspective Taking$_{AMFJR}$, the personality effects for the AMFJR Relationship Maintenance function were fully inherited from the broad Social function, onto which Relationship Maintenance was found to map in the testing of Hypothesis 3.2.

Personality and the AMFJR: The (Directive) Teaching/Problem Solving/Behavioral Control Function. As a broadly Directive function, it was expected that the personality effects on the AMFJR (Ranson & Fitzgerald, in preparation) function of Teaching/Problem Solving/Behavioral Control would inherit those found for the Directive function of the TALE (Bluck & Alea, 2011). Results supported this prediction, with both the Teaching/Problem Solving/Behavioral Control and Directive functions being predicted by Emotionality/Neuroticism, Extraversion, Conscientiousness, Openness to Experience, and Altruism. As such, these findings provide additional support for the mapping of the Teaching/Problem Solving/Behavioral Control function onto the broad Directive function.

Personality and the AMFJR: The (Directive) Emotional Regulation Function. As with the Teaching/Problem Solving/Behavioral Control function of the AMFJR (Ranson & Fitzgerald, in preparation), the personality effects of the broad Directive function of the TALE (Bluck & Alea, 2011), were fully inherited by the broadly Directive AMFJR function of Emotion Regulation. Study 2 results showed that Emotion Regulation was positively predicted by Emotionality/Neuroticism, Extraversion, Agreeableness, Conscientiousness, Openness to Experience, and Altruism.

Personality and the AMFJR: The (Self) Self$_{TALE}$ Function. Finally, the personality effects that were found for the broad Self$_{\mathrm{TALE}}$ were found for Self$_{\mathrm{AMFJR}}$. Rated frequency of functional use of autobiographical memory content for both Self$_{\mathrm{TALE}}$ and Self$_{\mathrm{AMFJR}}$ were predicted by Emotionality/Neuroticism, Extraversion, Openness to Experience, Altruism, and the inverse of Honesty-Humility. Thus the mapping of Self$_{\mathrm{AMFJR}}$ onto higher-order Self$_{\mathrm{TALE}}$ further supports the mapping established in the testing of Hypothesis 3.2.

Goal 3.1. Study 2 yielded two age effects: One for Self$_{\mathrm{TALE}}$, and one for its subordinate AMFS function of Counterfactual Thinking and the broad Self function of the TALE (Bluck & Alea, 2011). Both effects indicated that rated frequency of functional use of autobiographical memory content declines as a function of age. That age inversely predicts the use of autobiographical memory content for Self$_{\mathrm{TALE}}$ replicates previous results. Bluck and Alea (2009) found that older adults tend to use autobiographical memory content for Self$_{\mathrm{TALE}}$ purposes less frequently than do younger adults, presumably because older adults have developed a stable self-concept that, contrary to the self-concepts of younger adults, requires little continued input from autobiographical memory content.

These age effects also align with the mapping of the Counterfactual Thinking function onto broad Self$_{\mathrm{TALE}}$ that was found in the testing of Hypothesis 3.2. And although results also showed that the use of autobiographical memory content for Self$_{\mathrm{AMFJR}}$—which also mapped onto Self$_{\mathrm{TALE}}$—also declined with age, the age effect for Self$_{\mathrm{AMFJR}}$ was only marginally significant. This may have been due to slight differences in constructs of Self$_{\mathrm{AMFJR}}$ and Self$_{\mathrm{TALE}}$, such that Self$_{\mathrm{AMFJR}}$ items are more concerned with self-identity than Self$_{\mathrm{TALE}}$ items, which are more oriented toward self-continuity (see Tables for 18 and 19 for AMFJR and TALE items, respectively). As such, the Counterfactual Thinking items may be more aligned with the Self$_{\mathrm{TALE}}$

items (e.g., "how I have changed," and whether " I am still the same type of person as before"), than are the $\mathrm{Self}_{\mathrm{AMFJR}}$ items (e.g., , "recognizing that (one) is part of a larger group," or "reminding (one's self) of who (one) was when younger,")—especially given that counterfactuals are often used to reconcile past actions in order to maintain self-understanding and sustain a consistent sense of self (e.g., Roese & Morrison, 2009; Roese & Olson, 1993).

Although mapping of Counterfactual Thinking onto $\mathrm{Self}_{\mathrm{TALE}}$ supports the idea that Counterfactual Thinking inherited the age effect from $\mathrm{Self}_{\mathrm{TALE}}$, there is recent related research that also supports this finding. For example, a study be De Brigard, Giovanello, Stewart, Lockrow, O'Brien, & Spreng (2016), yielded age effects between young and older healthy adults with respect to the generation of "likely" versus "unlikely" positive and negative autobiographical counterfactuals. Participants self-rated on a 1–7 scale the "likeliness" that their counterfactuals reflected details and outcomes that could have actually occurred, such that ratings of 1–3 constituted an "unlikely" counterfactual, and ratings of 5–7 reflected counterfactuals that were "likely." Additionally, events were rated for their "internal" (main event/episodic properties) versus "external" (semantic/nonepisodic properties) (p. 5). Results showed that younger adults were more likely to generate both positive and negative autobiographical counterfactuals about "likely" events, whereas older adults were more likely to generate positive "unlikely" autobiographical counterfactuals. More importantly, older adults' autobiographical counterfactuals were less likely than younger adults' autobiographical counterfactuals to feature "internal" or episodic details, to indicate that younger adults use more episodic memory content than older adults when generating counterfactuals. This suggests that, because older adults compared to younger adults use less episodic memory content for their counterfactuals, and because episodic memory content is what is thought necessary to the "re-experience" of a past event (Abram et al., 2014; Markowitsch & Staniloiu, 2011; Piolino, Desgranges, & Eustache, 2009; Tulving, 2002b) so that it can be "reframed" counterfactually (Addis et al., 2009; De Brigard et al., 2013; De Brigard et al., 2015; Schacter, Benoit, De Brigard, & Szpunar, in press; Van Hoeck, Ma, Ampe, Vandekerckhove, & Van Overwalle, 2013), older adults would, as Study 2 found, rate the frequency with which they use autobiographical memory content for counterfactual thinking lower than would younger adults.

Goal 3.2. Gender was found to predict the use of autobiographical memory content for the broad Social function of the TALE (Bluck & Alea, 2011), the Emotion Regulation function of the AMFJR (Ranson & Fitzgerald, in preparation), and the Counterfactual Thinking function of the AMFS. Thus the argument for the heritability of individual difference effects is not supported for Goal 3.2, as neither the Emotion Regulation or Counterfactual Thinking functions were found to be broadly Social.

Nor do the results of the Study 2 gender effects tests replicate findings found elsewhere. Although the TALE (e.g., Bluck & Alea, 2009) has been tested for gender effects, none have been reported to date. However, the Study 2 gender effect found for Social was small (R^2 = 1.0%) which may have made it difficult to detect in comparatively underpowered studies. Yet, indirect evidence may offer possible explanations for this finding. For example, McMahon and Rhudick (1961) describe interpersonal reminiscing as an act of self-disclosure. In 2005, Igarashi, Takai, & Yoshida reported evidence that women are more motivated than men to foster and maintain social relationships, often through self-disclosure. As such, women may be more likely than men to self-disclose—–i.e., engage in "past-talk" about autobiographical memories for the purpose of fostering and maintaining social bonds and intimacy. By comparison, men are less likely than women to self-disclose, preferring instead to use social interaction as a way to maintain social position or status (Igarashi, Takai, & Yoshida, 2005)—an objective of social collaboration that is not considered an objective of the Social function of the TALE.

Study 2 also found that men use autobiographical memory content with less frequency than women for the AMFJR function of Emotion Regulation. Although this effect was not found for the broadly Directive function onto which Emotion Regulation was show in in Study 2 to map, related research may support this effect. For example, brain evidence presented by MacRae, Ochsner, Mauss, Gabrieli, and Gross (2008) showed that, compared to women, men demonstrate an increase in the down-regulation of amygdala activity—which is associated with emotional response—and a decrease in prefrontal activity (p. 154)—which is associated with regulatory control. It was posited that men may therefore be more efficient regulators of emotion than women, such that men depend less on simulation-based, cognitive reappraisal-like (p. 148) strategies to bring emotions into check (p. 154). As such, men may rely less on the use of autobiographical memory content, as measured by the Emotion Regulation function, as a strategy for regulating emotions. Because such evidence is more conceptually aligned with the Emotion Regulation construct than to the constructs of the other broadly Directive functions—Prospection and Teaching/Problem Solving/Behavioral Control—such might explain why the effect was found for a first-order function but not its second-order "parent."

Finally, Study 2 found that men use autobiographical memory with greater frequency than women for Counterfactual Thinking. The general consensus in the counterfactual thinking literature is that gender does not predict the frequency with which individuals generate counterfactuals (Roese & Summerville, 2005). However, the Study 2 effect was quite small (only 0.2% of the variance in the function of Counterfactual Thinking was explained by gender); thus, it may be that previous studies seeking the differential use of counterfactual thinking by men and women were sufficiently powered to find equivalently small effects.

Goal 3.3. The first objective of Goal 3.3 was to replicate the culture effects found by Ranson (2014), which showed that Caucasians used autobiographical memory content for the function of Conversation with greater frequency than did African-American/Blacks. Additionally, Ranson found that African-American/Blacks used autobiographical memory content with greater frequency than Caucasians for the function of Teaching/Problem Solving/Behavioral Control. However, these effects were small (with ethnicity accounting for approximately 2.0% of in the variance in each the Conversation function and Teaching/Problem Solving/Behavioral Control function). Thus, although Study 2 results replicated these same patterns of effects, statistical significance was not obtained because the African-American/Black sample was prohibitively small.

With respect to the TALE (Bluck & Alea, 2011), culture was predictive only of $\text{Self}_{\text{TALE}}$. Study 2 also found that this effect was inherited by it's the $\text{Self}_{\text{TALE}}$ subordinate functions of $\text{Self}_{\text{AMFJR}}$ and Counterfactual Thinking. Specifically, results showed that the rated frequency of functional use of autobiographical memory content for $\text{Self}_{\text{TALE}}$, $\text{Self}_{\text{AMFJR}}$, and Counterfactual Thinking is higher for South Asians than Caucasians. Results also showed that South Asians use autobiographical memory content more frequently than African-American/Blacks for the two $\text{Self}_{\text{TALE}}$ subordinate functions of $\text{Self}_{\text{AMFJR}}$ and Counterfactual Thinking, but not for the parent function of $\text{Self}_{\text{TALE}}$. Such was the case for other Study 2 results that also showed that Caucasians use autobiographical memory with less frequency than South Asians for the AMFJR functions of Perspective $\text{Taking}_{\text{AMFJR}}$, Relationship Maintenance, Teaching/Problem Solving/Behavioral

Control, and Emotion Regulation, but not for the broad Social or Directive functions onto which theses AMFJR functions map.

Although theses effects failed to fully comply with the idea of inheritance, related research in differences between collectivistic and individualistic cultures may elucidate why culture effects were found for these specific Self- and Social-oriented functions. Traditionally, South Asian culture has long been considered *collectivistic*—i.e., interdependent, with a focus on social interaction and cooperation (Chadda & Deb, 2013). However, in more recent years, South Asian culture has been characterized as a “mixed” culture (Hofstede, 1984) that exhibits characteristics more common in cultures that considered *individualistic*—independent, with a focus on autonomy and self-achievement (Triandis & Bhawuk, 1997). This may be due to the fact that South Asian culture is “vertically” collectivistic—i.e., it features greater disparity across its hierarchy of social classes and thus more social inequality than collectivist (or individualistic) cultures characterized as “horizontal” (Triandis & Bhawuk, 1997). As such, the family unit—which tends to exist within the same social class—serves as the primary focus of South Asian cultures’ social structures (Chadda & Deb, 2013). With respect to autobiographical memory, individuals from collectivist cultures tend to recollect memories of social interactions more readily than do collectivist cultures (e.g., Jobson & O’Kearney; 2008; Wang, 2001), whereas individuals from individualistic cultures think and talk about their autobiographical memories with greater frequency than individuals from collectivist cultures (e.g., Fiske & Pillemer, 2006; Jobson & O’Kearney, 2008). Although Caucasians cultures (presuming Northern European cultures of origin) are characterized as more strongly individualistic than South Asian culture (Chadda & Deb, 2013), that Study 2 found South Asians to use autobiographical memory content with greater frequency than Caucasians for all six of the AMFJR’s functions. South Asians were also found to use autobiographical memory content with greater frequency than individualistic African-American/Blacks for the AMFJR functions of Relationship Maintenance and Self. These cultural effects may be attributable the AMFJR's social context of joint reminiscence, which is thought to elicit social and cultural influences on "past-talk" content and use (Kulkofsky & Koh, 2009). While "past-talk" is thought to facilitate autobiographical memory use for the socially situated AMFJR functions, its influence may be pronounced for individuals from collectivist cultures.

3.6 Conclusion

A number of replications and novel findings were yielded in the testing of Study 2 hypotheses and goals. Because the current paper is the first to examine the simulation-based functions of Perspective Taking, Prospection, and Counterfactual Thinking, and because few autobiographical memory functions studies have investigated the effects as personality, age, gender, and culture, many Study 2 findings are unsupported by direct evidence from previous studies, but often aligned with evidence from related lines of inquiry to provide some insight.

As for the overall contributions, limitations, implications, and future directions of Chapters 1–3 findings and conclusions, such are the topics discussed in Chapter 4.

CHAPTER 4 INTEGRATION OF CHAPTERS 1, 2, and 3: GENERAL DISCUSSION

4.1 General Summary

The springboard for the current paper was the detection of a new and previously unanticipated autobiographical memory function of perspective taking. Although the evidence for the perspective taking function was strong (Ranson & Fitzgerald, in preparation), its novelty warranted theoretical substantiation and empirical replication. Chapter 1 of the current paper explored the theoretical justification of the perspective taking function by adapting an existing cognitive process model to explain how autobiographical memory content might be used in the service of perspective taking, thereby qualifying perspective taking as *function* of autobiographical memory. Simulation theory according to Goldman (2006) posits that perspective taking was made possible when "background information" drawn from long-term memory storage was imaginatively mixed simulated to generate the possible mental states of another. Long-term memory content could therefore be seen as "input" for simulation processing. Using theory, taxonomy, conceptual cognitive models, and empirical evidence from brain imaging studies, Chapter 1 argued that a specific form of long-term memory content serving as simulation "input" is *autobiographical* memory content.

A recent revision to simulation theory by Shanton and Goldman (2010) augmented the simulation process model to explain both perspective taking and another simulation-based phenomena, mental time travel. To complement these dual purposes for which simulation could be used, Shanton and Goldman proposed the existence of two simulation forms: *interpersonal*, which underlies *other*-directed perspective taking, and *intrapersonal*, which underlies *self*-directed mental time travel. To illustrate how the specific form of long-term memory content used for interpersonal and intrapersonal simulation could be autobiographical, Chapter 1 proposed the Expanded Simulation Model—an extension of the revised simulation process model by Shanton and Goldman into which a conceptual model (the Self-Memory System by Conway, 2005, and Conway & Pleydell-Pearce, 2000) and a computational model (the Source Activation Confusion model by Reder et al., 2002, and Reder et al., 2009) were integrated in order to explain how autobiographical memory content could be activated and retrieved for perspective taking or mental time travel. To make the Expanded Simulation Model more amenable to empirical testing, Chapter 1 operationalized mental time travel as prospection (the use of autobiographical memory content to go forward in conceptual time to "pre-experiencing" the future) and counterfactual thinking (the use of autobiographical memory content to go back in conceptual time to "reframe" the past). Chapter 1 then argued that, if it could be empirically demonstrated that autobiographical memory content was used for perspective taking, prospection, and counterfactual thinking, such would be evidence that perspective taking, prospection, and counterfactual thinking are hypothetical functions of autobiographical memory.

The objectives of Chapters 2 and 3 concerned the empirical testing of select Chapter 1 hypotheses. Chapter 2 reported Study 1, which detailed the validation of the *Autobiographical Memory Functions of Simulation* (AMFS) scale. Chapter 3 detailed Study 2, which employed the AMFS and existing measures intended to support Chapter 1 hypotheses. Chapter 4 provides a general discussion about the intellectual merit and broader impacts of the current paper. The confirmation of previous research; strengths and novel contributions; issues, limitations, and nonsignificant findings; and implications and future directions are specifically addressed.

4.2 Confirmation and Corroboration of Previous Research

Confirmation of Chapter 1 Hypotheses

Study 2 was designed to empirically confirm the theoretically substantiated hypotheses of Chapter 1. Results of Study 2's Hypotheses 3.1 (the nine-factor structure) and 3.2 (the mapping of the nine-function structure onto the broad functions of the TALE) provided evidence for Hypothesis 1.2 (autobiographical memory content is a form of long-term memory content that can be used for simulation-based perspective taking), and Hypothesis 1.5 (autobiographical memory content is a form of long-term memory content that can be used for simulation-based mental time travel). The rated frequency of functional use of autobiographical memory content for perspective taking, prospection, and counterfactual thinking as measured by the AMFS served to demonstrate that individuals do use autobiographical memory content for theses purposes. As such, the use of autobiographical memory content for these purposes renders them *functions* of autobiographical memory to support Hypothesis 1.6 (perspective taking and the mental time travel behaviors of prospection and counterfactual thinking are functions of autobiographical memory). Finally, results of Hypothesis 3.4—that Perspective TakingAMFS and Counterfactual Thinking were significant predictors of the simulation-based Cognitive Reappraisal dimension from the ERQ (Gross & John, 2003), whereas Prospection was not—supported Hypothesis 1.7 (the autobiographical memory function of simulation-based perspective taking reflects interpersonal simulation; and the autobiographical memory functions of simulation-based prospection and counterfactual thinking reflect intrapersonal simulation). As such, results of the current paper add practical relevancy to what was as previously an untested conceptual supposition. Finally, and perhaps most importantly, results of Hypothesis 3.2 tests confirmed the replication of the Perspective Taking$_{AMFJR}$ function, an objective that was the initial catalyst for the current paper.

Corroboration of Related Brain Evidence

Because the current paper demonstrated, theoretically and empirically, that autobiographical episodic memory content could be used for the simulation-based functions of perspective taking, prospection, and counterfactual thinking, the current paper corroborates and provides a framework within which evidence from a variety of brain studies is unified. Neuroimaging research shows that the circuitry involved in autobiographical memory content retrieval (Buckner et al., 2008); mental simulation (e.g., Buckner, et al., 2008; Spreng & Mar, 2012); perspectivity (e.g., Buckner & Carroll, 2006; Spreng et al., 2009; Spreng & Grady, 2010; Rabin et al., 2010), perspective taking (Dodell-Feder et al., 2014; Knox, 2010; Perry et al., 2011); episodic simulation for prospection (Addis et al., 2009; De Brigard et al., 2013; De Brigard et al., 2016; Schacter, 2012; Schacter & Addis, 2007; Zheng et al., 2014), and counterfactual thinking (e.g., Addis et al., 2009; De Brigard et al., 2013; De Brigard & Giovanello, 2012; De Brigard et al., 2015; Schacter et al., in press; Van Hoeck et al., 2013) are underlain by shared neural circuitry largely within the default network (e.g., Andrews-Hanna, Smallwood, & Spreng, 2014). Not only does this research indicate that such capacities share neural real estate, the implicated neural substrates are known to feature overlapping functionality. The widely accepted interpretation of such neural collaboration is that these structures and processes arose simultaneously for the purposes of working symbiotically (e.g., Atance & O’Neill, 2001, 2005; Barsalou, 1988, 2003; Brown & Kulik, 1977; Suddendorf & Busby, 2003). Thus, the current paper’s finding that retrieved autobiographical memory content can be mentally simulated for the purpose of perspective taking, prospection, and counterfactual thinking provides an example of how known interconnected and interdependent brain processes manifest as everyday observable human behaviors.

Corroboration of Simulation Theory and Its Expansion

By acquiring evidence that autobiographical memory content—a hypothesized form of long-term memory content (e.g., Cohen & Squire, 1980; Tulving, 1972)—is used for perspective taking, indirect support was yielded for the simulation process model of perspective taking according to simulation theory (Goldman, 2006). Simulation theory posits that background information from long-term memory storage is used as simulation "input" (see Figure 2), which is then mixed with imagination to generate possible mental states to be attributed to a target other. Because autobiographical memory is a form of long-term memory (e.g., Tulving, 1972), the current paper provides empirical evidence that long-term memory content is used as simulation input for perspective taking.

The current paper also provides empirical support for the recent extension of simulation theory (Shanton & Goldman, 2010), which was augmented to account for mental time travel. Although Shanton and Goldman propose simulation as the mechanism through which individuals travel back through conceptual time in order to "re-experience" episodic memory content (a phenomenon that they call "episodic memory"), or through which individuals travel forward through conceptual time in order to "pre-experience" the future based on episodic memory content (a phenomenon that they call "prospection"), the current paper hypothesized that individuals also travel back through conceptual time in order to "reframe" episodic memory content—a phenomenon known in the literature "counterfactual thinking." The current paper also presented and discussed brain evidence that supports the inclusion of counterfactual thinking as a purpose for which episodic memory content is imaginatively simulated (e.g., Addis et al., 2009; De Brigard et al., 2013; De Brigard & Giovanello, 2012; De Brigard et al., 2015; Schacter et al., in press; Van Hoeck et al., 2013), thereby extending even further the utility of simulation theory and the simulation process model.

Confirmation of Individual Differences in Rated Frequency of Functional Use of Autobiographical Memory

The current paper also confirmed a number of individual differences in personality, age, gender, and culture as reported in the literature with respect to the Social, $\mathrm{Self}_{\mathrm{TALE}}$, and Directive autobiographical memory functions of the TALE (Bluck & Alea, 2011). Study 2 confirmed previous findings that the broad Social function is predicted by Extraversion (Rasmussen & Berntsen, 2010; Bluck & Alea, 2009) and Openness to Experience (Rasmussen & Berntsen, 2010; Bluck & Alea, 2009); that the broad Directive function is predicted by Emotionality/Neuroticism (Rasmussen & Berntsen, 2010) and Openness to Experience (Rasmussen & Berntsen, 2010); and that the Self function is predicted by Emotionality/Neuroticism (Cappeliez & O'Rourke, 2002; Rasmussen & Berntsen, 2010) and Openness to Experience (Rasmussen & Berntsen, 2010). Such replications were important given that the reported effects of personality on rated frequency of functional use of autobiographical memory are not consistent across studies (Rasmussen & Berntsen, 2010).

Study 2 also confirmed the age effect reported by Bluck and Alea (2009), whereby older adults use autobiographical memory content for $\mathrm{Self}_{\mathrm{TALE}}$ with less frequency than younger adults. Additionally, Study 2 found this same effect for $\mathrm{Self}_{\mathrm{AMFJR}}$ and Counterfactual Thinking—both of which map onto $\mathrm{Self}_{\mathrm{TALE}}$—to support the current paper's contention that first-order functions can inherit the individual differences of the second-order function to which they are empirically linked.

Finally, Study 2 replicated, albeit only marginally significantly, the pattern of two culture effects found in the validation of the AMFJR (Ranson & Fitzgerald, in preparation). As was reported previously, Caucasians were found to use autobiographical memory content for the AMFJR function of Conversation with greater frequency than African-American/Blacks.

Likewise, results of Study 2 confirmed that African-American/Blacks use autobiographical memory with greater frequency than Caucasians for the AMFJR function of Teaching/Problem Solving/Behavioral Control. Although the effects were not significant, this was most likely due to the small sample size of the African-American/Black group obtained for Study 2.

Chapter 4.3 Strengths and Novel Contributions

Strengths

A major strength of the current paper is the rigor with which the statistical analyses of Study 1 and Study 2 were conducted. Whereas much research with ordinal-level data is improperly treated as continuous, the current paper employed several statistical methods and techniques designed to accurately assess Likert-type responses. Such an approach better ensures the acquisition of truthful results and therefore more credible and meaningful interpretations.

Another strength is the current paper's multi-perspective approach to testing the viability of the autobiographical memory function of perspective taking, and ultimately the autobiographical memory functions of prospection and counterfactual thinking. From a theoretical standpoint, conceptual and computational models were adapted and integrated in support of the hypotheses that autobiographical memory is employed in ways that have not previously been considered by memory researchers. Brain evidence from various lines of research was presented and integrated in support of theory and as the basis of prediction. A reliable measurement instrument, the AMFS, was developed and validated for the purpose of empirically testing the current paper's theoretical claims.

Novel Contributions

Although the initial impetus for the current paper was the theoretical and empirical substantiation of Perspective Taking$_{AMFJR}$, what emerged was the discovery and ultimate verification of the two new and independent autobiographical memory functions of Prospection, and Counterfactual thinking. Study 2 also showed that the new functions mapped onto the broad TALE (Bluck & Alea, 2011) functions such that Perspective Taking$_{AMFS}$ was broadly Social, Prospection was broadly Directive, and Counterfactual Thinking was broadly Self$_{TALE}$ as predicted by theory and related findings.

The current study also introduced a new valid and reliable instrument for measuring the perspective taking, prospection, and counterfactual thinking functions of autobiographical memory. Because the functions measured using the *Autobiographical Memory Functions of Simulation* (AMFS) scale were shown to be independent in the presence of the functions measured by the *Autobiographical Memory Functions of Joint Reminiscence* (AMFJR) scale (Ranson & Fitzgerald, in preparation)—which also map onto the broad Social, Self, and Directive functions—the AMFS can be used alone or in conjunction with other autobiographical memory functions scales without loss of structural integrity.

Although previous research supports the argument that the context within which the items of an autobiographical memory scale are situated is vital to the detection and accurate assessment of the functions being measured (e.g., Kulkofsky & Koh, 2009), the current paper was the first known study to compare and contrast the subscales of two constructually identical, but differentially contextually situated, functions. The current study found that the "simulation-based" Perspective Taking$_{AMFS}$ and the "socially situated" Perspective Taking$_{AMFJR}$ yield only moderately correlated response data, even across the two items shared by both scales. Because the presentation of Study 2 survey blocks were randomly ordered, the current study eliminated the risk that such effects would be confounded by order effects.

As was recommended by Ranson and Fitzgerald (in preparation), associations found between the broad Social, $\text{Self}_{\text{TALE}}$, and Directive functions and the functions of the AMFJR were tested in a second-order structural equation model whereby the AMFJR functions were configured as first-order latents subordinate to the second-order TALE function to which they were associated per previous findings. Not only as the model recommended by Ranson and Fitzgerald confirmed, but a CFA incorporating the AMFS functions also yielded the predicted second-order model. Further support for the higher-order configurations was obtained through the "inheritance" of the individual difference effects by first-order AMFS and AMFJR functions from the second-order TALE function with which they were empirically linked. The current paper argued that, if the higher-order function was indicated by the lower-order function, then the effects of the broader higher-order function would be shared by the lower-order function, which represents more narrowly defined aspects of the broad function.

The current paper not only replicated a number of individual differences effects reported in the literature, but also yielded evidence for effects that have eluded detection in other studies. For example, Rasmussen and Berntsen (2010) reported that personality effects assessed on the broad functions of the TALE (Bluck et al., 2005; Bluck & Alea, 2011) were inconsistent with respect to Agreeableness and Conscientiousness. However, the current paper found that both Agreeableness and Conscientiousness positively predicted the Social and Directive functions, as well as Social's subordinate functions of Perspective $\text{Taking}_{\text{AMFS}}$, Perspective $\text{Taking}_{\text{AMFJR}}$, and AMFJR Conversation and Relationship Maintenance, and the Directive's subordinate functions of AMFS Prospection, and AMFJR Teaching/Problem Solving/Behavioral Control and Emotion Regulation. However, the effects yielded by the current paper are small—perhaps negligible—and may therefore have limited utility to autobiographical memory functions research. If nothing else, the reported effect sizes should assist researchers in determining the needed power to detect expected effects of this size, or help to justify why effects may be inconsistent across studies.

Finally, the current paper demonstrated the fitness and utility of the HEXACO-100 (Ashton & Lee, 2004; 2009) for autobiographical memory research. Study 1 and 2 results showed that, for those HEXACO dimensions that align with traditional Big Five factors (Agreeableness, Conscientiousness, Emotionality/Neuroticism, Extraversion, and Openness to Experience), effects found in previous studies were replicated. As such, the HEXACO was shown to be a faithful alternative to traditional Five Factor scales. Additionally, the HEXACO's Honesty-Humility dimension and the interstitial facet of Altruism provided additional insight into the individual differences in rated frequency of functional use of autobiographical memory content.

Chapter 4.4 Issues, Limitations, and Nonsignificant Findings

Issues in Measurement and Analysis

The foremost issue of the current paper was the high inter-item correlations between the items of the AMFS's Counterfactual Thinking subscale, which were yielded by the Study 2 data. This finding was unexpected, as it was not prefigured by Study 1 results. Before proceeding, the AMFS structure was re-verified with EFA[65] using Study 2 data, as well as CFA. Although the CFA results revealed some attenuated fit indices and destabilized estimates, the least favorable outcomes were restricted to the Counterfactual Thinking subscale, and the overall models were not unduly compromised according to accepted guidelines. Thus analyses proceeded, and results were interpreted with caution.

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[65] Upon discovery of the high inter-item correlations of the Counterfactual Thinking subscale, a principal axis factoring EFA was run using R-Factor (Basto & Pereira, 2012a) in SPSS (IBM Inc., 2015) so as to verify the AMFS structure. Despite the fact that the loading values of the Counterfactual Thinking items on its factor were high, overall results were commensurate with the EFA conducted for Study 1.

The reason for the high inter-item correlations on the Counterfactual Thinking subscale in Study 2 is unknown. Potential causes include the possibility that, although not portended by Study 1 results, the Counterfactual Thinking subscale may be too conceptually narrow (Clark & Watson, 1995). Because individual differences in counterfactual thinking are rarely assessed (Ruiselová et al., 2009), there are no existing self-report counterfactual thinking scales from which potential Counterfactual Thinking items might have been adapted. Secondly, the Study 1 survey included the qualitative mental time travel conditions, one of which concerned counterfactual thinking. Because Study 1 presented the mental time travel conditions before the AMFS scale, Study 1 respondents may have been inadvertently primed to respond to the AMFS items differently than was the case for Study 2, which did not include the mental time travel conditions. However, this explanation suggests that similar issues should have occurred with the AMFS subscale of Prospection, which was also preceded by a prospection mental time travel condition in Study 1. However, the Prospection subscale performed consistently across Studies 1 and 2. Thirdly, the blocks of scale items were randomly presented in the Study 2 online survey, but were not for randomly ordered in Study 1. As such, Study 1 may have inadvertently induced order effects that would not have likewise occurred in Study 2. However, this too suggests that any such order effects would have likewise impacted the Perspective Taking and Prospection subscales, but did not. Finally, there may have been differences between the Study 1 and Study 2 samples that influenced these results. Although the mean ages, age ranges, and gender split for Study 1 and Study 2 were equivalent, there were differences in ethnic/race representation. For example, the Study 1 sample was approximately 25% African-American/Black (which was also the case for Ranson & Fitzgerald, in preparation), but the African-American/Black group comprised less than 6% of the sample for Study 2.

