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SEMIOTIC DETERMINANTS IN EPISODE-BUILDING: BEYOND AUTONOETIC CONSCIOUSNESS

ABSTRACT

This account examines how episodes are constructed and measured, and how Peirce's Index informs and even hastens the advancement of this process—from binding spatial features, to the awareness of participant roles and temporal sequencing. It provides semiotic rationale for how episodes develop from static single pictures (dependent on verbatim memory) to events whose frames reflect a deictic and sequential character—superseding the consciousness inherent in auto-noesis.

Empirical evidence will trace children's event memory—first iconic and static, and later characteristic of increasingly more complex interpretants which specify directional and logical relations, and memory sources. The signs which promote episodic thought are indexical in nature, given their largely relational character. They incorporate deictic projections of the self in diverse orientations, entering into different participant slots inherent to the event. Notice of the latter entails the influence of index to apprehend the spatial, participatory, and temporal directionality within and across event frames. This progression requires a rudimentary consciousness of aspectual features (telicity, dynamicity), as well as an appreciation for the events' purposes/goals. Anticipating how, where, and when events conclude is critical to realizing the event's purpose/goal, since, according to Bauer 2006: 384, it constitutes the basis upon which episodes are constructed.

Keywords: Episode-building, episodic memory, indexical signs, auto-noetic consciousness.

1. THE ARCHITECTURE OF EPISODES

Episodes consist in events with a beginning, middle, and end, characterized by sequentiality in space and time; cf. (Hayne, Imuta, 2011); (Suddendorf, Nielsen, von Gehlen, 2011). As Hayne and Imuta observe:

“For example, Tulving has argued that episodic memory is characterized by mental time travel and auto-noetic consciousness; that is, episodic memories are accompanied by a subjective awareness that the event happened in the past to ‘me.’ In the absence of a verbal report, it is difficult to see how non-

human animals or preverbal children would ever be able to satisfy these essential criteria” (2011, 318).

Hence, the concept of movement over space and time must be in place, and must be applied to the self. To illustrate: finding a familiar object requires recall of where it was placed, memory of concurrent events with securing its placement, and the current impetus for recovering it. Building a house constitutes a further example of how the foundation was initially constructed (telicity), how the external and internal walls continued the process (durativity), and ultimately how the roof and finishing details concluded the project (telicity). In fact, the structure of episodes is not satisfied by conformity to a state of existence, but requires apprehension that events have some degree of directional shape created by the number and kind of participants and resultative states of affairs. As such, awareness of an event’s telicity (end-point) is critical (Bauer, 2006, 384). Establishing an end-point serves as the catalyst for creating determinative spatial and/or temporal frames, within which participants function in predetermined ways and without which relations between events would be truncated. Thus, to qualify as episodic, events’ spatial and temporal endpoints must be established; and their relevance to resultative states of affairs (sequential potential) must be recognized. Attention to end-points can be hastened by use of physical indices in Secondness (cf. West, 2013, 16–26; 2016 a, 228–231), indicated by gaze, head orientation, or finger pointing toward the place where the event (action, state) is perceived to have terminated, e.g., focus on the location where an object had been transferred; and Secondness is implicated when the body part as sign faces its object in the here and now. Accordingly, a topic/subject frame is established, which structures the event by limiting its duration, and, at the same time, expands movement from the event in question to resultative states of affairs, e.g., apprehension that transfer of something to another marks the conclusion of giving events—suggesting the benefits that receipt of the commodity might afford in subsequent states of affairs. Notice of the frame’s end-point supplies still further advantages. Its structural limitation (end-point) suggests a semantic relation—hinting at the event’s purpose; as such, novel interpretants, namely, utility for participants, is implicated.

In short, in its role as visual tracer, index highlights event contours and continuity across events (illustrating connections between source, path, and goal). It manages distinctions between near and far events by unifying once separate events into a cohesive series of conceptually related events. At the outset, index surfaces as physical gestures (gaze, reach, and/or pointing), which serve as attentional gatekeepers in the visuo-kinesthetic modality. When index materializes as a physical gesture, it is secondary to the object under scrutiny. Moreover, in semiosis, it possesses the additional force to

suggest participatory and temporal event relations. In addition to their early attentional function, gestural indexes serve as latent affordances to clarify meaning associations between objects and contexts. Nonetheless in their initial function, via the visual modality, index naturally draws a physical and logical pathway between referent points that make up the inward and outward structure of the spatial field, and begin to operate as location-finders for objects participating in the proposition which the signer is establishing. Essentially, these early indexes are attentional—they frame a localized assertion, potentially making cohesive components of an event, and cementing its structure through projections of potential next events.

This process (inherent to index) of suggesting spatial and temporal relations, frames which semantic and structural features are intrinsic to the event. The interpretant of index (its meaning, effect) represents how telicity (event's conclusion) applies to the event in question, establishing a defining event property (its purpose/goal).

