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Storytelling as Adaptive Collective Sensemaking

Lucas M. Bietti, Otilie Tilston, Adrian Bangerter

Institute of Work and Organizational Psychology, University of Neuchâtel

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Abstract

Storytelling represents a key element in the creation and propagation of culture. Three main accounts of the adaptive function of storytelling include (a) manipulating the behavior of the audience to enhance the fitness of the narrator, (b) transmitting survival-relevant information while avoiding the costs involved in the first-hand acquisition of that information, and (c) maintaining social bonds or group-level cooperation. We assess the substantial evidence collected in experimental and ethnographic studies for each account. These accounts do not always appeal to the specific features of storytelling above and beyond language use in general. We propose that the specific adaptive value of storytelling lies in making sense of non-routine, uncertain, or novel situations, thereby enabling the collaborative development of previously acquired skills and knowledge, but also promoting social cohesion by strengthening intragroup identity and clarifying intergroup relations.

Keywords: Storytelling; Adaptive function; Cultural transmission; Sensemaking

1. Introduction

Storytelling plays a central role in our everyday lives. It is one of the most widespread social activities through which people in different cultures share personal memories (e.g.,

Correspondence should be sent to Lucas M. Bietti, Institut de Psychologie du Travail et des Organisations, Université de Neuchâtel, Rue Emile-Argand 11, CH-2000 Neuchâtel, Switzerland. E-mail: lucbietti@gmail.com

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Fivush, 2011; McBride, 2014) and cultural information (e.g., Boyd, 2009; Currie & Sterelny, 2017; Donald, 1991; Dunbar, 2010; Scalise Sugiyama, 2001). In its canonical form, storytelling is a collaborative conversational activity focused on the production of narrative discourse (Mandelbaum, 2013), whereby a narrator typically recounts a sequence of past events, including protagonists' actions, and how they contribute to changing an initial situation (Bruner, 1990; Labov & Waletzky, 1967). Members of the audience participate in the activity by reacting to the tellings or guiding them (Bavelas, Coates, & Johnson, 2000; Hirst & Manier, 1996). The activity of storytelling can be analytically distinguished from stories or narratives which are cultural products created, transmitted, and transformed, through the storytelling activity.

The universality of storytelling (Brown, 1991) suggests it may have an adaptive function; that is, it may have evolved because it confers some kind of fitness benefit to individuals or groups in the ancestral environments where it emerged. Various contenders for this function have been suggested, including (a) manipulating the beliefs of the audience to enhance the fitness of the narrator (Scalise Sugiyama, 1996), (b) transmitting survival-relevant information while avoiding the costs involved in the first-hand acquisition of that information (Boyd, 2017; Scalise Sugiyama, 2001), or (c) maintaining social bonds or group-level cooperation (Dunbar, 1996; Smith et al., 2017).

While each of these accounts is supported by substantial evidence, they do not always appeal to the specific features of storytelling above and beyond language use in general. We argue in this paper that the specific adaptive value of storytelling lies in *making sense* of non-routine, uncertain, or novel situations, thereby enabling the collaborative development of previously acquired skills and knowledge, but also promoting social cohesion by strengthening intra-group identity and clarifying intergroup relations. In this function, storytelling acts as social glue that brings the community together by enabling the co-construction of social histories (e.g., Dunbar, 2014), the formation of a collective memory (e.g., Coman, Brown, Koppel, & Hirst, 2009), or the preservation of an established group history (e.g., Wertsch, 2002). The adaptivity of sensemaking via storytelling is perhaps most evident when fast, and unforeseen, changes in the cultural niche (e.g., natural disasters, sudden disease outbreaks, aggression by outgroups) (Claidière & Sperber, 2010) take place. In such situations, groups need to protect or modify existing worldviews to make sense of out of the ordinary, uncertain, or novel situations that otherwise could undermine group cohesion and thus survival (Proulx, Inzlicht, & Harmon-Jones, 2012; Rosnow, 1980; Wagner, Kronberger, & Seifert, 2002). Evidence for the sensemaking function of storytelling comes from a wide range of disciplines, contexts, and historical epochs, but we make the case that it is also plausible in the ancestral environments where storytelling probably evolved (Dunbar, 2004; Scalise Sugiyama, 2001). The sensemaking function of storytelling is therefore the means by which the other functions of storytelling are realized.

We proceed by briefly reviewing what should count as acceptable standards of evidence for making adaptive claims about storytelling (Section 2). Then, in Section 3, we review three prominent claims about adaptive functions of storytelling. It is important to note that these claims are not mutually exclusive, nor are they exclusive of a collective sensemaking function of storytelling. In Section 4, we describe collective sensemaking as

the specific mechanism by which storytelling serves an adaptive function, over and beyond the advantages afforded by language use more generally. We conclude with implications and avenues for future research in Section 5.

2. Is storytelling an adaptation?

A *prima facie* line of argument for the adaptive nature of storytelling is its universality. Storytelling has emerged independently across the globe, even among isolated peoples, and develops reliably early in ontogeny (Scalise Sugiyama, 2001). Early humans began to be increasingly involved in cooperative tasks and the transmission of skills from elders to youngsters (Bowles & Gintis, 2011). Thus, cooperative behavior became crucial for human survival (Tomasello, Melis, Tennie, Wyman, & Herrmann, 2012) and may have boosted the transition from the use of simple communicative behaviors like gesture, body posture, movement, vocalizations, and facial expressions (Donald, 1991, 2007) to more elaborated forms like language, including narrative (Donald, 1991). Narrative itself may have emerged from these prior developments, probably in the Pleistocene epoch, between 30,000 and 100,000 years ago (Scalise Sugiyama, 2001).