A second issue with Study 2 was that the complexity of the proposed CFA models prohibited the use of polychoric correlations with asymptotic covariance matrices, both of which are recommended for ordinal and MV nonnormal data, and which are necessary to produce the Satorra-Bentler adjusted chi-square. Although a workaround using the Bollen-Stine (Bollen & Stein,1992) bootstrap (2000 iterations) was recommended as an acceptable workaround in the literature (e.g., Byrne, 2000; Cheung & Lau, 2008; Hox, 1995; Ichikawa & Konishi, 1995; Yuan & Bentler, 2000; Yung & Bentler, 1996; Zhu, 1997), comparisons of CFA results for each of the three individual scales (AMFS, AMFJR, TALE) used to test the hypothesized models showed that, compared to estimates and fit indices yielded with the polychoric protocol, results were acceptably commensurate, but nonetheless less favorable (e.g., higher chi-square values using Bollen-Stine). As such, results were interpreted with caution. The current paper also emphasizes the importance of future research to replicate results with a statistical software package (e.g., EQS, Multivariate Software, 2014) capable of simultaneous polychoric matrix construction.

Limitations

There are a number of assumptions made by the current paper that could, if unfounded, weaken, if not invalidate, results. One, it was assumed that respondents understood the use of autobiographical memory content for various behaviors to the extent that they could reasonably estimate their use of autobiographical memory content for those behaviors. In an attempt to garner support for this assumption, Study 1 included qualitative measures intended to support the assumption that respondents' perceptions of their estimated use of autobiographical memory content is just that (i.e., how frequently they use autobiographical memory content for perspective taking, prospection, and counterfactual thinking), and not simply their estimates of the frequency with which they engage in the corresponding behavior (i.e., how frequently they engage in perspective taking, prospection, and counterfactual thinking regardless of whether or not autobiographical memory content is used). Although these Study 1 data were not formally analyzed, responses were consistent with related research employing similar paradigms. However, without the corroboration of corresponding brain data (e.g., indicating that the areas of the brain responsible for autobiographical memory retrieval are activated during estimation of rated frequency of functional use of autobiographical memory content for any of the measured functions), this remains an empirically unsubstantiated assumption.

Additionally, the literature supports the assumption that *episodic*, more so than *semantic*, autobiographical memory content is used for the reminiscence behaviors measured by autobiographical memory functions scales (e.g., Tulving, 2002b), as well as mental simulation (e.g., Gaesser & Schacter, 2014), perspective taking (Shanton & Goldman, 2010), and mental time travel (e.g., Duval, Desgranges, de La Sayette, Belliard, & Eustache et al., 2012; Irish, Addis, Hodges, & Piguet, 2012; Klein, Loftus, & Kihlstrom, 2002; Manning, Denkova, & Unterberger, 2013; Shanton & Goldman, 2010). As such, the current paper founded arguments on this assumption and supported these contentions with established theory. For example, Chapter 1 employed the SAC (Reder et al., 2002; Reder et al., 2009) to explain how episodic autobiographical memory content could be *preferentially* activated over semantic autobiographical memory content so that simulation for perspective taking or mental time travel could ensue. However, no current autobiographical memory functions scale can empirically verify that episodic memory content is preferentially used; thus if it were discovered that semantic memory content could be simulated as well as episodic memory content for the "re-experience" of past events, a number of the current paper's conclusions would be annulled.

The current paper also assumes that the autobiographical memory functions proposed and verified herein exist fully independently of human-designed measurement procedures (e.g., Maul, 2013). However, much like the nature of light ("is it a wave or a particle"?), the autobiographical memory functions that emerge through the various self-report instruments may be shaped by the instrument itself. Given the differential use of autobiographical memory content for simulation-based Perspective Taking$_{AMFS}$ versus socially situated Perspective Taking$_{AMFJR}$, rated frequency of functional use of autobiographical memory content for any purpose may be fully dependent on the measurement context within which it is grounded, whether intentional or not. However, at least at present, there appears to be no way to find autobiographical memory functions that are not first conceptualized, then explicitly sought.

Nonsignificant Findings

As for nonsignificant findings, Study 2 was intentionally adequately powered to ensure that even small effects would be detected. This facilitated the current paper's success in yielding effects that other studies have either failed to find or reported as inconsistent, most likely because other studies were underpowered. As such, the current paper's nonsignificant effects were in most cases true null effects. For those effects that were significant, effect sizes were also reported so that researchers could draw their own conclusions about their relative importance.

In other cases, the current study did not include supplementary measures that may have yielded effects found in related research. For example, previous studies (Addis et al., 2009; Cole, Morrison, & Conway, 2013, Schacter, Gaesser, & Addis, 2013) have reported that older adults' imagined future scenarios tend to feature more semantic versus episodic detail. This could have implications for rated frequency of functional use of autobiographical memory content for prospection, given that prospection is thought to rely primarily on episodic autobiographical memory content (e.g., Tulving, 2002b; Shanton & Goldman, 2010). That Study 2 found no differential use of autobiographical memory content as a function of age for Prospection, could imply that any predominance of semantic detail used for older adults' prospections has little to no impact on rated frequency of functional use of autobiographical memory for that purpose. However, because one of the limitations of the current study is that the AMFS—like any functions scale—cannot distinguish between the use of episodic versus semantic autobiographical memory content, it is not possible to draw a firm conclusion about any nonsignificant results for which episodic versus semantic detail may be a factor.

Although the majority of individual difference effects found for the Social, $\text{Self}_{\text{TALE}}$, and Directive functions were "inherited" by their corresponding subordinate functions, there were a few nonsignificant findings. For example, for personality, Perspective $\text{Taking}_{\text{AMFS}}$ inherited all of the Social TALE effects, but Perspective $\text{Taking}_{\text{AMFS}}$ was predicted by the inverse of the Honesty-Humility facet of Greed-Avoidance, whereas the broad Social function was not. Likewise, although results of Hypothesis 3.2 indicated that $\text{Self}_{\text{AMFJR}}$ function mapped onto $\text{Self}_{\text{TALE}}$, results showed that, unlike $\text{Self}_{\text{TALE}}$, $\text{Self}_{\text{AMFJR}}$ was not significantly predicted by age. However, in this case, the effect of age on $\text{Self}_{\text{AMFJR}}$ was marginally significant (p = .062), and, like $\text{Self}_{\text{TALE}}$, showed the same decline in rated frequency of functional use of autobiographical memory over the lifespan. Therefore, the failure of the first-order functions to inherit the effects found for their higher-order broad functions may imply that, whereas some individual differences can be captured only at the broad, higher-order level, other individual differences can only be detected at the subordinate level where the constructs are more precisely defined.

Finally, that the current study did not include more measures that may have elucidated various findings and effects may be seen as a limitation. For example, variables such as attachment and coping styles, or the incorporation of emotion manipulation techniques, would have provided additional data with which to parse the effects of emotional valence known to inform autobiographical memory content, its recall, and its use (for a review, see Holland & Kensinger, 2010). But given that the main objective of the current paper was to validate and examine the autobiographical memory functions of perspective taking, prospection, and counterfactual thinking, the current paper's investigations were limited to those that would most thoroughly, yet resourcefully, serve that purpose.

Chapter 4.5 Implications and Future Directions

From a research perspective, it is hoped that substantiating the existence of three new autobiographical memory functions of perspective taking, prospection, and counterfactual thinking through theory and testing will prompt other researchers to consider potentially overlooked uses of autobiographical memory. From a clinical perspective, understanding how autobiographical memory content informs interpersonal and intrapersonal simulation can aid counselors and developers of interventions interested in addressing the source of maladaptive perspective taking, prospection, and counterfactual thinking strategies. Future studies should aim to replicate the findings of Study 2 and use its results as guidelines for further inquiry. Future studies should also develop ways to test elements of the Expanded Simulation Model other than the long-term memory component—either those that follow as proposed in simulation theory (Goldman, 2006; Shanton & Goldman, 2010) or those that were revealed when the long-term memory component was "unpacked" in Chapter 1.

Chapter 1 also posits that the Expanded Simulation Model, by way of the SAC (Reder et al., 2002; Reder et al., 2009), accounts for research indicating that semantic and episodic autobiographical memory exist on a continuum that allows these memory forms to overlap

(Baddeley, 2001; Brewer, 1996; Burianova et al., 2010; Gilboa, 2004; Rajah & McIntosh, 2005; Tulving, 2001). And although episodic memory is thought essential to “re-experiencing,” “pre-experiencing,” and “reframing” past scenarios (Abram et al., 2014; Markowitsch & Staniloiu, 2011; Piolino et al., 2009; Tulving, 2002b), it is known that the retrieval of *semantic* autobiographical memory content can facilitate access to more specific *episodic* autobiographical memory content (Conway, 2005; Conway & Pleydell-Pearce, 2000). In fact, recent research suggests that, with respect to prospection, autobiographical memory has a definitive “future” form comprised of episodic (imagining future scenarios) and semantic (imagining future self-knowledge or general events) properties (Duval et al., 2012; Irish et al., 2012; Klein et al., 2002; Manning et al., 2013). However, with respect to autobiographical memory functions, neither the AMFS, nor the AMFJR, nor the TALE were designed to evaluate the differential use of past versus future episodic and semantic memory. As this is an expanding line of research that could bring clarity and cohesion to the current paper and other studies, future research should focus on developing paradigms that more thoroughly explore the extent to which episodic versus semantic content is used with respect to rated frequency of functional use of autobiographical memory content.

That the current paper yielded evidence of differential context effects for “simulation-based” Perspective Taking$_{\text{AMFS}}$ and “socially situated” Perspective Taking$_{\text{AMFJR}}$, should prompt researchers to consider other contexts from which other functions might emerge—that is, research might take a less global approach to the exploration of autobiographical memory functions in order to discern more situation-specific uses of autobiographical memory. Likewise, much like trends in personality research, researchers might take a holistic, process-based approach to the conceptualization and exploration of autobiographical memory functions as a complement to the study of traditional, mechanistic functions.

Future autobiographical memory functions studies would be well served by including measures of emotion/affect. There is a wealth of literature corroborating the importance of emotion—at both state- and trait-levels—to the encoding and "re-experience" of autobiographical memory content. Results of the current paper imply that taking emotion into consideration would enrich our understanding of rated frequency of functional use of autobiographical memory, especially for those functions that manifest as behaviors known to have strong emotional components. For example, while the conclusion of the current paper is that Counterfactual Thinking is a function of autobiographical memory, the counterfactual thinking literature has surprisingly little to say about the use of memory information in the generation of counterfactuals, unlike research on reminiscence and prospection, for which the use of memory information is a main focus. Rather, the use of memory content with respect to counterfactual thinking is simply assumed. Instead, research in this area focuses on the emotional basis of counterfactual thinking, and in particular, whether the counterfactuals generated are *upward* (positive) or *downward* (negative) in emotional bias. Thus, such individual differences as older adults having been found to engage in more positive (upward) counterfactuals than younger adults (Mather & Carstensen, 2005), could be neither confirmed nor disconfirmed by the current paper because the current paper included no measures for discerning the emotional bias of the autobiographical memory content used for counterfactuals. Future studies should attempt to add emotion and other measures to their research designs in order to make full use of the findings from related literatures as support for the results of functions research.

The current paper also added to the literature on autobiographical memory and culture, having yielded evidence for the differential use of autobiographical memory content within and between ethnic groups. Granted, the investigation of culture effects on autobiographical memory functions research is challenging, given the difficulties in obtaining subgroup samples large enough to sufficiently power a study in which such effects are likely to be small. However, cultural differences in the content (e.g., Ross & Wang, 2010), use (e.g., Ranson & Fitzgerald, in preparation), and cognitive processing (e.g., Ambady & Bharucha, 2009) of autobiographical memory suggest that this is a valid and important line of inquiry.

With respect to individual differences in general, memory research—including Studies 1 and 2 of the current paper—have perhaps been negligent by not evaluating the sum total of variance attributed to individual differences. In retrospect, the inclusion of such analyses may have yielded more meaningful answers to questions concerning the role of individual differences in the rated frequency of autobiographical memory content for the functions under review. However, adding potentially informative, but essentially subordinate, analyses to the current paper would have been excessive for a study primarily focused on the validation of new autobiographical memory functions. Thus future autobiographical memory studies with a primary objective of testing individual differences should strongly consider the incorporation of such tests.

Contingently, future research should develop paradigms for testing each step of the simulation theory cognitive process, as well as the components of the Expanded Simulation Model. The current paper did not empirically test Chapter 1's Hypothesis 1.1 (that mental simulation is the mechanism by which autobiographical memory content is used for perspective taking, prospection, and counterfactual thinking), Hypothesis 1.3 (that the search and retrieval process for relevant autobiographical memory content for perspective taking, prospection, and counterfactual thinking is as proposed by the Self-Memory System according to Conway and Pleydell-Pearce, 2000), or Hypothesis 1.4 (that the activation and retrieval of relevant autobiographical memory content for autobiographical memory content for perspective taking, prospection, and counterfactual thinking is as proposed by the Source Activation Confusion computational model according to Reder et al., 2002, and Reder et al., 2000), because such would require neuroimaging or other cognitive tests beyond the current study's scope. However, it is important to test each stage of the simulation process, both upstream and downstream from the long-term memory component, in order to empirically validate and expand upon current theory.

4.6 Conclusion

In the late 1980s, memory researcher Alan Baddeley asked, "What the hell is it for?", and a new domain of autobiographical memory research was born. Research began to identify the everyday purposes for which humans use autobiographical memory; that is, the *functions* of autobiographical memory (Baddeley, 1988; Bluck & Alea, 2002, 2011; Neisser, 1982). The current paper aimed to add to that growing body of research by theoretically and empirically substantiating the autobiographical memory functions of perspective taking, prospection, and counterfactual thinking.

APPENDIX A
Studies 1 & 2: Mechanical Turk Worker's Agreement

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3. **Your Use of the Site**

a. **Requesters in General**. Upon completion of Services to Requesters' reasonable satisfaction, Requesters must pay Providers for their Services. As a Requester, you agree that upon your approval of the Services performed by a Provider, payment will be remitted to the Provider automatically (as described in Section 4 below). After you have approved the applicable Services, you are not entitled to any refund of your payment for such Services. If a Requester is not reasonably satisfied with the Services, the Requester may reject the Services. As a Requester, you will be charged a fee for your use of Amazon Mechanical Turk in connection with each request for Services. Please review the applicable Amazon Mechanical Turk Fees contained in the Policies for all applicable fees associated with your use of the Site pursuant to this Agreement. All fees are in U.S. dollars unless stated otherwise. The Amazon Mechanical Turk Fees may vary in the future. You agree to pay the amounts set forth in the Amazon Mechanical Turk Fees from time to time on the terms set forth herein and therein, and to check the fees and terms each time you use the Site. You acknowledge that, while Providers are agreeing to perform Services for you as independent contractors and not employees, repeated and frequent performance of Services by the same Provider on your behalf could result in reclassification of that employment status. If you have any questions about your obligations to comply with local laws and regulations pursuant to Section 6, you should seek independent legal advice. To the extent you receive any contact or personal information regarding any Provider who has performed Services for you, such information may only be used as necessary for you to comply with applicable laws and for no other purpose whatsoever. Further, you agree that you will only accept work product from Providers that has been submitted through the Site.

b. **Providers in General**. You may only register once with Mechanical Turk as a Provider. Providers may perform Services for any Requester in accordance with the specifications submitted by the Requester. However, if the Services do not meet the Requester's reasonable satisfaction, the Requester may reject the Services and repost the specific request. As a Provider, the Requester for whom you provide Services is your client, and as such, you agree that the work product of any Services you perform is deemed a "work made for hire" for the benefit of the Requester, and all ownership rights, including worldwide intellectual property rights, will vest with the Requester immediately upon your performance of the Service. To the extent any such rights do not vest in Requester under applicable law, you hereby assign or exclusively grant (without the right to any compensation) all right, title and interest, including all intellectual property rights, to such work product to Requester. As a Provider you are performing Services for a Requester in your personal capacity as an independent contractor and not as an employee of the Requester. You specifically acknowledge and agree to the following: (i) you will not use robots, scripts or other automated methods to complete the Services; (ii) you will submit all work product through the Site only, and not directly to a Requester; (iii) you will provide Requesters for whom you perform

Services with any information reasonably requested by them in connection your performance of such Services; (iv) you are responsible for, and have and will, comply with all applicable laws and registration requirements, including those applicable to independent contractors and maximum working hours regulations; (v) this Agreement does not create an association, joint venture, partnership or franchise, employer/employee relationship between Providers and Requesters, or Providers and Amazon Mechanical Turk; (vi) you will not represent yourself as an employee or agent of a Requester or Amazon Mechanical Turk; (vii) you will not be entitled to any of the benefits that a Requester or Amazon Mechanical Turk may make available to its employees, such as vacation pay, sick leave, insurance programs, including group health insurance or retirement benefits; (viii) you are not eligible to recover worker's compensation benefits in the event of injury; and (ix) if you are not a resident or citizen of the United States, all Services that you use the Site to perform for a Requester will be performed outside of the United States. If you have any questions about your obligations to comply with local laws and regulations pursuant to Section 5, you should seek independent legal advice.

c. **Listing and Promotions Generally**. As a Requester or Provider, you may not sell, offer for sale, request, purchase, or provide any Service that violates applicable law or is prohibited by the Policies. Notwithstanding any provision of this Agreement, Amazon Mechanical Turk will have the right, in its sole discretion, to determine the content, appearance, design, functionality and all other aspects of the Site (including the right to re-design, modify, remove and alter the content, appearance, design, navigation, functionality, and other aspects of the Site and/or any page thereof and any element, aspect, portion or feature thereof, from time to time).

d. **Information and Feedback**. You must supply accurate and complete information for all Services in accordance with our data requirements, as may be designated by us from time to time, including in the Policies. You recognize and agree that Amazon Mechanical Turk will implement mechanisms allowing us and others to track your requests for, or your performance of, Services and rate your performance as a Requester or Provider, and Amazon Mechanical Turk reserves the right to collect feedback regarding your performance and to post such feedback on the Site. You may not take any actions that may undermine the integrity of the feedback system. You agree that submission of any information, feedback, content, data or other materials (collectively, "**Materials**") is at your own risk, and that none of Amazon Mechanical Turk, its Affiliates, Requesters or Providers has any obligations (including without limitation obligations of confidentiality) with respect to such Materials. You represent and warrant that you have all rights necessary to submit the Materials. You hereby grant to Amazon Mechanical Turk and its Affiliates a royalty-free, non-exclusive, worldwide, perpetual, irrevocable right and license to use, reproduce, perform, display, distribute, adapt, modify, re-format, create derivative works of, and otherwise commercially or non-commercially exploit in any manner, any and all Materials, and to sublicense the foregoing rights, in connection with the operation and maintenance of the Site. For avoidance of doubt, if you are a Requester, if you create any tests, specifications, criteria lists or other programs for use on the Site to evaluate or otherwise select Providers they will be considered Materials for purposes of this Agreement and may be used and/or referenced by us or other Requesters and Providers pursuant to the license granted above.

e. **Customer Service**. Amazon Mechanical Turk will be responsible for and will have sole discretion regarding all customer service issues relating to use of the Site and its features.

f. **Disputes between Requesters and Providers**. Your use of the Site is at your own risk. Because Amazon Mechanical Turk is not involved in the actual transaction between Providers and Requesters, Amazon Mechanical Turk will not be involved in resolving any disputes between participants related to or arising out of the Services or any transaction.

4. **Payment Service**. Amazon Mechanical Turk or its Affiliates will process all payments made by Requesters to Providers (the "**Payment Service**"). Requester payments made through the Payment Service are received by Amazon Mechanical Turk or its Affiliates on behalf of Providers, and may be disbursed only in accordance with the terms outlined below.

a. **Prepaid HITs**. Each Requester must prepay for work they intend on acquiring through the Services by purchasing Mechanical Turk Prepaid HITs ("**Prepaid HITs**") from Amazon Payments, Inc. Prepaid HITs are subject to the Mechanical Turk Prepaid HITs Terms and Conditions. Prepaid HITs are maintained in a single Prepaid HIT account for you solely for use of the Services. The amount of Prepaid HITs purchased must be at least equal to the total amount that will be owed to Providers upon completion and acceptance of the Services and any amounts payable to Amazon Mechanical Turk in connection with Requester's use of the Site. If the Prepaid HITs are purchased with proceeds from a bank account, the Prepaid HITs may not be available for use for up to four (4) days before such funds are available for disbursement to a Provider's Payment Account (defined below). After Requester's acceptance of the Services, the Payment Service will debit the amount owed to each Provider from the Requester's Payment Account, and credit each Provider's Payment Account that amount.

b. **Disbursement of Funds to Providers**. When Providers register with the Site, a payment account ("**Payment Account**") will automatically be established in conjunction with their registration. Providers may disburse funds from their Payment Account by the following methods, at their option: (i) to an ACH-Enabled Bank Account in U.S. dollars; (ii) or by converting such funds to a credit that is held for the benefit of Provider in an Amazon.com gift certificate account. For select countries, Amazon Mechanical Turk may enable Providers to request disbursements through physical checks in U.S. or local currency. Check disbursements may be subject to additional fees, registration and documentary requirements. See our FAQs for more information. Funds will only be disbursed in compliance with applicable laws and regulations, including without limitation the United States Patriot Act and the regulations of the Office of Foreign Assets Control. Providers may not share a bank account. We reserve the right to cancel your Payment Account for any reason.

c. **Authorizations for ACH-Enabled Bank Account**. If you are a Provider, you hereby authorize Amazon Mechanical Turk and its Affiliates, and any third party service providers or agents acting on their behalf, to debit or credit your ACH-Enabled Bank Account (including by creating a paper draft or an electronic funds transfer) and/or your Payment Account, as applicable, (i) to transfer, disburse or process other payment transactions associated with the Services; and (ii) to settle payment for any fees that may be charged under this Agreement. In the event there is an error in the processing of any transaction described above, you authorize us to initiate debit or credit entries to your ACH-Enabled Bank Account or your Payment Account, as applicable, to correct such error, provided that any such correction is made in accordance with applicable laws and regulations, and to make any inquiries we consider necessary to validate the error, which may include ordering a credit report, performing credit checks, or verifying the information you provide against third party databases. If we are unable to debit any ACH-Enabled Bank Account you select for any reason, you authorize us to resubmit the debit, plus any applicable fees, to any other ACH-Enabled Bank Account you have on file with us (or, in the case of any fees that are owed under this Agreement, to deduct such amounts from the funds in your Payment Account). Your authorizations will remain in full force and effect until we receive written notification from you of any termination. Any termination will become effective as soon as we have had a reasonable amount of time to act on it, but in any event not later than thirty (30) days after written notice of termination is received by us in accordance with Section 12(e).

d. **Restrictions and Limitations**. We reserve the right to terminate or suspend any Payment Account, or to delay the availability of any Prepaid HITs, transfer or disbursement of any amounts, in each case for any reason in our sole discretion, including, without limitation, if we believe that a Requester or Provider is in violation of this Agreement. We reserve the right to restrict the transfer to Providers of any amounts held in a Requester's Prepaid HIT account for such time as we reasonable deem necessary to protect us or others: (a) if we are subject to financial risk, (b) if Provider has violated any term of this Agreement or the Policies, (c) if any dispute exists involving Provider's Payment Account or involving the Services provided by Provider, or (d) in connection with fraudulent, abusive or unlawful activities as determined by us. Further, we reserve the right to restrict the transfer to Providers of any amounts held in a Requester's Prepaid HIT account for up to ten (10) Business Days (as defined below) following Requester's acceptance of the Services provided by Provider. Other than a credit to a Provider's Payment Account for Services rendered by such Provider, amounts held in Payment Accounts cannot be transferred to other Requesters or Providers. If Amazon Mechanical Turk terminates this Agreement because you have violated the Policies then (i) any Services that have been completed by Providers but not yet accepted by you will be deemed accepted and the applicable payments will be remitted to the Providers and deducted from your Prepaid HITS balance and (ii) your remaining Prepaid HITS balance (if any) will become the property of Amazon Mechanical Turk.

e. **Our Liability**. We (and our Affiliates) act only in the capacity of a payment processor in facilitating the transactions between Requesters and Providers, and are not otherwise involved in the actual transactions. We will only be responsible for initiating purchases of Prepaid HITs and the transfers or disbursements at the direction of Requesters and Providers. We will be entitled to rely on the instructions of Requesters and Providers without any further inquiry or liability whatsoever. We will not be liable if we are not able to complete a transaction for any reason, including, but not limited to,

If any system or equipment was not working properly and you knew or had been advised about the breakdown before you initiated the transaction;
If you do not have enough available funds in your Prepaid HIT account or in your Payment Account to complete the applicable transaction, or if the transfer would cause you to exceed any applicable transfer limit with respect to your ACH-Enabled Bank Account;
If circumstances beyond our control (such as, but not limited to, power outages, fire, flood, mechanical or systems failure) prevent the proper execution of the transaction, despite reasonable precautions we have taken;
If your transaction is intercepted by legal process or other encumbrances restricting transfer, or your participation in the Site has been terminated or

suspended for security purposes;
If we are unable to confirm your identity or have reason to believe that the transfer requested is unauthorized; or
If you have not provided us with correct, current and complete payment information.

f. **Statements and Account Balances**. We will send an e-mail confirmation to you after you purchase any Prepaid HITs, make payments to a Provider or other payment transaction occurs with respect to a Payment Account. In addition, you may access your transaction information (your "Activity History") online in the "Your Account," and "View Transaction History" (or equivalent) areas of the Site. You may access this feature only with a browser that is compatible with the Service, including any security features that are part of the Service. Interest will not be paid on Prepaid HITs or any amounts held in Payment Accounts. If no transfer, disbursement or other payment transaction occurs with respect to your Payment Account for at least two (2) years and six (6) months, consecutively, the balance in your Payment Account will be automatically converted into an Amazon.com gift certificate and sent electronically to your then-current e-mail address associated with your Payment Account.

g. **Transaction Errors**. If you believe that any payment transaction initiated by us (or our agent) is erroneous, or if you need more information about any such transaction, you should contact us as soon as possible.

5. **Compliance with Laws**.

a. **Taxes**. You agree that it is your responsibility to determine any and all taxes and duties, including without limitation, sales, use, transfer, value added, withholding and other taxes and/or duties assessed, incurred or required to be collected, paid or withheld for any reason in connection with any request for, or performance of Services, or your use of the Site, or otherwise in connection with any action, inaction or omission of you or any of affiliate of yours, or any of your or their respective employees, agents, contractors or representatives ("**Taxes**") and to collect, withhold, report, and remit correct taxes to the appropriate tax authority, and to otherwise be responsible for the collection and payment of any and all Taxes. YOU ALSO AGREE THAT AMAZON MECHANICAL TURK AND ITS AFFILIATES ARE NOT OBLIGATED TO DETERMINE WHETHER TAXES APPLY AND ARE NOT RESPONSIBLE TO COLLECT, REPORT, OR REMIT ANY TAXES ARISING FROM ANY TRANSACTION.

b. **Registrations** You agree that is your responsibility to determine whether and to what extent any permits, registrations, authorization or filings (including without limitation with respect to the transfer of technology) are required by any governmental agency in any jurisdiction in which you have requested or are performing Services ("**Permits**"). YOU ALSO AGREE THAT AMAZON MECHANICAL TURK AND ITS AFFILIATES ARE NOT OBLIGATED TO DETERMINE WHETHER ANY SUCH PERMITS APPLY TO ANY TRANSACTION.

c. **Compliance with Laws**; The Site may be used only for lawful purposes and in a lawful manner. You may not use the Site in any manner that violates any applicable law or governmental regulation. In addition to your obligations with respect to Taxes and Permits above, you agree to comply with all applicable laws, statutes, and regulations of any jurisdiction in which you request or perform Services.

d. **Investigation**. Amazon Mechanical Turk has the right, but not the obligation, to monitor any activity, content and Materials associated with the Site. Amazon Mechanical Turk may investigate any reported violation of its Policies or complaints and take any action that it deems appropriate.

6. **Disclosure of Information; Confidentiality; Privacy**

a. **Our Use of Data and Communications**. Our Privacy Notice and this Agreement describe our collection, use, and disclosure of information associated with the Site, including how we handle personal information. In addition to the disclosures described in our Privacy Notice, we may disclose to Requesters your name, address, data on HITs you have completed, and Provider Tax Information. "**Provider Tax Information**" means tax identification information of Providers, such as a Social Security Number or Employer Identification Number. You hereby consent to our use and disclosure of Provider Tax Information and other data as described in this Section 6 and our Privacy Notice.

b. **Your Use of Data and Communications**. You may use information or other data acquired from your use of the Site solely to the extent necessary for you to use the Site and for no other purpose, including but not limited to, for purposes of solicitation, advertising, marketing, unsolicited e-mail or spamming, harassment, invasion of privacy, or otherwise objectionable conduct.

c. **Press Releases and Public Disclosures**. You may generally publicize your use of the Site, however you may not issue any press release with respect to Amazon Mechanical Turk or the Site, without Amazon Mechanical Turk's express prior written consent.

7. **No Warranties**. THE SITE, THE PAYMENT SERVICE AND THE SITE SERVICES ARE PROVIDED ON AN "AS IS" BASIS. TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, AMAZON MECHANICAL TURK MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION:

a. ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE, OR NON-INFRINGEMENT;

b. THAT THE SITE, THE PAYMENT SERVICE OR THE SITE SERVICES WILL MEET YOUR REQUIREMENTS, WILL ALWAYS BE AVAILABLE, ACCESSIBLE, UNINTERRUPTED, TIMELY, SECURE, OPERATE WITHOUT ERROR, OR WILL CONTAIN ANY PARTICULAR FEATURES OR FUNCTIONALITY;

c. THAT THE INFORMATION, CONTENT, OR MATERIALS INCLUDED ON THE SITE WILL BE AS REPRESENTED BY REQUESTERS OR PROVIDERS, THAT THE SERVICES ARE LAWFUL, OR THAT REQUESTERS OR PROVIDERS WILL PERFORM AS PROMISED; OR

d. ANY IMPLIED WARRANTY ARISING FROM COURSE OF DEALING OR USAGE OF TRADE.