As such, recognition of the event's goal ultimately facilitates its consideration as episode, in that event connections consist not in loosely held disparate structures, but in a compound of closely held logical sequences. This is in line with Bauer's (2006) observation that establishing a goal for events is a precursor to perceiving events as sequential. As Bauer (2006, 384) illustrates, "... to enjoy a meal of pasta with sauce, one must first cook the pasta." Bauer's explanation for this phenomenon resides in the fact that certain kinds of events are more ripe than are others (actions more than states) to generate inferences regarding their end-states. Although Bauer's model is not semiotic in nature, and hence does not recognize the influence of the interpretant upon perceiving events as episodes, her claim does highlight the far-reaching influence of spatial boundaries upon advances in semantic knowledge.

2. SEMIOSIS OF EVENT RELATIONS

Binding events sequentially depends upon a representational system in which the culmination of one event is logically connected to the initiation of, often resultative of another event, thus constituting an episode. In fact, representational thought is foundational to Bauer's contention that certain events enable others. According to Bauer, actions and certain stative events "enable" children to infer its goal, events which are intrinsically instantaneous or which presume an accomplishment. Thus, looking beyond the immediate space and time of one event is encouraged, and facilitates episode-building. Accordingly, Bauer contends: "A robust finding is that ordered recall is facilitated by enabling relations in events" (Bauer, 2006, 384). Actions, rather than states, more clearly illustrate enabling events, given the

continuity that visual observation affords, between the objects and participants carrying out the integral activity. Essentially, action end-states/goals are more easily discerned, in that sign, object, and interpretant are co-present, which obviates cohesion. In short, episode-building entails not merely binding spatial and temporal features into structures/frames; it must entail recognition of the underlying effects/goals inherent to particular events which, indexes afford by virtue of their relational character. The work of index in episode-building is to suggest potential effects and/or resultative states of affairs, enhancing the establishment and maintenance of logical event relations.

The role of index in this endeavor is paramount. It makes salient to self and to others the flow of spatial and temporal features within event complexes. Its function is indispensable, serving as deictic stabilizer to convey points-of-view. It does so by commandeering notice and attention to situated objects/topics, and by supplying an imperative (where to look) to follow another's event profile. In this way, index directs the mental eyeballs where to find relevant contextual features of event paths, situating viewpoint shifts. A quintessential example of this process is the power of indexical terms such as demonstratives ("this"/"that") accompanied by other pointing gestures direct the listener to the conversational focus/topic, especially when the demonstrative changes referents.

Because perceiving relations depends largely upon binding event features, it necessarily draws upon underlying representations, not upon simple association paradigms. This is so since establishing event relations requires a unitary representation which draws together event features with effects, such that the representation classifies the features qualifying that event as a particular kind, e.g., animate agents/receivers in transfer exchanges.

Present objects, especially those which undergo movement within transfer exchanges during the implementation of a goal, qualify as good candidates for discerning source, path, and goal, since following their trajectory is salient. This is especially so given that their displacement from the source location to the goal location is orchestrated via participant effort. The transfer by means of another is not ordinarily unexpected when two participants negotiate the exchange. This kind of event, with its integration of social and cognitive goals, constitutes fertile material to bind event features and to encourage interrelating what were once separate events. The function of index continues to be vital—such that the signer's inner, mental attention is directed toward the progressivity of actions/states. As such, participants' line of movement draws attention toward the shape of the action, i.e., using another's body orientation and reorientation to determine event direction and duration (cf. West, 2013, 15, 40; West, 2014, 153). The advent of joint attention at 1;4 (Saylor, 2004, 608), provides further support for following

index to integrate social with cognitive purposes. Soon after joint gaze exchanges emerge, index incorporates absent objects into events—such that they, likewise become viable objects in events. Looking with another toward the empty place (where an object ordinarily had been) provides a forum for children to express what they have to date merely inferred—that absent objects are includable in self experienced events. As such, the influence of displaced objects to observed end-states is operational (cf. West, 2011a). In short, the influence of index in constructing episode-representations is indispensable; it accounts for the directional progression—where participants are ultimately proceeding in the event. Index supersedes the iconic snapshot of the event (its static shape), by reaching forward to incorporate the participants' purpose. Accordingly, the fact that the sign (in this case index) compels notice of the objects/participants' utility in producing the event's effect underscores its prominence in binding event components.

3. THE DEVELOPMENT OF EPISODIC THOUGHT

Infants must first perceive the event's situatedness, spatial and temporal boundaries, prior to constructing episodes wherein objects and participants' orientation and motility are integrated. Quinn and Intraub (2007, 331) found that as young as 0;3 spatial boundary extension skills are operational, in that their infants habituated (looked less) at pictures depicting a wider panorama, beyond a narrow visual field. Quinn and Intraub assume that looking longer at a narrow slice of occupied space (than a wider scene) indicates memory of implicit boundaries, e.g. corners or windows in a room. The stimuli consisted of a teddy in a corner (both wide and narrow views), without any obvious border around the teddy. In this case, infants appeared to impose their own spatial boundaries in looking longer at the narrower scene, although the exact boundary is not explicit.

