Collective procedural memory

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Abstract

Collective procedural memory is a group's memory of how to do things, as opposed to a group's memory of facts. It enables groups to mount effective responses to periodic events (e.g., natural hazards) and to sustain collective projects (e.g., combatting climate change). This article presents an account of collective procedural memory called the Ability Conception. The Ability Conception has various advantages over other accounts of collective procedural memory, such as those appealing to collective know-how and collective identity. It also demonstrates new applications for collective procedural memory. I develop three in this article: to social epistemology, to the ethics of memorialization, and to a pattern of group vulnerability to recurring hazardous events that I call the *saeculum effect*.

Keywords Collective memory · Natural hazards · Memorialization · Social epistemology

1 Introduction

Imagine disaster strikes. Perhaps a flood or pandemic devastates your community. Or maybe it's a social disorder—a riot, an economic collapse, or a power grab by an aspiring tyrant. As your community picks up the pieces, media personalities, politicians, and concerned citizens sincerely demand the disaster be remembered so that it never happens again.

Such demands are common after tragedy. What do they mean?

Answering this question is difficult. Taken literally, they are demands to *remember that* the disaster happened. Yet this isn't quite right. The people in your community want to prevent a similar event. Prevention requires action, and merely storing the information that a disaster happened does not always produce the appropriate response. Consider the Covid-19 pandemic: Despite storing and publicizing vast

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amounts of information concerning similar health crises, many people failed to act as they should to prevent the worst consequences of Covid-19.

Perhaps what is demanded is to *remember how* to prevent a similar disaster. This answer also falls short for at least two reasons. First, it is ambiguous between remembering an action and remembering a plan of how to bring about some outcome. The latter sense creates a similar problem to the one just mentioned. Consider the Saturn V rockets used in NASA's Apollo and Skylab space missions circa 1970: Despite saving plans for how to build Saturn Vs, the United States had forgotten how to produce them since at least the 1990s.[1] Similarly, a population might remember plans for how to respond to a hazardous event but nevertheless in some sense forget how to carry them out.

Second, the answer is insufficiently clear regarding to whom or to what the demands are addressed. Some individuals may remember how to respond appropriately to the next hazardous event and escape it unharmed while the group they belong to fails to stop the event from becoming a disaster. Although these survivors may deserve praise for their individual responsibility, it is indeterminate whether they have contributed to fulfilling the demands. Preventing disaster often requires coordinated activity and sometimes cannot be achieved even if many people individually remember how to respond to a hazardous event.

By now it should be apparent that although we can talk around our question, we lack a way to effectively conceptualize the answer. I correct this deficit by further developing a concept that fulfils this role. The concept is *collective procedural memory*, the memory possessed by groups of how to do things. In this article, I defend an account of collective procedural memory that I call the Ability Conception. This account explains what collective procedural memory is and helps us see that it has practical and theoretical benefits beyond clarifying public discourse. In particular, the Ability Conception shows that the concept of collective procedural memory raises new questions for social epistemology and the ethics of memorialization. It also helps us gain insight into a dynamic about how groups respond to multi-generational, periodic events that I call the saeculum effect.

Group responses to intermittent events are not the only cases where collective procedural memory is expressed. It is also necessary for sustaining group activities like preventing climate change and sustaining group productions like the construction of the Saturn V. Despite this wide relevance, little has been written about the concept.[2] I nevertheless argue that the Ability Conception explains what collective procedural memory is better than the other accounts that have been loosely suggested, namely what I call the collective know-how account and the collective identity account.

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[1] Although the United States still possesses the blueprints for making Saturn Vs, the special factories, tools, materials, advanced welding skills, and knowledge of how the vehicle differed from these plans have since disappeared. For details, see Frost (2015, December 11) and Hutchinson (2013, April 14).

[2] For uses of the term collective procedural memory, see Manier and Hirst (2008: 258–261), Arango-Muñoz and Michaelian (2020: 197), and Cockayne and Salter (2021: 292). See Olick et al. (2011) for an anthology and overview of the literature on collective memory.

Giving a general account of collective procedural memory is of course different from understanding how it is produced in particular situations. I do not embark on this latter task here. Yet gaining this understanding requires adequate concepts. By developing the Ability Conception of collective procedural memory, I aim to provide a helpful vocabulary for investigating what makes some groups succeed and others fail at preserving various actions over time.