8. **General Release**. BECAUSE AMAZON MECHANICAL TURK IS NOT INVOLVED IN TRANSACTIONS BETWEEN REQUESTERS AND PROVIDERS OR OTHER PARTICIPANT DEALINGS, YOU HEREBY RELEASE AMAZON MECHANICAL TURK AND ITS AFFILIATES (AND THEIR RESPECTIVE EMPLOYEES, DIRECTORS, AGENTS AND REPRESENTATIVES) FROM ANY AND ALL CLAIMS, DEMANDS, AND DAMAGES (ACTUAL, CONSEQUENTIAL AND OTHERWISE) OF EVERY KIND AND NATURE, KNOWN AND UNKNOWN, SUSPECTED AND UNSUSPECTED, DISCLOSED AND UNDISCLOSED, ARISING OUT OF OR IN ANY WAY CONNECTED WITH ANY DISPUTE BETWEEN ONE OR MORE REQUESTERS, PROVIDERS, OR OTHER USERS OF THE SITE.

9. **Indemnity; Limitation of Liability**.

a. **Indemnity and Defense**. You will indemnify and hold harmless Amazon Mechanical Turk and its Affiliates (and their respective employees, directors, agents and representatives) from and against any and all claims, costs, losses, damages, judgments, penalties, interest and expenses (including reasonable attorneys' fees) arising out of any claim, action, audit, investigation, inquiry or other proceeding instituted by a person or entity ("**Claim**") that arises out of or relates to: (i) any actual or alleged breach of your representations, warranties, or obligations set forth in this Agreement; (ii) your Services and any Materials, including any actual or alleged infringement of any intellectual property or proprietary rights by any of your Services or Materials; and/or (iii) your failure to comply with any applicable laws and regulations in connection with your use of the Site.

b. **Limitation of Liability**. TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, AMAZON MECHANICAL TURK AND ITS AFFILIATES WILL NOT BE LIABLE FOR ANY INDIRECT, INCIDENTAL, PUNITIVE OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT, THE SITE, THE

PAYMENT SERVICE, THE SITE SERVICES, THE INABILITY TO USE THE SITE SERVICES, OR ANY SERVICES PURCHASED OR OBTAINED OR MESSAGES RECEIVED OR TRANSACTIONS ENTERED INTO THROUGH THE SITE. TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, IN NO EVENT WILL AMAZON MECHANICAL TURK'S OR ITS AFFILIATES' AGGREGATE LIABILITY ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT OR THE TRANSACTIONS CONTEMPLATED HEREBY, WHETHER IN CONTRACT, TORT (INCLUDING NEGLIGENCE, PRODUCT LIABILITY OR OTHER THEORY), WARRANTY OR OTHERWISE, EXCEED THE AMOUNT OF FEES EARNED BY AMAZON MECHANICAL TURK IN CONNECTION WITH YOUR REQUEST FOR, OR YOUR PERFORMANCE OF, SERVICES DURING THE TWELVE (12) MONTH PERIOD IMMEDIATELY PRECEDING THE EVENT GIVING RISE TO THE CLAIM FOR LIABILITY.

10. **Applicable Law; Arbitration**. The Site is arranged, sponsored, and managed by Amazon Mechanical Turk in the state of Washington, USA. The laws of the state of Washington govern this Agreement and all of its terms and conditions, without giving effect to any principles of conflicts of laws. You agree that any action at law or in equity arising out of or relating to these terms and conditions shall be submitted to confidential arbitration in Seattle, Washington, except that, to the extent you have in any manner violated or threatened to violate Amazon Mechanical Turk's intellectual property rights, Amazon Mechanical Turk may seek injunctive or other appropriate relief in any state or federal court in the state of Washington, and you consent to exclusive jurisdiction and venue in such courts. Arbitration under this agreement shall be conducted under the rules then prevailing of the American Arbitration Association. The arbitrator's award shall be binding and may be entered as a judgment in any court of competent jurisdiction. To the fullest extent permitted by applicable law, no arbitration under this Agreement shall be joined to an arbitration involving any other party subject to this Agreement, whether through class arbitration proceedings or otherwise.

11. **Termination**. You may at any time elect to stop using the Site, provided that in discontinuing any Site activities, you must use Amazon Mechanical Turk's standard functionality and further must abide by all applicable Amazon Mechanical Turk Policies, Procedures and Guidelines. Amazon Mechanical Turk, in its sole discretion, may terminate this Agreement, suspend access to the Site, or remove any Service listings immediately without notice for any reason.

12. **General Provisions**

a. **Entire Agreement**. This Agreement and the general terms and conditions of the Site, including the Policies, constitute the entire agreement of the parties with respect to the subject matter hereof, and supersede and cancel all prior and contemporaneous agreements, claims, representations, and understandings of the parties in connection with the subject matter hereof. We will not be bound by, and specifically object to, any term, condition or other provision which is different from or in addition to the provisions of this Agreement including when submitted by you in any order, invoice, bill, receipt, acceptance, confirmation, correspondence or other document.

b. **Assignment**. You may not assign this Agreement without our prior written consent. We may assign this Agreement at any time, without notice. Subject to the foregoing, this Agreement will be binding on each party's successors and permitted assigns.

c. **Severability**. If any provision of this Agreement shall be deemed unlawful, void, or for any reason unenforceable, then that provision shall be deemed severable from these terms and conditions and shall not affect the validity and enforceability of any remaining provisions.

d. **No Waiver**. We will not be considered to have waived any of our rights or remedies, or portion thereof, unless the waiver is in writing and signed by us. Amazon Mechanical Turk's failure to enforce the strict performance of any provision of this Agreement will not constitute a waiver of Amazon Mechanical Turk's right to subsequently enforce such provision or any other provisions of this Agreement.

e. **Notices**. All notices relating to this Agreement (including the Payment Service) will be sent by e-mail or will be posted on the Site. We will send notices to you at the e-mail address maintained in our records for you. You must send notices to us at our current e-mail address published on the Site. E-mail notices are deemed written notices for all purposes for which written notices may be required. E-mail notices are deemed received the business day after transmission if properly addressed to the intended recipient.

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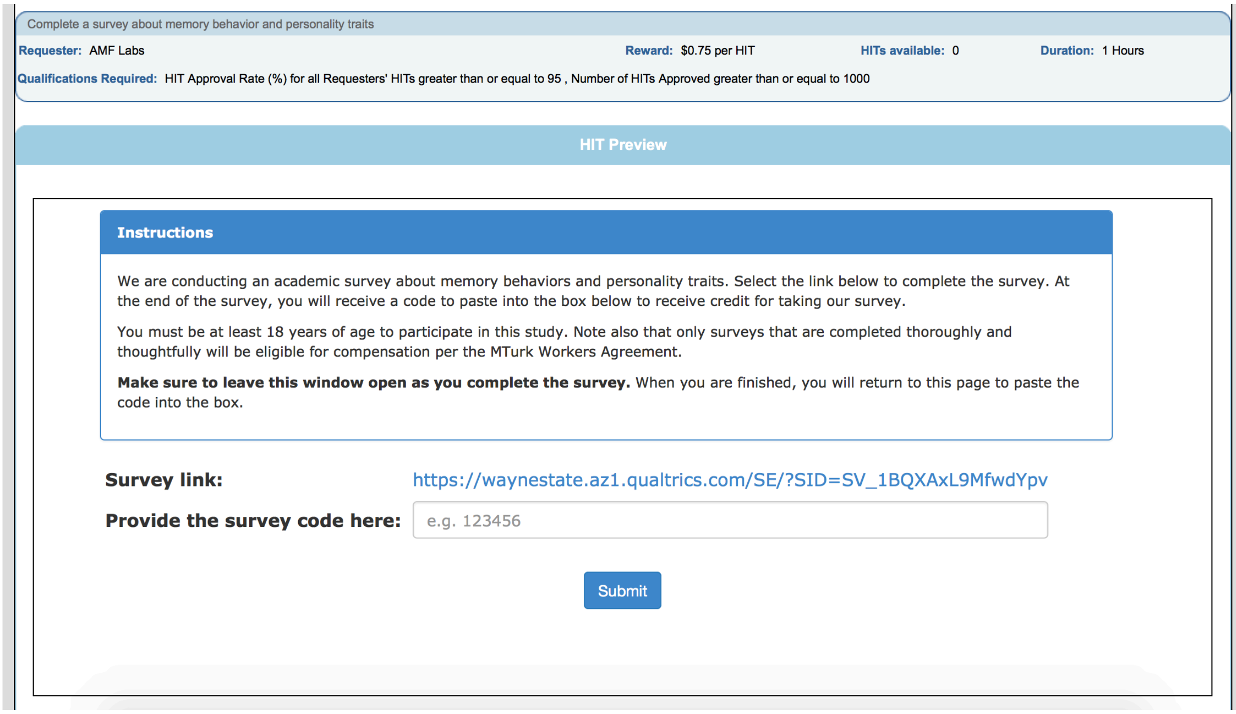
APPENDIX B
Studies 1 & 2: MTurk Synopsis Page


Complete a survey about memory behavior and personality traits

Requester: AMF Labs Reward: $0.75 per HIT HITs available: 0 Duration: 1 Hours

Qualifications Required: HIT Approval Rate (%) for all Requesters' HITs greater than or equal to 95 , Number of HITs Approved greater than or equal to 1000

HIT Preview

Instructions

We are conducting an academic survey about memory behaviors and personality traits. Select the link below to complete the survey. At the end of the survey, you will receive a code to paste into the box below to receive credit for taking our survey.

You must be at least 18 years of age to participate in this study. Note also that only surveys that are completed thoroughly and thoughtfully will be eligible for compensation per the MTurk Workers Agreement.

Make sure to leave this window open as you complete the survey. When you are finished, you will return to this page to paste the code into the box.

Survey link: https://waynestate.az1.qualtrics.com/SE/?SID=SV_1BQXAxL9MfwdYpv

Provide the survey code here: e.g. 123456

Submit

APPENDIX C
Studies 1 & 2: Behavioral Research Information Sheet
Title of Study 1: *Autobiographical Memory Functions of Simulation*
Title of Study 2: *The Role of Autobiographical Memory in Interpersonal and Intrapersonal Simulation: A Theoretical and Empirical Exploration*

Principal Investigator (PI): Jana Ranson
Psychology
313-310-0041

Funding Source: Jana Ranson

When we say "you" in this consent form, we mean you; "we" means the researchers and other staff.

Purpose

You are being asked to be in a research study of the characteristics associated with the recollection of past events and the imagining of future scenarios because you are at least 18 years of age and hold an active Mechanical Turk Worker's account. This study is being conducted at Wayne State University. The estimated number of study participants to be enrolled at Wayne State University is about 100. **Please read this form and ask any questions you may have before agreeing to be in the study.**

In this research study, we are interested in understanding the purposes for which people use autobiographical memory. Autobiographical memories are the memories of one's personal past. They include factual information (e.g., "I went to the Bahamas when I was 12") as well as the emotions, images, and details of events (e.g., "I remember feeling so happy when I saw my cat's cute little black and white face for the first time.") Autobiographical memories are important because, when considered over a lifetime, provide us with the story of who we are and give us a sense of "self."

Autobiographical memories are also used for a number of purposes, especially in social situations. For example, we share memories with others to feel closer (e.g., "remember how much fun we had on the roller coaster at the fair last year?"), to help problem solve (e.g., "when that happened to me as a teenager, I did… maybe that will work for you, too"), and to encourage conversation (e.g., "I love talking about old times with you; we always end up laughing!").

Research in this area is fairly new, so memory researchers continue to consider novel ways in which we might use autobiographical memory. We then create surveys and ask individuals like yourself to estimate how often, if at all, they do use autobiographical memories in those ways.

Study Procedures

If you agree to take part in this research study, you will be asked to complete an online questionnaire regarding the purposes for which you use autobiographical memory in everyday situations. You will also be asked to provide general demographic information (age, gender, ethnicity), although you may choose to not provide that information. You will also be asked to complete a few survey questions regarding personality traits, emotional intelligence, self-efficacy, and cognitive style. The study procedures are as follows:

1. Once you have clicked the survey link in Mechanical Turk, you are directed to this online questionnaire.
2. After reading this informed consent, you will be asked if you wish to participate. If you choose to participate, you will be instructed to click the ACCEPT button at the bottom of the informed consent page. Clicking the ACCEPT button begins the survey. If you choose not to participate, click the DECLINE button and you will be exited from the survey.
3. Once you have finished answering the questions on a page, you will be instructed to click the NEXT button. At the bottom of every page is an EXIT button should you wish to quit the survey. You may quit the survey at any time.
4. The online questionnaire will take approximately 45[66] minutes to complete.
5. Questions will consist of statements followed by a rating scale. For example, you may be asked to estimate how frequently you talk about the past with others to increase intimacy. You then rate how often you estimate you talk about the past for this reason on a scale of 1 (not at all) to 6 (almost always). Information about the rating scale will be included at the top of each page.
6. Participants' identity is concealed from the researcher. The survey software will assign a random ID code to each participant's survey.
7. At the end of the survey, you will be given a completion code. You must enter this code in the space provided on the MTurk page where you accessed the survey link. Once you enter this code, your survey data will be submitted to the researcher. Once the researcher verifies that all attention checks were successfully passed, the researcher will release the $2.00[67] compensation to the participant's MTurk account. Note again that the researcher will only be able to release the compensation if the survey completion code is entered and submitted through MTurk.

Benefits

As a participant in this research study, there will be no direct benefit for you; however, information from this study may benefit other people now or in the future.

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[66] This version of the Informed Consent has been modified from the original, which indicated that the survey would take about 30 minutes to complete. However, early MTurk metrics indicated that the survey was taking closer to 45 minutes to complete.

[67] Due to the additional 15 minutes beyond the original estimate of 30 minutes that participants were on average taking to complete the survey, the compensation was increased from the original value of $1.00 in Amazon credit to $2.00.

Risks

There are no known risks at this time to participation in this study.

Study Costs

- Participation in this study will be of no cost to you.

Compensation

For taking part in this research study, you will be paid for your time and inconvenience. A total of $1.60[68] will be paid to the participant's MTurk Worker account after the researcher has verified that all attention checks were successfully passed in accordance with the MTurk Worker's Agreement.

Confidentiality

All information collected about you during the course of this study will be kept confidential to the extent permitted by law. You will be identified in the research records by a code name or number. Information that identifies you personally will not be released without your written permission. However, the study sponsor, the Institutional Review Board (IRB) at Wayne State University, or federal agencies with appropriate regulatory oversight [e.g., Food and Drug Administration (FDA), Office for Human Research Protections (OHRP), Office of Civil Rights (OCR), etc.) may review your records.

When the results of this research are published or discussed in conferences, no information will be included that would reveal your identity.

Voluntary Participation/Withdrawal

Taking part in this study is voluntary. You have the right to choose not to take part in this study. You are free to only answer questions that you want to answer. You are free to withdraw from participation in this study at any time. Your decisions will not change any present or future relationship with Wayne State University or its affiliates, or other services you are entitled to receive.

The PI may stop your participation in this study without your consent. The PI will make the decision and let you know if it is not possible for you to continue. The decision that is made is to protect your health and safety, or because you did not follow the instructions to take part in the study

The data that you provide may be collected and used by Amazon as per its privacy agreement. Additionally, participation in this research is for residents of the United States over the age of 18;

[68] The compensation paid for Study 1 was $2.00 for a 45-minute survey plus 10% MTurk fee. Due to an increase in the MTurk Fee as of January 2016 from 10% to 40%, Study 2 participants earned $1.60 for a 30 minute survey.

if you are not a resident of the United States and/or under the age of 18, please do not complete this survey.

Questions

If you have any questions about this study now or in the future, you may contact Jana Ranson at eh9405@wayne.edu or Joseph Fitzgerald, PhD at 313-577-2811. If you have questions or concerns about your rights as a research participant, the Chair of the Institutional Review Board can be contacted at (313) 577-1628. If you are unable to contact the research staff, or if you want to talk to someone other than the research staff, you may also call the Wayne State Research Subject Advocate at (313) 577-1628 to discuss problems, obtain information, or offer input.

Participation

By completing this questionnaire, you are agreeing to participate in this study.

The data that you provide may be collected and used by Amazon.com as per its privacy agreement. Additionally, participation in this research is for individuals over the age of 18; if you are under the age of 18, you may not complete this survey.

APPENDIX D
Studies 1 & 2: Qualtrics Validation Code Assignment Page

Thank you for participating in this study.

Your validation code is:
19914

To receive payment for participating*, click “Accept HIT” in the Mechanical Turk window, enter this validation code, then click “Submit”.

Powered by Qualtrics

APPENDIX E
Studies 1 & 2: Formulae for CFA Computations

Root Mean Square Error of Approximation (RMSEA) is a widely reported absolute fit index based on the non-centrality parameter. RMSEAs ≤ .08 are considered mediocre; ≤ .05 good, and ≤ .01 adequate. However, the RMSEA tends to be inflated with small samples and/or small degrees of freedom (*df*)—due to the tendency for greater sampling error in such models—so the RMSEA should be used as on of several indications of model suitability (Kenny, 2015).

$$\sqrt{\frac{\chi^2_{SB} - df_{SB}}{df_{SB}(N-1)}}$$

Tucker-Lewis Index of Non-Normed Fit Index (NNFI; TLI in AMOS) is an incremental fit index dependent on the average size of the correlations; i.e., the higher the correlations, the higher the NNFI. It is preferred over the Bentler-Bonnet Non-Nonormed Fit Index (NFI), which penalizes nonparsimonious models. To use the NNFI, the null model's RMSEA should be ≥ .158 in order to be informative. NNFI values ≥ .90 are considered adequate; values ≥ .95 are considered excellent. Note that "null" model referred to in the formula is also known as the "independence" model (Kenny, 2015).

$$\frac{\dfrac{\chi^2_{Null}}{df_{Null}} - \dfrac{\chi^2_{SB}}{df_{SB}}}{\dfrac{\chi^2_{Null}}{df_{Null}} - 1}$$

Comparative Fit Index (CFI) is another recommended incremental fit index based on the non-centrality measure. Like the NNFI, CFI values ≥ .90 are considered adequate while values ≥ .95 are considered excellent. Also, like the NNFI, the CFI should not be used when the RMSEA of the null model is ≥ .158. Note that "null" model referred to in the formula is also known as the "independence" model (Kenny, 2015).

$$\frac{\dfrac{\chi^2_{Null}}{df_{Null}} - \dfrac{\chi^2_{SB}}{df_{SB}}}{\dfrac{\chi^2_{Null}}{df_{Null}}}$$

Structural Equation Modeling (SEM) Reliabilities (Jöreskog's Rho) are not provided by LISREL, but can be computed using the formula below. Note that lambda (λ) = factor loading, and δ = standardized error variance ($1 - \lambda$). Reliabilities in the SEM context should be ≥ .70 to indicate acceptable internal validity (Werts, et al., 1978).

$$\rho = \frac{(\sum\lambda)^2}{(\sum\lambda)^2 + (\sum\delta)^2}$$

APPENDIX F
Study 2: Personality Facets of the AMFS

The following details the results of the simple linear regressions conducted for the purpose of exploring facet-level personality effects on the functions of the AMFS. As was done for the results of Hypothesis 3.6, which concerned only personality dimensions, reported results were limited to those that were significant at $p < .05$ or less. In addition, only effect sizes in the form of squared semi-partial coefficients (i.e., the amount of variance that the predictor uniquely explains in the outcome) were reported. Full results of the significant regression analyses (e.g., zero-order correlation coefficient, *t*-statistic, unstandardized regression coefficients, and *p*-value (* = .05, ** = .01, and *** = .001) are detailed in Table 37.

Results

Perspective Taking

Although Perspective $\text{Taking}_{\text{AMFS}}$ was not significantly predicted by the Honesty-Humility dimension in either Study 1 or Study 2, Study 2 found that Perspective $\text{Taking}_{\text{AMFS}}$ was significantly predicted by the inverse of the Honesty-Humility facet concerning *Greed-Avoidance*—i.e., desiring to display wealth and privilege (R_2 = 3.9%). Of the Emotionality/Neuroticism facets, Perspective $\text{Taking}_{\text{AMFS}}$ was predicted by *Anxiety*—i.e., the tendency to dwell on minor issues (R^2 = 0.9%), *Dependence*—i.e., a high need to seek encouragement and comfort (R^2 = 3.4%), and *Sentimentality*—i.e., possessing a strong empathic sensitivity toward others (R^2 = 6.0%).

All four facets of the Extraversion dimension were significant predictors of Perspective $\text{Taking}_{\text{AMFS}}$: *Social Self-Esteem*—i.e., having high positive self regard (R^2 = 1.0%), *Social Boldness*—i.e., a tendency toward high social confidence (R^2 = 1.6%), *Sociability*—i.e., an affinity for social conversation and interaction (R^2 = 5.0%), and *Liveliness*—i.e., a tendency toward optimism and cheerfulness (R^2 = 0.5% variance explained). Two facets belonging to Agreeableness significantly predicted Perspective Taking$_{AMFS}$: *Forgiveness*—i.e., a willingness to trust and not hold grudges (R^2 = 0.5%) and *Gentleness*—i.e., the tendency to be mild and lenient in dealings with others (R^2 = 2.9%). Likewise, two facets from the Conscientiousness dimension were significant predictors: *Diligence*—i.e., possessing a strong work ethic and a desire to achieve (R^2 = 3.0%) and *Perfectionism*—i.e., the tendency to be thorough and careful (R^2 = 3.0%). Finally, all four facets of Openness to Experience significantly predicted Perspective Taking$_{AMFS}$: *Aesthetic Appreciation*—i.e., possessing a high appreciation of beauty in art and nature (R^2 = 1.2%), *Inquisitiveness*—i.e., tending to have a high curiosity in the natural and social sciences (R^2 = 1.9%), *Creativity*—i.e., a strong desire to innovate and experiment (R^2 = 1.6%), and *Unconventionality*—i.e., tending to be nonconformist and open to the unfamiliar and eccentric (R^2 = 5.1%).

Prospection

A total of 16 facets were significant predictors of Prospection: From Honesty-Humility, the inverse of *Greed-Avoidance* (R^2 = 1.5%). From Emotionality/Neuroticism, *Anxiety* (R^2 = 1.6%), *Dependence* (R^2 = 1.2%), and *Sentimentality* (R^2 = 1.6%). From Extraversion, *Sociability* (R^2 = 1.6%). From Agreeableness, *Gentleness* (R^2 = 0.6%), and the inverse of *Flexibility*—i.e., tending to be stubborn and argumentative (R^2 = 0.6%). From Conscientiousness, *Diligence* (R^2 = 1.9%) and *Perfection* (R^2 = 3.3%). Finally, all four facets from Openness to Experience were significant: *Aesthetic Appreciation* (R^2 = 1.9%), *Inquisitiveness* (R2 = 2.8%), *Creativity* (R^2 = 3.1%), and *Unconventionality* (R^2 = 3.5%).

Counterfactual Thinking

Although the dimension of Openness to Experience was a significant predictor of the function of Counterfactual Thinking, two of its facets were: *Creativity* (R^2 = 0.6% variance explained) and *Unconventionality* (R^2 = 0.8%). Additionally, the inverse of all four Honesty-Humility facets significantly predicted Counterfactual Thinking: *Sincerity*—i.e., a tendency to manipulate and inveigle (R^2 = 1.9%), *Fairness*—i.e., a willingness to cheat or steal to get ahead (R^2 1.5%), *Greed-Avoidance* (R^2 = 3.9%), and *Modesty* (R^2 = 0.7%). Two facets from Emotionality/Neuroticism were predictive: *Anxiety* (R^2 = 3.4%) and *Dependence* (R^2= 0.9%). From Extraversion, significantly predictive facets included the inverse of *Social Self-Esteem*—i.e., a tendency to feel unpopular and possessing low social self-worth (R^2 = 2.8%), *Sociability* (R^2 = 1.2%), and the inverse of *Liveliness*—i.e., a lack of cheerfulness and a tendency to be nondynamic (R^2 = 2.3%). Just as the inverse Agreeableness significantly predicted Counterfactual Thinking, so did the inverse of two of its facets: the inverse of *Flexibility* (R^2 = 1.1%), and the inverse of *Patience*—tending to be quick tempered (R^2 = 0.6%). Finally, three facets from Conscientiousness were significant predictors: the inverse of *Organization*—a tendency toward sloppiness (R^2 = 1.9%), *Perfectionism* (R^2 = 0.7%), and the inverse of *Prudence*—i.e., the tendency toward impulsivity and disregard of consequences (R^2 = 4.8%). A complete summary of significant simple regression results regarding AMFS dimensions and facets can be found in Table 37.

Discussion

Perspective Taking$_{\text{AMFS}}$

Results showed that, in addition to being predicted by all six HEXACO (Ashton & Lee, 2005, 2009) dimensions and the interstitial facet of Altruism, Perspective Taking$_{\text{AMFS}}$ was further predicted by all four Extraversion facets: Social Self-Esteem, Social Boldness, Liveliness, and

Sociability, with the latter yielding the largest effect. These findings align with the idea that people who use autobiographical memory content with the greatest frequency are likely motivated to not only socialize with others, but to understand others. This interpretation is supported by findings that, in addition to Openness to Experience, rated frequency of functional use of autobiographical memory content for Perspective Taking$_{AMFS}$ is also predicted by the Openness facets of Aesthetic Appreciation, Inquisitiveness, Creativity, and Unconventionality. Thus, such individuals are curious about others, and may creatively recombine own past experiences with imagination to infer other minds. Additionally, both Extraversion and Openness are associated with social self-efficacy (Cavanaugh, 2013), which is linked to behavioral perspective taking (e.g., Gehlbach et al., 2008). This may be account for the association between Perspective Taking, Conscientiousness, and the latter's facets of Diligence and Perfection. These findings align with the idea that self-efficacy relates to thoughtful persistence of the meeting of goals (e.g., Judge et al., 2002), which, with respect to Perspective Taking$_{AMFS}$, could be thought of as the careful application of one's own experiences toward the inferring others' mental states. Such implies that people who use autobiographical memory content for the purpose of Perspective Taking$_{AMFS}$ are also high in empathy. Per the Interpersonal Reactivity Index (IRI) by Davis (1980, 1983), perspective taking is defined as a form of "cognitive" (compared to "emotional") empathy. Coupled with research showing that highly conscientious people are motivated to understanding ideas and people as accurately and thoroughly as possible (Howe, 2012), results suggest that people high in Conscientiousness draw more upon personal past experience in their attempt to attain empathic accuracy in their attributions of others mental states.

Prospection

Study 2 also found that the Emotionality/Neuroticism facets of Anxiety, Dependence, and Sentimentality predicted the Prospection function. This may imply that, as research shows, anxious, neurotic individuals' negative worldviews can bias perceptions of personal experiences such that the autobiographical memory content encoded into memory storage is subsequently similarly biased (e.g., Murray, Holland, Kensinger, 2013). Related research also shows that the recall of negatively biased emotions can modify affect at the state and trait levels (e.g., Murray et al., 2013). As such, downward-biased prospections may reflect either the emotional valence of the autobiographical memory content on which the prospection is based, the downward biasing of autobiographical memory content during the simulation of the imagined future scenario, or a combination of both.

That the dimension of Openness to Experience has been empirically linked to prospection (e.g., Allen et al., 2014; Prenda & Lachman, 2001) supports the Study 2 finding that both the Creativity and Inquisitiveness facets of Openness to Experience likewise predict rated frequency of functional use of autobiographical memory content for Prospection. The other two facets of Openness—Aesthetic Appreciation and Unconventionality—were also found to predict the Prospection function. Both facets are supported by research showing links between future thinking and *divergent thinking*—the ability to creatively generate and consider a number of possible solutions or outcomes (e.g., Furnham & Bachtiar, 2008; Gelade, 2002; George & Zhou, 2001). Together these findings may align with research indicating that people low in Openness to Experience prefer the status quo (McCrae, 1996), with a tendency toward resistance to change (McCrae, 1987).

Study 2 results also that showed the Conscientiousness facets of Diligence and Perfection were predictive of Prospection, such that individuals high in these traits may be motivated to accomplish goals by carefully weighing all possible (i.e., imagined) outcomes. As such, these findings may imply that the frequency with which Conscientious individuals use autobiographical memory content for prospection reflects either the deliberate and strategic voluntary recall of relevant autobiographical memory content, the thoughtful imaginative simulation of future scenarios, or both (e.g., Berntsen & Jacobsen, 2008; Tulving 1983).

A slightly larger effect (~ 2.0%) was found for the Extraversion facet of Sociability than—the tendency to seek out social interaction and conversation (Lee & Ashton, 2009) than was found for the Extraversion dimension. The facet effect may corresponds to related research in which the relation between behavioral prospection and Extraversion was thought to specifically reflect a tendency in individuals motivated to imagine future scenarios toward "social gregariousness" (Fortunato & Furey, 2011, p. 21). This idea comes from brain research indicating that extraverts show a greater degree of cortical activity during creative, imagination-based tasks (Fink & Neubauer, 2008) than do introverts, whose cortical activity is higher during mental reasoning tasks (e.g., Fink & Neubauer, 2008). Thus, as extraverts are more sociable, sociability predicts behavioral future thinking (Fortunato & Furey, 2009, 2011).

Study 2 also found that neither Agreeableness nor Honesty-Humility were predictive of Prospection; however, these dimensions' associated facets were predictive. Study 2 found that rated frequency of functional use of autobiographical memory content for Prospection was inversely predicted by Flexibility. This finding suggests that people who tend to be uncompromising, uncooperative, and argumentative (Lee & Ashton, 2009) use autobiographical memory content with high frequency for the purpose of Prospection compared to people high in Flexibility, whose function use of autobiographical memory content for imagining future scenarios is low. This finding aligns with related research that also yielded a negative association between the Agreeableness dimension and future thinking. Such studies claim that, because people high in Agreeableness prefer social harmony to rivalry, they are less motivated to engage in proactive future planning lest it might conflict with others' future goals and agendas (Graziano, Hair, & Finch, 1997; Prenda & Lachman, 2001). As such, a high score in Flexibility may manifest as the kind of social complicity to which previous findings are attributed, and which may suggest an infrequent use of autobiographical memory content for the function of Prospection. This interpretation is further supported by the Study 2 findings that Prospection was positively predicted by the Agreeableness facet of Gentleness—i.e., a tendency to be lenient toward others (Lee & Ashton, 2009), as well as the interstitial facet of Altruism. Thus, individuals who are not motivated to use autobiographical memory content for the function of Prospection may prefer instead to "keep the peace," either by yielding creative control of their future plans to others, or by granting others the authority to guide the future on their behalf.

Whereas the Honesty-Humility dimension was not predictive of Prospection in either Study1 or Study 2, its facet of Greed-Avoidance—i.e., a preoccupation with social status (Lee & Ashton, 2009)—was inversely predictive of Prospection. Similar to the implied meaning of this effect with respect to Perspective Taking, individuals not satisfied with the social status quo may be more motivated to imagine future scenarios involving progress, change, nonconformity, and the challenging of social norms. This may also tie in with Study 2 results that Openness to Experience predicts Prospection. People who are not resistant to—i.e., are open to—change, are more likely to consider the possibilities that change can bring (McCrae, 1987).