At 0;6, infants recognize motion along paths (and interrupted motion when paths are blocked) and end of paths. This is relevant to event relations in that the end of paths demarcates where beyond space ends. Motion along paths tracks the feature of event continuity, foundational in the apprehension of episodes. Children's recognition of the beginning and end of paths demonstrates expectations regarding event structure—how single events are connected with others to form aggregate structures/episodes. According to Baillargeon (1986), at 0;6, infants appear to realize that objects proceeding along a path can be stopped if blocked by another object. Although at 0;6 children recognize where motion events end, e.g., objects stopping at the end of a path or when they are blocked, they still have not demonstrated episodic thought, given the lack of continuity across events—relating a happening along one path to a resultative state of another. The non-episodic

character of memory at this age is likewise demonstrated by children's actual enactments, not merely by looking time. At 0;6 infants reproduce path-like gestures with physical movement of their own body, demonstrating a beginning and an end point. Nonetheless, their gestures (head movement) at this age are merely imitative (Meltzoff, Moore, 1977; Barr, Dowden, Hayne, 1996). These gestures are non-episodic, in that they lack intentionality to trace trajectories intrinsic to particular objects. Proof is likewise derived from other sources: the gestures constitute immediate reproductions only, because little, if any time intervened between observation of the model and the children's reproductions. In short, despite recognition of graphical arrays at 0;3 (Quinn, Intraub, 2007, 331) and spatial boundaries at 0;6 (Baillargeon, 1986), infants lack the skill (which index affords) to unite event features into episodes. As such, action relations lack logical connections to one another; and classification into aggregates of event types is likewise absent.

These event classifications are defined by predictable directional templates, e.g., the source, path and goal in a "provide"-like scenario, where giving represents the source, carrying an object through directed space the path, and arriving at the auspices of the intended receiver the goal. Consolidating the individual procedures is not operational until much later in development. Necessary for rudimentary episodic thought (which is absent at this early age) is the sequentiality of events. Despite apprehension of the distinctness of individual events, evidenced by discerning their beginnings and ends, episodic thought entails logically connecting them with concurrent contexts and with subsequent events. In other words, recognition that events cohere with other happenings to form single larger events often with several procedures is paramount. Children eventually classify these relations—when event aggregates are understood as kinds of events (templates). In this way, children discern that it is not merely the endpoint which defines event types, but factors originally external to the event which later become part of the event, e.g., participants which bring the event into existence, or into sharper focus. Accordingly, consideration of whether events can take agents/receivers/benefactors helps characterize whether events have the potential to expand into episodes. Essentially, the caliber of events' representations (how objects are utilized, or participants' action complexions) unites event profiles into a single, larger frame (an episode). Where object/participant trajectories begin and conclude (telicity) illustrates the topic of discourse (albeit implied), prior to using language for this purpose. As such, notice of event initiation/termination defines individual events, while, at the same time, suggesting how the event contributes to subsequent events.

Noticing spatial boundaries merely constitutes the touchstone in the process of thinking episodically. Episodic thought entails apprehending telicity

ty—the point where an array/action ends, and where beyond space/beyond present time begins (cf. Vendler, 1967 for an elaboration of telicity). It is critical to recognize that apprehension of boundaries defines space containment; nonetheless, spatial containment is but one component toward notice of temporal progressivity/sequentiality. Unless contiguous qualia are apprehended as first filling, then superseding, individual fields, events (actions, states of affairs) will fail to reach muster as episodes. Accordingly, perceiving events as episodes first requires recognition of space as occupied (incorporating objects/participants and their qualia); afterward determining how to unite bounded events characterizes more refined episodic thought—reflecting a relational character. In short, the principle of purposive, contiguous motion through space is one of the most critical advancements in determining event relations.

At 0;6, after objects have been mentally associated with place and identity attributes, in object files, (Leslie, Xu, Tremoulet, Scholl, 1998, 11; Leslie, Kálly, 2007, 117) representations still fail to reach muster to qualify as episodic images. This is the case because location/color/shape (which is static), not participant orientation and movement shifts, defines event representations. Event representations become episodic when they supersede their own internal relations, suggesting logical relations with other events. Tracing participant event roles can hasten determination of these extra-event relations. As such, children must recognize that individual events can suggest what is about to transpire, i.e., contribution to a consequence. As mentioned earlier, infants' reproductions of single gestures (head movement) are non-episodic, in that they do not suggest consequent states of affairs. As such, only spatial boundaries, not temporal ones, have been internalized. Apprehension of static relations between objects and locations ("object index") does not give rise to the recognition of events as moving toward a logical end. Hence, apprehension of single locations or actions cannot directly bridge one occupied space with another to hint at the event progressivity necessary for episodic reasoning. Incorporating qualia into static locations, which is operational at 0;9 (Leslie, et al., 1998, 13)—such that objects represent certain attributes—is critical to filling space, eventually to determine boundaries between spaces. Undoubtedly, noticing these characteristics and fitting them into functional classes still does not invite their inclusion within action templates or proposing resultative states of affairs. At this age, object files lack associations with action templates, leaving paths/goals unconsidered/undetermined. In this way, events are not moving, but are represented as instantaneous snapshots. Even at 0;9, when infants are "sensitive to individual identities of objects within spatial arrays, they have yet to demonstrate sensitivity to differences in movement trajectories necessary to code memory of event paths and goals" (Richmond, Zhao, Burns, 2015, 88). The fact that even at 0;11 ordered recall of visual displays (not action events)

endures only one month (Meltzoff, 1988, 475; Mandler, McDonough, 1995, 471; Bauer, et al., 2006, 382; Bauer, Wenner, Dropik, Wewerka, 2000, 135),¹ and that memories consist of single actions only, further illustrates the non-sequential nature of children's memory even after the one year mark.

