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Coherence of Personal Narratives across the Lifespan: A Multidimensional Model and Coding Method

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Abstract

Personal narratives are integral to autobiographical memory and to identity, with coherent personal narratives being linked to positive developmental outcomes across the lifespan. In this article, we review the theoretical and empirical literature that sets the stage for a new lifespan model of personal narrative coherence. This new model integrates context, chronology, and theme as essential dimensions of personal narrative coherence, each of which relies upon different developmental achievements and has a different developmental trajectory across the lifespan. A multidimensional method of coding narrative coherence (the Narrative Coherence Coding Scheme or NaCCS) was derived from the model and is described here. The utility of this approach is demonstrated by its application to 498 narratives that were collected in six laboratories from participants ranging in age from 3 years to adulthood. The value of the model is illustrated further by a discussion of its potential to guide future research on the developmental foundations of narrative coherence and on the benefits of personal narrative coherence for different aspects of psychological functioning.

Keywords

narrative development; coherence; autobiographical memory; self understanding

Personal narratives help us to make sense of our experiences (Bruner, 1990). One important measure of our success in drawing meaning from life events is the coherence of the personal narratives that we construct about these events (Linde, 1993). Indeed, coherence is a critical concept across studies of narrative in multiple domains, including autobiographical memory (Baker-Ward, Eaton, & Banks, 2005; Fivush, Haden, & Adam, 1995; Fivush, 2008; Kulkofsky, Wang, & Ceci, 2008; van den Broek, Bauer, & Bourg, 1997), understanding of

self and others (Bird & Reese, 2006; Fivush & Nelson, 2004), communication (Hudson & Shapiro, 1991; McCabe & Bliss, 2003), and identity formation (Habermas & Bluck, 2000; McAdams, 1993; McLean, Pasupathi, & Pals, 2007). For example, more coherent personal narratives are associated with better memory, deeper understanding of self, more effective communication, and stronger identity. Personal narrative coherence is also linked to physical and psychological health (Baerger & McAdams, 1999; **Fratrotoli, 2006; Pennebaker, 1997) and to closer family relationships (Bretherton & Munholland, 1999; Fiese et al., 1999; Laible & Thompson, 2000; Main, Kaplan & Cassidy, 1985; Waters & Waters, 2006). Note that narrative coherence is not necessarily a measure of the “artistic” quality of a narrative. A narrative could be highly coherent yet lack drama; however, we assert that for a narrative to be of high quality, it must first be coherent. Thus, coherence can be considered a necessary but not sufficient feature of a high-quality narrative.

Somewhat surprisingly, given the growing interest in personal narratives across the field of psychology and the critical theoretical and empirical arguments concerning the centrality of coherence, there is as yet no agreed upon definition of personal narrative coherence. As a working definition, we propose that a coherent personal narrative is one that *makes sense* to a naïve listener – not just in terms of understanding when, where, and what event took place, but also with respect to understanding the meaning of that event to the narrator. This definition guides the new model that we advance, one that extends existing frameworks in at least three ways: by taking a developmental approach, by viewing coherence in multidimensional terms, and by recognizing differential linkages between the dimensions and developmental outcomes.

Our developmental perspective suggests that the construction of a coherent personal narrative reflects a set of skills that develop in a regular fashion over time across the lifespan, and, as such, that theories and measures of narrative coherence must incorporate these developmental changes. Related to this developmental orientation, we argue that personal narrative coherence is multidimensional. Coherence cannot be seen as a unitary construct, but rather must be viewed as a property of a narrative that arises from a set of dimensions, each of which contributes to overall narrative coherence in different ways at different ages. Moreover, we present theoretical arguments and empirical evidence to support the view that dimensions of coherence are, to a large extent, independent, developing at varying rates across the lifespan. Further, these dimensions are combined in different ways to create coherence out of various kinds of experiences, such as highly positive versus negative events. Finally, we feel that the multiple dimensions of coherence may be differentially related to the outcome measures of interest. Some aspects of coherence may be more important for memory than for identity or communication, and vice versa. Thus, with a developmentally sensitive, multidimensional model of personal narrative coherence, we will be better able to predict and to measure the development of coherence, as well as the relations between narrative coherence and multiple aspects of psychological functioning across the lifespan.

In this paper we offer a review of the particularly robust literatures in cognitive developmental psychology and linguistics on personal narrative coherence and its outcomes. We do so to set the stage for the new lifespan model of personal narrative coherence that we propose, along with a companion scheme for coding the coherence in narratives of events that were experienced on a single occasion. We hasten to acknowledge that our treatment of the literature is restricted in a number of ways. First, given our focus on coherence of single event narratives, we exclude from our review linguistic models of narrative coherence that focus on stories of one’s whole life (life story analysis, e.g., Bohn & Berntsen, 2008; Habermas & Bluck, 2000; Habermas & de Silveira, 2008). Second, with our emphasis on the cognitive developmental literature, we exclude models that have emerged from clinical

psychology that include the role of narrative coherence in assessments of attachment status (e.g., the Adult Attachment Interview or AAI; Main et al., 1985) and ratings of family functioning (the Family Narrative Consortium Scheme; Fiese et al., 1999).

To foreshadow our model, we propose three independent dimensions of coherence: context, chronology, and theme. Critically, each dimension is hypothesized to rest upon different developmental achievements and to have a different developmental trajectory across the lifespan. To test the model of personal narrative coherence, we have also developed a coding scheme to measure each dimension of coherence across the lifespan. We apply this scheme to data from multiple laboratories and age groups in an effort to demonstrate the utility of the model, and to confirm some of the predictions that are derived from it.

Models of Narrative Coherence

Within cognitive developmental psychology, there are two traditions in the study of narrative coherence, one emerging from schema models of memory and representation (e.g., Mandler, 1978; Stein & Glenn, 1982**), and the other from linguistic analyses of narrative form (Chafe, 1990; Labov, 1972; Peterson & McCabe, 1983). Story schema and linguistic approaches to the study of narrative share much in common. Both posit that coherent narratives begin with orienting and contextual information that is then followed by referential information about what occurred. Both also assume that coherent narratives are evaluative, although evaluations arguably play a more dominant role in determining coherence within approaches in the linguistic tradition than in the story schema tradition. An important difference is that the story schema approach is built on the assumption that narratives are goal directed; indeed, narrative actions are seen as being driven by the protagonist's wish to achieve a goal. Approaches in the linguistic tradition, in contrast, do not presuppose that events, or the resulting narratives, are goal-directed. The review of the main findings of studies of personal narrative coherence illustrates further differences that arise from these two modes of analysis. Both the story schema and linguistic approaches informed the new model of narrative coherence that we propose later in this paper.

Story Schema Approach

In the story schema or story grammar approach, a coherent narrative is one that is goal-directed. The narrator must introduce a main character, then describe the problem besetting him or her, and then relay his/her attempts to solve the problem in a chain of events that leads to the resolution of the problem (Mandler, 1987; Mandler & Johnson, 1977; Stein & Glenn, 1979). Whereas a considerable amount of work on story schemas has addressed coherence in story recall or in fictional storytelling (see Nicolopoulou, 2008 for a model of narrative coherence in children's fictional storytelling), the work reviewed here focuses on the use of story schema approaches to conceptualize personal narrative coherence.

Consider first, for example, Peterson and McCabe's (1983) "story-grammar structure" analysis of personal narratives that drew heavily from the work of Stein and Glenn (1979). Their system involved seven major types of story structures: descriptive, action, and reactive sequences; and abbreviated, complete, complex and interactive episodes. These structures were classified from least to most complex, with the first three involving simple descriptions of characters, settings, and actions (descriptive sequence); the characters' behaviors (action sequences); and changes in the characters' environment (reactive sequence), without mention of goals, plans, and causal relations. The later "episodes" move from descriptions of the aims of the protagonist (abbreviated episode) to reveal evidence of planning by the protagonist (complete episode), involve multiple embedded episodes and multiple or repeated plan applications (complex episode), and portray perspectives from two people with goals who influence each other (interactive episode).

Taking this approach, Peterson and McCabe (1983) found that 9-year-old children adopted a more coherent or goal-directed pattern in their personal narratives than did 4- and 5-year-olds, with a dramatic increase in complex episodes observed between the ages 4 and 5. In fact, across studies (e.g., Champion, Seymour, & Camarata, 1995; Peterson & McCabe, 1983), over half of the personal narratives school-aged children told were goal-directed. At the same time, less sophisticated “reactive sequences” do not decrease over development (Champion et al.; McCabe, Capron, & Peterson, 1991), which may be consistent with suggestions in the literature that some experiences do not revolve around forming goals (e.g., stories about a happy experience; Hudson, Gebelt, Haviland, & Bentivenga, 1992), or do not lend themselves to problem resolution (e.g., stories in which someone was injured; see McCabe et al., 1991).

Thus, despite the important contributions of story schemas to cognitive psychology, the approach may not capture some important aspects of developmental change in coherence because many personal experiences lack explicit goals. Moreover, story grammar was not developed to capture narrators’ attempts to find personal significance in their experiences, which is central to our definition of personal narrative coherence.