Counterfactual Thinking

Study 2 results showed that, in addition to being predicted by the Emotionality/Neuroticism dimension, rated frequency of functional use of autobiographical memory for Counterfactual Thinking was also predicted by the Emotionality/Neuroticism facets of Anxiety—a tendency toward preoccupation of and excessive worry over minor issues—and Dependence—a high need for social support and approval (Lee & Ashton, 2009). Although Study 2 did not includes measures yielding information about respondents' trait procrastination or tendency toward upward or downward counterfactuals, the known personality effects suggest an alignment with the procrastination literature (e.g., Schouwenburg & Lay, 1995; Sirois, 2004) such that people who use autobiographical memory content frequently for the purpose of generating counterfactual thinking may do so to avoid the distressing consideration of what else might have been.

Although Study 1 did not find Agreeableness or Conscientiousness to be predictive of Counterfactual Thinking, Study 2 results showed that the inverse of both were predictive. Indirect support comes from studies indicating that people low in Agreeableness are prone to negative emotionality and emotional intensity, which are associated with the generation of downward (e.g., Allen et al., 2014). This may explain additional Study 2 results showing that the Counterfactual Thinking function was predicted by the Agreeableness facets of Flexibility and Patience to imply that people who use autobiographical memory content with the greatest frequency for counterfactual thinking are argumentative, unyielding, and quick-tempered (Lee & Ashton, 2009). The Conscientiousness facets of Organization and Prudence inversely predicted the use of autobiographical memory content for Counterfactual Thinking, while a third Conscientiousness facet, Perfection, positively predicted Counterfactual Thinking. Although Perfectionism can be defined as desiring order and accuracy (Lee & Ashton, 2009), it may be that, given the other personality traits associated with the function of Counterfactual Thinking, Perfectionism here may have neurotic overtones, such that the trait is a way of compensating for feelings of failure or inadequacy—i.e., an inferiority complex (e.g., Adler, 1930).

Table 1

Chapter 1: Hypotheses and Corresponding Figures

Hypothesis 1.1: The mechanism by which long-term memory content is used for the purpose of perspective taking is *mental simulation* as defined by *simulation theory* (Goldman, 2006; Goldman & Shanton, in press; Shanton & Goldman, 2010).	Figures 1, 2
Hypothesis 1.2: Autobiographical memory content in particular—rather than long-term memory in general—can be used as simulation output for simulation-based perspective taking.	Figure 3
Hypothesis 1.3: The "search and retrieval" procedure that operates "within" the long-term memory component could be explained by the *self-memory system* (SMS) as detailed in Conway (2005) and Conway and Pleydell-Pearce (2000).	Figure 3
Hypothesis 1.4: Simulation occurs in response to heightened neural activation of predominantly episodic memory content as predicted by the *source activation confusion* (SAC) model per Reder et al. (2002) and Reder et al. (2009). When used to support the "search and retrieval" of autobiographical memory content specifically as delineated by the SMS (Conway, 2005; Conway & Pleydell-Pearce, 2000), the SAC can explain how, at the neural level, *autobiographical* episodic memory content specifically, rather than episodic long-term memory content generally, can be used for simulation-based perspective taking.	Figures 4, 5, 6
Hypothesis 1.5: In addition to perspective taking, the Expanded Simulation Model can also be used to explain mental time travel (operationalized as reminiscence, prospection, and counterfactual thinking).	Figure 7, 8
Hypothesis 1.6: Because perspective taking, prospection, and counterfactual thinking are *purposes* for which autobiographical memory is used, then perspective taking, prospection, and counterfactual thinking are *functions* of autobiographical memory.	Figure 8
Hypothesis 1.7: The autobiographical memory function of perspective taking reflects interpersonal simulation, whereas the autobiographical memory functions of prospection and counterfactual thinking reflect *intrapersonal simulation* (Shanton & Goldman, 2010).	Figure 8

Table 2

Study 1: Demographics

Gender	Frequency (Percent)
1. Male	50 (45.50%)
2. Female	60 (54.50%)
3. Prefer not to answer	0 (0.00%)
Race/Ethnicity	
1. Caucasian	64 (58.2%)
2. African American/Black	29 (26.4%)
3. American Indian/Native American	7 (6.4%)
4. Other	3 (2.7%)
5. Asian	2 (1.80%)
6. Multiracial	2 (1.80%)
7. Arab	1 (0.90%)
8. Hawaiian/Pacific Islander	1 (0.90%)
9. Prefer not to answer	1 (0.90%)
10. Hispanic	0 (0.00%)
Age	Mean (*SD*)
1. Select option in years (18 through 65+)	39.06 (*12.96*)
2. Prefer not to answer	N/A

Table 3

Studies 1 & 2: Autobiographical Memory Functions of Simulation (AMFS) Scale

Perspective Taking (Interpersonal Simulation)	
1.*	I think about my own past experiences to help me understand others.
2.*	I think about my own past to help me better understand what another is thinking or feeling.
3.	I use my own past experiences as examples of why others might do what they do.
4.	I refer to my own past experiences when trying to figure out another's behaviors.
Prospection (Intrapersonal Simulation)	
5.	I think about my own past experiences when imagining how an upcoming event might or might not unfold.
6.	I think about my own past experiences when I believe that doing so can help guide my future.
7.	I think about my own past experiences to help me predict what will occur in the future.
Counterfactual thinking (Intrapersonal Simulation)	
8.	I spend time imagining specific past events with different details or outcomes than what actually occurred.
9.	I spend time imagining what I would do differently if I could travel back in time to a specific event.
10.	I spend time imagining what would have happened in the past if certain circumstances had been different
11.✓	I spend time reading survey questions so carefully that I will follow the instruction here to choose the number two rating option.

*Items are adapted from the CRS-A function of Perspective Taking.
✓Attention check item. Respondents who do not answer correctly are booted out of the survey.

Note. Respondents are presented with the statement, "The next section features a series of statements about the reasons why you might think about the past. On a scale of 1 to 6 (1 = Almost Never, 6 = Almost Always), please rate how frequently you engage in each of the following recollection-related behaviors and activities."

Table 4

Studies 1 & 2: Emotion Regulation Questionnaire (ERQ)

Cognitive Reappraisal

1. I control my emotions by changing the way I think about the situation I'm in.
2. When I want to feel less negative emotion, I change the way I'm thinking about the situation.
3. When I want to feel more positive emotion, I change the way I'm thinking about the situation.
4. When I want to feel more positive emotion (such as joy or amusement), I change what I'm thinking about.
5. When I want to feel less negative emotion (such as sadness or anger), I change what I'm thinking about.
6. When I'm faced with a stressful situation, I make myself think about it in a way that helps me stay calm.

Expressive Suppression

7. I control my emotions by not expressing them.
8. When I am feeling negative emotions, I make sure not to express them.
9. I keep my emotions to myself.
10. When I am feeling positive emotions, I am careful not to express them.

Note. Per Gross and John (2003). Respondents were presented with the following instruction: "We would like to ask you some questions about your emotional life, in particular, how you control (that is, regulate and manage) your emotions. The questions below involve two distinct aspects of your emotional life. One is your emotional experience, or what you feel like inside. The other is your emotional expression, or how you show your emotions in the way you talk, gesture, or behave. Although some of the following questions may seem similar to one another, they differ in important ways." Respondents were then asked to rate how strongly they agreed (or disagreed) with each statement on a 6-point scale (1 = Strongly Disagree; 6 = Strongly Agree).

Table 5

Studies 1: HEXACO 60-Item Personality Inventory

Honesty-Humility

Sincerity

30. I wouldn't use flattery to get a raise or promotion at work, even if I thought it would succeed.
54R. If I want something from someone, I will laugh at that person's worst jokes.
78. I wouldn't pretend to like someone just to get that person to do favors for me.

Fairness

12R. If I knew that I could never get caught, I would be willing to steal a million dollars.
60. I would never accept a bribe, even if it were very large.
84R. I'd be tempted to use counterfeit money, if I were sure I could get away with it.

Greed-Avoidance

18. Having a lot of money is not especially important to me.
90R. I would get a lot of pleasure from owning expensive luxury goods.

Modesty

72R. I think that I am entitled to more respect than the average person is.
96R. I want people to know that I am an important person of high status.

Emotionality/Neuroticism

Fearfulness

5. I would feel afraid if I had to travel in bad weather conditions.
53. When it comes to physical danger, I am very fearful.
77R. Even in an emergency I wouldn't feel like panicking.

Anxiety

11. I sometimes can't help worrying about little things.
35R. I worry a lot less than most people do.

Dependence

17. When I suffer from a painful experience, I need someone to make me feel comfortable.
41R. I can handle difficult situations without needing emotional support from anyone else.

Sentimentality

23. I feel like crying when I see other people crying.
71. I feel strong emotions when someone close to me is going away for a long time.
95R. I remain unemotional even in situations where most people get very sentimental.

Extraversion

Social Self-Esteem

4. I feel reasonably satisfied with myself overall.
52R. I feel that I am an unpopular person.
76R. I sometimes feel that I am a worthless person.

Social Boldness

10R. I rarely express my opinions in group meetings.
34 In social situations, I'm usually the one who makes the first move.
58. When I'm in a group of people, I'm often the one who speaks on behalf of the group.

Sociability

64. I prefer jobs that involve active social interaction to those that involve working alone.
88. The first thing that I always do in a new place is to make friends.

Liveliness

46. On most days, I feel cheerful and optimistic.
94R. Most people are more upbeat and dynamic than I generally am.

(continued next page)

Agreeableness

Forgiveness

3. I rarely hold a grudge, even against people who have badly wronged me.
27. My attitude toward people who have treated me badly is "forgive and forget".

Gentleness

9R. People sometimes tell me that I am too critical of others.
57. I tend to be lenient in judging other people.
81. Even when people make a lot of mistakes, I rarely say anything negative.

Flexibility

15R. People sometimes tell me that I'm too stubborn.
39. I am usually quite flexible in my opinions when people disagree with me.
63R. When people tell me that I'm wrong, my first reaction is to argue with them.

Patience

21R. People think of me as someone who has a quick temper.
69 Most people tend to get angry more quickly than I do.

Conscientiousness

Organization

26. I plan ahead and organize things, to avoid scrambling at the last minute.
74R. When working, I sometimes have difficulties due to being disorganized.

Diligence

32. I often push myself very hard when trying to achieve a goal.
80R. I do only the minimum amount of work needed to get by.

Perfectionism

38R. When working on something, I don't pay much attention to small details.
62. I always try to be accurate in my work, even at the expense of time.
86. People often call me a perfectionist.

Prudence

20R. I make decisions based on the feeling of the moment rather than on careful thought.
44R. I make a lot of mistakes because I don't think before I act.
92R. I prefer to do whatever comes to mind, rather than stick to a plan.

Openness to Experience

Aesthetic Appreciation

1R. I would be quite bored by a visit to an art gallery.
49. If I had the opportunity, I would like to attend a classical music concert.

Inquisitiveness

7. I'm interested in learning about the history and politics of other countries.
79R. I've never really enjoyed looking through an encyclopedia.

Creativity

37. I would enjoy creating a work of art, such as a novel, a song, or a painting.
61. People have often told me that I have a good imagination.
85R. I don't think of myself as the artistic or creative type.

Unconventionality

19R. I think that paying attention to radical ideas is a waste of time.
43. I like people who have unconventional views.
91R. I find it boring to discuss philosophy.
99.✓ People who fail to select option five for this item will be removed from this survey.

"R" denotes reverse-scored item

✓Attention check item. Respondents who do not answer correctly are booted out of the survey.

Note. Per Ashton & Lee (2005). Respondents were presented with the instruction, "The following section addresses various personality traits. On a 1 to 6 scale (1 = Strongly Disagree; 6 = Strongly Agree), please rate the extent to which you agree (or disagree) with each statement as it describes your personality: Please click the NEXT button to continue." Items above are numbered in accordance with the HEXACO inventory, but were presented to respondents in random order. Dimensions are denoted with boldface. Facets are denoted with italics.

Table 6

Study 1: Content Examples from Mental Time Travel Conditions and Self-Descriptors

REMINISCENCE			COUNTERFACTUAL THINKING				PROSPECTION		
Current Self	***Past Episode***	**Past Self**	***Actual Past Episode***	**Actual Past Self**	***Re-constructed Past Episode***	**Re-constructed Past Self**	***Future Episode***	**Future Self**	**AM Elements***
Active in a good mood; ready to work; enthusiastic; happy	Graduating from college; family was proud I worked so hard!	Smart; brisk; intelligent; multitasker; struggling	Coworker tried to take credit for my idea. I didn't know what to say and let her get away with it.	Irritated; tense; enthusiastic; restless; eager	Spoke up and said it was my idea but everyone looked at me like I was the one lying.	Calm; ashamed; felt foolish; careless; rushed	In staff meeting I bring up my idea and everyone loves it. Coworker is mad but that's okay.	Content; at peace; satisfied; happy; grateful	Conference room, wood table, black suit, ponytail, notepad
Tired; eager; curious; worried; irritable	Yesterday my cat just helped me feel better by purring in my lap. Warm and so cute.	Content; relaxed; savoring; happy; peaceful	Cat knocked over the plant and dirt was everywhere. I got mad and yelled at her.	Irate; helpless; hurt; impatient; ashamed	Instead of getting mad I just cleaned it up and realized the cat wasn't doing it to make me mad.	Calm; strong; rational; empathetic; articulate	I'm in the wedding dress from the magazine. It's blush and I'm holding orchids.	Peaceful; happy; content; relaxed; joyful	Blush dress, orchids, Mark, Our Savior altar, family
American; mother; Christian; singer; online gamer	The day my daughter was born was the happiest day ever. I hoped I'd be as good a mother as my mom.	Mother; daughter; peaceful; loving; appreciative	Homeless person asked me for money. I got mad and was afraid if I stopped I would be mugged	Upset; afraid; anxious; angry; resentful	This time as a Christian I asked how I could help. He was very thankful.	Relieved; strong; influential; caring; wise	I am reading Psalm 23 at sister's wedding. I don't get nervous and sound stupid.	Attendant; joyful; calm; peaceful; articulate	My confirmation bible, bookmark from Dad, our church, sister, sunshine
Great; busy; happy; crazy; engineer	My trip to France in college was first time I felt grown up. Met a cousin's family who made me feel very welcome.	Nostalgic; adult; female; family-oriented; traveler	Tina's party where I was in a mad mood and people didn't like me	Lonely; crazy; negative; active; hesitant	I imagined I was friendly and outgoing and people liked me	Friendly; crazy; positive; hesitant; active	10 year class reunion. I'm successful and having a good time. Britney is there.	Great; engineer; good; social; patriot	American Legion, Britney, Jacob, Lexus, songs from mid 2000s
Lazy; apprehensive; bored; hungry; frustrated	Track meet in high school. Expectations were high. I didn't perform well	Teenager; student; insecure; athletic; unsatisfied	Too scared to try out for cheerleading but thought I was just as good an athlete	Shy; uncertain; impertinent; socially awkward; quiet	Tried out and won and felt popular	Risk-taker; curious; encouraged; optimistic; self-confident	Working as a bb coach in cali where kids like me	Nervous; self-assured; realistic; aware; apprehen-sive	Black track pants, USC lanyard, sound of the ball in the gym, wood floor, bleachers

Note. The above examples reflect a random sample of five cases who provided at least five autobiographical memory elements.

*The list features the first five autobiographical memory (AM) content elements out of a possible 12.

Table 7

Study 1: AMFS Factor & Item Descriptives, Communalities, and MSAs per EPAF1

Item Number	*Mean (SD)*	*UV* Z_{Skew}	*UV* $Z_{Kurtosis}$	*Communalities*	*MSA Values*
Perspective Taking	**3.97 (1.08)**				
Item 1	4.05 (1.32)	–2.30*	–0.51	.62	.84
Item 2	3.87 (1.28)	–1.31	–0.85	.57	.75
Item 3	3.74 (1.30)	–1.87	–1.15	.46	.89
Item 4	4.25 (1.39)	–2.51*	–0.79	.77	.72
Prospection	**4.05 (1.06)**				
Item 5	4.04 (1.27)	–3.04**	–0.16	.40	.86
Item 6	4.27 (1.32)	–3.53***	+0.43	.48	.77
Item 7	3.85 (1.29)	–1.88	–0.74	.73	.74
Counterfactual Thinking	**3.70 (1.33)**				
Item 8	3.21 (1.59)	+0.96	–2.40*	.52	.66
Item 9	3.96 (1.51)	–1.79	–1.74	.91	.60
Item 10	3.94 (1.59)	–1.12	–2.26*	.64	.73

Note. $N = 110$ for all items. $^{*}p \leq .05$ ($Z \geq |1.96|$), $^{**}p \leq .01$ ($Z \geq |2.58|$), $^{***}p \leq .001$ ($Z \geq |3.29|$).

Bolded values reflect the factor means (standard deviations).

For item content, see Table 3.

Table 8

Study 1: EPAF1: AMFS Factor Correlations

	PT_S	PRO	CFT
PT	*.85*		
PRO	.17	*.76*	
CFT	**.56**	.22	*.84*

Note. PT_S = Perspective Taking (simulation based); PRO = Prospection; CFT = Counterfactual Thinking.

Bolded values denote correlations ≥ |.32|; i.e., that at least approximately 10% of the variance is shared between those two factors.

Italicized values denote the ordinal alpha reliability coefficient per factor (shown on the diagonal).

Table 9

Study 1: EPAF1: AMFS Sorted Pattern Matrix Using Geomin Q-Q Oblique Rotation

Item	*PT_S*	*PRO*	*CFT*
1	.73		
2	.78		
3	.67		
4	.75		
5		.51	
6		.65	
7		.86	
8			.58
9			.92
10			.72

Note. PT_S = Perspective Taking (simulation based); PRO = Prospection; CFT = Counterfactual Thinking. Factor loadings ≥ .30 were considered salient (Osborne & Costello, 2004) and statistically significant (Kline, 2002). Loadings ≤ .40 were considered nonsalient and n.s., thus were suppressed.

For item content, see Table 3.

Table 10

Study 1: EPAF2: AMFS Rotated Factor Matrix Using Varimax Orthogonal Rotation

Item	PT_S	*PRO*	*CFT*
1	.73		
2	.73		
3	.63		
4	.78		
5		.51	
6		.62	
7		.79	
8			.64
9			.94
10			.76

Note. PT_S = Perspective Taking (simulation based); PRO = Prospection; CFT = Counterfactual Thinking. Factor loadings ≤ .40 were suppressed.

For item content, see Table 3.

Table 11

Study 1: CFA AMFS Factor Means (SDs) and Squared Multiple Correlations

Item Number	*Mean (SD)*	*Multiple Squared Correlations*
Perspective Taking	**3.97 (1.08)**	
Item 1	4.05 (1.32)	.65
Item 2	3.87 (1.28)	.51
Item 3	3.74 (1.30)	.46
Item 4	4.25 (1.39)	.75
Prospection	**4.05 (1.06)**	
Item 5	4.04 (1.27)	.47
Item 6	4.27 (1.32)	.48
Item 7	3.85 (1.29)	.58
Counterfactual Thinking	**3.70 (1.33)**	
Item 8	3.21 (1.59)	.60
Item 9	3.96 (1.51)	.64
Item 10	3.94 (1.59)	.69

Note. For item content, see Table 3.

Table 12

Study 1: CFA: AMFS Factor Correlations

	PT_S	PRO	CFT
PT_S	*.91*		
PRO	.67***	*.86*	
CFT	.35**	.49***	*.94*

Note. PT_S = Perspective Taking (simulation based); PRO = Prospection; CFT = Counterfactual Thinking.

Italicized values denote the ordinal alpha reliability coefficient per factor (shown on the diagonal).

*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

Table 13

Study 1: CFA: AMFS Loadings Using RULS and Factors Allowed to Correlate

Item	PT_S	*PRO*	*CFT*
1	.80***		
2	.72***		
3	.68***		
4	.86***		
5		.68***	
6		.70***	
7		.77***	
8			.77***
9			.80***
10			.83***

Note. PT_S = Perspective Taking (simulation based); PRO = Prospection; CFT = Counterfactual Thinking. For item content, see Table 3.

Note: *$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

Table 14

Study 1: Correlations Between AMFS Scale Scores and ERQ Scale Scores

	Cognitive Reappraisal	Expressive Suppression
PT_S	.38***	.13
PRO	.35***	.08
CFT	.49***	–.01

Note. PT_S = Perspective Taking (simulation based); PRO = Prospection; CFT = Counterfactual Thinking.

*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

Table 15

Study 1: Functional Relations Between AMFS Functions and ERQ Dimensions: Cognitive Reappraisal (Representing Simulation-Based Behavior) and Expressive Suppression (Representing Social Behavior)

	PT_S					PRO					CFT				
	r	*b*	*t*	*p*	sr^2%	*r*	*b*	*t*	*p*	sr^2%	*r*	*b*	*t*	*p*	sr^2%
CR	.38	1.14	2.28	*	3.4%	.35	.46	.88	*n.s.*	.05%	.49	1.66	4.44	***	12.9%

Note. CR = Cognitive Reappraisal; PT_S = Perspective Taking (simulation based); PRO = Prospection; CFT = Counterfactual Thinking.

r = zero-order correlation; *b* = unstandardized regression coefficient; *t* = *t*-test statistic, sr^2% = unique variance explained based on squared multiple correlation; *df* for *t* = 106.

*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

Table 16

Study 1: Correlations Between AMFS Scale Scores and HEXACO Scale Scores

	HH	EMO	EXT	AGR	CSC	OPN
PT_S	–.56	–.28**	.22*	.13	.26**	.36***
PRO	.14	.22*	.06	.11	.33***	.44***
CFT	–.34***	.37***	–.21*	–.09	–.10	.09

Note. PT_S = Perspective Taking (simulation based); PRO = Prospection; CFT = Counterfactual Thinking; HH = Honesty-Humility; EMO = Emotionality/Neuroticism; EXT = Extraversion; AGR = Agreeableness; CSC = Conscientiousness; OPN = Openness to New Experiences.

*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

Table 17

Study 2: HEXACO 100-Item Personality Inventory

Honesty-Humility		
Sincerity		
	6R.	If I want something from a person I dislike, I will act very nicely toward that person in order to get it.
	30*.	I wouldn't use flattery to get a raise or promotion at work, even if I thought it would succeed.
	54R*.	If I want something from someone, I will laugh at that person's worst jokes.
	78*.	I wouldn't pretend to like someone just to get that person to do favors for me.
Fairness		
	12R*.	If I knew that I could never get caught, I would be willing to steal a million dollars.
	36R.	I would be tempted to buy stolen property if I were financially tight.
	60*.	I would never accept a bribe, even if it were very large.
	84R*.	I'd be tempted to use counterfeit money, if I were sure I could get away with it.
Greed-Avoidance		
	18*.	Having a lot of money is not especially important to me.
	42R.	I would like to live in a very expensive, high-class neighborhood.
	66R.	I would like to be seen driving around in a very expensive car.
	90R*.	I would get a lot of pleasure from owning expensive luxury goods.
Modesty		
	24.	I am an ordinary person who is no better than others.
	48.	I wouldn't want people to treat me as though I were superior to them.
	72R*.	I think that I am entitled to more respect than the average person is.
	96R*.	I want people to know that I am an important person of high status.
Emotionality/Neuroticism		
Fearfulness		
	5*.	I would feel afraid if I had to travel in bad weather conditions.
	29R.	I don't mind doing jobs that involve dangerous work.
	53*.	When it comes to physical danger, I am very fearful.
	77R*.	Even in an emergency I wouldn't feel like panicking.
Anxiety		
	11*.	I sometimes can't help worrying about little things.
	35R*.	I worry a lot less than most people do.
	59R.	I rarely, if ever, have trouble sleeping due to stress or anxiety.
	83.	I get very anxious when waiting to hear about an important decision.
Dependence		
	17*.	When I suffer from a painful experience, I need someone to make me feel comfortable.
	41R*.	I can handle difficult situations without needing emotional support from anyone else.
	65.	Whenever I feel worried about something, I want to share my concern with another person.
	89R.	I rarely discuss my problems with other people.
Sentimentality		
	23*.	I feel like crying when I see other people crying.
	47.	When someone I know well is unhappy, I can almost feel that person's pain myself.
	71*.	I feel strong emotions when someone close to me is going away for a long time.
	95R*.	I remain unemotional even in situations where most people get very sentimental.
Extraversion		
Social Self-Esteem		

4*. I feel reasonably satisfied with myself overall.
28. I think that most people like some aspects of my personality.
52R*. I feel that I am an unpopular person.
76R*. I sometimes feel that I am a worthless person.

Social Boldness

10R*. I rarely express my opinions in group meetings.
34* In social situations, I'm usually the one who makes the first move.
58*. When I'm in a group of people, I'm often the one who speaks on behalf of the group.
82R. I tend to feel quite self-conscious when speaking in front of a group of people.

Sociability

16R. I avoid making "small talk" with people.
40. I enjoy having lots of people around to talk with.
64*. I prefer jobs that involve active social interaction to those that involve working alone.
88*. The first thing that I always do in a new place is to make friends.

Liveliness

22. I am energetic nearly all the time.
46*. On most days, I feel cheerful and optimistic.
70R. People often tell me that I should try to cheer up.
94R*. Most people are more upbeat and dynamic than I generally am.

Agreeableness

Forgiveness

3*. I rarely hold a grudge, even against people who have badly wronged me.
27*. My attitude toward people who have treated me badly is "forgive and forget".
51R. If someone has cheated me once, I will always feel suspicious of that person.
75R. I find it hard to fully forgive someone who has done something mean to me.

Gentleness

9R*. People sometimes tell me that I am too critical of others.
33. I generally accept people's faults without complaining about them.
57*. I tend to be lenient in judging other people.
81*. Even when people make a lot of mistakes, I rarely say anything negative.

Flexibility

15R*. People sometimes tell me that I'm too stubborn.
39*. I am usually quite flexible in my opinions when people disagree with me.
63R*. When people tell me that I'm wrong, my first reaction is to argue with them.
87R. I find it hard to compromise with people when I really think I'm right.

Patience

21R*. People think of me as someone who has a quick temper.
45. I rarely feel anger, even when people treat me quite badly.
69* Most people tend to get angry more quickly than I do.
93R. I find it hard to keep my temper when people insult me.

Conscientiousness

Organization

2. I clean my office or home quite frequently.
26*. I plan ahead and organize things, to avoid scrambling at the last minute.
50R. People often joke with me about the messiness of my room or desk.
74R*. When working, I sometimes have difficulties due to being disorganized.

Diligence

8. When working, I often set ambitious goals for myself.
32*. I often push myself very hard when trying to achieve a goal.
56R. Often when I set a goal, I end up quitting without having reached it.
80R*. I do only the minimum amount of work needed to get by.

Perfectionism

14. I often check my work over repeatedly to find any mistakes.
38R*. When working on something, I don't pay much attention to small details.
62*. I always try to be accurate in my work, even at the expense of time.
86*. People often call me a perfectionist.

Prudence

20R*. I make decisions based on the feeling of the moment rather than on careful thought.
44R*. I make a lot of mistakes because I don't think before I act.
68. I don’t allow my impulses to govern my behavior.
92R*. I prefer to do whatever comes to mind, rather than stick to a plan.

Openness to Experience

Aesthetic Appreciation

1R*. I would be quite bored by a visit to an art gallery.
25R. I wouldn't spend my time reading a book of poetry.
49*. If I had the opportunity, I would like to attend a classical music concert.
73. Sometimes I like to just watch the wind as it blows through the trees.

Inquisitiveness

7*. I'm interested in learning about the history and politics of other countries.
31. I enjoy looking at maps of different places.
55R. I would be very bored by a book about the history of science and technology.
79R*. I’ve never really enjoyed looking through an encyclopedia.

Creativity

13R. I would like a job that requires following a routine rather than being creative.
37*. I would enjoy creating a work of art, such as a novel, a song, or a painting.
61*. People have often told me that I have a good imagination.
85R*. I don't think of myself as the artistic or creative type.

Unconventionality

19R*. I think that paying attention to radical ideas is a waste of time.
43*. I like people who have unconventional views.
67. I think of myself as a somewhat eccentric person.
91R*. I find it boring to discuss philosophy.

Altruism

97. I have sympathy for people who are less fortunate than I am.
98. I try to give generously to those in need.
99R. It wouldn’t bother me to harm someone I didn’t like.
100R. People see me as a hard-hearted person.
101.✓ People who fail to select option five for this item will be removed from this survey.

“R” denotes reverse-scored item
✓Attention check item. Respondents who do not answer correctly are booted out of the survey.
*Items included in the 60-item index

Note. Respondents will be presented with the instruction, “The following section addresses various personality traits. On a 1 to 6 scale (1 = Strongly Disagree; 6 = Strongly Agree), please rate the extent to which you agree (or disagree) with each statement as it describes your personality: Please click the NEXT button to continue.” Items above are numbered in accordance with the HEXACO inventory (Ashton & Lee, 2005), but will be presented to respondents in random order. Dimensions are denoted with boldface. Facets are denoted with italics.

Table 18

Study 2: Autobiographical Memory Functions of Joint Reminiscence (AMFJR) Scale

Conversation (Social)

1. Give us something to talk about.
2. Entertain myself with stories of past experiences.
3. Entertain others with stories of past experiences.
4. Share my life experiences with others.
5. Have fun.
6. Bond with others.

Perspective Taking (Social)

7. Help me understand others.
8. Help me understand what others are thinking or feeling.

Relationship Maintenance (Social)

9. Remind myself that I am loved/that the other is loved.
10. Help myself feel close to family members.
11. Help myself understand family members better.
12. Help myself remember friends or family members.
13. Repair relations between myself and friends or family members.
14. Help resolve disputes between myself and friends or family members.
15. Help myself understand friends better.
16. Help myself feel close to friends.

Teaching/Problem Solving/Behavioral Control (Directive)

17. Emphasize the consequences of negative behavior.
18. Clarify moral lessons.
19. Bring to mind appropriate or preferred behavior.
20. Explain ongoing activities.
21. Prepare myself or others for an upcoming event.
22. Help myself or others problem solve.
23. So that I or another avoids repeating a past mistake at some later date.
24. To see how my or another's strengths can help solve a present problem.
25. Help lessen my or another's negative emotions.

Emotion Regulation (Directive)

26. Emphasize or clarify appropriate emotional responses.
27. Help me or another control emotions.
28. Help me cope with stressful or upsetting situations.
29. Help me make sense of my or another's emotions.
30. Help me or another process an emotional experience.
31. Help me or another understand how to feel.