But demonstrating the adaptive nature of storytelling beyond “just-so” stories requires evidence that it is more than a by-product of existing mechanisms and capacities (Mellmann, 2012). Conclusive evidence may be forever beyond our grasp (Scalise Sugiyama, 1996). However, to be plausible, candidate accounts for the adaptive nature of storytelling should fulfill at least three related criteria. First, storytelling has to provide a reproductive or survival advantage. Typically, these advantages most immediately benefit individuals, so it is not *a priori* clear how storytelling may be adaptive because it seems costly to the individual to share information with others. But adaptations that increase the chances of survival of the group may also affect individual members of those groups. Second, there should be some evidence of “special design,” that is, that storytelling is sufficiently universal or complex to make an “evolutionary byproduct” account improbable (Mellmann, 2012; Scalise Sugiyama, 2001, 2005). Third, because storytelling is a linguistic phenomenon, claims that storytelling *per se* is adaptive should show the specific benefits that storytelling brings above and beyond those conferred by the ability to communicate via language (Mellmann, 2012), which can help to solve a number of cooperation dilemmas (E. A. Smith, 2010). Evidence for these criteria is typically drawn from three sources. A first source is the structure and content of narrative, which exploits various aspects of the human cognitive system (e.g., content biases; Stubbersfield, Flynn, & Tehrani, 2017). A second source is the instinctive motivations of participants to engage in storytelling activities (Mellmann, 2012). A third is the existence of neural circuits specialized for story production and comprehension (Mar, 2011). The accounts we describe typically focus on evidence from the first two sources.

Demonstrating that storytelling is an adaptation is complicated by the fact that what counts as a “story” or “storytelling” varies widely. A staggering wealth of human knowledge gets expressed in narrative form, including gossip (Dunbar, 2004), rumors (e.g.,

Guerin & Miyazaki, 2006), urban legends (Bangerter & Heath, 2004; Stubbersfield et al., 2017; Zipes, 2012), traditional legends (Dégh, 2001), conspiracy theories (Franks, Bangerter, & Bauer, 2013), myths (Lévi-Strauss, 1955), personal life events (McAdams & Guo, 2015), and even scientific facts (Dahlstrom, 2014). The functions of these different discursive products may vary; thus, claiming a singly overarching function risks being excessively reductive. Moreover, because language use in its modern form has evolved over long time scales, and co-evolved with cognitive abilities (Oatley & Mar, 2005), functionalities may have shifted over time. Ancestral functions may have been co-opted to serve in new contexts (Buss, Haselton, Shackelford, Bleske, & Wakefield, 1998). Modern functions of storytelling may not correspond to the functions it originally was selected for. For example, modern life is replete with narratives (novels, movies, jokes, conspiracy theories, gossip) that are produced and consumed for their entertainment value. However, this does not necessarily mean that stories evolved as a form of entertainment.

In the next section, we examine three accounts of the adaptive nature of storytelling according to these criteria, detailing the arguments and sources of evidence they provide.

3. Adaptive functions of storytelling

3.1. *Enhancing individual fitness*

Storytelling may be primarily adaptive for individuals. One account builds on the Machiavellian intelligence hypothesis (Byrne & Whiten, 1988), which proposed that social competition for resources and mates constituted a key selection pressure leading to humans' high cognitive abilities. This pressure selected for socially intelligent strategies like deception, manipulation, or coalition formation as a means to beat competing conspecifics. Consistent with this account, the ability to craft narratives may have evolved in order to manipulate the perceptions or beliefs of others. Indeed, storytellers tailor their stories to fit their individual audiences to further their own interests (Scalise Sugiyama, 1996). Distinct from the Machiavellian intelligence hypothesis, Miller (2000) has suggested that verbal abilities more generally may have evolved as an honest signal (Zahavi & Zahavi, 1997) of an individual's reproductive fitness to potential mates. The ability to procure novel information for conspecifics may constitute a reliable indicator of an individual's social status, power, or access to information or allies. Likewise, the ability to entertain others via displays of verbal prowess like poetry or storytelling may signal intelligence and thus quality as a mate (Donahue & Green, 2016). Recent evidence confirms that, in hunter-gatherers, skilled storytellers are indeed more popular and reproduce more than non-skilled storytellers (Smith et al., 2017).