Linguistic Approaches

In contrast to the story grammar approach, most schemes of personal narrative coherence are based instead upon a linguistic mode of analysis that was articulated by Labov (1972; Labov & Waletzky, 1967/1997). Labov and colleagues proposed that personal narratives serve two primary functions: reference and evaluation. The *reference* function of narrative is to provide information to the listener about **1) the participants, 2) where and when a specified event took place, and 3) what happened. Meaningful stories, however, must go beyond simply narrating event actions and placing them in context. The second function of narrative is that of *evaluation*, which includes nonverbal and verbal expressions of emotion, emphasis, perspective, and insight. Evaluations are the core of personal narratives because they convey the significance of the event for the teller. Both reference and evaluation are critical for a narrative to be coherent. But even a narrative that contains a great many referential and evaluative utterances will not be coherent if these devices are not placed at appropriate moments in the story. Labov theorized that a coherent narrative is organized around a “high point” or key moment in the story. Complicating actions lead up to the high point, which must be evaluated, and then the high point must be resolved through further wrap-up actions and internal reactions. Clearly our definition of a coherent personal narrative has much in common with Labov’s definition with its emphasis on what, where, when, and why the event is important. Below we profile several coding schemes that are based on Labov’s theory of narrative structure.

High point analysis—In addition to their coding scheme based on story grammar, Peterson and McCabe (1983) operationalized Labov’s (1972) theory with their high-point analysis. In high-point analysis, a personal narrative is first analyzed by clause with respect to *complicating actions* (what happened), *orientations* (who, when, and where), and *evaluations* (emotional references, exclamations, judgments, perceptions). A narrative that contains orientations and evaluations is deemed more coherent than a narrative that consists solely of complicating actions. Next, the global coherence of the narrative is assessed via the presence of a “high point” or climax to the story, followed by a resolution. This “classic” pattern is considered the most developed or coherent in Peterson and McCabe’s scheme. Less developed narrative structures include: **1) “ending-at-the-high-point,” which lacks a resolution; 2) “leap-frogging,” in which the narrator jumps from event to event without any apparent connections between events; 3) “chronological,” in which the narrator tells events in a logical order but fails to evaluate events, orient the listener, or include a high point; 4)

“impoverished,” in which the narrative is too short to contain a discernible structure; and 5) “disoriented” or incoherent stories.

Peterson and McCabe (1983) tested this coding scheme with over 1000 personal narratives produced by 96 3-1/2 to 9-1/2-year-old children from primarily working-class European American backgrounds. The general conclusion from this study and others (e.g., Peterson, 1994) is that European American children progress from using the less developed narrative forms at age 4 (primarily leap-frog, impoverished, disoriented, and chronological) to the more developed forms of end-at-the-high-point and classic from ages 5 to 9. The chronological pattern, however, continues to be a prevalent form through age 8. By age 9, the majority of children (58%) are using a classic structure in their personal narratives (see also O’Kearney, Speyer, & Kenardy, 2007).

Microanalytic approaches to high-point analysis, in which the total number of different types of actions, orientations, and evaluations is tallied, also offer useful information on the development of the components of high-point structure. Although longer stories are certainly not always more coherent stories, the inclusion of orientation and evaluation clauses does tend to create coherence in a story. These studies reveal that although children use evaluations in their narratives from as early as age 2, these evaluations are mostly in the form of intensifiers (“*waaay* high up in the sky”), and by the preschool years, affective information (“it was *fun*”) and dialogue (She said “*We’re going to the zoo.*”) (Fivush, 1991; Fivush et al., 1995; McCabe & Peterson, 1991; Trionfi & Reese, 2009). In middle childhood and adolescence, children’s evaluations expand to include more sophisticated techniques such as judgments, explanations, interpretations, and intentions (e.g., Baker-Ward, Eaton, & Banks, 2005; O’Kearney et al., 2007; Peterson & Biggs, 2001). Likewise, children are able to use some orientation devices such as “and then” from a young age (Fivush, 1991), but their use of more complex temporal and causal orientations, such as “so” and “because,” and their inclusion of setting and background information, increases into middle childhood (Hendrickson & Shapiro, 2001; Hood & Bloom, 1979; Hudson & Shapiro, 1991; McCabe & Peterson, 1985; O’Kearney et al., 2007).

The coherence of a narrative using high-point analysis also depends on the valence of the event. Narratives about negative events more often include high points and thus are deemed more coherent than those concerning positive events (Fivush et al., 2003; Peterson & Biggs, 1998, 2001; but see Bohanek, Fivush, & Walker, 2005). Notably, a number of the events in Peterson and McCabe’s (1983) original corpus, and in subsequent studies using high-point analysis, are about personal injuries or other negative events. High-point analysis may be particularly well suited to establishing the development of coherence in narratives about negative events that conform to a classic high-point structure. Thus, as with the story schema approaches, global high-point analysis can be seen to be somewhat limited by its reliance on the structure of the original event in determining global coherence.

It is important to note that coherence in global high-point schemes is typically conceived of as unidimensional in that narratives are classified along a single dimension of structural coherence or well-formedness. This global approach to coherence has the advantage of parsimony. We argue, however, that coherence comprises multiple dimensions, with potentially different developmental trajectories. To illustrate a multidimensional scheme of coherence, consider O’Kearney et al.’s (2007) analysis in which coherence was scored along three dimensions, each rated on a 3-point scale: **1) orientation (to people, place, and time); 2) sequencing (chronological ordering); and 3) evaluation (inclusion of internal states or statements about the point of the narrative). Reliability was high for the orientation and sequencing dimensions (94% agreement), but was lower for the evaluation dimension (69%). Moreover, children’s age correlated weakly with their coherence on the orientation

dimension ($r = .23$), and not at all with the other dimensions of coherence, suggesting additional variability in the development of coherence that remains to be captured.

Life event analysis—Another example of a multidimensional approach to narrative coherence arising out of the linguistic tradition is Baerger and McAdam's (1999) scheme for coding coherence in the life story. In contrast to other approaches to life story analysis in which a story of the whole life is requested, McAdam's (1993) procedure consists of interviewing adults about discrete life events, such as a high point, low point, and turning point. These individual event narratives can then be analyzed for level of insight achieved (McLean & Thorne, 2003; Pratt, Norris, Arnold, & Filyer, 1999) and for coherence.

Baerger and McAdam's (1999) coherence scheme taps four dimensions: orientation, affect, structure, and integration. Each of these dimensions is scored along a 7-point Likert-type scale and then summed for a total coherence score. *Orientation* measures whether narrators include critical information about the characters, setting, and time near the beginning of their narrative. *Affect* taps the evaluative component of the narrative: does the narrator tell the listener the evaluative point of the central topic? Clearly, these orientation and affect dimensions are similar to Labov's (1972) reference and evaluation dimensions and they resonate with our definition of coherence. *Structure* includes both temporal sequencing and adherence to a canonical story structure in which a goal is described and then resolved. This dimension is similar to both the story schema and high-point approaches. *Integration* is a dimension unique to the life story approach that measures the degree to which the meaning of the event fits with the narrator's history and identity. This scheme is multidimensional and nuanced, and most importantly, it captures individual differences in the mature forms of coherence that continue to develop into adulthood. However, to date this scheme has only been used with adults' life stories, and it is unclear as to whether it could be adapted to use with younger participants.

Narrative assessment protocol—Finally, the Narrative Assessment Profile (NAP; Bliss et al., 1998) evolved from linguistic approaches in response to the needs of speech-language therapists charged with the task of assessing the narratives of children with diverse ethnic and linguistic backgrounds. The NAP involves binary judgments on six dimensions of narrative: topic maintenance, sequencing, detail, orientations, conjunctions, and fluency. The NAP is intended to be a lifespan scheme but so far has been applied mainly as a screening tool for narrative disorders in school-age children drawn from clinical populations (e.g., Biddle, McCabe, & Bliss, 1996; Miranda, McCabe, & Bliss, 1998) and diverse cultural backgrounds (McCabe & Bliss, 2003). With its binary judgments, it is possible that this scheme may not detect lifespan changes in personal narrative coherence in typical populations. Moreover, the approach is mainly designed to tap temporal, causal, and chronological coherence, but not to evaluative coherence.

A Multidimensional Model of Personal Narrative Coherence across the Lifespan

It is apparent from this review that researchers have conceptualized coherence in personal narratives in different ways and for different reasons. Yet many of the approaches to personal narrative coherence that we have reviewed tap similar constructs. We drew upon these existing models to derive the three dimensions that we view as essential, independent aspects of coherence in personal narratives.

Three Dimensions of Narrative Coherence: Context, Chronology, and Theme

The first recurrent dimension in the work on narrative coherence is an emphasis on contextual details in the narrative: Where and when did an event being discussed take place? This information is necessary for the listener to make sense of the event description that

follows. The second recurrent dimension is the temporal ordering of the narrative: Can the listener infer the order in which the original actions within an event took place, either from the sequencing of these actions or from linguistic markers of temporality? A narrator does not have to tell about events in the order in which they took place originally for the narrative to be temporally coherent. In fact, one way that highly skilled narrators create dramatic stories is to rearrange the original order of actions within the event: by starting at the high point, for instance, and then going back in time to narrate the actions that led up to that high point. As long as the narrator includes temporal and causal linguistic markers to clarify this order, the narrative will still be coherent to the listener with respect to chronology. Finally, for a narrative to be coherent, it must contain information about the point of the story, with this aspect of the narrative being captured by a third dimension, theme. The thematic dimension is assessed through the inclusion of a high point and a resolution, accompanied by affective and evaluative information. The story as a whole must also be sufficiently on-topic and developed for the emotional point to be clear. Digressions may not harm the overall coherence of the narrative if they are marked as such in the narrative.