Although search for hidden objects emerges at 0;10 (Piaget, Inhelder, 1966/1969, 14–15), it does not yet constitute enactment of more than a single goal-directed behavior. It falls short of a sequential character—illustrating a minimum of two events. It merely results in finding the sought-after object, lending some cause-effect purpose to the event. Even more advanced search behaviors fail to reach muster as episodes; they only reveal children's verbatim knowledge of object location or event coordinations. Once children realize that participants/objects take part in different event frames (such that they can productively be applied to more than one situation), events can be said to have rudimentary status as episodes. Not even when three sequential actions endure in memory (at 2;0) for 24 plus hours (Bauer & Shore, 1987; Bauer et al., 2000, 135) is there sufficient evidence that children think episodically. This is so given the presumption on the part of two and three-year-olds that contemporaneous events necessarily possess some logical relationship. The fact that events are spatially and temporally near often misleads younger children to infer a logical relation.

It is not until event relations are perceived to have a logical order, and are actually reproduced as sequential action schemes after the two-year mark (Wenner & Bauer, 1999, 589), that episodic thought is truly operational. In short, evidence that children bind location with objects within visual arrays at 1;5, and remember two sequential events is still insufficient to qualify as episodic. Richmond, Zhao, and Burns' (2015) findings support the non-episodic nature of children's thought prior to 2;0. The fact that children looked longer at objects which changed location (indicating non-recognition) at 1;5 and 1;11, than at objects substituted in the same place as original object (demonstrating recognition, since memory was retrieved), still fails to demonstrate that any logical relationship (cause-effect or otherwise) has been applied to the objects. It only suggests that substituting objects in the same array (rather than moving them to other arrays) is an operation with which children at this age are more familiar. The upshot of Richmond, et al.'s findings supports children's greater comfort with object substitution than with object movement or displacement into contiguous events.

What children need to exercise to ascertain the "feeling" of episode is diverse experiences in similar kinds of events, transitionalizing them to knowledge of event roles and their shifting nature. Assuming diverse directional movement paths and orientations via one's body supplies the

¹ Mandler and McDonough (1995, 471) also observe that their subjects recalled causal events more reliably than arbitrary events. Cf. Mandler (2004, 230–233) for a general discussion of ordered recall in development.

directional experience necessary to enhance knowledge of event contours. At 2;0, children are able to take a rudimentary form of allocentric perspectives; they were able to select the correct plate on the floor under which they recovered a reward, despite assuming distinct orientations to the plates. Children entered an arena from different doors and saw the array of plates from different orientations. In this paradigm, children, in fact, did demonstrate relational skills in locating objects despite new orientations (Sluzenski, Newcombe, Satlow, 2004; Ribordy, Jabès, Banta Lavenex, Lavenex, 2013, 19). According to Ribordy, et al. (2013), these allocentric skills are critical to a cohesive spatial perspective. Children's success locating the target plates after shifting their orientation (despite the absence of landmarks at 2;0 demonstrates apprehension of space relations over time, consequent to the different perspectives that they assumed. This allocentric perspective (approaching the object array from different directions) allows children to sequentially experience different spatial relations with object arrays, requiring some prospective thought, in that distal visual cues and other vantage points (points of origin) are integrated to determine changes in event participant orientation and object location. Measuring event relations at this age (2;0) is more reliable, since enactment utilizing the self's whole body is possible. Moreover, children's enactment of event sequences (three events) one month after a model enacted them (Bauer et al., 2000, 135) clearly demonstrates memory of relations between two or three events. This use of the whole body to illustrate movement from one event to another is a quintessential example of how the body becomes the index, providing a compelling directional thrust toward resultative states of affairs. The entire body physically transitions from one action to another, allowing an actual experience of changing event relations.

4. THE EMERGENCE OF EPISODES AND AUTONOESIS

Children can employ either of two orientation systems to determine the source of the memory and to bind elements of the spatio-temporal context: an egocentric or allocentric perspective (Ribordy et al., 2013, 26). The former always precedes the latter in ontogeny for mammals and for other species (Raj, Bell, 2010, 387). An egocentric paradigm, discerning paths from the vantage point of self only, is employed utilizing path integration as early as 0;7 (Acredolo, 1978). Allocentric paradigms, in contrast, utilize vantage points other than self to determine locations of objects within the event. These other points of origin may consist of persons or other objects with inherent fronts/backs. Unlike egocentric perspectives, allocentric vantage points require landmark integration; and as such, they emerge somewhat later, at 1;6 or slightly beforehand with increased stimuli and place familiar-

ization (Richmond, Zhao, Burns, 2015, 89). According to Ribordy, et al. (2013, 26) the means to distinguish and remember “closely related spatial locations” improves between 2;0 and 3;6, consequent to maturation of distinct hippocampal circuits. Ribordy et al. (2013, 22) employed more sensitive measures beyond looking time, to determine whether children were using self only or other points of reference to inform their orientation to objects. Certain environmental features were systematically manipulated (presence of opaque curtains, multiple goal locations, and starting positions). These controls induced subjects to utilize points of reference other than the self, namely, landmarks, to reorient, given reentry into an arena via different doors across several trials. Consequent to their novel orientation to the objects (plates), children’s view of the array altered. What is still missing in children’s perspectival skills, such that they fall short of more advanced forms of episodic thought, is attribution of allocentric perspectives to participants of events. Without allocentric perspective-taking, children lack the means to perceive events/arrays as others perceive them, especially in the face of orientational conflicts/contrasts—particularly when the parties face one another).