If storytelling were to only benefit tellers, however, listeners would evolve to disregard stories in order to avoid being manipulated. Clearly, then, storytelling abilities also benefit listeners. Scalise Sugiyama (2001) suggested that such benefits derive from the capacity of storytelling to create representations of the world that can substitute for firsthand experience via trial and error, which is often laborious and dangerous to acquire. Thus, humans

acquire survival-relevant information from narratives transmitted by their parents (Hewlett & Cavalli-Sforza, 1986), peers (Zarger & Stepp, 2004), and institutions (Barkow, O’Gorman, & Rendell, 2012), gaining access to a larger body of knowledge than would be feasible to acquire via first-hand experience (see the information transmission account in Section 3.2). Within the signaling approach, Dessalles (2010) suggested that information communicated must be relevant to audiences, and that it is often so when it is surprising, that is, when it violates their expectations (Labov, 2010; Labov & Waletzky, 1967). Surprising information enables the generation of inferences (Sperber & Wilson, 1986) to update an individual’s assumptions about a situation that may incorrect (e.g., negative gossip about a third party may lead me to revise my previously positive view of that individual). The ability of an individual to provide audiences with unexpected information advertises the individual’s ability to detect unexpectedness in the environment, which is a valuable asset. Dessalles (2010) tested this claim in a study where participants chose among possible variations of a detail in a story to make it more interesting. There was a strong tendency to choose the most unexpected variant. He interpreted this finding as suggesting a bias for surprising or unexpected information in narrative that confers adaptive benefits to tellers and listeners. For example, by anticipating sudden lethal aggression, tellers increase reputation whereas listeners can prepare their response.

Dessalles’s (2010, see also Sallinenfest & Dessalles, 2013) hypothesis exploits a particular structural feature of narrative, namely surprise (Brewer & Lichtenstein, 1982). This feature makes the adaptive nature of storytelling per se more plausible, because the abovementioned accounts did not really analyze storytelling properties: Machiavellian political manipulation or advertising of reproductive quality via language need not necessarily involve storytelling. But storytelling may be particularly useful for manipulating audiences because they have evolved mechanisms for epistemic vigilance (Sperber et al., 2010); that is, the ability to assess the quality of the information received and the trustworthiness of the individual who conveys it. Epistemic vigilance makes audiences wary of attempts at manipulation. The development of reasoning abilities may have been driven by epistemic vigilance. That is, storytelling may have constituted an adaptation to the epistemic vigilance of audiences. For example, storytelling devices like describing the behavior of target individuals or using reported speech that purports to quote them exactly (Holt, 1996) may be useful in suggesting particular interpretations of those individuals’ characteristics, but without explicitly stating them. Because of epistemic vigilance, individuals are more readily convinced by conclusions they have drawn themselves. Thus, the apparently objective and contextualized nature of the actions depicted in a story allows the audience to derive their own interpretations of the characters without the narrator explicitly communicating those interpretations to them. Skilled storytellers may use this to their advantage, making storytelling a particularly persuasive means of communication.

3.2. *Transmitting survival-relevant information*

In forager societies, storytelling may have constituted an effective practice for the transmission of survival-relevant information, allowing group members to avoid physical,

social, and health risks and increase their fitness (Boyd, 2017; Scalise Sugiyama, 2001, 2017). Stories about survival-relevant information reduce the complexity of the natural and social world (e.g., by compressing time relative to the actual experience being transmitted) and reduce the risk involved in acquiring such information. For example, novice hunters may learn about animal behavior from the stories that more expert hunters share in camps during hunting excursions, without actually getting involved in potentially dangerous hunting activities (Scalise Sugiyama, 2001). Thus, the transmission of cultural information via storytelling may constitute a means for peers and younger generations to expand episodic memory via vicarious experiences (Scalise Sugiyama, 2001), which in turn may enhance their ability to imagine or predict future events (Schacter, Addis, & Buckner, 2007), potentially enhancing the fitness of the group as a whole.

If storytelling evolved as a means of transmitting survival-related information, the content of stories should reflect that kind of information. In hunter-gatherer societies, many stories do indeed feature such content. For example, trickster stories reflect the problem of free-riding, and tellings involve mimicry of the behavior of animals or describe their habitats (Scalise Sugiyama, 2001, 2017). Similar content biases are apparent in modern-day stories like urban legends (Stubbersfield et al., 2017). Urban legends often evoke emotions relevant for survival. For example, disgust is survival-relevant because it motivates avoidance of potential contaminants in food and body products of humans and other animals (Heath, Bell, & Sternberg, 2001). Disgust has evolved to include a broader range of contaminants, including disease-causing pathogens (Eriksson & Coultas, 2014; Rozin, Haidt, & Fincher, 2009; Schaller & Park, 2011). Eriksson and Coultas (2014) showed that urban legends featuring high disgusting content are more preferentially transmitted than those with low disgusting content. Such an emotional transmission bias in storytelling may be an efficient way to sensitize other group members to health risks.

Another aspect relevant to this account concerns the way the content of stories is adapted to the constraints of human memory (Baker, Hymel, & Levin, 2018). Stories are highly memorable (Scalise Sugiyama, 2001; Sperber, 1985). Memory is a cognitive ability that enables the transmission of the information and the facilitation of social cohesion (see Section 3.3). For the sake of clarity, while in this section we explain why some stories are better adapted to be more memorable than others, in Section 3.3 we demonstrate how memory reports in narrative form promote social cohesion. In oral traditions, storytellers transmit cultural information handed down to them in spoken conversation by authoritative sources (Rubin, 1995). The recurrence of themes in these narratives operates to lighten the memory load of the teller and the audience, imply certain features of the plot, and define and stabilize oral traditions. These narratives contain scenes with visual imagery, tend to remain unchanged over time and generations, and are often remembered with a high degree of accuracy (Rubin & Umanath, 2015), even when the events in the narratives transmitted did not happen to either the teller or the listeners. Stories are also adapted to memory via minimally counterintuitive content (Barrett & Nyhof, 2001; Boyer, 1994; Norenzayan, Atran, Faulkner, & Schaller, 2006). Stories featuring an optimal level of counterintuitive items are more memorable, better transmitted, and ultimately enjoy more cultural success. It is unclear how this bias facilitates the transmission of

survival-related information in a narrow sense, because it would seem that such information should retain a minimal degree of accuracy in its representation of reality. However, minimal counterintuitiveness may favor the transmission of ideas fostering social cohesion, like religious ideas (see Section 3.3).