These three dimensions of context, chronology, and theme are prominent across diverse theories of narrative coherence (e.g., Labov, 1972; McAdams, 2006). The missing element from all existing models of narrative coherence, however, is a theory of how and why these different dimensions of personal narrative coherence would develop at different rates across the lifespan (but see Habermas & Bluck, 2000, for a theory of developmental changes in the life story in adolescence). What follows in the next section is an articulation of our theory of these developmental changes and of the linguistic, cognitive and social-cognitive skills underlying these changes.

Development of Coherence in Personal Narratives

Which dimensions of coherence will develop first, and why? We predict that the chronology dimension is the first to develop, although development on this dimension in its mature form will continue into adolescence. It is well-documented that infants and young children are sensitive to temporal order (Bauer, 2006a; Friedman, 2003), and that even preschoolers report familiar and routine events in their correct temporal order (Nelson & Gruendel, 1986). However, there is emerging evidence that temporal ordering is a complex skill that continues to develop across childhood (Friedman, 2005). In order to provide a narrative that follows a comprehensible temporal order, each action must be placed in relation to other actions, which requires the abilities to engage in causal reasoning and to create links both forward and backward in time in order to understand how multiple actions within an event are interlocked. These kinds of advanced temporal reasoning skills do not emerge until adolescence (Friedman, 1986). Thus, in narrating a unique autobiographical event, we predict that preschoolers and young children would be able to create a reasonably temporally ordered narrative, such as that represented as a “chronological” narrative in high-point analysis (Peterson & McCabe, 1983), but that the ability to create a more complicated, causally connected narrative that would allow for the majority of actions to be presented in temporal order would not emerge until later childhood.

With regard to the context dimension, we predict that young children will be near floor in providing time and/or place in their narratives, based on the findings of microanalytic analyses of orientations reviewed above (e.g., Fivush, 1991; Fivush et al., 1995; McCabe & Peterson, 1991; Trionfi & Reese, 2009). Performance on this dimension will not emerge until middle childhood, when children regularly start to provide some orientations to time and place in their narratives. Yet we predict that development on the context dimension will continue into adolescence and will show a more protracted course of development in comparison to the chronology dimension. Research on children’s developing understanding of time is also relevant for this dimension. Friedman and Lyon (2005) reported substantial

changes into middle childhood in reconstructing the time at which an event took place. Children's understanding of the conventions of time is still developing in middle childhood and early adolescence, especially in their attempts to coordinate multiple time scales (calendar months and years, seasons, and school years) in reconstructing the times of personally experienced events (Friedman, Reese, & Dai, 2009). Performance on the context dimension also involves an understanding of what the listener already knows and needs to know about the event. Although even preschoolers are capable of some limited perspective-taking, the ability to take the listener fully into account continues to develop into adolescence (Harter, 1999).

With regard to the theme dimension, based on previous narrative research, we predict that even preschoolers would be able to maintain and possibly elaborate upon a topic (Peterson & McCabe, 1983), but that the ability to provide a resolution or a connection between an event and the self would not emerge until adolescence (Habermas & DeSilveira, 2008). In essence, maintaining a topic relies on the ability to monitor communication and make judgments about similarity that allow one to put together several statements in a row, each related to the previous statement. These kinds of executive function abilities are in place by about age 4 (see Blair, Knipe, & Cummings, 2007), and so by the end of the preschool years, children should be able to generate an on-topic narrative. However, providing a resolution, or drawing a connection to the self, requires additional abilities. These other abilities include being able to create overarching temporal links between a past event and the current state of affairs, as well as the ability to self-reflect and create explicit links between experience and self-understanding. These types of metacognitive skills do not emerge until early adolescence (e.g., Friedman, 2004; Harter, 1999; see Habermas & Bluck, 2000, for an overview). Thus, we should not anticipate full development of the thematic dimension of coherence until adolescence. Given that the ability to reflect upon the meaning and consequences of events continues to develop into young adulthood (Habermas & de Silveira, 2008; McLean & Thorne, 2003), we might expect development on the thematic dimension of coherence to be the most protracted over the lifespan.

Therefore, we predict that age-related changes in coherence would reveal different developmental patterns across the three dimensions. Contextual coherence should remain low until the end of middle childhood, with high levels observed only during adolescence, when a more complex understanding of conventional notions of space and time emerge, coincident with the metacognitive ability to coordinate the provision of contextual information with the needs of the listener. Coherence with respect to chronology should be the first to emerge in development, given children's early capabilities with temporal ordering, but should continue to develop into early adolescence given the cognitive and linguistic demands of coordinating and marking the causal and temporal links of actions within an event. Coherence with respect to theme should continue to develop into adulthood, given that self-knowledge and insight into life events is a lifelong process.

An Initial Test of the Multidimensional Lifespan Model of Personal Narrative Coherence

We developed the multidimensional Narrative Coherence Coding Scheme (NaCCS) to integrate current schemes for coding coherence in personal narratives across the lifespan and to test our developmental predictions separately for each dimension. It is clear from our review that although many excellent schemes exist for coding coherence in specific types of personal narratives at specific points in development, no single system simultaneously taps the development of different aspects of coherence in personal narratives across the life course. Drawing on our knowledge of the literature and on our experience in coding personal narratives from participants of all ages, we developed the new scheme based on the

three theoretically independent dimensions that we posit contribute to narrative coherence: context, chronology, and theme.

The Narrative Coherence Coding Scheme (NaCCS)

We adopted a rating scale approach to coding coherence because we believe that scales are the best way to capture coherence of the entire story along each dimension. Microanalytic schemes of coherence, with their focus on individual elements of the narrative, may miss the forest for the trees, and are also conflated with narrative length. Moreover, using scales that enable us to rate the whole story is easier and faster than conducting microanalytic coding, even though the narrative must first be transcribed in both approaches.

Table 1 contains full descriptions of the three dimensions of the NaCCS, along with definitions of the anchor points of each scale. Examples of each point of each dimension are contained in the Appendix A. Each dimension consists of a 4-point scale ranging from 0 to 3. The first dimension, **Context**, refers to the orientation of the listener with respect to the time and place of the original event. A narrative that does not mention either time or place would receive a 0 on this dimension. A narrative that includes information about either time or place receives a 1. If the narrative includes information about both time and place, but if one of these aspects is vague (e.g., “A while back I went to the Metropolitan Museum of Art”) then it receives a 2 on this dimension. A narrative that is fully specified with respect to time and place receives full credit of 3 points.

The second dimension assessed is **Chronology**, or the order of actions included in the narrative. A narrative that contains no or almost no information about the order of events receives a 0. A narrative in which less than half of the actions can be ordered along a timeline receives a score of 1; a narrative in which between 50–75% of the actions can be ordered receives a 2; and a narrative in which greater than 75% of the relevant actions can be temporally ordered receives full credit of 3 points. It is important to emphasize that the criterion is the linguistic marking of temporal order within the narrative, not within the event. Thus, the coder’s final decision must be based on linguistic marking and ordering of the actions within the narrative, not on general knowledge of typical instances of the event. Violations of temporal ordering that are marked linguistically (e.g., “Now that happened after I got off the plane.”) do not count against the overall chronology score.

The third dimension assessed is **Theme**, or the meaning-making aspect of the narrative. Narratives that are substantially off-topic or that lack an apparent point to the story receive a 0 for this dimension. A narrative that has an identifiable topic but in which the topic is not developed via elaborations, evaluations, and causal linkages receives a 1. To receive a score of 2 on this dimension, the narrative must substantially develop the topic via causal linkages, elaborations, evaluations, and interpretations. To receive a complete score of 3, the narrative must include all of the above, but must also incorporate a resolution to the story or conflict. A resolution can consist of a link to other personal experiences, to future experiences, or to self concept or identity. A resolution does not have to be positive, but does need to provide new information. A narrative that contains a resolution but little else in the way of elaborations, evaluations, or development of the topic could not receive full credit for coherence on this dimension. For example, consider the hypothetical narrative “We ate ice cream and I fell down. And that’s why I shouldn’t run on the sidewalk.” Although this narrative contains a resolution (“And that’s why I shouldn’t run on the sidewalk”), it is not substantially developed, so would receive a 1 on theme.

Test Samples

We developed the scheme in a series of workshops at Clark University, Duke University, Emory University, and the University of North Carolina at Chapel Hill between 2003 and 2005 before arriving at the final coding system. We then tested our coding reliability on a set of 15 transcripts of personal narratives drawn from our individual laboratories. As illustrated in Tables 2–4, the ages of the participants in this reliability set ranged from preschool to adulthood; tasks and event types were also diverse (see also Appendix B for the varied narrative elicitation prompts). Each of the six authors coded the set of transcripts independently. Reliability was assessed across each possible pair of coders for each dimension using Shrout-Fleiss intraclass correlation coefficients with absolute agreement. Reliability for Context across all coding pairs averaged .80 (range of .70–.90), for Chronology averaged .82 (range of .60–.90), and for Theme averaged .89 (range of .74–.94). The members of each laboratory group then proceeded to train coders in their own laboratories on the scheme and to code their datasets of personal narratives, with inter-rater reliability calculated from this point forward within each laboratory, again via Shrout-Fleiss intraclass correlation coefficients with absolute agreement. In all, we coded personal narratives from 14 datasets across five laboratories.