Self Identity (Self)

32. Help me feel good about myself.
33. Build or maintain my sense of self.
34. Build a unique individual identity for myself.
35. Help me to feel or recognize that I am part of a larger group.
36. Remind myself of what I was like when I was younger.

Note. Per Kulkofsky & Koh (2009) and adapted by Ranson & Fitzgerald (in preparation). Respondents are presented with the instruction, "We are interested in how and why people engage in *past-talk*. Past-talk is conversation about events that you have experienced with the person(s) you are speaking to or that you have experienced but your conversational partner(s) have not. Please keep past-talk conversations in mind when rating how often you engage in each

of the situations below using a 1 to 6 scale (1 = Almost never; 6 = Almost always). Please click the NEXT button to continue." On the next page, the items follow the stem statement,
"I engage in past-talk with another or others in order to..."

Table 19

Study 2: Thinking About Life Experiences (TALE) Scale

Social Function
1. When I hope to also find what another personal is like.
2. When I want to develop some more intimacy in a relationship.
3. When I want to develop a closer relationship with someone.
4. When I want to maintain a friendship by sharing memories with friends.
5. When I hope to also learn more about another person's life.

Directive Function
6. When I want to remember something that someone else said or did that might help me now.
7. When I believe that thinking about the past can help guide my future.
8. When I want to try to learn from my past mistakes.
9. When I need to make a life choice and I am uncertain which path to take.
10. When I want to remember a lesson I learned in the past.

Self Function
11. When I want to feel that I am the same person that I was before.
12. When I am concerned about whether I am still the same type of person that I was earlier.
13. When I am concerned about whether my values have changed over time.
14. When I am concerned about whether my beliefs have changed over time.
15. When I want to understand how I have changed from who I was before.

Note. Per Bluck & Alea (2011). Respondents are presented with the instruction, "Sometimes people think back over their life or talk to other people about their life: It may be about things that happened quite a long time ago or more recently. We are not interested in your memory for a particular event, but more generally in how you bring together and connect the different events and periods of your life. Please rate how often you do the following on a 1 to 6 scale (1 = Almost Never; 6 = Almost Always). Please click the NEXT button to continue." On the following page, the items follow the stem statement, "I think back over or talk about my life or certain periods of my life..."

Table 20

Study 2: Demographics

Gender	Frequency (Percent)
1. Male	450 (49.8%)
2. Female	449 (49.7%)
3. Transgender	3 (0.3%)
4. Prefer not to answer	1 (0.1%)
Race/Ethnicity	
1. Caucasian	584 (64.7%)
2. South Asian	157 (17.4%)
3. African-American/Black	51 (5.6%)
4. East Asian	43 (4.8%)
5. Hispanic	35 (3.9%)
6. Other	14 (1.6%)
7. Multiracial	10 (1.1%)
8. Arab/Middle Eastern	2 (0.2%)
9. Prefer not to answer	7 (0.8%)
Age	Mean (*SD*)
1. Select option in years (18 through 66+)	34.92 (*11.21*)
2. Prefer not to answer	N/A
Groups	Frequency (Percent)
18–24	144 (15.9%)
25–34	382 (42.4%)
35–44	206 (22.9%)
45–54	103 (11.4%)
55–64	54 (6.0%)
65 + >	14 (1.5%)

Table 21

Study 2: Scale Score Descriptives: AMFS, ERQ, HEXACO, AMFJR, and TALE

Scale/Dimension	Mean (SD)	UV Z_{Skew}	UV $Z_{Kurtosis}$
AMFS			
Perspective Taking	4.31 (1.02)	–8.70***	+3.20**
Prospection	4.36 (0.96)	–8.05***	+4.21***
Counterfactual Thinking	4.07 (1.26)	–6.52***	–2.36**
ERQ			
Cognitive Reappraisal	4.25 (0.97)	–6.65***	+2.33*
Expressive Suppression	3.36 (1.20)	–1.02	–4.23***
HEXACO			
Honesty-Humility	4.10 (0.87)	–0.98	–2.94**
Emotionality/Neuroticism	3.78 (0.77)	–1.60	+1.67
Extraversion	3.74 (0.88)	–2.99**	–0.23
Agreeableness	3.54 (0.81)	–1.90	+2.24*
Conscientiousness	4.31 (0.74)	–1.84	–0.40
Openness to Experience	4.18 (0.81)	–2.37*	–1.69
Altruism	4.48 (0.93)	–6.05***	+0.52
AMFJR			
Conversation	4.50 (1.01)	–11.40***	+6.37***
Perspective Taking	4.19 (1.18)	–8.57***	+1.37
Relationship Maintenance	4.12 (1.02)	–6.65***	+2.24*
Teaching/Problem Solving/Behavioral Control	4.09 (0.93)	–7.46***	+3.40***
Emotion Regulation	4.01 (1.05)	–7.06***	+1.59
Self	3.92 (1.07)	–6.56***	+0.31
TALE			
Social	4.30 (1.04)	–8.62***	+2.55*
Directive	4.49 (0.98)	–10.09***	+6.12***
Self	3.95 (1.22)	–5.99***	–1.76

Note. N = 110 for all items. **Bolded** values reflect the factor means (standard deviations). For item content, see Table 3.

*$p \leq .05$ ($Z \geq |1.96|$), **$p \leq .01$ ($Z \geq |2.58|$), ***$p \leq .001$ ($Z \geq |3.29|$).

Table 22

Study 2: Inter-Item Correlations for the Functions of the AMFS, AMFJR, and TALE

AMFS: Perspective Taking (PT_S), Prospection (PRO), Counterfactual Thinking (CFT)

	PT_S01	PT_S02	PT_S03	PT_S04	PRO05	PROS06	PRO07	CFT08	CFT09	CFT10
PT_S01										
PT_S02	**.64**									
PT_S03	**.62**	**.60**								
PT_S04	**.66**	**.68**	**.59**							
PRO05	.42	.42	.42	.44						
PRO06	.49	.51	.47	.46	**.42**					
PRO07	.41	.41	.42	.41	**.51**	**.46**				
CFT08	.21	.23	.22	.25	.28	.22	.23			
CFT09	.20	.20	.21	.21	.28	.21	.28	**.79**		
CFT10	.22	.21	.24	.25	.29	.23	.24	**.87**	**.89**	

AMFJR: Conversation (C), Perspective Taking (PT_{JR}), Relationship Maintenance (R)

	C01	C02	C03	C04	C05	C06	P_{JR}07	P_{JR}08	R09	R10	R11	R12	R13	R14	R15	R16
C01																
C02	**.50**															
C03	**.51**	**.63**														
C04	**.41**	**.44**	**.58**													
C05	**.52**	**.56**	**.51**	**.40**												
C06	**.44**	**.44**	**.51**	**.52**	**.46**											
P_{JR}07	.22	.28	.31	.37	.27	.37										
P_{JR}08	.22	.30	.35	.37	.25	.39	**.64**									
R09	.23	.33	.31	.35	.32	.39	.48	.46								
R10	.29	.32	.34	.36	.37	.43	.36	.37	**.51**							
R11	.23	.27	.27	.32	.24	.35	.53	.54	**.51**	**.60**						
R12	.41	.42	.39	.39	.37	.34	.27	.31	**.45**	**.57**	**.44**					
R13	.21	.27	.24	.27	.26	.36	.43	.44	**.46**	**.48**	**.51**	**.41**				
R14	.21	.26	.24	.32	.29	.33	.44	.45	**.46**	**.44**	**.47**	**.34**	**.60**			
R15	.25	.33	.31	.39	.29	.39	.63	.58	**.49**	**.42**	**.57**	**.37**	**.46**	**.52**		
R16	.42	.40	.40	.42	.47	.56	.44	.42	**.47**	**.52**	**.43**	**.42**	**.40**	**.41**	**.53**	
T17	.14	.19	.20	.26	.14	.21	.38	.37	.34	.24	.35	.25	.32	.41	.37	.24
T18	.17	.21	.20	.25	.19	.22	.43	.42	.43	.34	.41	.31	.40	.46	.42	.28
T19	.23	.26	.25	.30	.24	.28	.48	.47	.45	.35	.43	.31	.41	.49	.48	.36
T20	.31	.29	.33	.34	.34	.34	.42	.43	.35	.35	.37	.34	.40	.43	.41	.38
T21	.26	.24	.25	.29	.33	.29	.41	.43	.38	.31	.39	.33	.39	.44	.45	.31
T22	.27	.23	.27	.35	.24	.35	.47	.45	.35	.29	.33	.30	.33	.38	.38	.25
T23	.20	.26	.29	.30	.18	.28	.40	.43	.35	.38	.46	.31	.41	.44	.46	.37
T24	.22	.24	.28	.32	.24	.32	.54	.53	.43	.34	.40	.28	.41	.44	.46	.34
T25	.18	.22	.22	.30	.22	.32	.43	.44	.40	.30	.32	.28	.33	.36	.39	.34
E26	.21	.26	.24	.31	.22	.33	.51	.56	.48	.37	.48	.31	.44	.44	.51	.42
E27	.17	.22	.17	.22	.19	.27	.48	.47	.44	.37	.39	.28	.43	.46	.50	.39
E28	.18	.28	.23	.32	.20	.35	.48	.47	.45	.32	.42	.30	.46	.46	.50	.34
E29	.23	.27	.29	.39	.19	.38	.61	.61	.48	.39	.53	.31	.48	.49	.63	.44
E30	.25	.26	.31	.41	.19	.38	.55	.56	.43	.38	.46	.32	.40	.40	.51	.42
E31	.24	.29	.24	.37	.24	.34	.57	.58	.50	.42	.50	.34	.45	.49	.57	.41
S_{JR}32	.32	.40	.32	.33	.43	.33	.35	.37	.45	.43	.38	.35	.36	.39	.40	.46
S_{JR}33	.31	.36	.31	.36	.35	.35	.45	.42	.50	.43	.43	.42	.36	.38	.43	.42
S_{JR}34	.24	.33	.26	.30	.32	.28	.37	.37	.40	.34	.36	.35	.31	.31	.41	.36
S_{JR}35	.26	.25	.26	.31	.33	.35	.45	.39	.48	.45	.43	.35	.43	.41	.45	.46
S_{JR}36	.31	.45	.38	.35	.36	.28	.33	.33	.41	.36	.37	.46	.30	.31	.35	.33

AMFJR: Teaching/Problem Solving/Behavioral Control (TPB), Emotion Regulation (ER)

	T17	T18	T19	T20	T21	T22	T23	T24	T25	E26	E27	E28	E29	E30	E31
C01	.14	.17	.23	.31	.26	.27	.20	.22	.18	.21	.17	.18	.23	.25	.24
C02	.19	.21	.26	.29	.24	.23	.26	.24	.22	.26	.22	.27	.27	.26	.29
C03	.20	.20	.25	.33	.25	.27	.29	.28	.22	.24	.17	.23	.29	.31	.24
C04	.26	.25	.30	.34	.28	.35	.30	.32	.30	.31	.22	.32	.39	.41	.37
C05	.14	.19	.24	.34	.33	.24	.18	.24	.22	.22	.19	.20	.19	.19	.24
C06	.21	.22	.28	.34	.29	.35	.28	.32	.32	.33	.27	.35	.38	.39	.34
$P_{JR}07$	.38	.43	.48	.42	.41	.47	.40	.54	.43	.50	.48	.48	.62	.55	.57
$P_{JR}08$	.37	.42	.47	.43	.43	.45	.43	.53	.44	.56	.47	.47	.61	.56	.58
R09	.34	.43	.45	.35	.38	.35	.35	.43	.40	.48	.44	.45	.48	.43	.50
R10	.24	.34	.35	.30	.35	.31	.29	.38	.34	.37	.37	.32	.39	.38	.42
R11	.35	.41	.43	.32	.37	.39	.33	.46	.40	.48	.39	.42	.53	.46	.50
R12	.25	.31	.31	.28	.40	.33	.30	.31	.28	.30	.28	.30	.31	.32	.34
R13	.33	.40	.41	.33	.43	.39	.33	.41	.41	.44	.43	.46	.48	.40	.45
R14	.41	.46	.49	.36	.41	.44	.38	.44	.45	.44	.46	.46	.49	.40	.49
R15	.37	.42	.48	.39	.38	.45	.38	.46	.46	.51	.50	.51	.63	.51	.57
R16	.24	.28	.36	.34	.38	.31	.25	.37	.34	.42	.40	.34	.44	.42	.41
T17															
T18	**.52**														
T19	**.46**	**.53**													
T20	**.36**	**.41**	**.45**												
T21	**.46**	**.47**	**.43**	**.44**											
T22	**.42**	**.46**	**.46**	**.45**	**.44**										
T23	**.45**	**.49**	**.46**	**.32**	**.40**	**.47**									
T24	**.36**	**.36**	**.44**	**.43**	**.43**	**.54**	**.47**								
T25	**.32**	**.36**	**.41**	**.37**	**.38**	**.41**	**.38**	**.43**							
E26	.44	.48	.57	.42	.43	.42	.40	.48	.47						
E27	.39	.46	.46	.38	.46	.40	.32	.42	.47	**.57**					
E28	.41	.43	.47	.37	.35	.47	.41	.46	.48	**.48**	**.50**				
E29	.45	.50	.53	.39	.37	.49	.45	.51	.47	**.57**	**.53**	**.53**			
E30	.37	.42	.44	.37	.36	.42	.39	.48	.42	**.51**	**.48**	**.51**	**.61**		
E31	.39	.48	.52	.39	.40	.46	.42	.51	.45	**.57**	**.53**	**.52**	**.64**	**.57**	
$S_{JR}32$	.25	.31	.43	.34	.39	.30	.26	.36	.32	.40	.43	.38	.38	.39	.39
$S_{JR}33$	.29	.40	.51	.41	.43	.38	.30	.42	.37	.48	.47	.45	.47	.45	.48
$S_{JR}34$	.29	37	.44	.37	.38	.32	.27	.35	.34	.41	.41	.38	.39	.35	.43
$S_{JR}35$	.32	.36	.43	.38	.39	.39	.22	.39	.36	.43	.48	.41	.45	.41	.45
$S_{JR}36$	.28	.33	.35	.25	.25	.28	.35	.31	.27	.33	.28	.30	.34	.32	.35

AMFJR: Self (S_{JR})

	$S_{JR}32$	$S_{JR}33$	$S_{JR}34$	$S_{JR}35$	$S_{JR}36$
C01	.32	.31	.24	.26	.31
C02	.40	.36	.33	.25	.46
C03	.32	.31	.26	.26	.38
C04	.33	.36	.30	.31	.35
C05	.43	.35	.32	.33	.36
C06	.38	.35	.28	.35	.26
$P_{JR}07$	.35	.45	.37	.45	.33
$P_{JR}08$	.37	.42	.37	.39	.33
R09	.45	.50	.40	.48	.41
R10	.43	.43	.34	.46	.36
R11	.38	.43	.36	.43	.37
R12	.35	.42	.35	.35	.46
R13	.36	.36	.31	.43	.30
R14	.39	.38	.31	.41	.31
R15	.40	.43	.41	.45	.35
R16	.46	.42	.36	.46	.33
T17	.25	.29	.29	.32	.28
T18	.31	.40	.37	.36	.33

T19	.43	.51	.44	.43	.35
T20	.39	.43	.38	.39	.25
T21	.30	.38	.32	.39	.28
T22	.26	.30	.27	.22	.35
T23	.36	.42	.35	.39	.31
T24	.32	.37	.34	.39	.27
T25	.34	.41	.37	.38	.25
E26	.40	.48	.41	.43	.33
E27	.43	.47	.41	.48	.28
E28	.38	.48	.38	.41	.30
E29	.38	.47	.39	.45	.34
E30	.39	.45	.35	.41	.32
E31	.39	.48	.43	.45	.35
S_{JR}32					
S_{JR}33	**.58**				
S_{JR}34	**.45**	**.59**			
S_{JR}35	**.48**	**.49**	**.42**		
S_{JR}36	**.40**	**.44**	**.33**	**.34**	

TALE: Social (SC), Directive (D), Self (S_T)

	SC01	SC02	SC03	SC04	SC05	D06	D07	D08	D09	D10	S_T11	S_T12	S_T13	S_T14	S_T15
SC01															
SC02	**.46**														
SC03	**.51**	**.66**													
SC04	**.45**	**.49**	**.57**												
SC05	**.62**	**.48**	**.52**	**.47**											
D06	.38	.32	.40	.37	.40										
D07	.37	.31	.37	.30	.37	**.52**									
D08	.30	.25	.28	.20	.30	**.51**	**.54**								
D09	.35	.27	.31	.27	.31	**.49**	**.50**	**.50**							
D10	.33	.27	.29	.25	.34	**.54**	**.52**	**.67**	**.49**						
S_T11	.38	.33	.31	.29	.31	.35	.37	.33	.36	.33					
S_T12	.34	.26	.29	.26	.29	.37	.39	.39	.38	.43	**.66**				
S_T13	.33	.26	.26	.20	.28	.41	.45	.44	.42	.44	**.55**	**.67**			
S_T14	.35	.29	.26	.20	.30	.40	.40	.41	.40	.41	**.57**	**.69**	**.74**		
S_T15	.36	.31	.33	.26	.34	.45	.51	.50	.41	.52	**.47**	**.57**	**.64**	**.61**	

Note. Bold denotes inter-item correlations within the function.

For item content, see Tables 3, 18, and 19.

All correlations significant at $p < .001$.

Table 23

Study 2: Individual CFA Fit Indices and Diagnostics for AMFS, AMFJR, and TALE

	AMFS	AMFJR	TALE
Satorra-Bentler χ^2 (df)	74.74 (32)***	1662.82 (579)***	354.24 (87)***
Independence model χ^2 (df)	7116.03 (45)	21065.36 (630)	8492.10 (105)
Hotelier's Critical N	314.54	191.11	154.08
SB-adjusted RMSEA	.038	.046	.058
SB-adjusted NNFI	.991	.942	.962
SB-adjusted CFI	.985	.914	.950
SMC range	.49–.92	.39–.68	.46–.73
SMC average	.69	.53	.61
Factor loadings range	.70–.98	.62–.83	.68–.85
MV skew *Z*-score	21.90***	75.40***	35.43***
MV kurtosis *Z*-score	18.93***	44.47***	28.91***
Relative MV kurtosis	1.29	1.36	1.39
Condition Number	11.05	8.89	6.10
SEM factor reliability range	.93–.99	.83–.91	.91–.95

Note. MV skew, MV kurtosis, and relative MV kurtosis were computed on data designated as continuous.

*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

Table 24

Study 2: Individual CFA Factor Correlations

AMFS	PT_S	PRO	CFT			
PT_S	*.95*					
PRO	**.82*** ***	*.86*				
CFT	.31***	**.40*** ***	*.99*			
AMFJR	CONVO	PT_{JR}	RM	TPB	ER	$SELF_{JR}$
CONVO	*.89*					
PT_{JR}	**.56*** ***	*.96*				
RM	**.70*** ***	**.83*** ***	*.87*			
TPB	**.58*** ***	**.86*** ***	**.84*** ***	*.83*		
ER	**.54*** ***	**.92*** ***	**.89*** ***	**.91*** ***	*.92*	
$SELF_{JR}$	**.70*** ***	**.72*** ***	**.86*** ***	**.80*** ***	**.82*** ***	*.85*
TALE	SOC	DIR	$SELF_T$			
SOC	*.91*					
DIR	**.64*** ***	*.91*				
$SELF_T$	**.55*** ***	**.75*** ***	*.95*			

Note. PT_S = Perspective Taking (simulation based); PRO = Prospection; CFT = Counterfactual Thinking; CONVO = Conversation (Social); PT_{JR} = Perspective Taking (socially situated: Social); RM = Relationship Maintenance (Social); TPB = Teaching/Problem Solving/Behavioral Control (Directive); ER = Emotion Control (Directive); $SELF_{JR}$ = Self (socially situated; Self); SOC = Social; DIR = Directive; $SELF_T$ = Self (TALE).

Bolded values denote correlations ≥ |.32|; i.e., that at least approximately 10% of the variance is shared between those two factors.

Italicized values denote the ordinal alpha reliability coefficient per factor (shown on the diagonal).

*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

Table 25

Study 2: Comparisons Between Select LISREL and AMOS Estimates and Fit Indices for Individual CFAs Run on the AMFS, AMFJR, and TALE

		AMFS	AMFJR	TALE
χ^2 Test Statistic				
	LISREL§	74.74 (32) ***	1662.82 (579)***	354.24 (87)***
	AMOS	67.13 (32)***	2343.55 (579)***	354.70 (87)***
RMSEA				
	LISREL§	.038	.046	.058
	AMOS	.035	.048	.058
NNFI				
	LISREL§	.991	.942	.962
	AMOS	.991	.904	.929
CFI				
	LISREL§	.985	.914	.950
	AMOS	.983	.872	.915
SMC range				
	LISREL	.49–.92	.39–.68	.46–.73
	AMOS	.45–.93	.36–.69	.45–.71
SMC average				
	LISREL	.69	.53	.61
	AMOS	.65	.51	.56
Factor loadings range***				
	LISREL	.70–.98	.62–.83	.68–.85
	AMOS	.67–.98	.57–.80	.67–.84
SEM factor reliability range				
	LISREL	.93–.99	.83–.91	.91–.95
	AMOS	.93–.99	.78–.94	.89–.94

Note. AMOS denotes NNFI as TLI (Tucker-Lewis Non-normed Fit Index).

§For LISREL, value denotes the computed value using the Satorra-Bentler chi-square; for AMOS, value denotes the computed value using the ML Ratio chi-square.

All factor loadings in LISREL and AMOS were significant at the $p < .001$ level.

Study 2: CFA of 8-Factor Model: First- and Second-Order Standardized Regression Weights, Squared Multiple Correlations, and SEM Reliabilities

ITEM	*PT$_{S\&JR}$*	*PRO*	*CFT*	*CON*	*RM*	*TPB*	*ER*	*SELF*	*2ND*	*SMCs*	*REL*
AMFS01	.78									.61	
AMFS02	.78									.61	
AMFS03	.73									.53	
AMFS04	.80									.59	
JR07	.64									.41	
JR08	.65									.42	
AMFS05		.66								.43	
AMFS06		.66								.44	
AMFS07		.73								.53	
AMFS08			.88							.78	
AMFS09			.90							.81	
AMFS10			.99							.98	
JR01				.66						.43	
JR02				.74						.55	
JR03				.79						.62	
JR04				.68						.46	
JR05				.69						.47	
JR06				.68						.46	
JR09					.70					.50	
JR10					.69					.48	
JR11					.74					.54	
JR12					.59					.35	
JR13					.68					.47	
JR14					.69					.47	
JR15					.74					.55	
JR16					.65					.43	
JR17						.62				.38	
JR18						.69				.47	
JR19						.72				.52	
JR20						.60				.36	
JR21						.63				.39	
JR22						.69				.47	
JR23						.63				.39	
JR24						.71				.51	
JR25						.62				.39	
JR26							.74			.55	
JR27							.69			.48	
JR28							.69			.47	
JR29							.80			.64	
JR30							.72			.52	
JR31							.78			.61	
JR32								.70		.49	
JR33								.79		.63	
JR34								.67		.45	
JR35								.67		.44	
JR36								.56		.31	
PT									.75	.57	.87
PRO									.63	.40	.82
CFT									.32	.10	.99
CON									.62	.39	.85
RM									.91	.82	.83

TPB	.93	.86	.78
ER	.95	.90	.89
SELF	.85	.73	.82

Note. $PT_{S\&JR}$ = Perspective Taking (simulation based + socially situated); PRO = Prospection; CFT = Counterfactual Thinking; CON = Conversation; RM = Relationship Maintenance; TPB = Teaching/Problem Solving/Behavioral Control; ER = Emotion Regulation; $SELF_{JR}$ = Self (socially situated). For item content, see Tables 3 and 18.

For item content, see Tables 3 and 18.

All regression weights significant at $p \leq .001$.

Table 27

Study 2: Bivariate Correlations Between the Functions of the AMFS and AMFJR

	AMFS			**AMFJR**					
	PT_S	PRO	CFT	CON	PT_{JR}	RM	TPB	ER	$SELF_{JR}$
PT_S									
PRO	.64								
CFT	.27	.32							
CON	.33	.34	.17						
PT_{JR}	**.54**	.39	.19	.44					
RM	.44	.40	.23	.59	.67				
TPB	.53	.48	.25	.47	.69	.71			
ER	.52	.43	.28	.44	.75	.75	.79		
$SELF_{JR}$	.38	.38	.27	.57	.56	.72	.66	.68	

Note. PT_S = Perspective Taking (simulation based); PRO = Prospection; CFT = Counterfactual Thinking; CON = Conversation; PT_{JR} = Perspective Taking (socially situated); RM = Relationship Maintenance; TPB = Teaching/Problem Solving/Behavioral Control; ER = Emotion Regulation; SELF = Self (socially situated).

Coefficient in **bold** is correlation between simulation-based and socially situated Perspective Taking functions.

All correlations significant at $p < .001$.

Table 28

Study 2: The Use of Autobiographical Memory for Simulation-Based Versus Socially Situated Perspective Taking: Functional Relations and Correlations

	PT_S					PT_{JR}					
	r	*b*	*t*	*p*	$sr^2\%$	*r*	*b*	*t*	*p*	$sr^2\%$	Z_{DBP}
CR	.29	.19	5.40	***	2.9%	.26	.13	4.14	***	1.7%	.69
ES	.24	.13	2.40	*	0.6%	.33	.36	7.59	***	5.6%	2.08**

Testing Difference between Correlation Coefficients

	r_1	ρ *(rho)*	Z_{DBP}	*p-value*
AMFJR(2) × AMFS(4)	.54***	.51***	.88	.190
AMFJR(2) × AMFS(2)	.51***	.48***	.84	.200
AMFJR(2) × AMFS(2)	.51***	--	.88	.190
AMFJR(2) × AMFS(4)	.54***	--		

Testing Differential Use of Autobiographical Memory Content for AMFS vs. AMFJR Perspective Taking Subscales

	M_{JR} *(SD)*	M_S *(SD)*	*Z*	*p-value*
AMFJR(2) vs. AMFS(4)	4.19 (1.18)	4.31 (1.02)	–3.26	< .001
AMFJR(2) vs. AMFS(2)	4.19 (1.18)	4.05 (1.26)	–4.85	< .001

Note. CR = Cognitive Reappraisal; ES = Expressive Suppression; PT_S = Perspective Taking (simulation based); PT_{JR} = Perspective Taking (socially situated); AMFS(2) = Scale score for the two items that directly correspond to the two items from the AMFJR; MJR = Mean of AMFJR Perspective Taking subscale; MS = Mean of AMFS Perspective Taking Subscale

r = zero-order correlation; *b* = unstandardized regression coefficient; *t* = *t*-test statistic, $sr^2\%$ = unique variance explained based on the squared semi-partial correlation; *df* for *t* = 899.

Z_{DBP} = *Z*-score yielded in one-tailed significance test of difference between proportions (Preacher, 2002); ZT = Z-score yielded in two-tailed significance test of differences between mean ranks

**p* ≤ .05; ***p* ≤ .01; ****p* ≤ .001.

Table 29

Study 2: CFA of 9-Factor Model: First- and Second-Order Standardized Regression Weights, Squared Multiple Correlations, and SEM Reliabilities

ITEM	*PT_S*	*PRO*	*CFT*	*CON*	*PT_{JR}*	*RM*	*TPB*	*ER*	*$SELF_{JR}$*	*2ND*	*SMCs*	*REL*
AMFS01	.82										.66	
AMFS02	.82										.67	
AMFS03	.74										.55	
AMFS04	.81										.66	
AMFS05		.65									.43	
AMFS06		.66									.44	
AMFS07		.73									.53	
AMFS08			.88								.77	
AMFS09			.90								.81	
AMFS10			.99								.98	
JR01				.66							.43	
JR02				.74							.55	
JR03				.79							.62	
JR04				.68							.46	
JR05				.69							.47	
JR06				.68							.46	
JR07					.80						.63	
JR08					.80						.64	
JR09						.70					.49	
JR10						.68					.47	
JR11						.74					.55	
JR12						.59					.34	
JR13						.68					.47	
JR14						.69					.47	
JR15						.75					.56	
JR16						.65					.43	
JR17							.62				.38	
JR18							.68				.47	
JR19							.72				.51	
JR20							.60				.36	
JR21							.63				.39	
JR22							.69				.47	
JR23							.63				.39	
JR24							.72				.52	
JR25							.62				.39	
JR26								.74			.54	
JR27								.69			.48	
JR28								.68			.47	
JR29								.80			.64	
JR30								.72			.52	
JR31								.78			.61	
JR32									.70		.49	
JR33									.80		.63	
JR34									.67		.45	
JR35									.67		.44	
JR36									.55		.31	
PT_S										.64	.41	.94
PRO										.62	.38	.82
CFT										.31	.10	.99
CON										.62	.38	.85

PT_{JR}	.92	.85	.94
RM	.91	.82	.83
TPB	.93	.86	.78
ER	.96	.92	.89
$SELF_{JR}$	.84	.70	.82

Note. PT_S = Perspective Taking (simulation based); PRO = Prospection; CFT = Counterfactual Thinking; PT_{JR} = Perspective Taking (socially situated); CON = Conversation; RM = Relationship Maintenance; TPB = Teaching/Problem Solving/Behavioral Control; ER = Emotion Regulation; $SELF_{JR}$ = Self (socially situated). For item content, see Tables 3 and 18.

2ND = Second-order standardized regression coefficients; SMCs = Squared multiple correlations; REL = SEM reliabilities.

For item content, see Tables 3, 18, and 19.

All regression weights significant at $p \leq .001$.