If storytelling confers adaptive benefits related to the transmission of survival-related information, it should feature prominently in teaching (Scalise Sugiyama, 2017). Teaching is “behavior evolved to facilitate learning in others” (Kline, 2015, p. 3). It enables younger or less experienced group members to become better fitted to their community and thus be more successful in their responses to the ecological demands of their cultural niche throughout their lives. A review of 982 texts from 23 diverse hunter-gatherer societies (Garfield, Garfield, & Hewlett, 2016) collected from the Human Relations Area Files (HRAF) showed that teaching in the form of storytelling plays a significant role in the transmission of cultural information about ecology, religious belief and practices, and cultural values and kinship (Garfield et al., 2016). However, teaching in the form of storytelling plays a limited role in the transmission of subsistence skills (Garfield et al., 2016). Ethnographic studies in farmer societies have shown that in contexts of informal instruction, learning in children occurs through observation and active participation (Silva, Correa-Chávez, & Rogoff, 2010). In Mayan communities, for example, children “learn through engagement with others (in a system of ongoing guidance and support) in the everyday mature activities of their community” (Rogoff, 1994, p. 216). In these contexts, the transmission of cultural information (e.g., weaving) from adults to children relies on the interplay of imitation, demonstration, trial and error, scaffolding, and storytelling (Greenfield & Lave, 1982).

More recently, experimental studies have begun to use the method of serial reproduction (Wagoner, 2017) to simulate cumulative cultural evolution, or the continuous improvement of cultural artifacts (e.g., woven baskets, knots, paper airplanes, and stone stools) from one generation to the next (Bietti, Bangertner, & Mayor, 2017; Caldwell, Atkinson, & Renner, 2016; Mesoudi & Whiten, 2008; Morgan et al., 2015; Zwirner & Thornton, 2015). This research has typically compared the emergence of cumulative culture as a function of various modes of information transmission (Caldwell & Millen, 2008, 2009), including imitation (new generations observed what previous generations did), emulation (new generations observed cultural products and their performance), and teaching (new and old generations interacted about the completed task). Findings coming from experiments using low complexity tasks (e.g., building a paper airplane or building a tower having as tools only spaghetti and modeling clay; see Caldwell & Millen, 2009) tended to show that cumulative cultural evolution can occur in any of these conditions. That is, teaching was not a necessary ingredient for cumulative culture to accrue (Caldwell & Millen, 2009; Zwirner & Thornton, 2015), although it may have been beneficial in some situations, such as for more complex tasks (Caldwell, Renner, & Atkinson, 2017; Morgan et al., 2015). Moreover, these studies did not examine the content of the social interactions involved in the teaching conditions. Thus, they were not informative about whether teaching involves storytelling. A recent study that did so (Bietti et al., 2017) found that storytelling was quite rare in transmitting knowledge of cooking skills to further generations. More

frequent kinds of talk included instruction-giving or advice. Thus, while evidence from foraging societies, ethnography, and experiments suggests that storytelling may play an important role in transmission of survival-related information, its exact role as a teaching method is unclear. Other forms of communication (e.g., direct instruction) may be more frequent, and possibly more efficient, in teaching than storytelling.

Taken together, there is much evidence that storytelling may play a role in the transmission of survival-related information (Scalise Sugiyama, 2001). There are some open issues with this account of the adaptive nature of storytelling. First, the range of what counts as survival-related information is broad. On the one hand, this could mean information about the physical environment, about food sources, or about animals that is relevant to physical survival. On the other hand, this could be information about cultural norms or values that is relevant for the cohesion of the group. Moreover, survival-relevant information of the first type should be accurate to at least some degree in order to be adaptive. However, many stories contain information that can hardly be described as accurate (e.g., myths, religious beliefs, fairy tales, and the like). While this may be detrimental to survival in terms of foraging or avoiding predators, it is not necessarily so for survival in terms of fostering group cohesion. A final issue concerns the added value or special role of storytelling in the transmission of survival-related information relative to language use more generally (Mellmann, 2012). This is an especially important issue for teaching, where storytelling appears to be used infrequently alongside other linguistic behaviors like instruction-giving.

3.3. *Facilitating social cohesion*

The adaptive value of storytelling may lie in its use for creating and cementing social bonds and thus facilitating social cohesion. This account is very broad and has been put forward in many different forms (Mellmann, 2012). Here, we describe a generic version before motivating its plausibility with reference to hunter-gatherer societies, thereby sharpening the claims and showing their limits.