While egocentric paradigms always employ the self as referent point for object place/motion (even when self’s orientation is altered); other-centered vantagepoints define allocentric systems, such that objects/persons outside of self likewise determine the location and distance of objects and persons taking part in the episode. The advantages of allocentric perspectives are many: no need for the perceiver to directly take part in the event, and in turn, the inferences which ensue are more likely to contain greater objectivity and hence greater validity as abductions. With use of allocentric points of view, the underlying structure and classification of episodes are determined by the particular referent point (point of orientation) to locations, times and other participants within the episode, and are updated with the introduction of new participants and episodes. The deictic character which requires updating from episode to episode (frequent location and orientation shifts), hastens the manufacture of inferences as to how such shifts (object/person substitutions) redefine the event in question, and how subsequent events, in turn, might be affected. Were the event trajectory to characterize ball-playing, one episode might entail the agent launching a round object along a path, to reach another player at another location, only to reverse the process. Once reaching the receiver, the perspective, together with the event structure alters with the shift-role, mandating recalculation of object distances and object access according to an allocentric viewpoint. Were an observer to utilize an egocentric viewpoint only, distances and orientations of objects at each turn would be measured from ego’s place of continual relocation and/or ego’s updates in orientation only. Accordingly, the interpretants of index (effects of perceiver’s gaze trajectory) would be centered upon

where ego is traveling and facing, without reference to how the scene might be interpreted via any other viewpoint, especially that of an objective other.

It is important to stress that until allocentric paradigms inform the perception and encoding/storage/retrieval of events, episodic thought is not fully operational, because until some perspectival objectivity defines logical relations, why one event precedes/follows another (from a host of viewpoints), the contribution of events to consequent states of affairs is obscured. In other words, if simple idiosyncratic embodiment is the only/primary consideration, as is the case when employing an egocentric paradigm, effects upon other participants are likely to be foreclosed; and generating plausible inferences (containing logical validity) about events to come, is often compromised.

In view of reliance upon ordered recall and orientational posturing with respect to objects in events, episodic memory has a procedural component, in that it charts event sequences (Hayne, 2007, 228). It likewise must draw from semantic knowledge (factual knowledge emanating from declarative knowledge) to connect events logically. In this way, episodic memory relies upon both semantic and procedural memory. Episodic memory (in the form of procedural knowledge) emerges later than does semantic memory (Tulving, 2005, 11), presumably because it depends on both systems, and because semantic memory can feature an undifferentiated world-knowledge-based system.² More fitting rationale for the later emergence of episodic memory (with its procedural component) appears to be a consequence of semiotic factors, namely, the difference between indexical signs, on the one hand and symbolic ones on the other. Drawing propositions from indexical signs (operating to unify events) appears to require more refined logical skills, since index points toward event relations without stating the nature of the relation. This kind of situational sign requires far more inferencing to determine potential logical connections. Conversely, symbols more explicitly express the nature of relations, making inferencing far less necessary. This issue is especially relevant to the development of episodic thought, wherein apprehending relational representations (namely indexes) is central.

Hayne's (2007) and Hayne and Imuta's (2011) findings support the fact that event relations rise to the level of episodic thought. They demonstrate that episode-building depends largely upon the consciousness of the child's own past experiences. At 3;0 Hayne and Imuta found children to be conscious of previous hiding places, but not their temporal order. Hayne and Imuta 2011 conclude that although episodic memory begins emerging between 3;0 and 4;0, it is not reliably in place until 4;0, when consciousness of

² For a discussion of the emergence of declarative and procedural memory, cf. (Bauer, de Boer, Lukowski, 2007, 241–243).

temporal sequences is in place. Three-year-olds were able to remember where objects were hidden in a particular room (after observing the hiding process); but not when they were hidden, or who was responsible for the hiding. Four-year-olds were conscious of and were able to recall all three factors of the hiding process (where, when, and whom), indicating that recall of temporal sequences consisting of more than two events and participant identity are more advanced cognitive skills than remembering three “where” events. Given that episodic memory requires awareness and recall of temporal sequences, it does not emerge until children unequivocally demonstrate (ordinarily through narration) conscious reconstruction of the events in the correct order (Tulving, 2005, 32): “Children’s ability to remember how and when and in what setting they learned a new fact can be assessed even more directly [via narratives]. When this is done, findings again suggest a magical number of 4 as the number of years needed to develop a nearly fully operational episodic memory system.” Bauer, Stewart, White, Larkina’s (2016) findings similarly indicate that at 4;0, event recall after one week is more accurate when cues (especially location) are provided, compared to uncued recall. In short, although episodic representations begin emerging at 3;0, they continue to be refined even beyond 6;0 (Nelson, 1993; Perner, Ruffman, 1995, 543; Tulving, 2002, 7).