Table 30

Study 2: CFA of AMFJR Mapped onto the TALE: First- and Second-Order Standardized Regression Weights, Squared Multiple Correlations, Factor Correlations, and SEM Reliabilities

ITEM	*CON*	*PT_{JR}*	*RM*	*TPB*	*ER*	*$SELF_{JR}$*	*SOC*	*DIR*	*$SELF_{T}$*	*2ND*	*SMCs*	*REL*
JR01	.65										.42	
JR02	.73										.53	
JR03	.78										.62	
JR04	.69										.48	
JR05	.68										.47	
JR06	.69										.47	
JR07		.79									.62	
JR08		.81									.66	
JR09			.70								.49	
JR10			.70								.49	
JR11			.73								.53	
JR12			.61								.37	
JR13			.68								.46	
JR14			.69								.45	
JR15			.74								.54	
JR16			.68								.46	
JR17				.63							.40	
JR18				.69							.47	
JR19				.71							.50	
JR20				.58							.33	
JR21				.61							.37	
JR22				.70							.49	
JR23				.65							.42	
JR24				.72							.52	
JR25				.61							.37	
JR26					.74						.55	
JR27					.69						.48	
JR28					.70						.49	
JR29					.80						.63	
JR30					.72						.52	
JR31					.78						.60	
JR32						.71					.50	
JR33						.81					.65	
JR34						.67					.45	
JR35						.64					.41	
JR36						.57					.32	
TALE01							.71				.50	
TALE02							.64				.41	
TALE03							.72				.51	
TALE04							.64				.41	
TALE05							.70				.48	
TALE06								.67			.44	
TALE07								.67			.45	
TALE08								.68			.46	
TALE09								.63			.39	
TALE10								.68			.47	
TALE11									.72		.51	
TALE12									.81		.66	
TALE13									.83		.68	

TALE14			.74		.69	
TALE15			.92		.55	
CON				.73	.53	.85
PT_{JR}				.87	.74	.94
RM				.89	.79	.83
TPB				.92	.85	.78
ER				.91	.83	.89
$SELF_{JR}$				.71	.50	.82
SOC						.99
DIR	.85					.99
$SELF_T$	.64	.77				.99

Note. CON = AMFJR Conversation; PT_{JR} = AMFJR Perspective Taking; RM = AMFJR Relationship Maintenance; TPB = AMFJR Teaching/Problem Solving/Behavioral Control; ER = AMFJR Emotion Regulation; $SELF_{JR}$ = AMFJR Self; SOC = TALE Social; DIR = TALE Directive; $SELF_T$ = TALE Self. For item content, see Tables 18 and 19.

2ND = Second-order standardized regression coefficients; SMCs = Squared multiple correlations; REL = SEM reliabilities.

For item content, see Tables 18 and 19.

All regression weights significant at $p \leq .001$.

Table 31

Study 2: CFA of AMFS Mapped onto the TALE: First- and Second-Order Standardized Regression Weights, Squared Multiple Correlations, Factor Correlations, and SEM Reliabilities

ITEM	*PT_S*	*PRO*	*CFT*	*SOC*	*DIR*	*$SELF_T$*	*2ND*	*SMCs*	*REL*
AMFS01	.81							.66	
AMFS02	.82							.68	
AMFS03	.74							.55	
AMFS04	.82							.67	
AMFS05		.66						.43	
AMFS06		.69						.48	
AMFS07		.69						.48	
AMFS08			.88					.78	
AMFS09			.90					.81	
AMFS10			.99					.98	
TALE01				.72				.52	
TALE02				.71				.50	
TALE03				.78				.61	
TALE04				.66				.44	
TALE05				.73				.53	
TALE06					.71			.50	
TALE07					.74			.55	
TALE08					.74			.55	
TALE09					.69			.45	
TALE10					.76			.58	
TALE11						.70		.49	
TALE12						.82		.67	
TALE13						.84		.71	
TALE14						.84		.71	
TALE15						.74		.55	
PT_S							.59	.34	.94
PRO							.62	.38	.82
CFT							.36	.13	.99
SOC									.99
DIR				.65					.99
$SELF_T$				.52	.71				.99
2^{ND} Order									.84

Note. PT_S = AMFS Perspective Taking; PRO = AMFS Prospection; CFT = AMFS Counterfactual Thinking; SOC = TALE Social; DIR = TALE Directive; $SELF_T$ = TALE Self. For item content, see Tables 3 and 19.

2ND = Second-order standardized regression coefficients; SMCs = Squared multiple correlations; REL = SEM reliabilities.

For item content, see Tables 3 and 19.

All regression weights significant at $p \leq .001$.

Table 32

Study 2: CFA of AMFJR and AMFS Mapped onto the TALE: First- and Second-Order Standardized Regression Weights, Squared Multiple Correlations, Factor Correlations, and SEM Reliabilities

ITEM	*PT_S*	*PRO*	*CFT*	*CON*	*PT_{JR}*	*RM*	*TPB*	*ER*	*$SELF_{JR}$*	*SOC*	*DIR*	*$SELF_T$*	*2ND*	*SMCs*	*REL*
AMFS01	.82													.66	
AMFS02	.82													.68	
AMFS03	.74													.55	
AMFS04	.81													.66	
AMFS05		.68												.43	
AMFS06		.68												.46	
AMFS07		.71												.50	
AMFS08			.88											.78	
AMFS09			.90											.81	
AMFS10			.99											.98	
JR01				.65										.42	
JR02				.73										.54	
JR03				.79										.62	
JR04				.69										.48	
JR05				.68										.47	
JR06				.69										.47	
JR07					.79									.62	
JR08					.81									.66	
JR09						.70								.49	
JR10						.70								.49	
JR11						.73								.53	
JR12						.60								.36	
JR13						.68								.46	
JR14						.67								.45	
JR15						.74								.55	
JR16						.68								.46	
JR17							.63							.40	
JR18							.69							.47	
JR19							.71							.50	
JR20							.58							.34	
JR21							.61							.37	
JR22							.70							.49	
JR23							.65							.41	
JR24							.72							.52	
JR25							.61							.37	
JR26								.74						.55	
JR27								.69						.48	
JR28								.70						.48	
JR29								.80						.64	
JR30								.72						.52	
JR31								.78						.60	
JR32									.71					.50	
JR33									.81					.63	
JR34									.67					.45	
JR35									.64					.41	
JR36									.57					.32	
TALE01										.71				.50	
TALE02										.63				.40	
TALE03										.71				.50	
TALE04										.63				.39	
TALE05										.69				.48	
TALE06											.66			.48	
TALE07											.68			.46	
TALE08											.67			.45	

TALE09		.62			.40	
TALE10		.68			.46	
TALE11			.72		.52	
TALE12			.81		.66	
TALE13			.82		.68	
TALE14			.83		.69	
TALE15			.74		.55	
PT_S				.64	.41	.94
PRO				.64	.41	.82
CFT				.37	.13	.99
CON				.71	.51	.85
PT_{JR}				.88	.78	.94
RM				.88	.78	.83
TPB				.92	.85	.78
ER				.91	.83	.87
$SELF_{JR}$				.71	.50	.82
SOC						
DIR	.87					
$SELF_T$	.65	.77				

Note. *Note*: PT_S =AMFS Perspective Taking; PRO = AMFS Prospection; CFT = AMFS Counterfactual Thinking; CON = AMFJR Conversation; PT_{JR} = AMFJR Perspective Taking; RM = AMFJR Relationship Maintenance; TPB = AMRJR Teaching/Problem Solving/Behavioral Control; ER = AMFJR Emotion Regulation; $SELF_{JR}$ = AMFJR Self; SOC = TALE Social; DIR = TALE Directive; $SELF_T$ = TALE Self. For item content, see Tables 3, 18, and 19.

2ND = Second-order standardized regression coefficients; SMCs = Squared multiple correlations; REL = SEM reliabilities.

For item content, see Tables 3, 18, and 19.

All regression weights significant at $p \leq .001$.

Table 33

Study 2: Correlations Between AMFS Scale Scores and EQR Scale Scores

	Cognitive Reappraisal	Expressive Suppression	Z_{DBP}
Perspective Taking (simulation based)	.29***	.24***	1.14
Prospection	.24***	.20***	.89
Counterfactual Thinking	.15***	.12***	1.08

Note. Z_{DBP} = *Z*-score yielded in one-tailed significance test of difference between proportions (Preacher, 2002).

**p* ≤ .05; ***p* ≤ .01; ****p* ≤ .001.

Table 34

Study 2: Functional Relations Between AMFS Functions and ERQ Dimension of Cognitive Reappraisal (Representing Simulation-Based Behavior)

	PT_S					PRO					CFT				
	r	*b*	*t*	*p*	$sr^2\%$	*r*	*b*	*t*	*p*	$sr^2\%$	*r*	*b*	*t*	*p*	$sr^2\%$
CR	.29	.21	5.31	***	2.86%	.26	.07	1.67	*n.s.*	.28%	.15	.06	2.11	*	.45%

Note. CR = Cognitive Reappraisal; PT_S = Perspective Taking (simulation based); PRO = Prospection; CFT = Counterfactual Thinking.

r = zero-order correlation; *b* = unstandardized regression coefficient; *t* = *t*-test statistic, $sr^2\%$ = unique variance explained based on the squared semi-partial correlation; *df* for $t = 899$).

$^*p \leq .05$; $^{**}p \leq .01$; $^{***}p \leq .001$.

Table 35

Study 2: Correlations Between AMFJR Emotion Regulation Scale Score and ERQ Scale Scores

	Cognitive Reappraisal	Expressive Suppression	Z_{DBP}
Emotion Regulation	.26***	.45***	4.64***

Note. Z_{DBP} = *Z*-score yielded in one-tailed significance test of difference between proportions (Preacher, 2002).

*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

Table 36

Study 2: Significant Use of Autobiographical Memory for TALE Functions as Predicted by HEXACO Personality Traits (Dimensions Only)

	R	*b*	*t*	*p*	R^2%
Social					
Emotionality/Neuroticism	.25	.37	7.69	***	6.2%
Extraversion	.23	.28	7.20	***	5.4%
Agreeableness	.09	.11	2.59	**	0.7%
Conscientiousness	.13	.19	4.03	***	1.8%
Openness to Experience	.22	.28	6.71	***	4.6%
Altruism	.22	.25	6.90	***	4.9%
Directive					
Emotionality/Neuroticism	.26	.33	8.10	***	6.8%
Extraversion	.18	.20	5.48	***	3.2%
Agreeableness	.08	.10	4.00	***	1.7%
Conscientiousness	.20	.28	5.98	***	3.8%
Openness to Experience	.19	.23	5.91	***	3.7%
Altruism	.26	.27	8.15	***	6.9%
Self					
Honesty-Humility	–.11	–.15	–3.29	**	1.2%
Emotionality/Neuroticism	.26	.41	8.06	***	6.7%
Extraversion	.09	.12	2.67	**	.8%
Openness to Experience	.11	.16	3.21	**	1.1%
Altruism	.10	.13	3.00	**	1.0%

Note. *R* = zero-order correlation; *b* = unstandardized regression coefficient; *t* = *t*-test statistic, R^2% = variance explained; *df* for *t* = 901.

**p* ≤ .05; ***p* ≤ .01; ****p* ≤ .001.

Table 37

Study 2: Significant Use of Autobiographical Memory for AMFS Functions as Predicted by HEXACO Personality Traits (Dimensions and Facets)

	R	*b*	*t*	*p*	R^2%
Perspective Taking					
Honesty-Humility	--	--	--	--	--
Greed-Avoidance	–.12	–.09	–3.47	**	1.3%
Emotionality/Neuroticism	.20	.19	6.06	***	3.9%
Anxiety	*.10*	*.09*	*2.93*	**	*.9%*
Dependence	*.19*	*.18*	*5.67*	***	*3.4%*
Sentimentality	*.25*	*.24*	*7.61*	***	*6.0%*
Extraversion	.24	.18	4.28	***	2.7%
Social Self Esteem	*.10*	*.10*	*3.06*	**	*1.0%*
Social Boldness	*.13*	*.12*	*3.83*	***	*1.6%*
Sociability	*.22*	*.19*	*6.90*	***	*5.0%*
Liveliness	*.07*	*.07*	*2.15*	*	*.5%*
Agreeableness	.07	.09	2.17	*	.5%
Forgiveness	*.07*	*.07*	*2.08*	*	*.5%*
Gentleness	*.17*	*.18*	*5.17*	***	*2.9%*
Conscientiousness	.12	.16	3.54	***	1.4%
Diligence	*.17*	*.18*	*5.27*	***	*3.0%*
Perfection	*.17*	*.20*	*5.24*	***	*3.0%*
Openness to Experience	.19	.24	5.92	***	3.7%
Aesthetic Appreciate	*.11*	*.10*	*3.32*	**	*1.2%*
Inquisitive	*.14*	*.12*	*4.21*	***	*1.9%*
Creativity	*.13*	*.12*	*3.77*	***	*1.6%*
Unconventionality	*.23*	*.25*	*6.99*	***	*5.1%*
Altruism	.16	.17	4.77	***	2.5%
Prospection					
Honesty-Humility	–.07	–.08	–2.22	*	.5%
Greed Avoidance	*–.12*	*–.09*	*–3.75*	***	*1.5%*
Emotionality/Neuroticism	.16	.20	4.79	***	2.5%
Anxiety	*.13*	*.11*	*3.83*	***	*1.6%*
Dependence	*.11*	*.10*	*3.32*	**	*1.2%*
Sentimentality	*.18*	*.16*	*5.38*	***	*3.1%*
Extraversion	.08	.09	2.40	*	.6%
Sociability	*.13*	*.10*	*3.88*	***	*1.6%*
Agreeableness	--	--	--	--	--
Gentleness	*.08*	*.08*	*2.43*	*	*.6%*
Flexibility	*–.07*	*–.07*	*–2.10*	*	*.5%*
Conscientiousness	.08	.11	2.53	*	.7%
Diligence	*.14*	*.14*	*4.14*	***	*1.9%*
Perfection	*.18*	*.20*	*5.55*	***	*3.3%*
Openness to Experience	.22	.26	6.74	***	4.8%
Aesthetic Appreciate	*.14*	*.12*	*4.21*	***	*1.9%*
Inquisitive	*.17*	*.14*	*5.07*	***	*2.8%*
Creativity	*.18*	*.16*	*5.34*	***	*3.1%*
Unconventionality	*.19*	*.20*	*5.74*	***	*3.5%*
Altruism	.09	.09	2.66	**	.8%
Counterfactual Thinking					
Honesty-Humility	–.19	–.28	–5.87	***	3.7%
Sincerity	–.14	–.16	–4.17	***	1.9%
Fairness	–.12	–.12	–3.74	***	1.5%
Greed-Avoidance	–.20	–.19	–6.11	***	3.9%

Modesty	–.08	–.10	–2.53	*	.7%
Emotionality/Neuroticism	.13	.21	3.80	***	1.6%
Anxiety	.19	.21	5.65	***	3.4%
Dependence	.10	.12	2.91	**	.9%
Extraversion	–.07	–.11	–2.21	*	.5%
Social Self-Esteem	–.17	–.20	–5.05	***	2.8%
Sociability	.11	.12	3.26	**	1.2%
Liveliness	–.15	–.18	–4.57	***	2.3%
Agreeableness	–.07	–.11	–2.04	*	.5%
Flexibility	–.10	–.13	–3.14	**	1.1%
Patience	–.08	–.09	–2.30	*	.6%
Conscientiousness	–.11	–.19	–3.44	**	1.3%
Organization	–.14	–.16	–4.20	***	1.9%
Perfection	.08	.12	2.46	*	.7%
Prudence	–.22	–.28	–6.75	***	4.8%

Note. R = zero-order correlation; b = unstandardized regression coefficient; t = t-test statistic, R^2% = variance explained; df for t = 901).

*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

Table 38

Study 2: Significant Use of Autobiographical Memory for AMFJR Functions as Predicted by HEXACO Personality Traits (Dimensions Only)

	R	*b*	*t*	*p*	R^2%
Conversation (Social)					
Emotionality/Neuroticism	.19	.25	5.93	***	3.7%
Extraversion	.24	.28	7.49	***	5.9%
Conscientiousness	.18	.24	5.37	***	3.1%
Openness to Experience	.19	.23	5.65	***	3.4%
Altruism	.21	.23	6.59	***	4.6%
Perspective Taking (Social)					
Emotionality/Neuroticism	.20	.30	6.10	***	4.0%
Extraversion	.24	.32	7.51	***	5.9%
Agreeableness	.13	.19	4.00	***	1.7%
Conscientiousness	.16	.25	4.79	***	2.5%
Openness to Experience	.22	.31	6.66	***	4.7%
Altruism	.20	.25	6.08	***	3.9%
Relationship Maintenance (Social)					
Emotionality/Neuroticism	.31	.41	9.88	***	9.8%
Extraversion	.32	.37	10.05	***	10.0%
Agreeableness	.12	.15	3.51	***	1.3%
Conscientiousness	.14	.19	4.18	***	1.9%
Openness to Experience	.17	.21	5.17	***	2.9%
Altruism	.24	.27	7.57	***	6.0%
Teaching/Problem Solving/Behavioral Control (Directive)					
Emotionality/Neuroticism	.22	.27	6.56	***	4.8%
Extraversion	.25	.26	7.71	***	6.2%
Agreeableness	.07	.08	2.07	*	.5%
Conscientiousness	.17	.22	5.21	***	2.9%
Openness to Experience	.18	.21	5.58	***	3.3%
Altruism	.19	.19	5.84	***	3.6%
Emotion Regulation (Directive)					
Emotionality/Neuroticism	.33	.45	10.52	***	10.9%
Extraversion	.21	.26	6.59	***	4.6%
Agreeableness	.09	.11	2.66	**	.8%
Conscientiousness	.12	.17	3.64	***	1.4%
Openness to Experience	.19	.25	5.80	***	3.6%
Altruism	.23	.26	7.08	***	5.3%
Self					
Honesty-Humility	–.16	–.20	–4.86	***	2.6%
Emotionality/Neuroticism	.22	.31	6.82	***	4.9%
Extraversion	.23	.29	7.12	***	5.2%
Openness to Experience	.17	.22	5.14	***	2.8%
Altruism	.09	.10	2.57	**	.7%

Note. *R* = zero-order; *b* = unstandardized regression coefficient; R^2% = variance explained; *df* for *t* = 901.

*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

Table 39

Study 2: Significant Use of Autobiographical Memory for TALE, AMFS, and AMFJR Functions as Predicted by Age and Gender (Female = Reference Group)

	R	b	t	p	R^2%
Age					
TALE Self	.09	–.01	–2.70	**	0.8%
AMFS Counterfactual Thinking	.13	–.02	–3.95	***	1.7%
Gender (Male = 1; Female = 0)					
TALE Social	.10	–.21	–2.97	**	1.0%
AMFS Counterfactual Thinking	.10	.25	3.04	**	0.2%
AMFJR Emotion Regulation	.07	–.15	–2.12	*	0.5%

Note. R = zero-order correlation; b = unstandardized regression coefficient; t = t-test statistic, R^2% = variance explained; df for t = 901.

*$p \le .05$; **$p \le .01$; ***$p \le .001$.

Table 40

Study 2: Significant Differences in the Use of Autobiographical Memory for TALE, AMFS, and AMFJR Functions by Ethnicity: Caucasian, African-American/Black and South Asian

	$\chi^2(2)_{KW}$	Z_{MWU}	MR_C	MR_{AAB}	MR_{SA}	r
TALE Self	41.33***					
Caucasian v AA/B		*n.s.*				
AA/B v South Asian		*n.s.*				
Caucasian v South Asian		–6.45*	344.75		468.66	.237
AMFS CFT	17.00***					
Caucasian v AA/B		*n.s.*				
AA/B v South Asian		–2.82*		84.00	111.16	.195
Caucasian v South Asian		–3.94*	355.01		430.46	.145
AMFJR Self	45.29***					
Caucasian v AA/B		*n.s.*				
AA/B v South Asian		–3.56*		78.50	112.95	.247
Caucasian v South Asian		–6.70*	343.75		472.37	.246
AMFJR PT	23.08***					
Caucasian v AA/B		*n.s.*				
AA/B v South Asian		*n.s.*				
Caucasian v South Asian		–4.49*	352.07		441.41	.172
AMFJR RM	34.13***					
Caucasian v AA/B		*n.s.*				
AA/B v South Asian		–2.93*		83.06	111.46	.204
Caucasian v South Asian		–5.84*	347.22		459.46	.214
AMFJR TPB	31.68***					
Caucasian v AA/B		*n.s.*				
AA/B v South Asian		*n.s.*				
Caucasian v South Asian		–5.64*	348.04		456.40	.207
AMFJR ER	25.64***					
Caucasian v AA/B		*n.s.*				
AA/B v South Asian		*n.s.*				
Caucasian v South Asian		–4.97*	350.76		446.29	.183

Note. $\chi^2(2)_{KW}$ = Kruskal-Wallis chi-square (*df* = 2 for all KW models); Z_{MWU} = *Z*-statistics for Mann-Whitney *U* pairwise post-hoc tests; *M* = mean scale score for group; *r*% = variance explained, where $r = |Z|/\sqrt{N}$ (Field, 2005). For the Caucasian v African-American/Black comparisons, $N = 635$; for African-American/Black v South Asian, $N = 208$; for Caucasian v South Asian, $N = 741$.

AA/B = African-American/Black; CFT = Counterfactual Thinking; PT = Perspective Taking; RM = Relationship Maintenance; TPB = Teaching/Problem Solving/Behavioral Control; ER = Emotion Regulation.

For all Kruskal-Wallis χ^2 tests: $*p \leq .05$; $**p \leq .01$; $***p \leq .001$; for all Mann-Whitney *U* pairwise post-hoc tests: $*p \leq .0167$ ($\alpha = .05/3$).

Figure 1. Low-level mind reading according to simulation theory (Goldman, 2006). Simulation is automatic; stimuli elicit the mirror neuron system rather than long-term memory. The output is an attribution, but one of emotion only. It is likely that low-level mind reading occurs concurrent with high-level mind reading if the mirror neuron system is elicited by the target other.

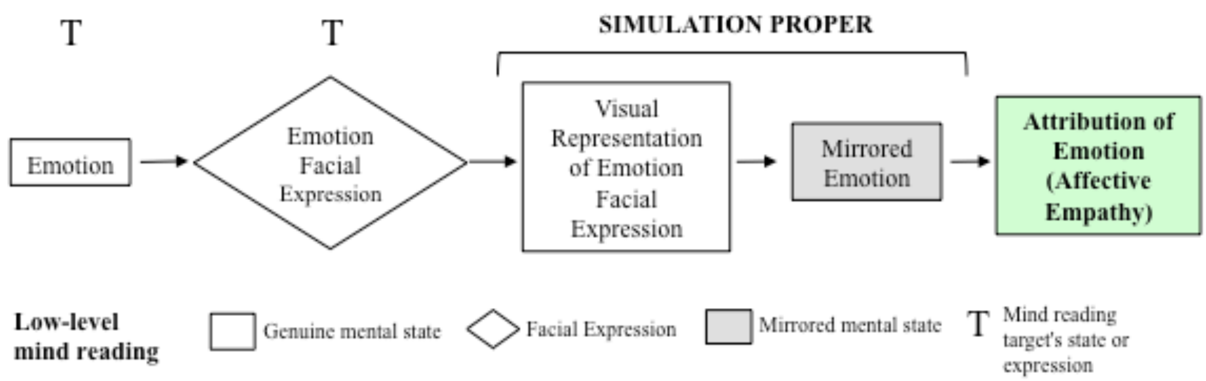
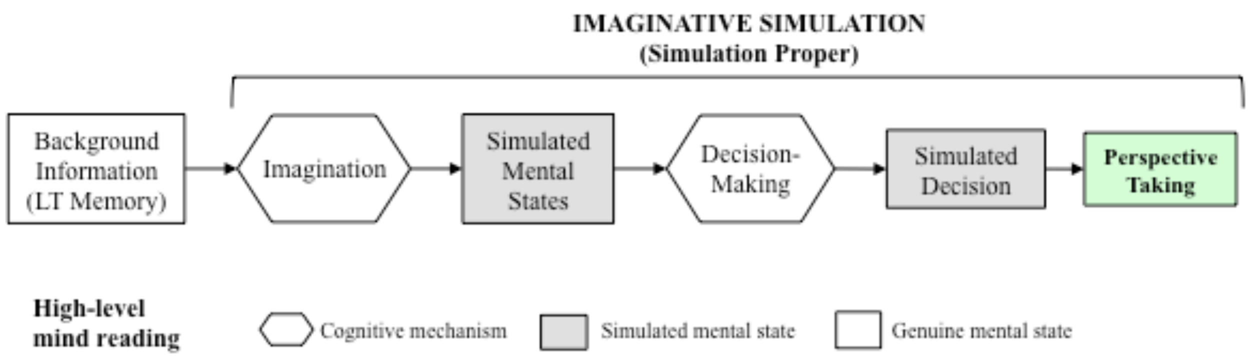


Figure 2. High-level mind reading per simulation theory (Goldman, 2006). The goal of re-experiencing the past in order to infer another mind activates long-term memory content ("background information") that serves that goal. The retrieved memories serve as simulation process input, which triggers the "imaginative simulation"* process. Shanton and Goldman characterize perspective taking as "other-directed"; therefore, the simulation form used for perspective taking is *interpersonal* simulation.



**Goldman (2006) and Shanton and Goldman (2010) refer to this process as "simulation proper."*

Figure 3. An integrated view of the traditional taxonomies of long-term memory as they apply to the long-term memory component of the simulation process. Broadly, long-term memory is thought to be either *declarative* or *nondeclarative* (Cohen & Squire, 1980; depicted in yellow). Declarative is comprised of *semantic* and *episodic* memory (Tulving, 1972; depicted in blue). Later theories favored the view that semantic and episodic memories are not discrete systems but extremes of a continuum (Conway, 2005; Fitzgerald & Broadbridge, 2012; Greenberg & Verfaellie, 2010; Kihlstrom, 1984; Rubin, 2012). Declarative and nondeclarative can overlap (depicted below with curved arrows) if doing so serves the goal for which the memory information is retrieved (Gilboa, 2004).

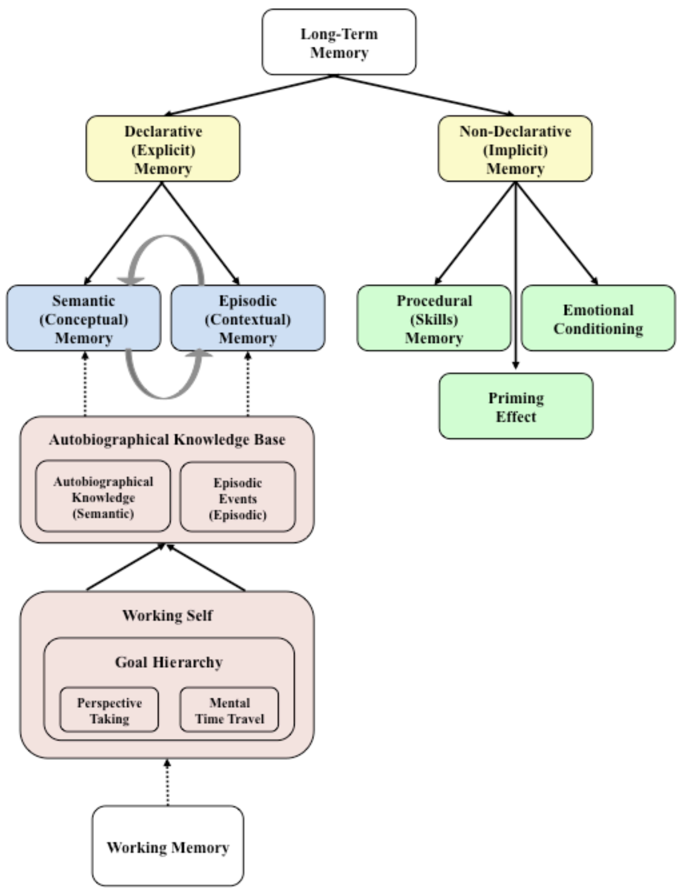


Figure 4. The *source activation confusion computational model* or SAC (Reder et al., 2002; Reder et al., 2009) adapted for the current paper. In keeping with traditional long-term memory taxonomies (Tulving, 1972), the SAC features nodes for *concept* (semantic) and *episode* (episodic) information. When memory content need only be re-experienced for its semantic properties, the node preferentially activated is a *concept* node. This activation results in the assessment process of *recognition*, which produces the output of *identification*, *knowing*, *or believing*. Memory content that leads to recognition processing does not instigate simulation. When memory content needs to be re-experienced for its event and context properties the node preferentially activated and *episode node*. The ensuing assessment process is thus *recollection*, which results in *remembering*. Memory content that leads to remembering is submitted as input for simulation. If the activation of a node and its bindings (connections) are strong enough, spreading activation can occur. Because one type of node is activated preferentially, activation of attendant nodes is subordinate. This explains how concept information is included in episodic memories and vice versa, and also accounts for the instigation (or not) of simulation. Lines extending from the general context node represent the contextual "fan" that occurs when the general context is common to multiple episodes.

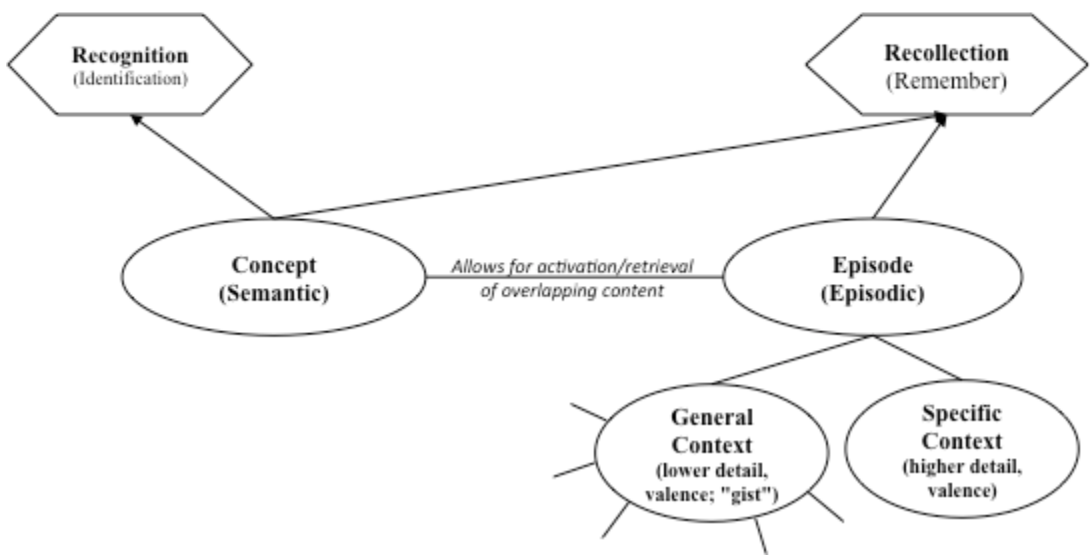


Figure 5. The proposed Expanded Simulation Model (adapted from Shanton & Goldman, 2010) when a goal necessitates predominantly semantic autobiographical memory content. The diagram shows that "unpacking" the long-term memory component reveals the self-memory system (SMS) (Conway, 2005; Conway & Pleydell-Pearce, 2000), and the source activation confusion (SAC) model (Reder et al., 2009). An goal to produce a behavioral outcome such as "identification," "knowing," or "believing," prompts the activation of a relevant self-concept stored in the SMS. This prompts the SMS's "search and retrieval" procedure to activate the associated semantic autobiographical memory content. At the neural level, the semantic autobiographical memory content is stored in a *concept* node. The predominant activation of a concept node results in the assessment process of *recognition*, which yields the behavioral outcomes of *identification, knowing*, or *believing*. Because such behavioral outcomes do not require the use of imagination, simulation does not occur.