An initial line of argument for the social-cohesive function of storytelling comes from ontogeny. The emergence of storytelling between the age of three and 5 years (Haden, Haine, & Fivush, 1997; Salmon & Reese, 2016) occurs in concert with an important development in children's theory of mind (e.g., Doherty, 2008). At this age, children already understand false beliefs (Baillargeon, Scott, & He, 2010), detect pretending (e.g., Doherty, 2009; Onishi, Baillargeon, & Leslie, 2007) and lying (Talwar & Lee, 2008), are able to keep secrets (Peskin & Ardino, 2003), develop peer relationships (e.g., Hay, Payne, & Chadwick, 2004), and understand moral culpability (Killen, Mulvey, Richardson, Jampol, & Woodward, 2011). Storytelling thus emerges as part of an increasingly sophisticated array of cognitive abilities oriented toward sociality. Early childhood is also when adults start to talk with their children about their memories (Fivush, 2011; Haden, Marcus, & Jant, 2018). This affects how children structure their autobiographical memories in the future (Nelson & Fivush, 2004). In turn, these autobiographical memories constitute the foundation for the creation of a life story that is unique to the self (Bruner,

1990; Habermas & Bluck, 2000; McAdams, 2001; Nelson, 2003). Reminiscing together about the day's events is also part of everyday interactions in families (Fivush, Zaman, & Merrill, 2018). In sum, then, storytelling is a vehicle for fostering the integration of individuals into groups from early childhood onwards.

Storytelling is instrumental in fostering bonds in many other small-scale social units. Romantic partners, friends, and colleagues all tell stories to begin new relationships and consolidate social bonds. For example, work groups constitute communities of practice (Wenger, 1998) in which storytelling is constitutive of everyday activities, but also the maintenance and continuity of experience and collective expertise (Bangerter, Mayor, & Pekarek Doehler, 2011; Orr, 1996).

Memory plays an important role in the way storytelling fosters social cohesion. As discussed in the previous section, memory biases make storytelling an inherently constructive activity, where constraints on the accurate transmission of information are often secondary.

Thus, it seems unlikely that storytelling's adaptive value derives solely from the transmission of survival-relevant information in a narrow sense. On the other hand, memory biases allow enhanced memory conformity with other ingroup members than with those outside the group, regardless of the truth-value of the information recalled. Memory conformity occurs when one person's memory report about an event can influence what another person subsequently claims to remember about the same event (Gabbert, Memon, & Wright, 2006) and may lead to mixing of individual episodic memories (based on first-hand experience) with vicarious episodic memories (recollections of events that happened to other people; Pillemer, Steiner, Kuwabara, Thomsen, & Svob, 2015). Social memory biases in the transmission of information include memory conformity (Gabbert, Memon, & Allan, 2003; Hope & Gabbert, 2018; Jaeger, Lauris, Slemeczy, & Dobbins, 2012; Meade & Roediger, 2002; Roediger & McDermott, 2011), socially shared-induced forgetting—increased forgetting of non-mentioned information related to what is mentioned in conversation relative to unrelated information that is not mentioned in conversation (Cuc, Koppel, & Hirst, 2007; Stone, Barnier, Sutton, & Hirst, 2010, 2013; Stone & Wang, 2018) — or the preferential retention of stereotype-consistent information over repeated transmission (Allport & Postman, 1947; Bangerter, 2000b; Lyons & Kashima, 2003, 2006; Maswood & Rajaram, 2018). Social memory biases may lead to the emergence of collective memories (Hirst, Yamashiro, & Coman, 2018). Thus, the operation of memory biases in storytelling may enable the creation of a “shared reality” (Echterhoff, Higgins, & Levine, 2009; Hardin & Higgins, 1996), which can be understood “as the experienced commonality, or alignment, of inner states (attitudes, judgments) about a given target with another person” (Echterhoff, Kopietz, & Higgins, 2017, p. 807). Experiencing a shared reality is one way to foster social bonds or feelings of belonging and community between individuals.

This account of storytelling as fostering social cohesion is well supported by a broad base of research from psychology and other social sciences and is thus relatively unproblematic. It remains to be shown, however, that the account works for the ancestral environments where storytelling emerged (Mellmann, 2012). In other words, how did the social cohesion fostered by storytelling alleviate ancestral selection pressures? One prominent hypothesis in this respect is Dunbar (1996), who proposed that language evolved as

an extension of grooming in primates. Language, especially gossip, was instrumental in maintaining social bonds and coalitions between individuals in a more efficient way than physical grooming. Language enables the creation of kin out of non-kin, extending “the common practice in small-scale societies of assigning a non-kin newcomer a status as fictional kin within the existing kin-group” (David-Barrett & Dunbar, 2017, p. 25). Gossip in particular is a process for managing reputations of individuals within a group by identifying and punishing cheaters, thereby maintaining incentives for cooperation. An ethnography of gossip in Zinacantán, Mexico (Haviland, 1977), found that the most frequent topics were about social deviancy (e.g., illicit sexual relationships, drunkenness). Ju/'hoansi Bushmen spend a third of daytime conversations complaining about and criticizing other group members, which sometimes operate to regulate social norms in the community (Wiessner, 2014). Experimental game theory research further suggested that gossip fosters cooperation (Feinberg, Willer, & Schultz, 2014) by allowing group members to identify and ostracize cheaters. By strengthening social bonds and allowing the identification of cheaters, gossip represented an important boost to sociality as groups started to become larger and began to include non-kin (Dunbar, 2004). Note that Dunbar's account did not discuss storytelling in particular. But because gossip consists of talk about absent others' actions, it can be considered as a form of storytelling.