As can be seen in Tables 2 – 4, the datasets with which we worked can be classified into samples from three age groups: Preschool (ages 3–5), School-Age (ages 6-high school), and Adults (college and above). We attempted to explore developmental changes within each of these age ranges as well. For ease of presentation in these tables, and Appendix B, we gave each study an identifying label that provides information about where the data were collected and the age(s) of the participants. For instance, the MA-3 dataset was collected in Massachusetts with children who were on average 3 years of age (Cleveland, Reese, & Grolnick, 2007). One dataset was longitudinal and was collected collaboratively across two sites (IL & NC-5 and IL & NC-6 were collected in Illinois and in North Carolina). Demographic details and size of each sample are presented in the second column of each of Tables 2, 3, and 4. As shown in Table 2, data for the preschool group (ages 3–5) were drawn from five datasets in three laboratories (Bauer, Haden/Ornstein, and Reese) and two countries (US and New Zealand) comprising 182 children in total. Table 3 illustrates that the school-age group (ages 6 to 14) was drawn from six datasets in four U.S. laboratories (Baker-Ward, Bauer, Fivush, Haden/Ornstein) and comprises 211 children in total (but note that 61 of these children were also represented in the IL & NC-5 preschool dataset). Table 4 indicates that the adult datasets were drawn from four studies in three U.S. laboratories (Baker-Ward, Bauer, Fivush) with 109 participants, ranging from young adults (undergraduates) to midlife adults (average age 52 years).

Procedures

The tasks and types of events narrated are shown in column three of Tables 2, 3, and 4 for the preschool, school-aged and adult datasets, respectively. In part because of the ages of the participants, and in part because of the objectives of individual studies, the narrative elicitation procedures and event types differed across datasets, as did the narrative prompts (Appendix B). As described in Table 2, for the datasets involving preschool aged children, the narratives were elicited for events that were naturally occurring (nominated by parents) and for events that were staged or documented (i.e., a pretend zoo). With the samples of school-aged children in the datasets described in Table 3, interviewers asked children to recall naturally occurring events, some of which had been previously nominated by parents. Some of these events were selected for their strong emotional content (positive or negative). As can be seen in Table 4, for two datasets involving adult participants (GA-20 and NC-52) the narrated events were selected to be moderate or high in emotional valence, either positive or negative, as was the case with some of the datasets involving school-aged

participants. In all of these studies with adults, except for MN-36 and NC-52, the narratives were written, instead of spoken. The reliabilities obtained for individual datasets, expressed as Shrout-Fleiss intraclass correlations, are reported in the final column of Tables 2, 3, and 4, for the Preschool, School-Age, and Adult datasets, respectively. Reliability was excellent across all dimensions, age groups, and elicitation methods, with the intraclass correlation coefficients ranging from .83 to 1.0 across all samples.

Results

In order to assess the validity of the coding scheme, we were interested in examining three issues. First, we predicted that the three dimensions of coherence are distinct because we believe that they reflect different underlying competencies. Thus, we examined correlations among these three dimensions in each of our samples. For each age group within each sample, we conducted correlations among all available dimensions of coherence. For instance, if a sample could be coded for all three dimensions of coherence, then three correlations were computed for that sample. Second, we predicted that these three dimensions would show different patterns of growth across age, reflecting the varying developmental trajectories of the competencies that underlie each coherence dimension. As such, we examined developmental pathways for each dimension across all samples that could be coded for that dimension. Finally, because we hypothesized that narrative coherence is an independent construct, distinct from other aspects of linguistic skill or sheer narrative length, we tested its independence in each age group within each sample by conducting correlations for each dimension with narrative length and with standardized measures of language development, when available. All correlations are Pearson's product-moment correlations, unless otherwise noted.

Narrative Coherence in Preschool Children

The coherence ratings for the three dimensions of narrative coherence as a function of age (from 3 to 52 years), as reflected in the 16 different datasets that were coded, are displayed in Figure 1. The preschool children's mean coherence ratings are shown in the left-hand side of the figure. As can be seen, the preschoolers scored very low on the context dimension, with an average context score of around .5, but it should be noted that only one sample could be coded on this dimension because in the other samples the initial prompt contained time and location information. Preschoolers also scored very low on the chronology dimension, with most samples scoring below .5 on average. In the one sample with a higher score, the prompt included a request to the children to temporally order the event from the first to the last thing that happened (NZ-4b). Children's scores on the theme dimension, however, were somewhat higher, with most samples scoring close to a 1 or just over 1. Thus, as predicted, preschool children's narrative coherence was low on all three dimensions, albeit not at floor for any one. These children are already showing some elements of coherence in their personal narratives, most notably the ability to stay on topic, but their abilities to provide contextual information about time and place, and to order an event narrative chronologically, are still quite limited.

Moderate correlations existed across the three dimensions of coherence for preschoolers (3 out of 7 possible correlations were significant; 43%). These correlations were between chronology and theme ($r = .38, p < .05$ for MA-3; $r = .48, p < .05$ for NZ-4b; and $r = .58, p < .05$ for MN-4). In the single preschool sample that could be coded for context (IL & NC-5), none of the dimensions was significantly correlated. Thus, although two of the dimensions of coherence are somewhat correlated for this age group, they are still tapping relatively independent aspects of narrative coherence. Longitudinal correlations were only available in the IL & NC sample, but no significant links across time in coherence were

found from age 5 to 6 ($r_s = .02$ to $.20$). Thus, children who told more coherent narratives at age 5 did not necessarily tell more coherent narratives at age 6.

Preschool children's coherence on every dimension and in every sample, however, was correlated with the overall length of their narratives (r_s ranged from $.36$ to $.79$, all $p_s < .05$). Thematic coherence was also sometimes correlated with children's expressive language ability ($r_s = .41$, $p < .05$ in both NZ-4a and NZ-4b samples and in the MN-4 sample), but contextual and chronological coherence were not correlated with children's language. Thus, during the preschool period, coherence is largely a function of story length, with longer stories being rated as more coherent. Children with better expressive language skills also tell stories with more coherent themes than do their peers with less expressive language skills.

To summarize the results with preschool children, their stories at this age show only the seeds of coherence. They are able to stay on-topic, but their provision of contextual information and their ability to order a narrative in chronological sequence are still limited. The strongest determinant of coherence at this age is the length of the narrative, with longer narratives being rated as more coherent on all three dimensions. Children's expressive language skill also plays a role in their thematic coherence.

Narrative Coherence in School-Age Children and Adolescents

The average scores for school-age children on each dimension of coherence as a function of the location of the sample and age are displayed in the middle section of Figure 1. School-age children's average scores on the context dimension ranged from $.5$ to 2 . Thus, as predicted, these children are providing some information about time and/or place, but only in mid-adolescence are they starting to specify time and place in their narratives. As can also be seen in Figure 1, school-age children's scores on the chronology dimension revealed a general developmental progression, with the youngest children scoring just over $.5$ on chronology, the young adolescents scoring around 2 , and the adolescents scoring over 2.5 . Children progress from providing chronological information for less than half of the propositions in their narratives in the early school years to including this information for over 75% of their propositions by adolescence. Thus, children appear to undergo a dramatic development in their ability to chronologically order events between ages 6 and 11 years. A less dramatic developmental progression was also evident on the theme dimension, with some younger children scoring under 1.5 and some adolescents scoring close to 2.5 . Young adolescents' narratives are on-topic and elaborated, but may not yet include a full resolution.

Across the school-age samples, only a few correlations among dimensions were apparent (6 out of 25 possible correlations were significant; 24%). In the NC-11 sample, theme was correlated with context ($r = .53$, $p < .05$) and with chronology ($r = .41$, $p < .05$), but only for disappointing events. In the GA-12 sample, chronology was correlated with context and with theme (both $r_s = .29$, $p_s < .05$), but only for negative events. No correlations existed among the coherence dimensions for positive events in either of these samples. Chronology and theme were positively correlated in the MN-8 sample ($r = .58$, $p < .01$), and chronology and context were negatively correlated in the GA-14 sample ($r = -.48$, $p < .05$), but only for positive events. As with the preschool samples, the three dimensions of coherence were relatively independent in this age group; more to the point, no clear patterns of correlations between particular dimensions were discerned.

Further, coherence was not always correlated with narrative length, as it was in the preschool samples. In the IL & NC-6 longitudinal follow-up, all three dimensions remained correlated with length (r_s ranged from $.34$ to $.55$, $p_s < .05$). In the MN-6 and NC-11 samples, however, only thematic coherence was correlated with length ($r_s = .54$ and $.62$, respectively, $p_s < .05$). In the MN-8 sample, only temporal coherence was correlated with length ($r = .46$,

$p < .05$). In the GA-12 sample, length was not correlated with coherence on any dimension, and in the GA-14 sample, only context was correlated with length ($r = .52, p < .05$), and only for negative narratives. Measures of children's language skill were available for three samples, and in only one sample was there a significant correlation between coherence and language, and then for only one dimension of coherence. In the IL & NC-6 sample, children's contextual coherence was correlated with their expressive language ($r = .34, p < .05$). Thus, school-age children's narrative coherence may be beginning to emerge as a separate skill, distinct from narrative length and overall language proficiency.