To ascertain a full-fledged episodic memory system, children must supersede memory of past temporally ordered events; and they must have the means to utilize past memories to infer future states of affairs, such that contributing events/conditions are recognized. The work of Tulving (2002, 2005), Mandler (2004), Hayne (2007), Klein, Cosmides, Costabile, and Mei (2002), Suddendorf, Nielsen, and von Gehlen (2011, 31) and Klein (2015, 12) demonstrates the necessity of projecting the self into novel events. This skill requires consciousness of how resultative events affect event participants and how they might affect such in the future, namely *autonoesis*. Wheeler, Stuss, and Tulving (1997, 332) define *autonoesis* as a system of memory that “renders possible conscious recollection of personal happenings and events from one’s past and mental projection of anticipated events into one’s subjective future.” Wheeler et al.’s definition brings into focus the importance of remembering beyond simple past event sequences, by virtue of building potential event sequences to satisfy a future goal. *Autonoesis* is necessary for the development of episodic thought, in that it enhances perspectival diversity, and is responsible for uniting actions (especially enabling ones) with their participants and subsequent (yet unrealized) resultative states of affairs.

Although many investigators note the vital role of *autonoetic* consciousness in episode-building, Tulving’s (1985; 1997; 2002; 2005) insights have been the most influential. Whereas *noetic* consciousness entails consolidating events which are remembered accurately in their actual and logical se-

quence, auto-noetic consciousness entails the additional skill of remembering how the self-traveled, or is likely to travel, through the event sequence. Episodic memory depends upon the same skills: imaging consolidated event sequences (noetic), and inserting the self as player in such event sequences, both in the past and in the future (auto-noetic). But, what truly sets episodic memory apart from auto-noesis is the means to further project the self into events experienced by others (not by the self alone), and situating others in subsequent diverse events. In view of this other-based viewpoint, taking allocentric perspectives is vital to thinking episodically—a fact recognized by Szpunar and Tulving (2011, 6) as well as Klein (2015). To accomplish this, allocentric goals must motivate images of event frames, to adequately capture how hypotheses translate into action to remedy real world problems. When children represent the self in past scenarios, and recall the sequence of those scenarios ordinarily during narratives, they are only remembering the happening itself and their own feelings. To truly think episodically, they must make inferences based upon others' anticipated reactions—a less direct source for creating the inferences. As such, children not merely cultivate auto-noetic consciousness (insinuating the self only as event participant), but insert others into their perspectives and they, themselves assume the perspectives of the other. Until children consciously incorporate appreciation for diverse perspectives—projecting the self into possible events which others may have experienced, or others into the children's own experiences—episodic memory falls short of its ultimate utility. It must incorporate consciousness of objective points-of-view—to recommend courses of action in immanent episodes (one of Peirce's primary directives for abductive reasoning (1909, MS 637, 15).

To make workable recommendations, procedural memory (knowing the steps to reach a goal) must integrate with semantic memory (knowing what to suggest to ascertain a goal). To recommend successful courses of action for diverse others, (episodes), children must reason abductively—anticipating participants' likely reactions, and proposing more workable paths of action given the conditions intrinsic to the episodes. This is so, because episodes consist in event frames which hold together by implicit logical affiliation.

In fact, the reason for the rather late ontogenesis of episodic memory (Tulving, 2005, 11) is likely to be a consequence of the need to integrate procedural knowledge into declarative knowledge, particularly into semantic knowledge. Because procedural knowledge cannot ordinarily be “brought to conscious awareness” (Mandler, 2004, 46), accessing it and applying it to perceptual-motor turns within event sequences requires executive control, not present early on in ontogeny (Baddeley, 2007, 148–149). The procedural knowledge necessary for episodic memory resides in the spatial and temporal situatedness of the contributing events. In contrast, the auto-noetic property of episodic memory relies upon declarative, semantic knowledge.

Its procedural dependence consists in coordinating spatial and temporal components (sequencing the where and when of event internal features), consonant with Newcombe, Lloyd, and Balcomb's (2011) analysis; whereas, its focus on participants' assumption of event slots clearly qualifies it as semantic. In short, episodic memory requires children to integrate procedural with semantic knowledge to organize representations of past and future events pertaining to self and others. To coordinate both kinds of knowledge effectively, children need to have an awareness of the source for their event memories, i.e., how they know the events—from self-observation, or others narratives, and need to exert executive control, utilizing the episodic buffer, to block irrelevant event memories from influencing related abductions.