Beyond gossip about particular individuals, stories in hunter-gather societies are also concerned with norms and cultural values. Garfield et al.'s (2016) review of social learning in hunter-gatherer societies showed that cultural values and kinship (including social norms, morality, culturally preferred social and emotional behaviors between kin, gender roles, and age-graded social distinctions) and religious beliefs and practices are often transmitted by teaching and sometimes (less frequently) by storytelling. A recent study of the Agta, a Filipino hunter-gatherer population, also found that storytelling often was about norms. Agta narratives feature information about coordinating cooperative behavior (e.g., foraging) and broadcasting social norms (e.g., sex equality). Moreover, the presence of skilled storytellers in a camp is associated with an increase in cooperative behavior in individuals from that camp (Smith et al., 2017). Campfires may have been the place where stories were first told as a regular part of hunter-gatherer life, often at dusk or at night (Dunbar, 2014; Wiessner, 2014). They created opportunities for cooperative work (fire-making and fire-tending) and sharing food in the more relaxed environment granted by extra hours of light after sunset. Among Ju/'hoansi Bushmen, campfire conversations differ from daytime conversations, with storytelling being more frequent in the nighttime and more focused on individuals from larger social networks (geographically dispersed communities) and illustrate the functioning of social institutions, besides provides entertainment, a further mechanism for reinforcing social bonds (Wiessner, 2014).

4. The collective sensemaking function of storytelling

In the arguments proposed by the previous accounts it is not always clear how storytelling is adaptive above and beyond the ability to communicate via language. In other

words, what makes storytelling particularly suited to (a) enhancing individual fitness, (b) transmitting survival-relevant information, or (c) facilitating social cohesion? In this section, we review literature on storytelling as a social activity specialized for collectively making sense of non-routine events, that is, events that violate expectations. We argue that it is sensemaking that constitutes the specific adaptive benefit of storytelling.

Sensemaking is central in human psychological functioning. It has been independently investigated by a host of observers of the human condition, including novelists, philosophers, and scientists (Proulx et al., 2012). It is the process by which people give meaning to experience (Weick, 1995). Experiences are organized through knowledge structures (e.g., schemas, scripts, frames, or social representations; Bartlett, 1932; Goffman, 1974; Mandler, 1984; Moscovici, 1984; Schank & Abelson, 1977). Meaning is usually derived from expectations being met, which makes people feel they can predict and control their environments (Harris, 1994). Sensemaking is thus most necessary in out-of-the-ordinary situations that cannot be readily categorized on the basis of what is already known (Kiesler & Sproull, 1982; Proulx et al., 2012). In these situations, the incongruity between pre-existing schemas and events leads to subjective experience of surprise (Reisenzein, Horstmann, & Schützwohl, 2017) and a state of “aversive arousal” (Proulx et al., 2012, p. 317) at the level of very basic physiological parameters (e.g., increased skin conductance and cardiac variability; vascular constriction). These physiological signatures of negative arousal produced by expectancy violations occur irrespective of how momentous or trivial the violation is or of its valence. That is, even minor violations of expectancies and positive violations produce arousal. This state in turn motivates efforts to re-establish meaning via compensatory behaviors (e.g., accommodation, altering a schema to account for the event, or assimilation, reconstructing the event so it matches the schema; Piaget, 1954).

Sensemaking is both an individual and a collective process. Individual sensemaking is constituted by social-cognitive processes (Harris, 1994), while collective sensemaking involves communication (Weick, 1995). The process of collective sensemaking is facilitated by particular group members, like parents in family remembering (Hirst & Manier, 1996) or leaders in organizations (Isabella, 1990; Maitlis, 2005). Indeed, one of the main characteristics of charismatic leaders is their ability to orchestrate dramatic narratives that facilitate followers’ identification to a cause, vision, or worldview (Gardner & Avolio, 1998; Sharma & Grant, 2011). Storytelling is arguably the primary social activity by which collective sensemaking is accomplished. By its very nature, storytelling is geared toward surprise and unexpectedness. Part of the intuitive concept of what makes a story worth telling is its contrast with the audience’s expectations (Bruner, 1991; Labov, 1972; Polanyi, 1979). Routine information does not violate expectations, and so does not meet the minimum requirement of significance for “tellability” (Norrick, 2007). Storytelling entails placing events into a coherent sequence or animating them by invoking protagonists’ motives. It can enable the establishment of causal links or the attribution of responsibility for actions and events (Gabriel, 2000). This promotes understanding, enabling groups to build, use, and update knowledge structures to respond to unexpected situations. The intrinsically constructive nature of storytelling further enables tellers to tailor stories

to audiences' needs or interests (Scalise Sugiyama, 1996), making the story meaningful for them. Such a process may explain how storytelling fosters social cohesion as well as why good storytellers are often valued social partners or charismatic leaders (Gardner & Avolio, 1998; Smith et al., 2017).