2 The ability conception of collective procedural memory

This project initially risks misunderstanding because 'procedural memory' is already part of our vocabulary. In its current use, this term refers to the capacity of individuals to remember how to perform motor and cognitive tasks like tying one's shoes or adding and subtracting numbers.[3] Experiments by psychologist Brenda Milner in the 1960s showed that amnesic patients can learn mirror drawing without remembering that they had practiced this skill.[4] Since then, scientists have established that an individual's procedural memory depends on different areas of the brain from semantic memory (the memory of facts and general information) and episodic memory (the memory of experiencing an event first-hand).[5] Although multiple kinds of memory are typically involved when learning and performing any task, procedural memories are for their contribution characteristically not stored and retrieved consciously and are difficult for individuals to express in words.[6]

Groups obviously have a vastly different structure from the individuals comprising them, and so we shouldn't expect any of the properties just mentioned to transfer to a kind of procedural memory they possess.[7] Applying the term to groups is nevertheless still apt. Psychologists did not coin 'procedural memory' *ex nihilo*. Instead, they drew influence from philosophers and artificial intelligence researchers for whom 'procedural' just meant having to do with how to do things, in contrast to adjectives like 'propositional' or 'declarative', which mean having to do with statements that are true or false.[8] I use 'procedural memory' to express this original, more basic sense. 'Collective procedural memory' accordingly refers to the capacity of groups to store and retrieve *doings* as opposed to propositional or declarative information, irrespective of how groups must be arranged to realize this capacity.[9]

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[3] See Buckner and Tulvig (1995: 445) and Mimeau et al. (2016: 900).

[4] Squire (2004: 171). I thank an anonymous reviewer for urging me to consider this history.

[5] See Buckner and Tulvig (1995: 444, 449), and Ullman (2004: 234–242).

[6] See Buckner and Tulvig (1995: 444) and Ullman (2004: 237, 242–244).

[7] Aleida Assman (2006: 216).

[8] The Oxford English Dictionary (July 2023) traces early use of 'procedural memory' to the psychologist Paul A. Kolers (1975: 305) who credits the philosopher Israel Scheffler (1965: 14) for inspiring his adopting the term. In an influential article advancing Milner's work on amnesiacs, psychologists Neal J. Cohen and Larry R. Squire (1980: 209) cite artificial intelligence researcher Terry Winograd's (1975: 186) discussion of the procedural-declarative distinction to motivate the significance of their research.

[9] As I discuss in Sect. 3.3, it might be that groups cannot have the capacity to store and retrieve procedures without also having the capacity to store and retrieve propositional information. This is an empirical matter, however, and does not prevent these capacities from being conceptually distinct.

Starting with this superficial characterization allows us to form an account of collective procedural memory that is unencumbered by connotations from individual psychology without being gratuitously revisionary?

What ought such an account look like? I propose four conditions: First, an account should fit a plausible range of cases. Although collective procedural memory is a technical term, the superficial characterization and few examples already given show that we have some sense of its extension. Second, an account should be relatively uncontroversial. Although almost every issue in philosophy is disputed to some extent, an account should not invite unnecessary disagreement on balance with other values. Third, an account should be practically useful. It should allow us to determine whether collective procedural memories exist in particular situations and provide some indication why, thereby enabling us to preserve or change them. And fourth, an account should be intellectually fruitful in that it opens new questions for inquiry.

I certainly don't claim to have found *the* ideal account of collective procedural memory. But I do claim that my account fulfils the criteria just mentioned sufficiently well to be worth attention. I will even go so far as to claim that any better account is likely a version or refinement of mine, although adequately establishing this would require more attempts to characterize the concept.