5. INDEX AS FACILITATOR OF EVENT RELATIONS

Early on in ontogeny, event images are drawn from semantic memory; they are rather undifferentiated, making apprehension of spatial or temporal factors difficult, and recognition of fixed sequential ordering. Consequently, such images, ordinarily represented as object files, are non-episodic in nature. These less differentiated representations obscure part-whole relations; accordingly, the presence of one co-occurring component in the overall scheme often remains unexamined, such that the effect of a contributing element is overlooked in favor of a simple frequency determination. More particularly, undifferentiated pictures (iconic ones absent the directional focus of index) make salient the impression of the over-all event shape, without placing emphasis on how components to the event fit within the logical event scheme. With the emergence of differentiations among event components comes increased potentiality to notice and construct other than coincidental relations; and organizing these differentiations requires dependence upon some procedural knowledge (determining the order of spatial arrays and temporal sequences). The organization and coordination of these spatial and temporal event components mandates the use of indexical signs. Index obviates relevant spatial, temporal, and participant features, supplying attentional and directional focus (West, 2014, 150–154; 2016b, 2016c). It makes salient the procedural aspects of events which are often inexplicit, unconscious, and unretrievable from memory (Mandler, 2004, 46). In other words, because index facilitates awareness of relations (even perceptual motor ones), it can convert actions which are ordinarily automatic to conscious awareness. In that index draws attention to spatio-temporal sequences, it can monitor variations in when and where events materialize. Index shows the where by gestural pointing; it indicates the who by pronoun use (conveying participatory roles); and it illustrates the when via tense and positional adverbs. In short, index's means to draw and shift attention

among event features makes plain its relational character. Its noticing effects upon its producer and upon observers goes beyond establishing new topics/foci of interest. Index's capacity to move the focus to other concurrent objects or to proximate events supplies it with the means to imply event relations through suggestions of co-presence/continuity across objects, persons and actions/states of being. It draws paths uniting physical event features to one another, and insinuates the inclusion of absent objects by pointing to their typical location. Index can even enhance notice of how one event progresses to another (West, 2016c).

The force of index in building episodes is evident. Quintessential to this process is noticing relations between features of events, extending to event-to-event relations; and index serves just this purpose—shifting attention and thereby directing the self and others to the proposition being fashioned (however implied). It does so initially via directional gaze, head nodding, and body and finger pointing toward the individual subject of the proposition to be communicated. In fact, these gestures feature the primary indexes utilized to exact notice of event components, prior to the onset of language (cf. West, 2013, 16–26). During this early stage in development (from 0;6–1;6), index takes the form of gestures, supplying a necessary attentional and directional template to communicate implicit messages for partners to follow.

The attentional and directional aspect of Index is obviated in several of the purposes which Peirce articulates, namely, physical contiguity between sign and object via brute force attention to objects in Secondness (the material world) (1903, 2.248), and an absence of resemblance (iconic) or lawlike (symbolic) relations between sign and object: “The index asserts nothing; it only says ‘There!’ It takes hold of our eyes, as it were, and forcibly directs them to a particular object, and there it stops ...” (1885, 3.361).

Here the relational nature of index is evident: it brutally regulates interactions between sign users, and forcibly aligns the implicit focus of the sign producer with that of the receiver in joint attentional exchanges—emerging at 1;2 (Saylor, 2004, 608), just prior to language onset. The sign producer's use of directed gaze toward one then another object/person can convey what is deemed to be the event focus; and shifting the direction of gaze can indicate a subsequent goal for the event, qualifying it as a proto episode. As such, index fashions implied propositions before they are explicitly produced via language.

In the same year (1885), Peirce extends indexical use to linguistic genres, again emphasizing index's role in relating material objects in the mind of the signer by forcing attention to the subject of discourse (1885, 8.41). Index continues securing attentional foci in language, supported by the fact that children's initial fifty words ordinarily include primary indexes, namely, pronouns, especially the demonstratives “this,” and “that” (Clark, 2009, 94).

These and other pronouns, e.g., “I,” “you,” continue to initiate the recognition of participant roles within events, emerging at 2;8 (West, 2011b, 95). The eventual recognition of the deictic character (shifting referents) of these pronouns, e.g., speaker, object near/far from speaker, again reflecting index’s means to relate participants to their contexts. The pronouns represent the proposition that location of objects is determined by the location and orientation of particular persons who assume particular roles in the discourse (ordinarily speaker), as well as in the event being reported. Establishing, maintaining, and shifting the topic of discourse is Peirce’s clearest vision regarding index’s relational function. “One of these kinds is the *index*, which like a pointing finger exercises a real physiological *force* over the attention, like the power of a mesmerizer, and directs it to a particular object of sense. One such index at least must enter into every proposition, its function being to designate the subject of discourse” (1885, 8.41).³ Here Peirce determines that the ultimate nature of index is to serve as a modal operator –compulsively introducing to another mind novel topics of discourse/event organizations. The effect of these novel object relations is the establishment of new habits/event coordinations (cf. West, 2016b: chapter 13 for an elaboration of index as habit).

Consequent to exposure to the objects of the event, together with the linguistic indexes referring to the object, event participants can be tracked, hastening apprehension of event sequentiality/movement. These indexes ultimately measure the progression of events through demonstrations of participant contribution to actions and states. Ultimately, notice of participant contribution to an event, and determining resultative events can further facilitate episodic thought. In other words, using these pronouns provides a first-hand feel for how episodes develop and extend pivotal nuclear events. Deictic terms are powerful indexical tools, in that they relate objects and participants to their contexts; they direct the hearer where and when to look for the objects and participants within event structures. Peirce alludes to this in his 1908 expansion of index:

“... *Designatives* (or *Denotatives*), or *Indicatives*, *Denominatives*, which like a Demonstrative pronoun, or a pointing finger, brutally direct the mental eyeballs of the interpreter to the object in question, which in this case cannot be given by independent reasoning” (Peirce, 1908, 8.35).