A wealth of literature across the social sciences indeed documented the collective sensemaking function of storytelling, in both small and large groups. For example, research on small groups such as families suggested it is possible to re-story problematic life events that may have disrupted shared systems of belief by narrating them together (Brookfield, Brown, & Reavey, 2008; Koenig Kellas & Trees, 2006; Monk, 1997). Sensemaking in family remembering is enabled by members adopting different roles. Children might act as narrators, while parents may take on the roles of mentors (who prompt) or monitors (who assess) during collaborative storytelling (Hirst & Manier, 1996). Other small groups confront non-routine events, both on a low-level, everyday basis and in the form of large-scale change. This is achieved through face-to-face storytelling (Bangerter et al., 2011; Brown, 2006; Brown & Duguid, 1991; Linde, 2001). Stories can provide an interpretative framework and enable participation in a collective reasoning process (Orr, 1996), often being told in series (McBride, 2014; Norrick, 2007; Ryave, 1978). Many organizational groups tell stories as part of their everyday knowledge integration, for example, nursing teams (Bangerter et al., 2011), midwives in traditional societies (Jordan, 1989), photocopy repair technicians (Orr, 1996), and car factory workers (Patriotta, 2003). Storytelling is therefore an important way for small groups to make sense of the unexpected events and problems that constitute everyday life, be it in families or at the workplace.

Small group interactions are typically embedded in larger networks (see Maswood & Rajaram, 2018). Storytelling facilitates the creation of an overarching identity and thus the definition of an ingroup and an outgroup. Large groups cohere based on shared norms, beliefs and ideologies (e.g., Bar-Tal, 2000) or collective memories (Halbwachs, 1950). Two prominent forms of such large groupings include nations and religions. For nations, narratives like founding myths establish a sense of nationhood and enable people to imagine themselves as belonging to a community, even when it is comprised of a vast amount of individuals they will never meet (Anderson, 1983). These narratives are an important component of nationalist discourse that links the present to the past and gives meaning to current events. They can be told and re-told by both ordinary citizens and leaders (De Cillia, Reisigl, & Wodak, 1999). For religions, storytelling interacts with more formalized aspects of religious discourse like laws, hymns, or prophecies (Ricoeur, 1995). Religious storytelling is a vast topic that cannot be treated in detail here. Suffice it to say, however, that many symbolic elements of religion are narrative in nature, and that storytelling can be used to create a sense of religious community. For example, in late nineteenth-century America, religious sermons became progressively infused with storytelling as a means to appeal to a wider and more diverse set of audiences (Reynolds, 1980).

At no time are collective sensemaking processes more evident than in the wake of sudden catastrophic events that threaten existing worldviews (e.g., disease outbreaks, natural

disasters, outgroup aggressions) as well as survival (Proulx et al., 2012; Rosnow, 1980; Wagner et al., 2002). This is when people most need symbolic protection, because several conflicting explanations coexist to create a climate of fear and uncertainty (Franks et al., 2013). Various forms of storytelling emerge spontaneously in such situations. War and conflict lead to the appearance of rumors (Allport & Postman, 1947), as do changes in organizations like mergers or layoffs (DiFonzo & Bordia, 2007; Smet, Van der Elst, Griep, & De Witte, 2016). Outbreaks of infectious diseases are another example. The mortal risk they pose is often accompanied by a symbolic threat, especially when the mechanisms of infection are not well understood (Joffe, 1999). When the Black Death spread through Europe in the 14th century, many narratives emerged and circulated to explain the outbreak. Some were based on (incorrect) scholarly theories (miasmatic theories of disease propagation), while others appealed to religion (e.g., divine punishment) and still others blamed the outbreak on stigmatized outgroups (e.g., Jews) plotting to undermine society. In modernity, this phenomenon persists, with scientific theories competing with various popular explanations for public attention (Eicher & Bangertner, 2015).

The example of the Black Death illustrates a common pattern of collective sensemaking in crises: the stigmatization of outgroups as being the cause of the crisis. While rumors often scapegoat particular outgroups, this pattern is perhaps most evident in conspiracy theories (Graumann & Moscovici, 1987). Beyond disease outbreaks, conspiracy theories are also associated with traumatic events like terrorist attacks or assassinations of leaders and may serve as a means of system justification by scapegoating particular groups in society (Jolley, Douglas, & Sutton, 2018). Outgroup blame can thus serve to sharpen a sense of ingroup identity (Tajfel & Turner, 1986). Moreover, while xenophobic behavior seems dysfunctional in the modern world, it may have evolved as an adaptive reaction in ancestral environments, where encounters with outgroups were often dangerous because of the risk of aggression or infection by pathogens against which the ingroup possesses no immunity (Schaller & Park, 2011).

The account of storytelling as collective sensemaking is broadly supported by the literature. How does this account fare when applied to ancestral human environments? In other words, is it plausible that stories evolved to facilitate collective sensemaking in ancestral groups and what selection pressure did they help alleviate? Here it is important to note that a sensemaking account is not an exclusive alternative to the other accounts reviewed above. However, sensemaking accounts for the specific character of storytelling beyond language use in general. That is, while all three accounts above are well-supported by the available data, the functions they embody can and often are fulfilled by other, non-narrative forms of communication. However, storytelling seems adaptive for sensemaking in ancestral environments because managing unexpectedness is relevant for many aspects of survival, including general threat detection (Proulx et al., 2012), predicting lethal aggression (Dessalles, 2010), avoiding infection risk (Schaller & Murray, 2008), or coordinating collective behavior in the face of external threat (Joffe, 1999), to name but a few examples. The ubiquity of managing unexpectedness makes a group-level social process for this function plausible. Thus, storytelling seems like a prime candidate for collective sensemaking.