Next, developing an account will be easier if we fix intuitions with a paradigm case of collective procedural memory. We can find one by looking to the Simeulue islanders and their response to the 2004 Indian Ocean earthquake and tsunami. In 1907, a major tsunami hit Simeulue island in Indonesia, tragically killing over half the native population.[10] The surviving Simeulue islanders responded by adding what they called the *Smong* story to their oral tradition. This story gave listeners instructions about how to survive a similar event. When a major tsunami again hit the island in 2004, barely any survivors of the 1907 event were still alive. Yet their decedents who learned the *Smong* story heeded its advice and encouraged other villagers to move to high ground. As a result, almost all the Simeulue islanders survived.[11]

The Simeulue islanders clearly had a collective procedural memory of how to be resilient to tsunamis when the 2004 Indian Ocean earthquake and tsunami struck. I claim that the following account—the *Ability Conception*—captures the essential features of what this means: At time *t*, a population has a collective procedural memory of how to *X* if and only if a sufficient number of the population's individual members engage in a set of practices, *P*, such that these three conditions are met:

> *Potentiality*. At *t*, the population has the ability to *X* in virtue of the individual members engaging in the practices in *P*.
> *Endurance*. For some continuous amount of time leading up to *t*, the population had the ability to *X* in virtue of the individual members engaging in the practices in *P*.

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[10] Rahman et al. (2018: 13).

[11] McAdoo et al. (2006: 664–665). For excepts of various versions of the *Smong* story, see Rahman et al. (2018: 20).

Reliability. Over some (contextually defined) range of environments where the population's individual members engage in the practices in *P* and that are similar to the population's actual environment at *t*, the population has the ability to *X* in virtue of the individual members engaging in the practices in *P*.[12]

The Ability Conception has several terms that require clarification.

By a 'practice', I mean any pattern of collective behavior that is a component of the collective procedural memory the account targets, or any pattern of individual behavior. These behaviors may be intentional or non-intentional. They may constitutively involve external objects. They also may be enacted through bodily movements as well as mental events. The enactment of a practice by an individual may involve her procedural, semantic, or episodic memory, or any other kind of memory she possesses. Examples of practices on the collective level include constructing automobiles, developing software, holding conferences, and playing tennis. Examples of practices on the individual level include reading blueprints, writing lines of code, asking questions, and hitting a ball with a racquet.[13]

What makes one collective procedural memory a component of another is just that the former is necessary for but not identical to the latter. The collective procedural memory of making tires, for instance, is a component of the collective procedural memory of constructing automobiles. This classification makes the Ability Conception recursive but not circular: we can explain a collective procedural memory's existence in terms of its components, and these components in terms of others, until at last we reach components that are explained in terms of individual practices, which are not themselves collective procedural memories. We can apply this pattern of analysis to the Simeulue islanders. Their collective procedural memory of tsunami resilience exists in virtue of their collective procedural memory of how to recount the *Smong* story, which exists partly in virtue of the individual practice of speaking one of the Simeulue languages.[14] Explaining a collective procedural memory does not always require an explanation in terms of individual practice (similarly, explaining computer behavior does not always require an explanation in terms of activating logic gates) but the working assumption is that such an explanation is always possible in principle.[15]

The basic idea of the Ability Conception is that collective procedural memories can be understood as group abilities with various properties. Specifically, they are group abilities that persist over time and that are recursively explainable and reliably

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[12] Collins (2019: 65, 71) also argues for a reliability or robustness condition for group abilities. Unlike her, I ascribe this condition to abilities themselves and not their outcomes to satisfy the Potentiality Condition at nearby environments.

[13] See Haslanger (2018: 232–233), Reckwitz (2002: 249), and Part Two of Goldman (1999), for more examples of practices. Following Haslanger (2018: 235) I assume that practices may be unintentional because they admit of multiple interpretability. What one person intends as a practice of religious purification—washing one's body, for instance—another might see as a practice of sanitation.

[14] Rahman et al., (2018: 15–16) state that while the most common language of the Simeulue people is Devayan, at least five other languages are also spoken on the island.

[15] I should furthermore add that I do not intend the Ability Conception to be a metaphysical account. While I claim that collective procedural memory can be explained in terms of individual practices, I am agnostic whether collective procedural memory is identical to such practices.

supported by individual practice. This characterization enables the Ability Conception to fit a plausible range of cases by making individual and collective procedural memory instances of a more general concept.

To start, individual procedural memories can be actual or merely potential. Someone who remembers how to fry an egg need not always be at a stove. Something similar is true for collective procedural memory. A tsunami needn't have hit Simeulue island in 2004 and prompted a reaction from its inhabitants for them to have a collective procedural memory of tsunami resilience in 2004. They could have merely had the potential to display this resilience. The Potentiality Condition captures this dual nature of collective procedural memory because abilities can be actual or potential.