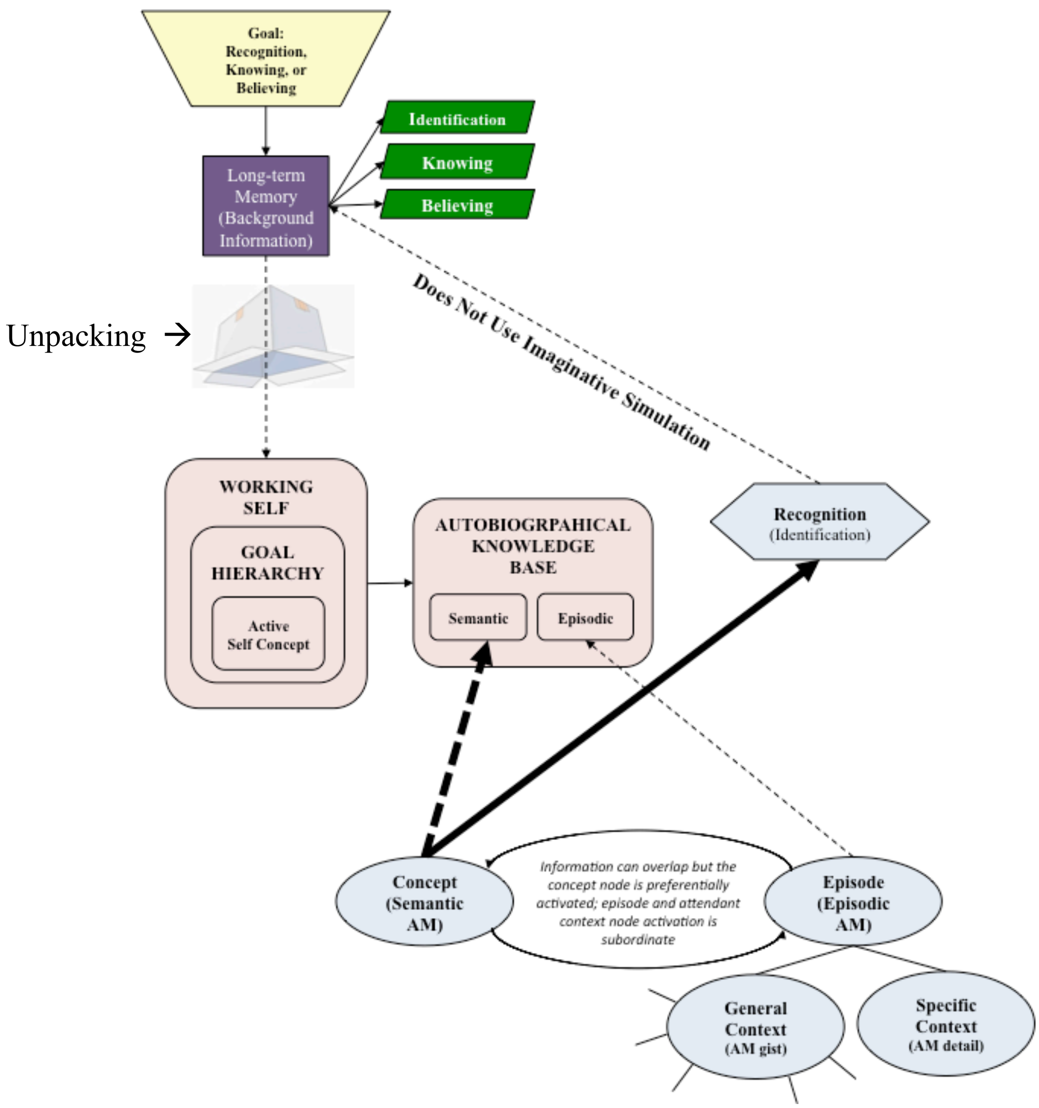


Figure 6. The proposed Expanded Simulation Model for perspective taking, which was adapted from Goldman (2006) and Shanton & Goldman (2010). The "unpacking" of the long-term memory component reveals the components of the *Self-Memory System* (SMS) (Conway, 2005; Conway & Pleydell-Pearce, 2000), and the *Source Activation Confusion* (SAC) model (Reder et al., 2009). The current paper hypothesizes that a form of long-term memory content used for perspective taking is autobiographical episodic memory content. This content is extracted upon the setting of a perspective-taking goal, which then prompts the activation of the corresponding self-concept stored in the SMS (depicted in pink). This triggers the SMS's "search and retrieval" procedure to activate the autobiographical episodic memory content at the neural level. Per the SAC (depicted in blue), this content is stored in an episode node. The illustration shows that, although episodic (and contextual) memory content is predominantly activated in response to a perspective-taking goal, any associated semantic memory content can be activated as well. The predominant activation of an autobiographical memory episode node prompts the assessment process of *recollection*, which requires the use of imaginative simulation (depicted in light green). The behavioral outcome is the inferring of another's mind; i.e., perspective taking. Shanton and Goldman characterize perspective taking as "other-directed"; therefore, the form of simulation used for perspective taking is *intrapersonal* simulation.

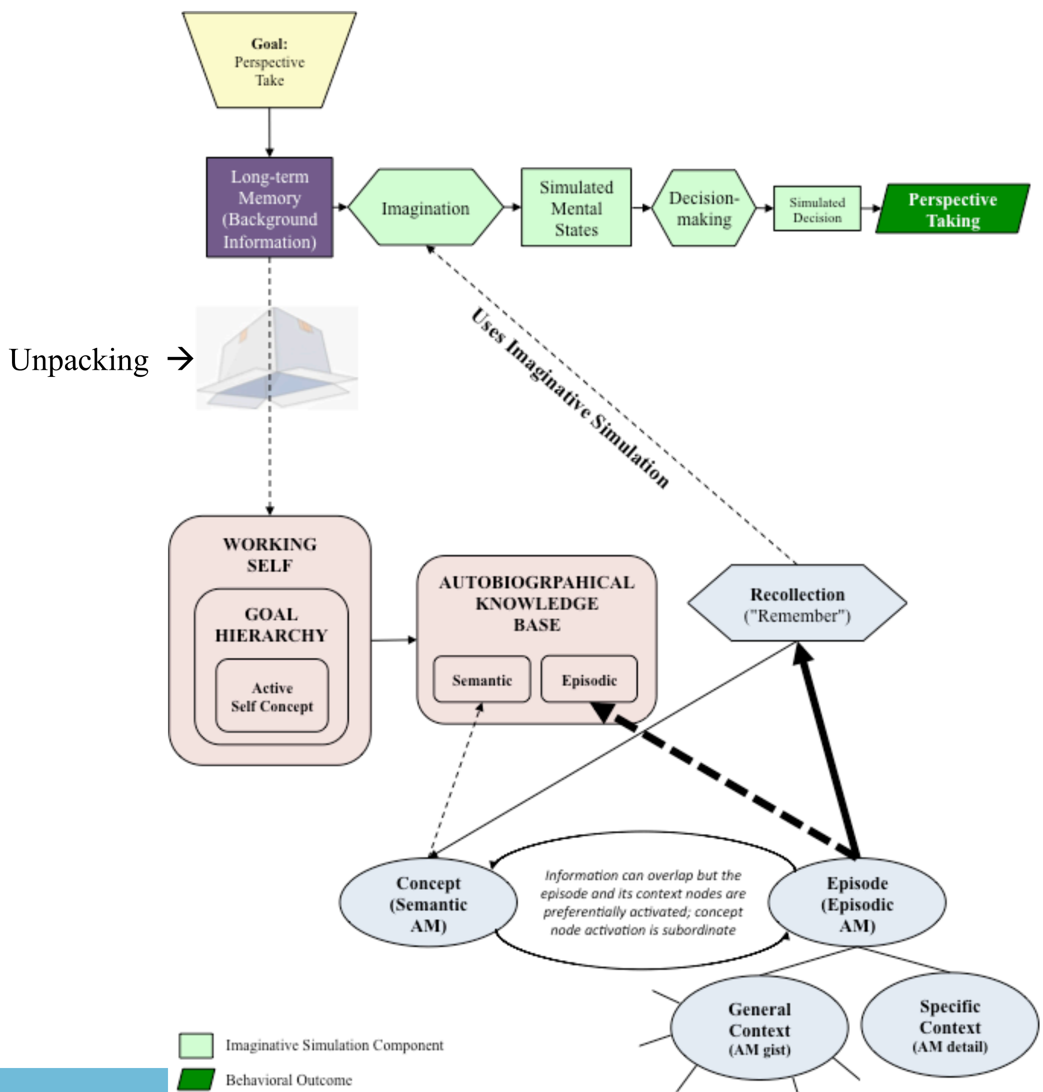


Figure 7. A possible simulation process model for mental time travel as adapted from Shanton and Goldman (2010). As with *high-level mind reading* (perspective taking), long-term memory content ("background information") serves as simulation input. The current paper operationalizes mental time travel as the behavioral outcomes of *reminiscence* ("re-experiencing" the past by retrieving and subjectively reliving predominantly episodic memory content), *prospection* ("pre-experiencing" the future by retrieving and imaginatively employing predominantly episodic memory content for the purpose of subjectively envisioning potential scenarios), and *counterfactual thinking* ("reframing" the past by retrieving and imaginatively employing predominantly episodic memory content for the purpose of subjectively changing or augmenting a past event). Shanton and Goldman characterize mental time travel as "self-directed"; therefore, the simulation form used for mental time travel is *intrapersonal* simulation.

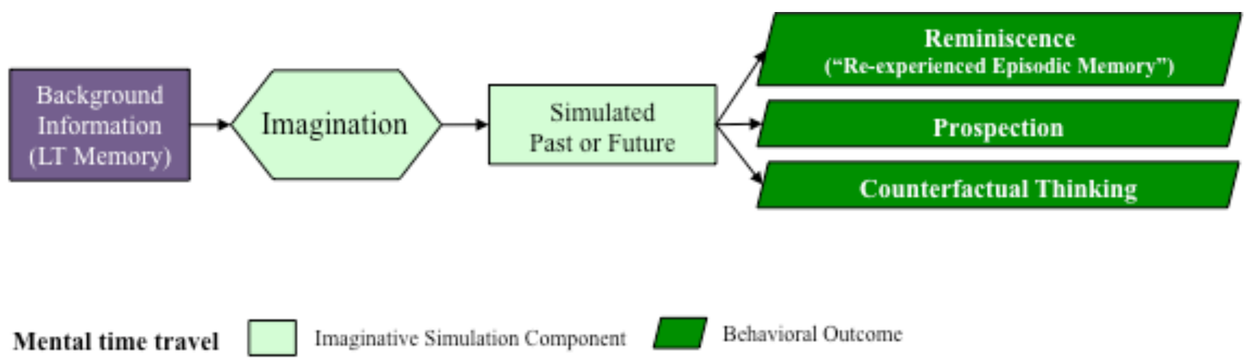


Figure 8. The complete proposed Expanded Simulation Model, which was adapted from Goldman (2006) and Shanton & Goldman (2010), and incorporates the components of the Self-Memory System (SMS) (Conway, 2005; Conway & Pleydell-Pearce, 2000) and the Source Activation Confusion (SAC) model (Reder et al., 2009). The path that leads to perspective taking reflects *interpersonal* simulation processing, while the past leading to the mental time travel behavioral outcomes reflects *intrapersonal* simulation processing.

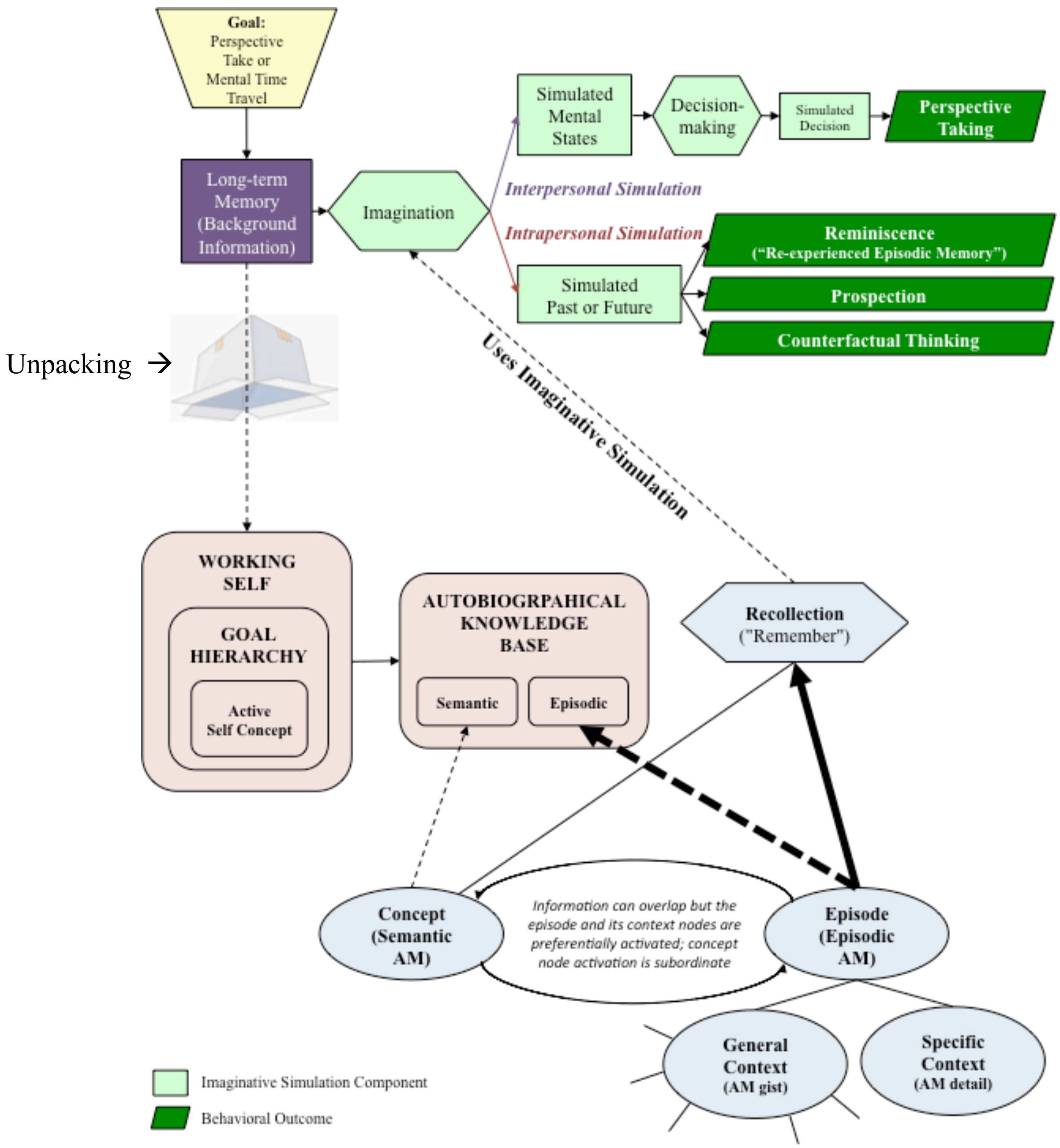


Figure 9. The model of autobiographical functions as validated by Ranson & Fitzgerald (in preparation). All functions emerged from the broad three-function model of Self, Social, and Directive (e.g., Neisser, 1982; Tulving, 2002b). Consistent with the model by Kulkofsky and Koh (2009) that the Ranson and Fitzgerald study attempted to replicate with a diverse adult sample, the Directive function split into the subfunctions of Teaching/Problem-Solving/Behavioral Control and Emotion Regulation, and the subfunctions of Conversation and Relationship Maintenance emerged from the Social function. Although the current paper found evidence that two Relationship Maintenance items were actually tapping into the use of autobiographical memory for perspective taking (PT), no other study has reported a PT function.

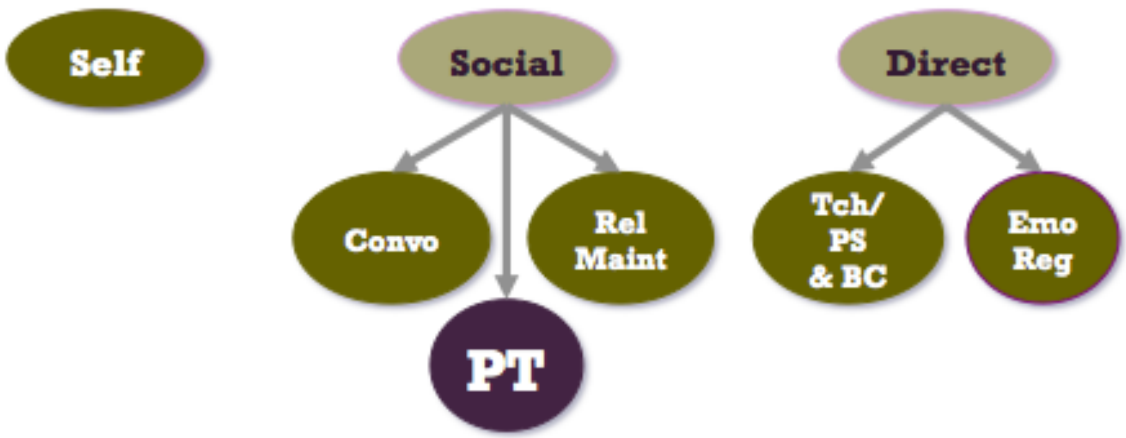
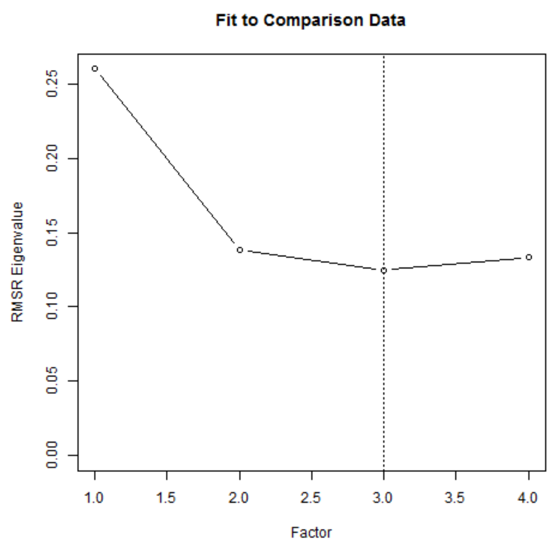
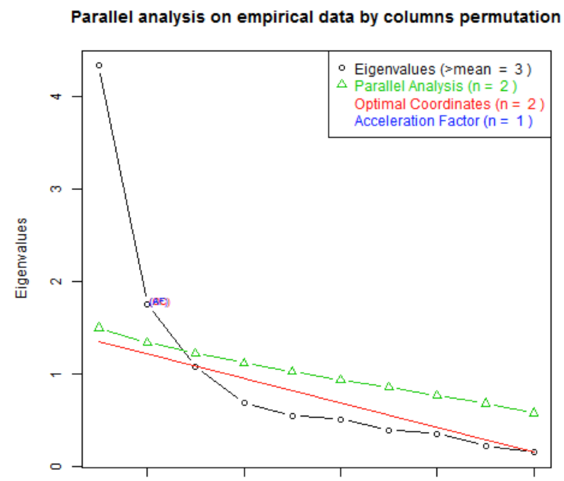


Figure 10. Graphic representations of Study 1's EPAF1 extraction diagnostics. The fit to comparison data test (a) supported a three-factor structure as hypothesized, as did the Kaiser eigenvalue rule (b). However, the parallel analysis (PA), optimal coordinates (OC), and acceleration factor (AF), all shown (b), as well as the scree plot (c) were inconclusive, predicting 2–3 factors. Note that AC is reflects the optimal number of factors minus 1; thus the number of factors it recommended was two.

a.



b.



c.

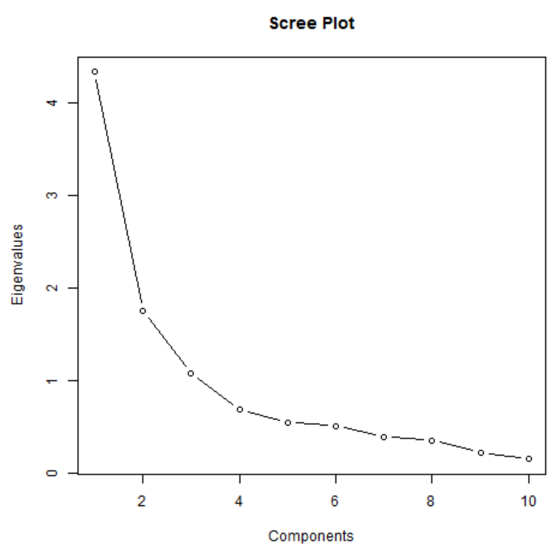


Figure 11. Study 1 EPAF1 factor diagram illustrates the loading strength and patterns when applying geomin Q-Q oblique rotation.

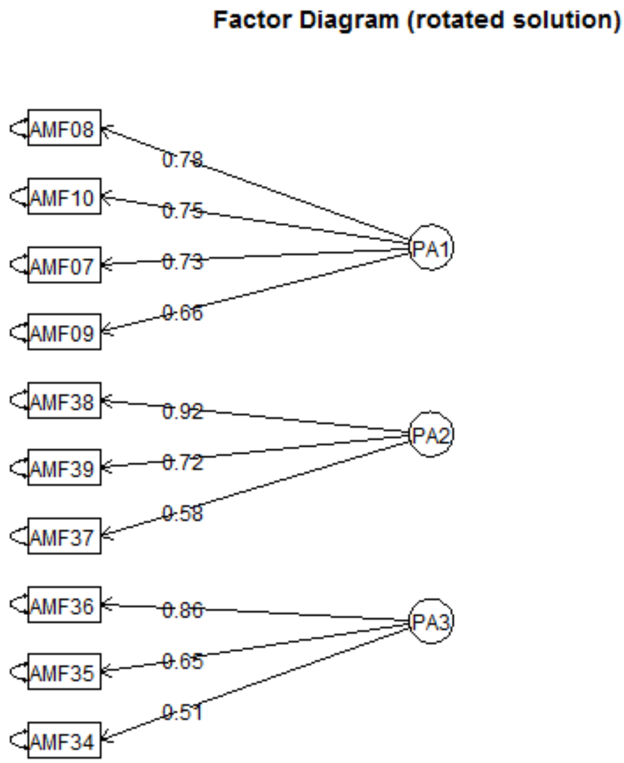


Figure 12. Study 1 EPAF1 factor diagram illustrates the loading strength and patterns when applying varimax orthogonal rotation.

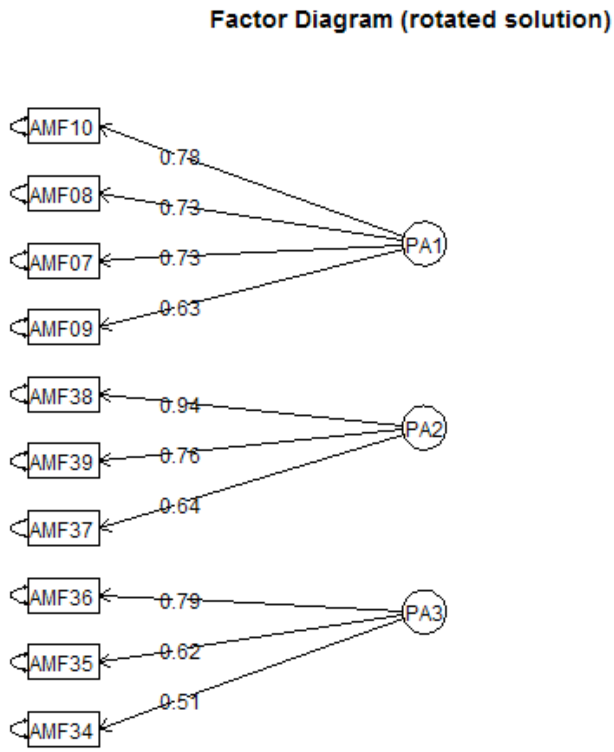


Figure 13. Study 1 path diagram per the SEM-CFA of EPAF1. Loadings are standardized estimates. All were significant and positive.

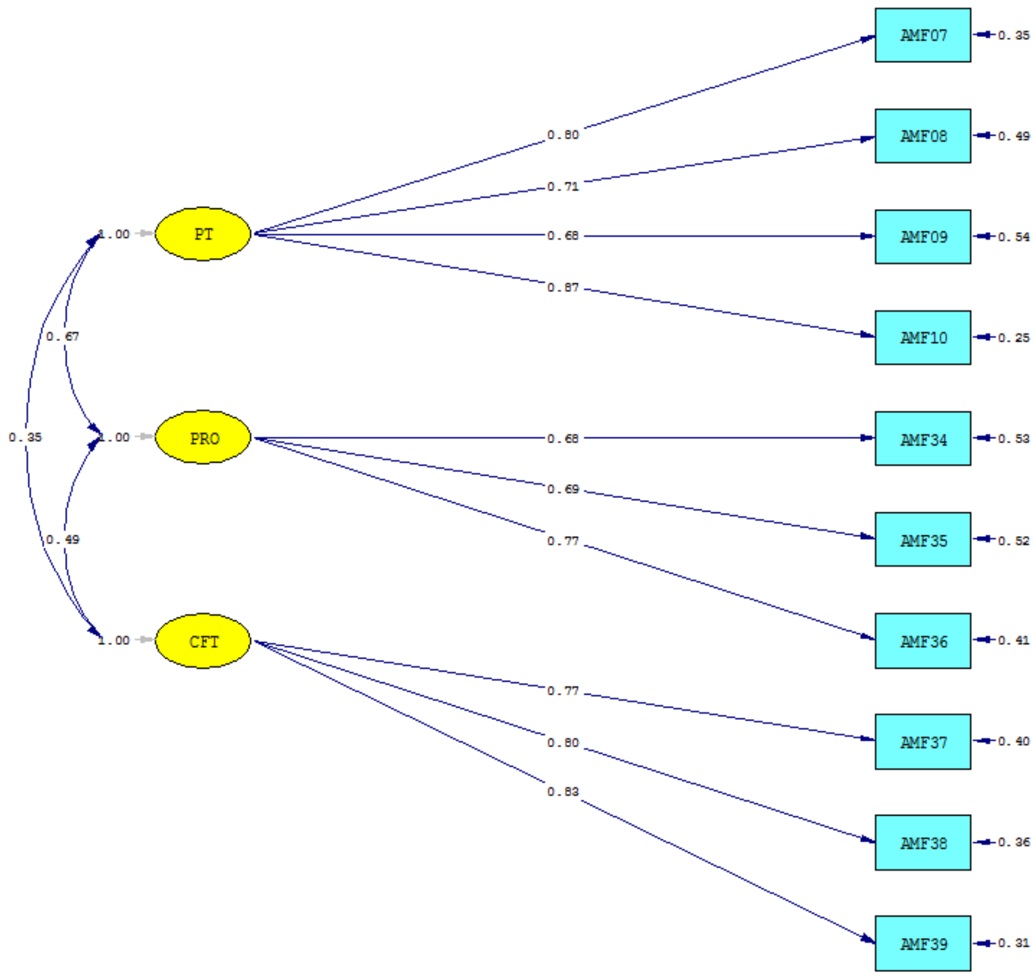


Figure 14. The hypothesized eight-function structure when the AMFS and AMFJR (Ranson & Fitzgerald, in preparation) scales are combined. As predicted by the theoretical Expanded Simulation Model, the three "simulation-based" AMFS functions of Prospection (PRO) and Counterfactual Thinking (CFT) will be shown in CFA to be independent and unique autobiographical memory functions in the presence of the "socially situated" AMFJR functions of Conversation (CON), Relationship Maintenance (RM), Teaching/Problem Solving/Behavioral Control (TPB), Emotion Regulation (ER), and Self (S). However, in the hypothesized eight-function model, the Perspective Taking function comprises the Perspective Taking subscales of the AMFS and AMFJR.

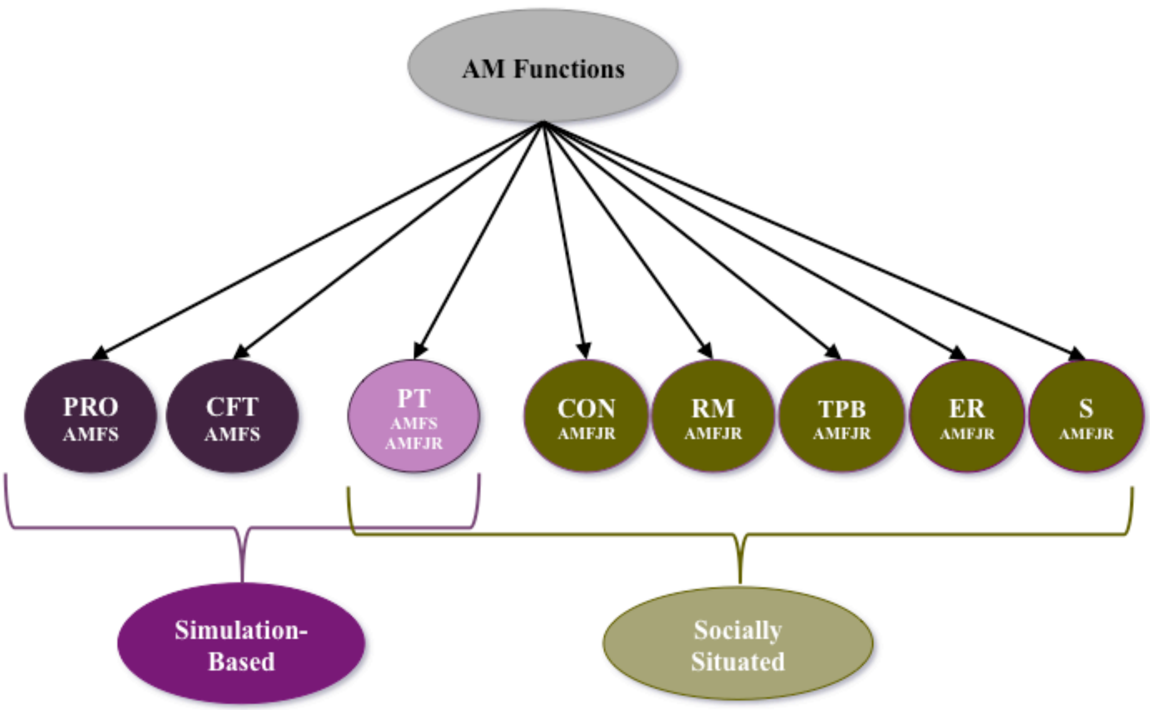


Figure 15: The expected relations between the functions of the AMFS and AMFJR, and the TALE's three broad Social, Self, and Directive functions (Bluck & Alea, 2011). CRS-A (aka AMFJR; Ranson & Fitzgerald, in press) validation showed that Conversation (CON), Perspective Taking (PT), and Relationship Maintenance (RM) mapped onto the broad Social function; Teaching/Problem Solving/Behavioral Control (TPB) and Emotion Regulation (ER) mapped on to the broad Directive function; and Self (S) mapped onto the broad Self function. Study 2 hypotheses state that, although the AMFS PT function is characterized as a simulation-based function, it will also map onto the TALE Social function because it reflects *interpersonal* simulation, which is driven by social goals (see Chapter 1, Hypothesis 1.7). It is also hypothesized that the Prospection (PRO) and Counterfactual Thinking (CFT) functions will map onto the TALE Self function because they reflect *intrapersonal* simulation, which is driven by self goals (see Chapter 1, Hypothesis 1.7). Because the Directive function has been shown to concern the guiding of present and future thoughts and actions (Williams et al., 2008), the PRO and CFT functions may also map onto the TALE's Directive function.