Because there was a range of emotions represented in the events in three of the school-age samples (NC-11, GA-12 and GA-14), we were able to examine whether coherence varied as a function of the emotional valence of the event. In the GA-12 and the GA-14 samples, children told more chronologically coherent narratives about negative ($M = 2.70$, and 2.88 , respectively) than positive events ($M = 1.97$, and 2.43 , respectively), and in the GA-12 sample, more thematically coherent narratives about negative ($M = 1.76$) than positive events ($M = 1.55$), but there were no differences for contextual coherence as a function of event valence. In the NC-11 sample, in which events of moderate emotional intensity were narrated, there were no differences between positive and negative events on any coherence dimension.

To summarize the results with school-aged samples, children's narratives continue to grow more coherent on all three dimensions into adolescence. The most dramatic developmental change was evident for the chronology dimension, with more gradual changes for the context and theme dimensions. Compared to that of preschoolers, the coherence of school-aged children's narratives becomes less a function of narrative length and language skill, but may vary as a function of the emotional valence of the event; indeed, when differences are found, negative events seem to be more coherently organized than positive events, but only on some dimensions of coherence. Clearly, more data are needed on this point. School-age children's scores on the three dimensions of coherence were mostly independent, again suggesting that the three scales measure different aspects of coherence.

Narrative Coherence in Adults

Figure 1 displays as well the average coherence scores for each adult dataset on each dimension as a function of location and age. As can be seen in the right hand portion of the figure, adults in all of these samples scored relatively high on the context dimension, greater than 1.5 on average, although no sample reached an average score of 2.5 or higher. These values are higher than those for the adolescent datasets from the school-age group, indicating that participants are specifying either time or place, but not both, in their narratives. Chronology was uniformly high in the adult samples, with a minimum average score of over 2.5. Over 75% of the utterances in adults' narratives are coherent with respect to chronology. Adults were also highly coherent with respect to the theme dimension. All samples scored a minimum average of over 2 for theme, indicating that their narratives were highly elaborated, and some participants were providing resolutions.

Across the adult datasets, the only instance in which the three coherence dimensions were significantly correlated was in MN-24, and then only when adults narrated their early childhood memories (2 significant correlations out of 19; 10%). For the early childhood memories only, context correlated with chronology ($r = .42, p < .05$) and theme ($r = .50, p < .05$). Thus, the three dimensions of coherence were even less intercorrelated than for the school-age samples. When adults told narratives of more recent past experiences, there were no correlations among dimensions. Narrative length was correlated with context ($r = .59, p < .05$) and with theme ($r = .54, p < .05$) in only one of the adult studies (NC-52). Language

skill was assessed only in MN-36, but correlations between coherence and language were not computed because of the small sample size ($N = 10$).

Only one study addressed longitudinal stability of coherence across a 2-year period. Individuals' narratives about intensely negative events in the GA-20 sample were consistently coherent across two years for context ($r = .51, p < .05$) but were not consistent over time for chronology or theme. In the GA-20 and NC-52 samples, we were able to analyze coherence as a function of the emotional valence of the event, but found no differences on any coherence dimension across positive and negative events.

In summary, adults' narratives are highly coherent with respect to chronology and theme, and only somewhat less coherent with respect to context. These three dimensions are independent indices of coherence by adulthood. Coherence is no longer a function of the length of the narrative for young adults, but there was an indication in the data that narrative length once again becomes correlated with coherence in mid-life adults (NC-52). The finding that narrators are not generally consistent in coherence over time may mean that coherence is not a general skill on the part of the narrator by adulthood, but has more to do with the degree to which the narrator has reflected upon a particular event.

Comparing the Developmental Trajectories of the Three Dimensions of Coherence

We predicted not only that the three dimensions of coherence would be relatively independent, but also that the developmental trajectories of the dimensions would vary. Based on the developmental underpinnings of each dimension, we predicted that chronological coherence would develop first, then contextual coherence, and that thematic coherence would show the most protracted development across the lifespan. To test these predictions more directly, we conducted a separate regression analysis for each dimension of coherence as a function of age. We tested linear, logarithmic, and quadratic curves for each coherence dimension. For contextual coherence, the quadratic curve provided the best fit, accounting for 89% of the variance with age, $F(2, 6) = 33.17, p < .01$. For chronological coherence, again a quadratic curve provided the best fit, accounting for 73% of the variance with age, $F(2, 6) = 11.98, p < .01$. For thematic coherence, the logarithmic curve provided the best fit, accounting for 72% of the variance with age, $F(1, 7) = 21.25, p < .01$.

These different trajectories are displayed in Figure 2. Chronological coherence indeed develops first, with a peak in young adulthood, and a dip in midlife. Contextual coherence develops more slowly, with a slightly later peak in adulthood, but also dips in midlife. In contrast, thematic coherence continues to increase throughout the lifespan. Although the rate of development on this dimension begins to slow down in adulthood, it does not diminish with age.

Discussion

Developmental Underpinnings of Change in Three Dimensions of Narrative Coherence

Overall, the NaCCS shows reliable and predicted developmental change, and may shed light on the skills underlying narrative competence. Preschoolers show low coherence on all three dimensions, and their coherence is largely a product of narrative length. This pattern suggests that early in development, narrative coherence is an undifferentiated skill that is based on general verbal and perhaps episodic memory skills, rather than on specific narrative competencies. Preschoolers, especially those with more sophisticated language skills, are able to maintain a topic reasonably well, but have difficulty placing an event in specific time and place. Preschoolers even have difficulty retelling an event in chronological order, suggesting that cognitive skills underlying narrative competence are still immature. The rapid domain-general changes in episodic memory (Bauer, 2006b) and executive

functioning (Carlson, 2005) that are taking place during this period are likely to contribute to preschoolers' competence in all dimensions of narrative coherence. Preschoolers are still developing basic skills of remembering and organizing information, and then must translate that information into language in order to produce a coherent narrative. These children are only able to express through language a fraction of what they remember about an event (Simcock & Hayne, 2003).

During childhood, we begin to see narrative skills become differentiated from their receptive and expressive vocabulary skills. Early in the preschool years, children are unable to produce a coherent narrative about an event if they lack the requisite vocabulary (e.g., Cheatham & Bauer, 2005; Peterson & Rideout, 1998; Simcock & Hayne, 2002). By late preschool, children tell on-topic narratives, and become better at chronology, although context still remains quite low. The sharp increase in the ability to tell a chronologically ordered narrative in middle childhood conforms to the age at which children demonstrate a dramatic change in their understanding of conventional time (Friedman, 2003, 2004). We note here that a great deal of research has established that very young children are able to both behaviorally re-enact and verbally report familiar events in correct temporal sequence (Nelson, 1986), but the skills assessed in narrative require the child to report a single, often novel episode in chronological order, and this, perhaps not surprisingly, appears to be a much more difficult skill.

Context also remains surprisingly difficult, even in middle childhood. The ability to place an event in time and space appears to emerge during adolescence. As discussed earlier, context relies on both the understanding of culturally mediated markers of time and space, as well as sophisticated perspective-taking skills that allow the narrator to understand what the listener does and does not know. Both cultural constructions of time and space and sophisticated perspective-taking skills emerge in adolescence (Friedman, 2004; Harter, 1999), which may account for this late developing narrative ability. An advance in executive functioning at these ages may also help adolescents select and include only the relevant contextual information needed by the listener. Executive functioning abilities continue to develop into adulthood, with significant gains in late adolescence and young adulthood, and a significant decline beginning in the 50s and early 60s (De Luca et al., 2003). Thus, the effect of executive functioning on narrative coherence should act to create a peak in performance in young adulthood and a decline in late middle-age.

Finally, adults are able to tell coherent narratives, scoring higher on all three dimensions of narrative coherence than children and adolescents. Interestingly, contextual and chronological coherence both appear to dip in mid-life. It is possible that different forces act upon the development of these aspects of coherence over time. Perhaps the positive development in contextual coherence observed in adolescence is due to a mastery of conventional markers of time and space, along with an increase in executive functioning, but decreases in executive functioning in later life work to depress contextual coherence. On some measures of executive functioning, De Luca et al. (2003) noted that adults in the 50–64 year age group performed similarly to 8–11 year old children. If changes in executive functioning are governing contextual coherence, then we would expect contextual coherence to peak in young adulthood and then later decline because of age-related difficulties in perspective-taking. The returning correlation between narrative length and contextual coherence in midlife, similar to the correlations obtained in the early childhood years, may indicate that midlife adults had difficulty selecting relevant contextual details to include in their narratives unless the narratives were quite lengthy and contained more of all types of information. However, an alternative explanation is that mid-life adults were selecting different types of events to narrate or were narrating events for a different purpose. For instance, events that were told primarily to inform the listener of an internal change in the

narrator would not necessarily require specific information about time and place to be coherent, nor would these events need to be marked as explicitly for chronology. We hope to explore the links between event type and coherence in future research.