Here Peirce not merely reiterates his assertion that index is the primary tool for showcasing new topics/propositions to a single mind, but highlights the effect of the proposition upon the mental perspective of other interpreters. “Directing the mental eyeballs” of another presumes that a novel propo-

³ Atkin (2005, 163–164) illuminates these qualities of index and three additional qualities: reference to individuals, independence from interpretation, and asserting nothing. Cf. West (forthcoming) for a further discussion of Index within the construct of the division of signs.

sition is being introduced. This validates the influence of subjective propositions (provided that they have some plausibility), in that they are not given by “independent reasoning” alone (to satisfy an idiosyncratic standard).

The fact that the object of index is ordinarily co-present with Index heightens its relational and attentional component, illustrating Peirce’s recognition of the effectiveness of spatial and temporal continuity between assumptions of sign users and the material world. It likewise represents the primacy of having sign and object in close proximity particularly in the absence of language/other symbols. Because Index neither resembles the object, nor codifies the object as one of a class (as do symbols), contiguity with its object is paramount to discern new topics of discourse. In this case, index is an attention marker, shifting from focus to focus, and highlighting object location in the physical context.

Even after the onset of language, the influence of index, as an independent device, to structure episodes is vital. It allows a more objective construction of event profiles and relations with the incorporation of other points of view. The only point of origin for how event relations are perceived is ultimately not the child’s own, but is allocentric—determined by the perspective of other potential event participants in imagined locations at future times. These more diverse templates permit children to transition to mental indexes to directionalize events. Indexical legisigns (conventional signs such as words which point) suggest novel spatio-temporal and participant contours within and across events, without requiring actual participation. This promotes and even transcends application of allocentric perspectives, in that others’ perceptions of events can be imagined and amplified. This relational character (reaching across places, and times, via different participant perspectives by means of index) enhances the concept of events as frames whose boundaries may exist outside of the child’s own experience. Hence, the moving character of events is further facilitated. Appreciating perspectival shifts across participants is ultimately responsible for notice of more logical connections between event components. The utility of index is far-reaching; it serves as a measure and facilitator for drawing possible event relations, both prior to the influence of symbols in language. It takes full advantage of allocentric perspective-taking in suggesting different event relations—heretofore unexperienced, but within the realm of real possibility.⁴ In short, index constitutes a long-term action organizer, in simulating diverse orientations to events (inside, outside), energizing participants with the foresight to infer novel event relations.

⁴ Peirce’s notion of possibility is taken from his concept of virtual habit—an image in the mind so vivid that it represents a course of action one step away from being implemented (MS 620; West, 2017).

6. CONCLUSION

The topic of episodic memory is relevant to, and enhances, the field of Cognitive Semiotics in diverse ways. In using gesture as the primary sign to measure the advancement of even representations from static to dynamic motion paradigms, it explicitly operates on issues outlined in Zlatev (2012). The issue most relevant here is the development of gesture, consciousness, and memory, and how embodiment is a form of acting out episodes. Zlatev, Sonesson, and Konderak (2016, 10) make a further case for the critical role of experimental studies and empirical findings to buttress the claim that cognitive representations underlie and facilitate cognitive skills. This inquiry likewise treats what Zlatev et al. (2016, 11) refer to as “meaning dynamism” in that the focus is on “processes” in development. This account illustrates the process by which mental events evolve into episodes.

This account asserts and provides empirical evidence that semiotic determinants, particularly Index, drive the relational cognitions necessary for episode-building, reaching beyond autothetic consciousness. The meanings/effects (interpretants) associated with Index reveal the state of children’s implicit knowledge regarding the spatial and temporal coordinates bound to events. In ontogeny, events are first represented as spatial coordinates, object-location coordinations. This more static (still) snapshot of events constitutes a rather iconic means of representing events. Once spatial relations of events are characterized by index, such that attentional and action schemes control, meanings are informed by attentional and directional attributes—obviating movement and sequential happenings. But, only when Index is supported by Logical interpretants, affording more objective event coordinations, can children truly think episodically, superseding self-conscious experiences by representationalizing sequences as participant paths toward goals. Essential to this process (from spatial to temporal binding) is the way in which indexical signs (consequent to their interpretant potential) highlight the physical and logical relations holding between objects and participants of events.

The fact that infants recognize boundaries and supersede them at such young ages demonstrates that spatial telicity is a primary competency; but, without the attentional and directional quality afforded by index, noticing movement and orientational shifts would be an arduous affair. Index qualifies as deictic organizer; it cements locations, times, and participants to event templates, enabling episode construction. Index supplies the means to measure motion and sequentiality of events. It determines the origin, path, and end-point. As such, index supplies the raw material to develop coherent episodes which incorporate logical features of sequentiality and diverse points of view.

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