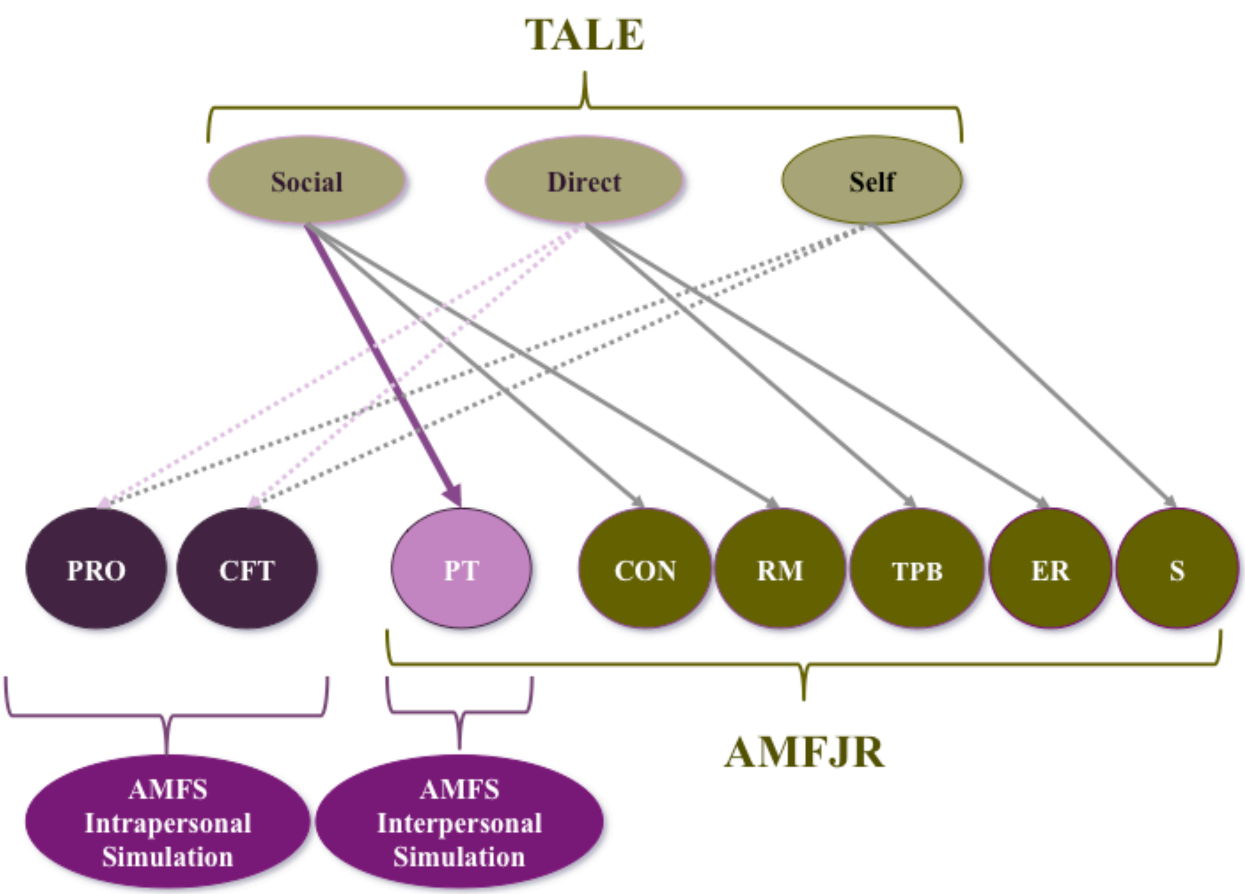


Figure 16: Results of the power analysis for Study 2's most complex model, which includes 61 observed variables (10 AMFS, 36 AMFJR, 15 TALE) and 11 latent variables (3 AMFS, 6 AMFJR, 3 TALE). Estimating a conservative effect size of .10, the recommended sample is at least 766. The target sample size is 900. Online sample size calculator by Soper (2006).

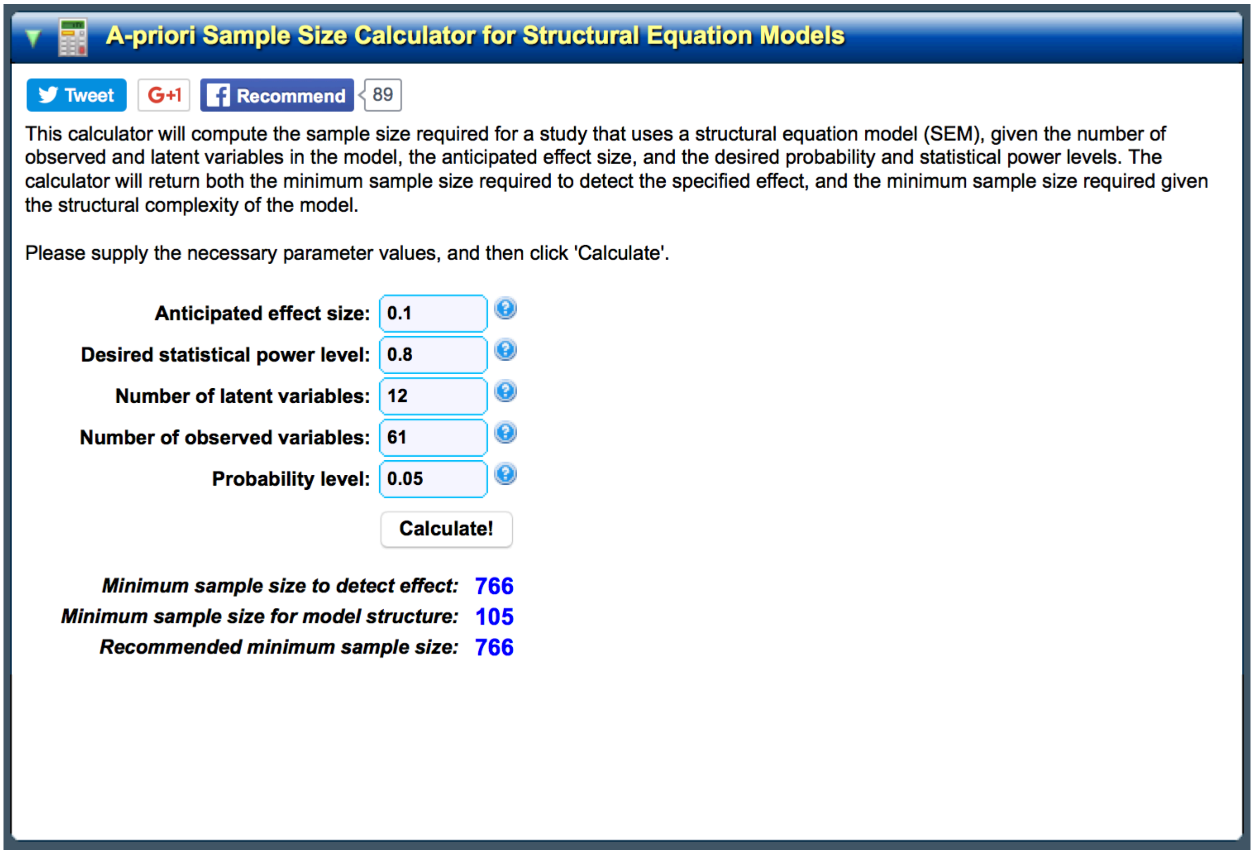


Figure 17: Results of the power analysis for a general multiple regression analysis using two predictors. The analysis was run using G*Power (Erdfelder et al. 1996).

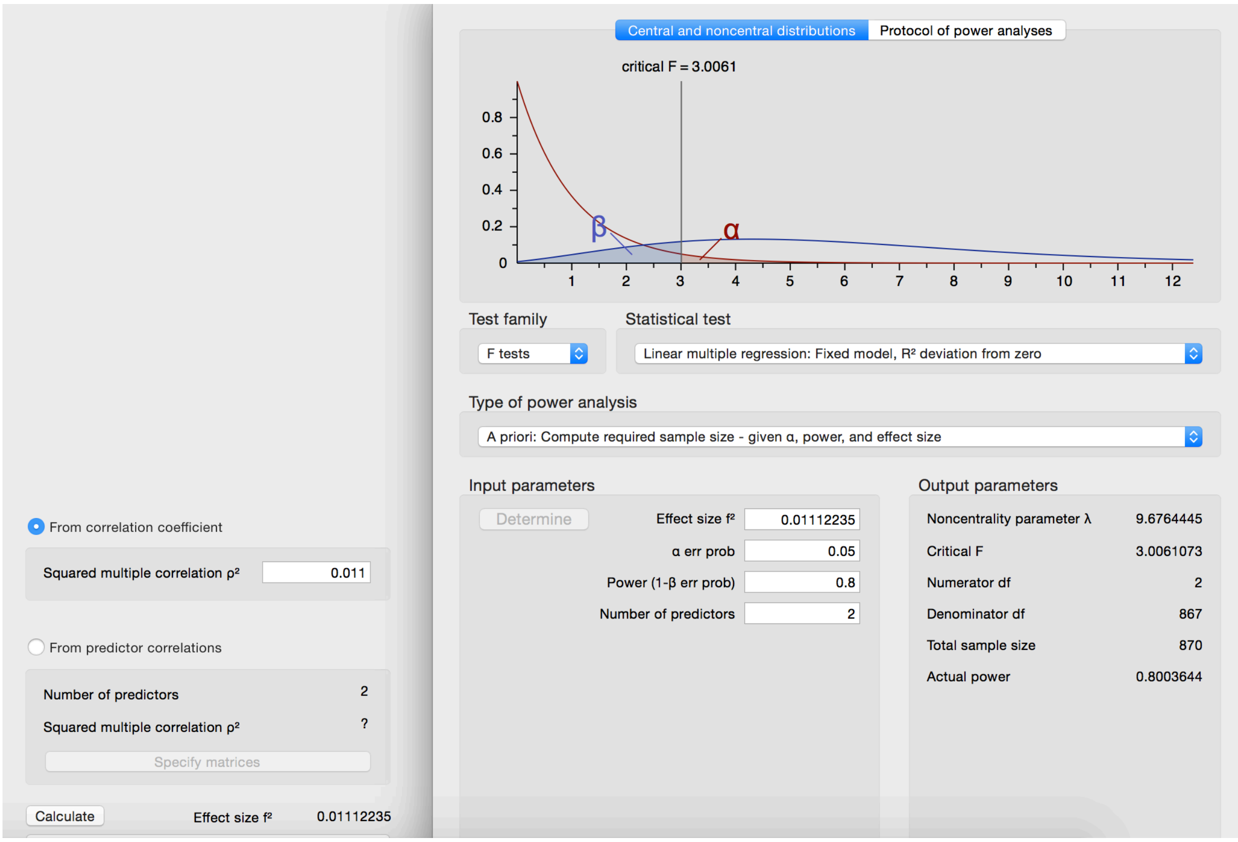


Figure 18. The nine-function structure that emerged when testing Hypothesis 3.1 using a second-order SEM CFA approach. Results showed that the AMFS function of Perspective Taking (PT_S) and the AMFJR function of Perspective Taking (PT_{JR}) were independent functions from one another, such that findings suggest there is a "simulation-based" function of Perspective Taking and a "socially situated" function of Perspective Taking. Results also confirmed that the AMFS "simulation-based" functions of Perspective Taking (PT_S), Prospection (PRO), and Counterfactual Thinking (CFT) are independent and unique autobiographical functions in the presence of the "socially situated" AMFJR functions of Conversation (CON), Perspective Taking (PT_{JR}) Relationship Maintenance (RM), Teaching/Problem Solving/Behavioral Control (TPB), Emotion Regulation (ER), and Self ($SELF_{JR}$).

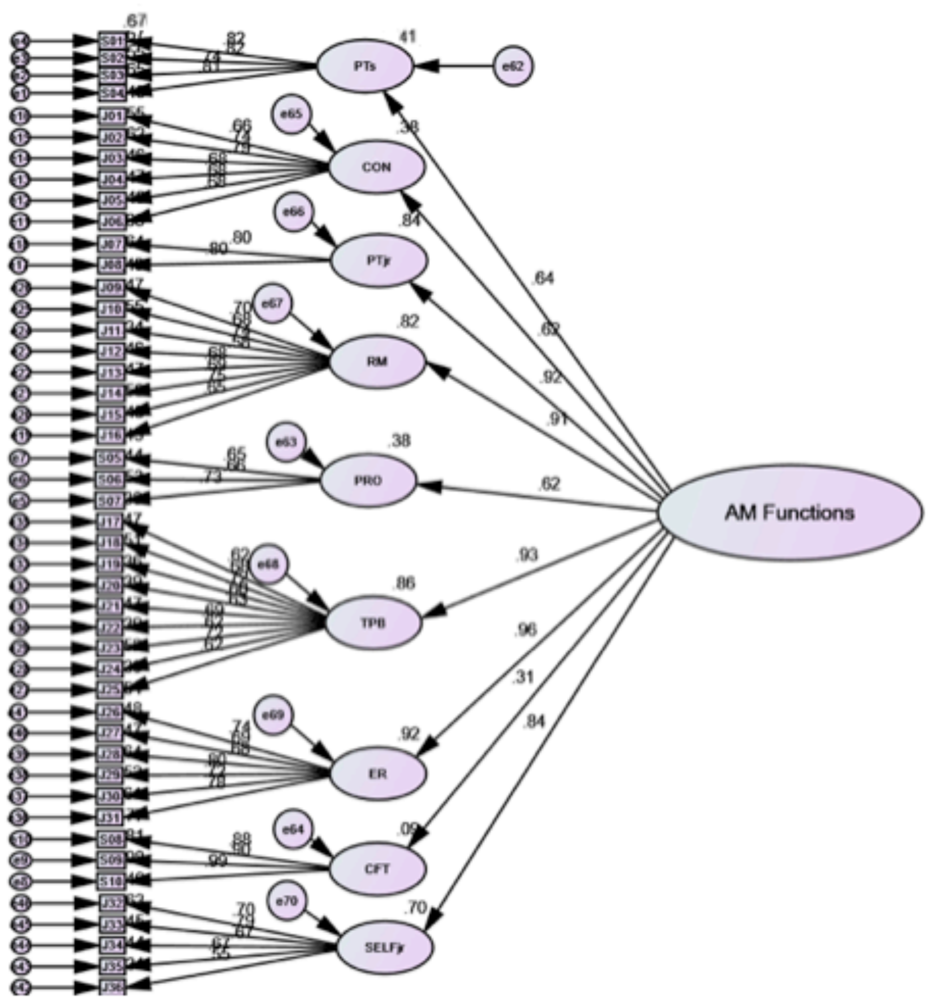


Figure 19. The Hypothesis 3.2 replication of the associations between the broad Social (SOC_T), Directive (DIR_T), and Self ($SELF_T$) functions of the TALE and the socially situated functions of the AMFJR as previously reported by Ranson and Fitzgerald (in preparation). As expected, results of the second-order CFA showed that the AMFJR functions of Conversation (CON), Perspective Taking (PT_{JR}), and Relationship Maintenance (RM) mapped onto the TALE's broad Social function; the AMFJR Teaching/Problem Solving/Behavioral Control (TPB) function mapped onto the TALE's broad Directive function, and the AMFJR's Self ($SELF_{JR}$) function mapped onto the TALE's broad Self function.

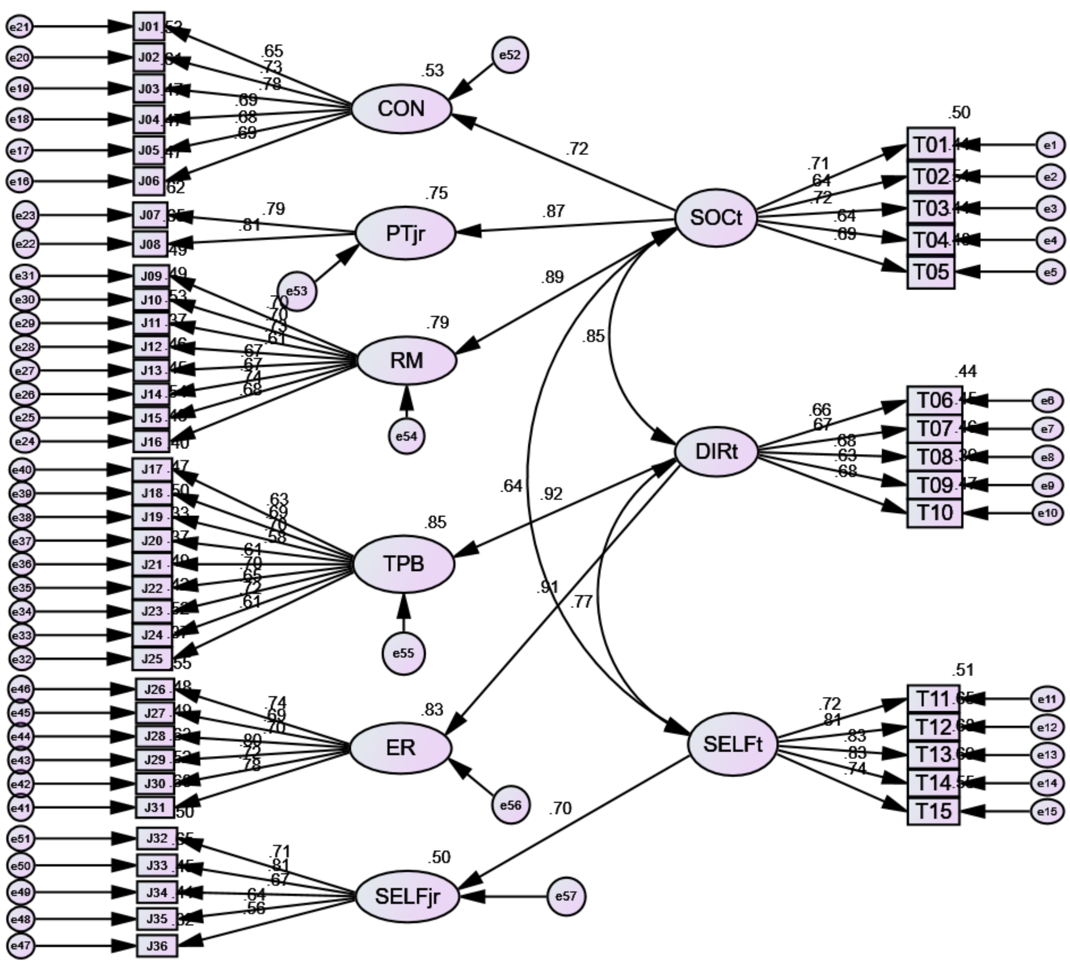


Figure 20. Results of the Hypothesis 3.2 test for associations between the simulation-based functions of the AMFS and the broad functions of the TALE supported the model shown below. As expected, the AMFS Perspective Taking (PT_S) function mapped onto the TALE's broad Social (SOC_T) function. However, because there was theoretical evidence that the AMFS mental time travel functions of Prospection (PRO) and Counterfactual Thinking (CFT) could be broadly Directive (DIR_T), Self ($SELF_T$), or some combination of both, specific mappings were not predicted. Results of the nine-function, second order CFA showed that the AMFS Prospection function mapped onto the TALE's broad Directive function, whereas the AMFS Counterfactual Thinking function mapped onto the TALE's broad Self ($SELF_T$) function.

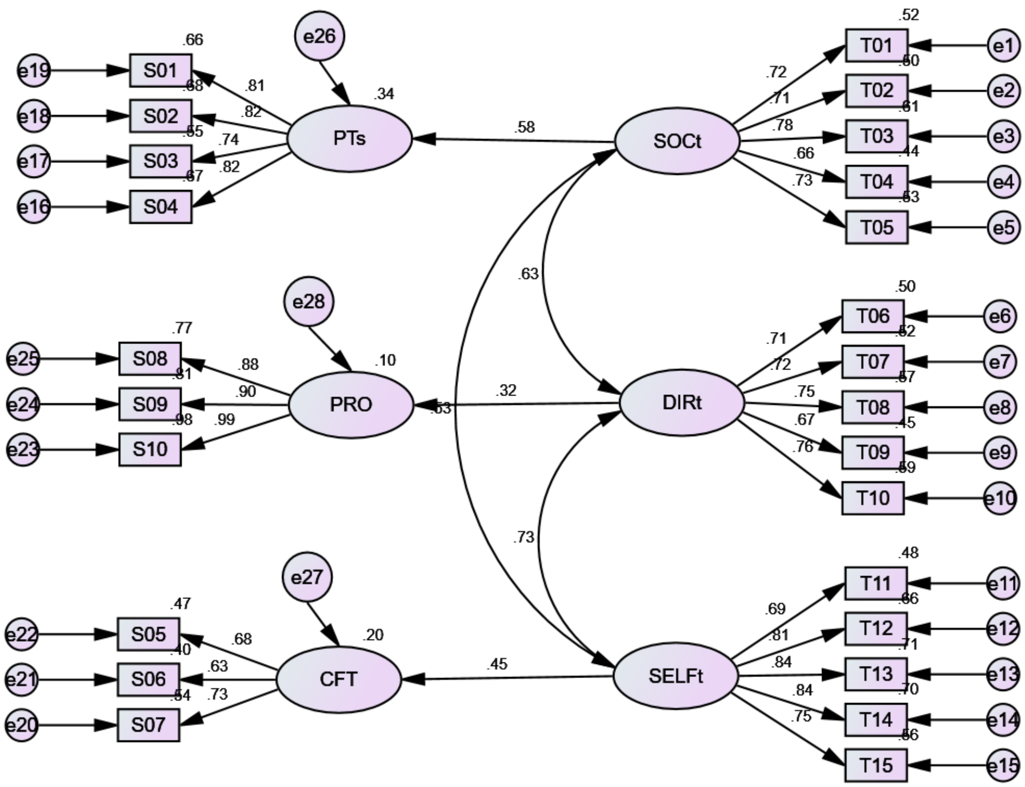
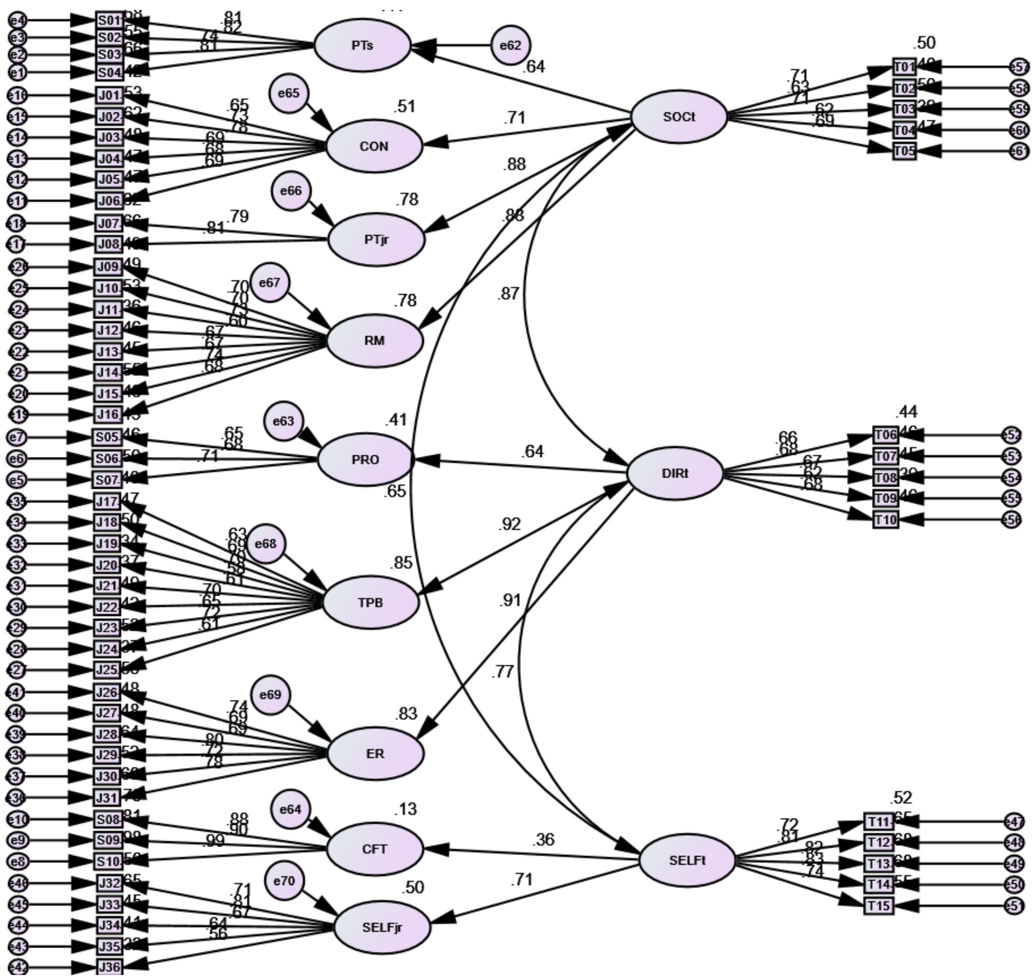


Figure 21. Results of the Hypothesis 3.2 test of whether the results of the AMFJR-TALE CFA and AMFS-TALE CFA would hold when examined as a single model. Results supported the mappings found for the individual Hypothesis 3.2 CFAs. Specifically, the functions that mapped onto the TALE's broad Social (SOC_T) function were the AMFS Perspective Taking (PT_S), and the AMFJR Conversation (CON), Perspective Taking (PT_{JR}), and Relationship Maintenance (RM functions. The functions that mapped onto the TALE's broad Directive (DIR_T) function were the AMFS Prospection (PRO) function, and the AMFJR Teaching/Problem Solving/Behavioral Control (TBP) and Emotion Regulation (ER) functions. The functions that mapped onto the TALE's broad Self ($SELF_T$) function were the AMFS Counterfactual Thinking (CFT) function and the AMFJR Self ($SELF_{JR}$) function.



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ABSTRACT

THE ROLE OF AUTOBIOGRAPHICAL MEMORY IN INTERPERSONAL AND INTRAPERSONAL SIMULATION: A THEORETICAL AND EMPIRICAL EXPLORATION

by

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Recent research seeking an expanded view of everyday autobiographical memory functions found evidence for a new function: *perspective taking* (Ranson & Fitzgerald, in preparation)—which is the inferring of others' mental states (Batson, Early, & Salvarani, 1997; Ickes, 2003). Because no other study has implicated the social behavior of perspective taking as a purpose for which autobiographical memory is used, Chapter 1 of the current paper proposes a conceptual cognitive process model developed to provide a theoretical explanation. The resultant *Expanded Simulation Model* was adapted for use in the current paper from the cognitive process model detailed in *simulation theory* (Goldman, 2006; Shanton & Goldman, 2010). The Expanded Simulation Model illustrates how, through the mechanism of mental simulation, autobiographical memory specifically, rather than long-term memory generally, can be used to inform perspective taking—thus theoretically substantiating perspective taking as a *function* of autobiographical memory.

Chapter 1 of the current paper details the "unpacking" of the simulation theory process model's superficially defined *long-term memory component* to show how autobiographical

memory content is activated, retrieved, and incorporated in simulation for perspective taking. Also aligned with a recent extension to simulation theory by Shanton and Goldman (2010), the Expanded Simulation Model can be used to explain how autobiographical memory specifically informs *mental time travel*—the mental traveling of oneself through conceptual time (Schacter & Addis, 2007). As such, the Expanded Simulation Model, in keeping with Shanton and Goldman's revised model, can account for the two ensuing forms of simulation: interpersonal and intrapersonal. That is, because perspective taking is *other*-directed, it is underlain by autobiographical memory-informed *interpersonal simulation*, whereas *self*-directed nature of mental time travel is underlain by autobiographical memory-informed *intrapersonal simulation*. Two empirical studies were designed to test the claims of Chapter 1. Study 1 (Chapter 2) validated a newly developed instrument for measuring the frequency with which individuals use autobiographical memory for perspective taking and two mental time travel functions: *prospection* (imagining future scenarios) (Schacter & Addis, 2007) and *counterfactual thinking* (reconstructing the past to imagine an details or an outcome that did not actually occur) (Roese & Olson, 1995).

Results of exploratory principal axis factoring for ordinal data, as well as confirmatory factor analysis using a structural equation model approach, yielded evidence that the 10-item *Autobiographical Memory Functions of Simulation* (AMFS) scale reliably measured the functions of perspective taking, prospection, and counterfactual thinking. Study 2 (Chapter 3) used the validated AMFS scale to evaluate the functions of perspective taking, prospection, and counterfactual thinking in the presence of, and in comparison to, other known autobiographical memory functions to glean a better understanding of their viability as independent functions. Results supported the independence of the AMFS functions. Further, evidence recommended the characterization of the AMFS function of Perspective Taking as “simulation-based,” whereas the AMFJR Perspective Taking function instead reflected rated frequency of functional use of autobiographical memory for socially situated Perspective Taking. Also discussed were mapping of the AMFS and AMFJR functions onto the broad functions of the TALE (Bluck & Alea, 2011), as well as personality, age, gender, and culture effects.

AUTOBIOGRAPHICAL STATEMENT

Jana Ranson is completing her Ph.D. in social cognition with a minor in quantitative methods and analysis at Wayne State University's Psychology program. She received her master's in Psychology from Wayne State University, and completed her Bachelor of Individualized Studies (Psychology, Philosophy of Science, and History of Science) at the University of Minnesota-Twin Cities. Her research interests include autobiographical memory functions, perspective taking, and mental time travel. She also currently works as a statistics consultant for the Research Design & Analysis (RDA) unit at Wayne State University, where she assists faculty, post-doctoral fellows, graduate students, and research staff in all phases of research. Her recent publications include *Everyday Memory: An Expanded Set of Autobiographical Memory Functions* (with Joseph M. Fitzgerald, Ph.D.; in preparation).