Unlike the context and chronology dimensions, coherence on the theme dimension continued to advance over the lifespan, as predicted. The highest levels of thematic coherence depend upon an ability to discover patterns across events and to draw meaning from events, skills which are not as likely to be affected by age-related declines in cognitive functioning. Notably, the midlife group had the highest scores in thematic coherence across all datasets, and thematic coherence continued to increase, although at a slowed rate, into mid-life.

Finally, the fact that the three dimensions of coherence are relatively independent of each other, especially by adulthood, indicates further that narrative coherence is, indeed, a multidimensional construct. The developmental patterns indicate that each of the dimensions is related to different sets of socio-cognitive skills, each of which has a different developmental trajectory and therefore leads to the uneven development of narrative coherence.

Implications for a Model of Personal Narrative Coherence across the Lifespan

Although not consistently defined, there is remarkable agreement in the literature that coherence is a critical aspect of personal narratives, and that context, chronology, and thematic integration are essential components of coherence. Our model of narrative coherence extends current theories by integrating the developmental and multidimensional aspects of personal narratives. Moreover, we have proposed a linguistic, cognitive, and social-cognitive basis for these changes across the lifespan in different aspects of narrative coherence. Our test of this theory with the NaCCS, albeit preliminary and partial, indicates that the developmental data are largely consistent with our predictions. As Figures 1 and 2 demonstrate, there are changes as a function of age that differ for each dimension of narrative coherence: context, chronology, and theme. These developmental patterns were evident regardless of the emotional valence of the event, the personal significance of the event, or the way in which the narrative was elicited. Importantly, we also saw decreasing correlations between coherence dimensions and either narrative length or vocabulary skills with development, suggesting that although narrative coherence may emerge from early language skills, coherence becomes a differentiated skill with development. Moreover, the fact that these different dimensions of coherence are largely statistically independent and show different developmental patterns suggests that they are related to different sets of social and cognitive skills.

Limitations

We acknowledge that this initial test of our multidimensional model of personal narrative coherence is limited. We have used the 16 samples available to us to illustrate the potential utility of the NaCCS, and we encourage more stringent empirical tests of our model in the future. Admittedly, our data were weighted toward the younger end of the developmental spectrum, so our conclusions about continued change across the lifespan in narrative coherence are speculative. Because we relied on existing datasets to test our model, in some instances the prompts that interviewers provided precluded coding of the context dimension. Moreover, our event elicitation procedures were largely conflated with age, such that younger children were asked to narrate specific events, whereas adolescents and adults were allowed more choice in which events to narrate. We are also mindful that although our datasets spanned several regions from two countries, most of the participants were of European descent and middle-class. Existing research identifies important differences in

narrative coherence as a function of culture (McCabe & Bliss, 2003). It is possible that new or adapted dimensions of coherence would be appropriate for narratives from non-Western cultures. For instance, the chronology dimension may need adaptation in cultures with different conceptions of time. We invite researchers of narratives from non-Western cultures to propose variations on our scheme in order to capture coherence in narratives from diverse cultures. Finally, our comparisons of developmental change across dimensions are constrained due to the inherent problem of applying categorical criteria to determine the level of an ordinal rating scale, although many existing scales of narrative coherence share this limitation. This limitation does not apply to our chronology dimension, which was defined numerically as the proportion of total utterances in the narrative that were chronologically sequenced.

Despite these limitations, we believe that the NaCCS is a promising tool for identifying developmental change across multiple dimensions of personal narrative coherence. The most important contribution of the NaCCS is that, unlike any other existing scheme, it is appropriate for use with participants from age 3 onwards. The youngest participants in our samples were not at floor on any dimension of coherence, and the oldest were not at ceiling, demonstrating the utility of the scheme across a wide age range. The NaCCS is highly reliable across all ages, dimensions, and types of single event narratives tested to date. It is also much faster to code using the NaCCS than to code via traditional measures of narrative coherence, which entail microanalytic coding of each individual clause prior to rating on global structures or scales. Moreover, we have observed that it is faster and easier to train coders to high levels of reliability on the NaCCS than on microanalytic coding schemes. Critically, the predicted developmental changes in narrative coherence are observed on all dimensions of the NaCCS.

Next Steps in Research on the Development of Narrative Coherence

We hope that the NaCCS generates future tests of theories of narrative coherence. As a first step, we acknowledge the need to test basic assumptions about the cognitive and social-cognitive underpinnings of narrative coherence across the lifespan, and as a second step, we hope to explore the relevance of narrative coherence for other aspects of development. Although we indicated in the introduction that narrative coherence is assumed to be related to autobiographical memory and self-concept, it must be indicated that the empirical basis for some of these links is only beginning to be established (e.g., Baerger & McAdams, 1999). To date, only some of these issues with the NaCCS have been addressed, primarily those concerning links between narrative coherence and memory. For instance, preschool children tell narratives that are more chronologically coherent when their mothers adopt a more elaborative maternal reminiscing (Cleveland et al., 2007), and mothers and children narrate negative events more coherently than positive events (Fivush, McDermott Sales, & Bohanek, 2008). Adults narrate their later childhood memories in a more chronologically and thematically coherent fashion than they narrate their earlier childhood memories (Burch, Jaafar, West, & Bauer, 2008). Finally, children's memories are more likely to survive one year later when their narratives soon after the event are more thematically coherent (Morris, Baker-Ward, & Bauer, 2009).

In conclusion, we are beginning to trace the roots of narrative coherence in parent-child interactions and to examine some of the ways in which it is linked to autobiographical memory, and we hope soon to extend these findings to the realm of self understanding and identity. With regard to memory, issues that still need to be addressed include linking narrative coherence to event representations, the retention of memories over time, and suggestibility. Although it is beyond the scope of the review provided in this paper, narrative coherence also has implications for socioemotional development, moral development, family functioning, and well-being (Baerger & McAdams, 1999; Fiese et al., 1999;

Pasupathi & Wainryb, 2010; Pennebaker, 1997). In future research, we plan to test the predictive value of the three dimensions of narrative coherence using the NaCCS for psychological and physical health. In particular, we expect that the thematic dimension of coherence will be especially relevant for well-being, because of its evaluative component, whereas the context and chronological dimensions of coherence may not be linked to well-being (see Baerger & McAdams, 1999).

It will also be important to examine the utility of our model and the associated scheme with narratives about a wider range of events, including, for example, narratives about highly traumatic events, such as a natural disaster or abuse. Highly negative events may be narrated less coherently than moderately negative or positive events. Other aspects of the original event may also be important for coherence, such as the personal significance of the event for the participant. Narratives may become more coherent across tellings (see Fivush, 2004), and so it may also be useful in future research to consider the extent to which an experience is likely to be shared with others in evaluating personal narrative coherence. We could also assess changes in narrative coherence as a function of the time since the event, because it is possible that coherence increases (or decreases) with time, as individuals cope with the consequences of significant experiences. Moreover, factors that contribute to coherence may be moderated by participant characteristics, such as coping style, attachment style, gender, prior knowledge, or the presence or absence of specific intervening experiences (see Ornstein, Haden, & Elischberger, 2006). Finally, we suggest that it is important to assess the coherence of narratives about events for which the details of what actually took place are known. When an event is objectively the same across participants, how might the coherence of the event narrative differ across narrators, and why? As a highly reliable, developmentally sensitive, and easily learned multidimensional scheme, the NaCCS should prove useful in testing these and other questions concerning narrative coherence and its development across the lifespan.