Individual procedural memories are furthermore temporally extended. When we ascribe a procedural memory to someone, we presuppose that what we ascribe started to exist in the past and continued to exist up to the present. Collective procedural memories also have this property. It would be strange to say the Simeulue islanders remembered how to be resilient to tsunamis in 2004 while knowing they couldn't have been resilient at any earlier time. The Endurance Condition expresses the temporal extension of procedural memory by ruling out this possibility.

Next, when an individual has a procedural memory, there is some task she can reliably perform. When a group has a collective procedural memory, there is similarly some outcome (an object, a collective behavior, and so forth) that the group can reliably produce. The Reliability Condition expresses this fact, as the following case helps illustrate. Suppose a herd of wild cows that fed on grass next to the ocean lived on Simeulue island. When the tsunami hit in 1907, many members of this herd died while others ran into the mountains and survived. The grass there happened to be better and more plentiful compared to the shore, which caused this portion of the herd to stay in place. Their descendants survived the 2004 tsunami unscathed as a result.

This mountain-grazing herd has some kind of ability to be resilient to tsunamis in virtue of its members' practice of eating grass. After all, they will not stray close to the shore so long as they engage in it. But unlike the Simeulue islanders, it is implausible the herd possesses a collective procedural memory of tsunami resilience. The Reliability Condition explains why. Given the herd's practices, it could have easily happened that its surviving members in 2004 met the same fate as in 1907. If the grass on the mountain had been too dry, if the grass near the shore had been more plentiful, or if one of many other environments similar to the actual one had existed, the herd would have quickly returned to the ocean and regained tsunami vulnerability. This is not the case with the Simeulue islanders. Thanks to their practices involving the *Smong* story, they would have displayed tsunamis resilience across a wide range of similar environments. We can of course imagine some environments that are incompatible with resilience, for instance when all the high ground is occupied by hostile militias. Yet these are properly considered irrelevant under most contexts because of their dissimilarity to the actual environment.

These considerations illustrate that the Ability Conception results in 'procedural memory' applying to groups largely as we might expect given general characteristics of how the term applies to individuals. But it also produces extensions of the term

that may be more surprising. In particular, the account does not entail that individual practices must involve cooperation or joint decision-making in order to generate a collective procedural memory.[16] This might cause some to question in what sense collective procedural memories are collective.

My response is that these memories are collective because the abilities supporting them are attributes of groups, not individuals. Consider that sandhill cranes camouflage themselves during breeding season by preening mud into their feathers.[17] Suppose for the sake of argument that this practice became prevalent solely a result of selection effects on individuals: sandhills genetically disposed to the behaviour survived while others died. This non-cooperative practice gives individual sandhills the ability to avoid dying from predation. But it also gives groups of sandhills the ability to avoid losing no more than some percentage of their members to predation. On the Ability Conception, the latter but not the former ability is a collective procedural memory simply because it applies to groups while fulfilling the Potentiality, Endurance, and Reliability conditions.[18]

This result is advantageous for the Ability Conception. The procedures groups store and retrieve depend on behaviors that fall along a spectrum of collectivity that the Ability Conception encompasses in its entirety. Merely aggregative group phenomena—like the sandhill cranes' predation resistance—stand at one end of the spectrum. Phenomena resulting from deliberate cooperation of group members—like the Simeulue islanders' tsunami resistance—fall at the other. We should expect many other phenomena to fall somewhere in-between. For example, Kim Sterelny reports in his paper 'Adaptation without Insight?' that Fijian islanders build cyclone-resistant huts even though they seemingly cannot explain how their construction techniques give them this property. He conjectures that individual hut builders may succeed through "blind, trusting imitation" of their forerunners.[19] On the Ability Conception, this practice endows groups of Fijians with a procedural memory of how to resist cyclones even if individual Fijians don't put explicit thought into continuing their practices or cooperate with anyone beyond their immediate ancestors.

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[16] There are more ways the Ability Conception is ecumenical about the relation between practices and collective procedural memories. Multiple practices may independently support a collective procedural memory at the same time. Multiple practices may also independently and serially support a collective procedural memory across time. The major constraint on the relation is that, with respect to a given environmental context, collective procedural memories supervene on practices: there is no change in the former without some change in the latter.