5. Discussion

In this article, we have reviewed three prominent accounts of the adaptive benefits storytelling may have conferred to ancestral human groups. First, storytelling may have benefited individuals by allowing them to manipulate information to affect their audiences' beliefs to the advantage of the tellers. Second, storytelling may have increased group-level fitness by constituting a vehicle for efficiently transmitting survival-relevant information. Third, storytelling may have benefited groups by facilitating social cohesion or the coordination of cooperative action. These accounts are not mutually exclusive and are all plausible and supported by various kinds of evidence. However, they are not always clear on a key criterion for explaining putative adaptive benefits of storytelling, namely the specific benefits storytelling confers relative to other forms of language use or social interaction (Mellmann, 2012). We have proposed that the specific benefit of storytelling is its use as a device for collective sense-making of non-routine or unexpected events that impinge on everyday group life. Storytelling processes (e.g., putting events in a temporal sequence and linking them by the actions of protagonists) are fundamentally constructive, which makes them well-suited to managing the fit between pre-existing knowledge structures and unexpected events. The open-endedness of repertoires of stories in oral traditions may contribute to their adaptive nature, allowing those repertoires to be flexibly tailored to specific circumstances while illustrating or upholding certain cultural traditions and values (Biesele, 1986). The sensemaking function of storytelling is therefore the means by which the other functions of storytelling are realized.

This collective sensemaking function is broad enough to account for both the way pedestrian forms of storytelling are used in everyday situations (e.g., two individuals gossiping about deviant behavior by an absent third party) as well as how rumors may emerge and spread to fill an informational gap in a highly ambiguous group-level situation (Allport & Postman, 1947) or even how some narratives may coalesce over long periods of time into myths that are fundamental for constituting the identity of a particular group. Our proposal is similar to other explanations of storytelling that have been advanced (e.g., Boyd, 2009; Saillenfest & Dessalles, 2013). But we emphasize the fundamental importance of collective sensemaking in managing unexpectedness as a function for which storytelling is particularly well-suited.

Our proposal of storytelling as adaptive collective sensemaking can link storytelling more explicitly to other common human activities. As just one example, consider play, which, like storytelling, is a social activity that is culturally universal and develops early in ontogeny (unlike storytelling, however, it is widespread across various species). Like storytelling, the adaptive functions of play are still under discussion. Play fighting (or "rough-and-tumble" play) is an inherently unpredictable activity that involves adapting to a partner's moves in real time, distinguishing pretence from real aggression, self-handicapping, and the like. One possible function of these behaviors may be enhancing the development of flexible responses to unexpected physical events entailing a sudden loss of control. Play can thus constitute "training for the unexpected" (Spinka, Newberry, & Bekoff, 2001, p. 141). Similarly, Boyd (2009) has proposed that storytelling, or art more generally, can be viewed as a kind of "cognitive play."

Viewing both physical play and cognitive play (e.g., storytelling) as adaptations for unexpectedness highlights the importance of the management of unexpectedness in human social life and further underscores a parallel between play and storytelling.

Our proposal has implications for further research on the role of storytelling in cultural transmission. Perhaps the most prominent issue in this respect concerns the transmission of survival-relevant information via teaching. In many cases, it is unclear what the role of storytelling in teaching is (although large-scale databases like the HRAF may underestimate the prevalence of storytelling in teaching).¹ In a broad sense, teaching can include many kinds of behavior (Biesele, 1986; Scalise Sugiyama, 2017). Experimental studies of the role of teaching in transmission of culturally acquired information (e.g., Zwirner & Thornton, 2015) typically did not analyze the content of teaching interactions. We have begun to do so (Bietti et al., 2017; Tilston, Bangerter, & Bietti, 2018). We found that much of teaching in social transmission experiments involved instructional discourse about what to do. It was rare for teachers to produce stories about what they actually did.

Initial analyses of the conversational contexts where teachers do actually produce stories (Bangerter, 2000a) suggested that these narratives reflected non-routine occurrences (e.g., poor performance, mistakes, or insights about how to do something better). This is in line with the sensemaking function we propose in this article. Because of the temporal constraints of experimental interactions, however, spontaneous storytelling may be easier to observe in other situations, for example where there is more time to reflect on experience and on lessons learned. That is why it is important for fieldwork to focus more on in-depth analyses of everyday social interactions (e.g., Bangerter et al., 2011; Orr, 1996) to clarify the role storytelling plays alongside other forms of transmission (e.g., commands or explanations; Greenfield & Lave, 1982).

Storytelling is part of an adaptive functional toolkit for the transmission of cultural information, the specific benefit of which is enabling collective sensemaking. What remains to be systematically studied in the laboratory and in the field is for what specific purposes people prefer to craft stories over other forms of communication (e.g., instructional or argumentative discourse) to transmit information (including teaching), promote social cohesion, and organize cooperation.

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Note

1. This may be because the original materials constituting the HRAF may have missed opportunities for observing storytelling-as-teaching. We thank an anonymous reviewer for pointing this out.

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