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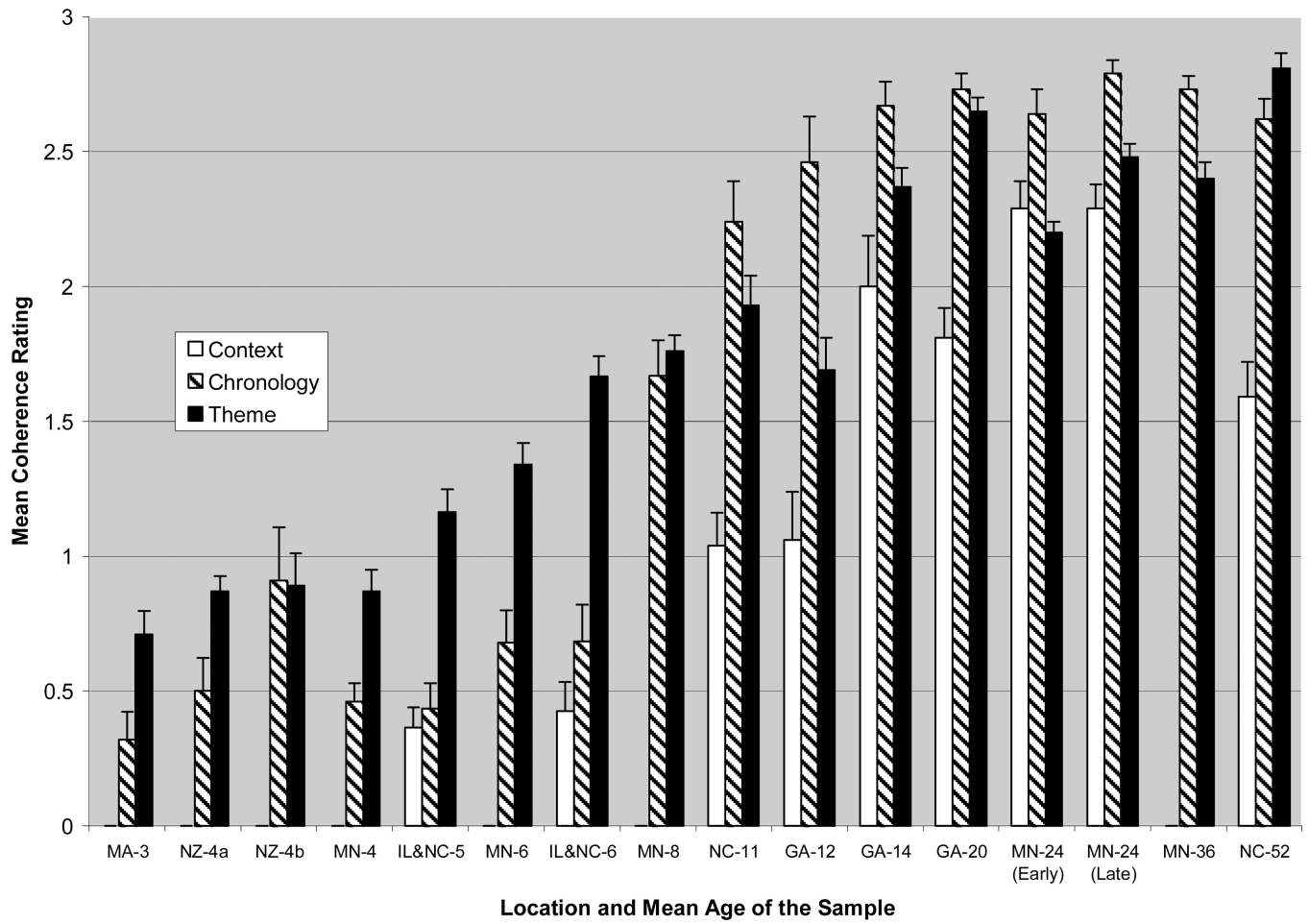


Figure 1.
The development of narrative coherence across the lifespan.

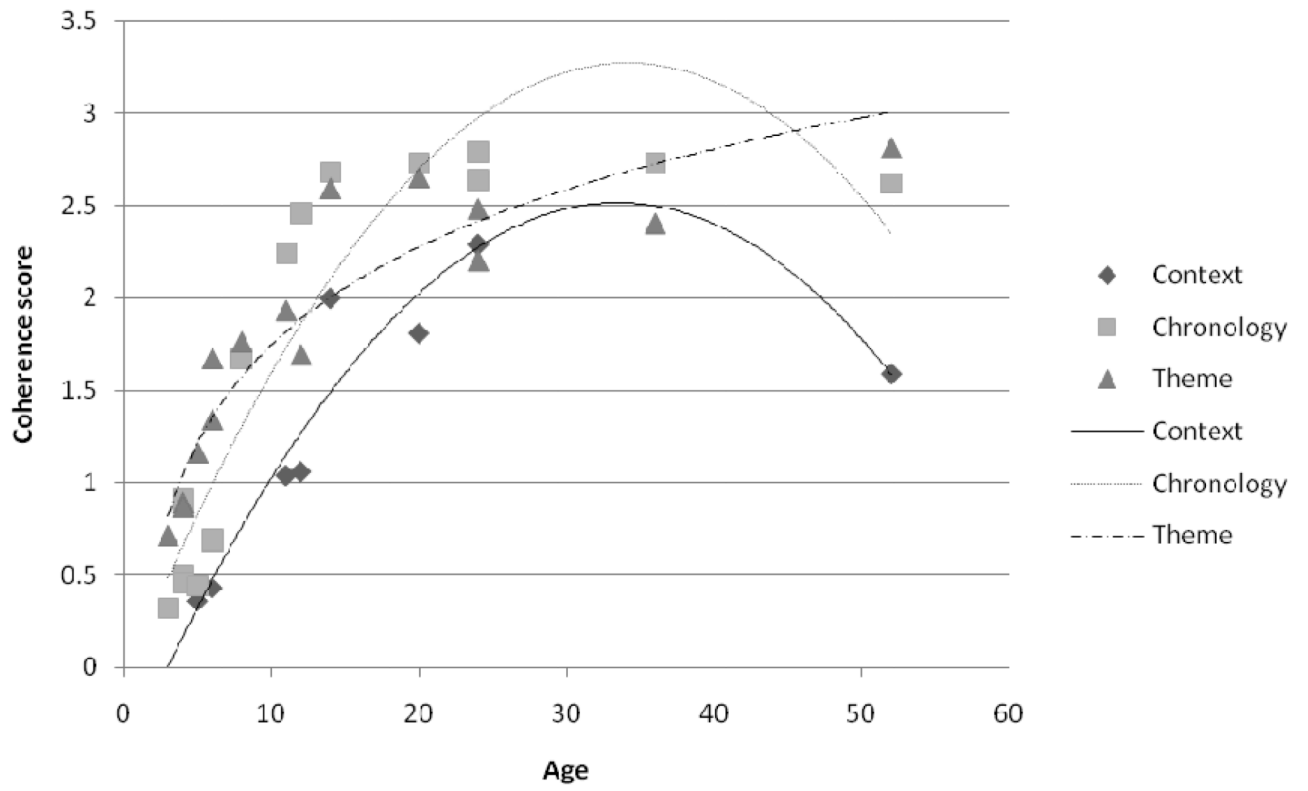


Figure 2.
Developmental trajectories for three dimensions of narrative coherence.

Table 1

Scoring Criteria for the Narrative Coherence Coding Scheme (NaCCS)

Criteria	Context: Orienting the narrative in time and space	Chronology: Relating components along timeline	Theme: Maintaining and elaborating on topic
<i>Level 0</i>	No information about time or location is provided.	Narrative consists of a list of actions with minimal or no information about temporal order.	The narrative is substantially off topic and/or characterized by multiple digressions that make the topic difficult to identify. No attempt to repair digressions.
<i>Level 1</i>	Partial information is provided; there is mention of time or location at any level of specificity.	Naïve listener can place some but not most of the events on a timeline. Fewer than half of the temporally relevant actions can be ordered on a timeline with confidence.	A topic is identifiable and most of the statements relate to it. The narrative may include minimal development of the topic through causal linkages, or personal evaluations and reactions, or elaborations of actions.
<i>Level 2</i>	Both time and place are mentioned but no more than one dimension is specific.	Naïve listener can place between 50–75% of the relevant actions on a timeline but cannot reliably order the entire story from start to finish with confidence.	The narrative substantially develops the topic. Several instances of causal linkages, and/or interpretations, and/or elaborations of previously reported actions are included.
<i>Level 3</i>	Both time and place are mentioned and both are specific.	Naïve listener can order almost all (> 75%) of the temporally relevant actions. This includes cases in which the speaker marks deviations from temporal order or repairs a violated timeline.	Narrative includes all the above and a resolution to the story, or links to other autobiographical experiences including future occurrences, or self-concept or identity. Resolution brings closure and provides new information.

Table 2

Characteristics of Preschool Samples Using the NaCCS

Study	Participants	Task	Reliability
MA-3	<i>N</i> = 28 (11 female) middle-class preschoolers aged 3;10 (2;10 to 4;11); 86% European American	Children participated in a pretend zoo activity and an experimenter interview two weeks later	Context N/A Chronology .97 Theme .98
NZ-4a	<i>N</i> = 38 (11 female) working- to middle-class preschoolers aged 4;5 (3;5 to 4;11); 77% European New Zealanders	Children participated in a pretend zoo activity and an experimenter interview two weeks later	Context N/A Chronology 1.0 Theme 1.0
NZ-4b	<i>N</i> = 35 (14 female) working- to middle-class preschoolers aged 4;6 (3;4 to 4;11); 86% European New Zealanders	Children participated in a pretend zoo activity and an experimenter interview two weeks later	Context N/A Chronology .92 Theme .94
MN-4	<i>N</i> = 20 (10 female) middle class; 100% Caucasian	A researcher prompted children for their memories of 9 semi-unique events that had been selected randomly from a calendar kept by the children's mothers.	Context N/A Chronology .99 Theme .97
IL & NC-5	<i>N</i> = 61 (34 female) middle class preschoolers when 5;0 (4;8 to 5;1) and again at 6;0 (5;9 to 6;2); 95% European American	A researcher prompted children for memories of 2 to 3 special, one time past events that had been selected by mothers.	Context .92 Chronology .92 Theme .94

Note. MA-3 = Massachusetts 3-year-olds (Reese; see Cleveland, Reese, & Grolnick, 2007); NZ-4a & b = New Zealand 4-year-olds (Reese); MN-4 = Minnesota 4-year-olds (Bauer); IL & NC-5 = Illinois and North Carolina 5-year-olds (Haden/Ornstein). Reliability expressed as interclass correlation.

Table 3

Characteristics of School-Age Samples Using the NaCCS

Study	Participants	Task	Reliability
MN-6	<i>N</i> = 20 (12 female) middle class; 95% Caucasian	A researcher prompted children for their memories of 9 semi-unique events that had been selected randomly from a calendar kept by the children's mothers for 4 previous months	Context N/A Chronology .90 Theme .96
IL & NC-6	<i>N</i> = 61 (34 female) middle class preschoolers when 5;0 (4;8 to 5;1) and again at 6;0 (5;9 to 6;2); 95% European American	A researcher prompted children for their memories 2 to 3 special, one time past events that had been selected by mothers.	Context .94 Chronology .94 Theme .95
MN-8	<i>N</i> = 20 (11 female) middle class; 95% Caucasian	A researcher prompted children for their memories of 9 semi-unique events that had been selected randomly from a calendar kept by the children's mothers for 4 previous months	Context N/A Chronology .98 Theme .88
NC-11	<i>N</i> = 35 (25 female) middle class children between 6.8 and 14.5 years of age (<i>M</i> = 11.3 years, <i>SD</i> = 1.81), recruited from community organizations; the sample was predominantly European American	A researcher asked the child to identify in sequence satisfying and disappointing personal experiences (defined) that had happened while the child was in the current grade (within about the past 6 months) and to describe each experience.	Context .92 Chronology .90 Theme .83
GA-12	<i>N</i> = 51 (35 females) racially and economically diverse children between 8- and 12-years of age (mean age = 10.2 years, <i>S.D.</i> = 1.47) with moderate chronic asthma	A researcher promoted the children to recall two negative events associated with their asthma, a time they were scared and a time they were frustrated, and a happy experience, not necessarily associated with their asthma in counterbalanced order	Context .97 Chronology .90 Theme .96
GA-14	<i>N</i> = 24 (12 females) ethnically diverse middle class children between 11- and 14-years old (mean age = 12.7)	A researcher prompted children to recall a negative experience and a positive experience in counterbalanced order	Context .97 Chronology 1.00 Theme 1.00

Note. MN-6, -8 = Minnesota 6- and 8-year-olds (Bauer); IL & NC-6 = Illinois and North Carolina 6-year-olds (Haden and Ornstein); NC-11 = North Carolina 11-year-olds (Baker-Ward); GA-12, -14 = Georgia 12- and 14-year-olds (Fivush).

Table 4

Characteristics of Adult Samples Using the NaCCS

Study	Participants	Task	Reliability
GA-20	N = 44 (all female) college students (mean age 19.22, range from 19 – 22 years) predominantly White and middle class	Participants were asked to write narratives about two negative events, one intensely negative and one moderately negative experience, and two positive events, one intensely positive and one moderately positive, in a counterbalanced order.	Context .96 Chronology .89 Theme .88
MN-24	N = 26 (13 female) middle class; mean age 24 years (range 19–47); unknown% White (majority)	Participants provided written narratives about 4 “early memories” (from before the age of 7 year) and 4 “late” memories (from age 7 onward)	Context .95 Chronology .95 Theme .91
MN-36	N = 10 (10 female) middle class; mean age 36 years (27–45); 90% White	A researcher prompted the mothers for their memories of 9 semi-unique events that had been selected randomly from a calendar they kept for 4 previous months	Context N/A Chronology 1.0 Theme 1.0
NC-52	N = 29 (18 female) White, middle class adults between 40 and 60 years of age ($M = 52.4$ years, $SD = 3.6$ years) from the community	A researcher asked the participants to provide spoken narrative accounts of self-selected satisfying and disappointing personal experiences (order counterbalanced across participants) that had occurred within the past six months. Participants were asked to select events that were fairly significant but not out of the range of typical experience for mid-life adults	Context .86 Chronology .94 Theme 1.00

Note. GA-20 = Georgia 20-year-olds (Fivush); MN-24 = Minnesota 24-year-olds (Bauer); MN-36 = Minnesota 36-year-olds (Bauer); NC-52 = North Carolina 52-year-olds (Baker-Ward)

Appendix A

Examples of Levels of Narrative Coherence on the NaCCS

Coherence Dimension	Rating Level	Example	Rationale for Score
Context	0	I got cavities.	No mention of time or location is provided
	1	When I first found out <i>[general time]</i> that I had more serious asthma....	Mention of time or place at any level of specificity
	2	I was a small child about age 5 <i>[specific time]</i> . I was held by my parents on a famous bridge <i>[general place]</i> .	Both time and place are mentioned but no more than one dimension is specific
Chronology	3	I remember when my mom had my brother. I was 2 years and 8 months <i>[specific time]</i> when she brought him home <i>[specific place]</i> .	Both time and place are mentioned and both are specific
	0	A gorilla. A tiger. An elephant. A giraffe. Balloon.	List of actions with minimal or no information about temporal order
	1	I ate all my frosting out of my bowl. We went to the grocery store and got 'em. And we had to wait until the gingerbread houses were ready.	Fewer than half of the temporally relevant actions can be ordered on a timeline
Theme	2	I found a giraffe but the giraffe was sick. And then we looked under a blanket, you know what we found? The baby elephant. I saw fishes. Goldfish. A zebra eating. And then I saw a tiger when doing his (unintelligible) dance. And then I saw the koala jumping around the tree. After the banana he burps.	Can place between 50–75% of the relevant actions on a timeline
	3	We won 2-1 and it wasn't—it was sort of our best game, because usually all through the main season we didn't do very well in the games, and then when we went in the tournament we did pretty well. And our team, well on our team, no one really got hurt at the game, so we and the other team didn't get hurt. And lots of times—the one time that the ball went in, the player just went right past the defense and got it in, just like right into the corner. And one of ours was like that, and the other—I can't remember what the other one was like.	Can place more than 75% of the relevant actions on a timeline
	0	I got a dress. Me and Shelley got a dress. And Jessie's gonna get on her computer and send it to us. We're gonna buy it. And buy the shoes with flowers on the side. I got the shoes with the flowers on the side.	The narrative is substantially off topic and/or characterized by multiple digressions that make the topic difficult to identify
Theme	1	I was a small child about age 5. I was held by my parents on a famous bridge. It was in winter and I was wearing a hat. Then I took off my hat, and threw it outside the bridge, mimicking some sound of the plane.	A topic is identifiable and most of the statements relate to the topic in a consistent manner. However, there is no substantial development.
	2	I was kind of scared because they might have to put that trache in, and I didn't know what it would affect to my asthma, on my lungs. I just didn't know because I was kind of crying and I was kind of scared. And I just didn't like the sound of it. I thought it was going to do something to me like not let me breathe anymore or something. And I just didn't really like it and it just hurt me really bad.	The narrative substantially develops the topic. However, there is no resolution, links to other autobiographical experiences, or self-concept; only a wrap-up statement.
	3	It wasn't really the fact of getting into medical school that was thrilling even though it was a good thing but just what I had gone through to get there and all the hard work and the struggle had paid off. And that's because I basically had, for the last four years, I saw myself through school. <i>[link to other autobiographical experiences]</i> I've had to like work between two to four jobs and at the same time I'm getting four degrees and two minors and I remember times I'd work like third shift from 11 pm to 7 am and then have to go to chemistry class at 8 am and go through rush hour traffic in the morning and all that, so it just made it all worth it like, when I saw the first letter I just felt good that all the hard work was not in vain. <i>[link to self-concept]</i> It paid off and it just shows that if you are willing to work hard you can succeed.	The narrative substantially develops the topic. In addition, there is a link to other autobiographical experiences and self-concept.

Appendix B

Narrative Prompts for Each Sample

Study	Narrative Prompt
MA-3	<i>I'd like you to tell me everything that happened when you went to the pretend zoo at _____. I wasn't invited and I didn't get to go with you.</i>
NZ-4a	<i>A little while ago, you went to visit the pretend zoo. I wasn't there that time so I would like you to tell me everything that happened when you went to visit the pretend zoo. Tell me everything you can remember.</i>
NZ-4b	<i>A little while ago, you went to visit the pretend zoo. I wasn't there that time so I would like you to tell me everything that happened when you went to visit the pretend zoo. Tell me everything you can remember. Start with the first thing you did and finish with the last thing.</i>
MN-4	<i>What can you tell me about ____? What else do you remember?</i>
IL & NC-5	<i>Your mom said that you _____. Tell me about that. What else do you remember?</i>
MN-6	<i>What can you tell me about ____? What else do you remember?</i>
IL & NC-6	<i>Your mom said that you _____. Tell me about that. What else do you remember?</i>
GA-20	<i>A written prompt to: Please write about this event for about 10 minutes. Please try to write continuously and do not worry about spelling or grammar. Please include your thoughts and feelings about this event.</i>

Note. MA-3 = Massachusetts 3-year-olds (Reese; see Cleveland, Reese, & Grolnick, 2007); NZ-4a & b = New Zealand 4-year-olds (Reese); MN-4 = Minnesota 4-year-olds (Bauer); IL & NC-5 = Illinois and North Carolina 5-year-olds (Haden/Ornstein); MN-6, -8 = Minnesota 6- and 8-year-olds (Bauer); IL & NC-6 = Illinois and North Carolina 6-year-olds (Haden and Ornstein); NC-11 = North Carolina 11-year-olds (Baker-Ward); GA-12, -14 = Georgia 12- and 14-year-olds (Fivush); GA-20 = Georgia 20-year-olds (Fivush); MN-24 = Minnesota 24-year-olds (Bauer); MN-36 = Minnesota 36-year-olds (Bauer); NC-52 = North Carolina 52-year-olds (Baker-Ward).