[17] Delhey et al. (2007: 151).

[18] Some readers might object here that the concept I'm interested in is more aptly named 'group procedural memory', given the range of social structures to which I apply the term. I've decided against this terminology because there is a precedent for using 'collective procedural memory', likely due to the existence of a large literature on collective memory. See footnote 2 for references. The terminology 'collective procedural memory' is admittedly somewhat unfortunate because there is also a precedent in philosophy of distinguishing between collectives (groups organized under jointly recognized decision procedures), coalitions (groups organized only by shared goals), and combinations (groups that are neither collections nor coalitions). Groups of any of these kinds – not just collectives – may possess collective procedural memories. My gloss of the distinction between collectives, coalitions, and combinations is from Collins (2019: 4).

[19] Sterelny (2017: 138).

Invoking this wide spectrum of applicability raises another extensional concern, namely that the Ability Conception overgeneralizes. It categorizes many group phenomena as collective procedural memories due to its permissive construal of abilities and the ways practices can support them. The account allows us to say, for instance, that the entire human race has a collective procedural memory of how to eat at least k kilograms of food per year and another of how to play at least n games of chess per hour.

Such results are no embarrassment to the Ability Conception. They simply mean there are a lot of collective procedural memories, just as there are a lot of individual procedural memories. Although many collective procedural memories are trivial, theorists can investigate ones they consider significant by distinguishing various kinds of collective procedural memories. The Ability Conception is furthermore not an account on which anything goes: It is false that the entire human race has a collective procedural memory of how to digest at least k kilograms of food per year because digestion, unlike eating, is not a behavior and so not a practice. Group abilities that are unreliably supported by practices, such as the tsunami resilience of the fictional mountain-grass-eating cows, are not collective procedural memories. Individual memories of how to perform various actions do not generate collective procedural memories without being sufficiently prevalent within or otherwise adequately related to some population. Although John Stith Pemberton remembered how to make Coca-Cola after he invented it in secret, no group had a collective procedural memory of how to make the drink until it entered mass production.

These considerations suffice to explain the Ability Conception and show that it fits a plausible range of cases.[20] Over the remaining sections, I argue that the Ability Conception additionally fulfills the other three criteria that are desirable in an account of collective procedural memory.

3 Alternative accounts of collective procedural memory

I mentioned earlier that little has been written about collective procedural memory. The research that does exist nevertheless tends to characterize collective procedural memory in two alternative ways that are at least suggestive of competing accounts. The first is that collective procedural memory is a kind of collective know-how. The second is that collective procedural memory is essentially related to the production of collective identity.

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[20] One might object that the Ability Conception is missing a causal condition. It's arguably appropriate to say an individual remembers how to perform some action only if her performance bears an appropriate causal relation to a past act of learning. (Hopkins 2014: 324) Why not adopt a similar constraint for groups? I have not included one for two reasons: First, a casual condition is no longer an uncontroversial feature of memory generally. Some researchers argue that episodic memories are best construed as reliable imaginative reconstructions that need not bear a causal relation to the past. (Michaelian 2016: 7; Michaelian and Robins 2018: 27) Something broadly similar may turn out to hold for collective procedural memory. Second, causal requirements are not typically mentioned in discussions of procedural memory because of its non-representational character. I thank an anonymous referee for encouraging me to consider this issue.

The collective know-how account is the more commonly mentioned alternative.[21] Distinguishing knowing-how from knowing-that is standard in epistemology. Paradigmatically, it is the difference between an individual's *knowing how* to balance on a bike versus *knowing that* bike-balancing is produced by such and such physiological conditions. When one says that collective procedural memory is collective know-how, one can mean this in either a literal or figurative sense. The problem is that the account becomes too controversial with the former sense and with the latter too unclear.

If collective procedural memory is literally a kind of collective know-how, then for the account to be useful one must say what collective know-how is. This requires taking a stand on protracted debates about the difference between knowing-how and knowing-that. According to the major philosophical view called *intellectualism*, all instances of individual know-how are reducible to instances of knowing-that. Knowing-that involves a subject having a mental state directed towards a proposition. When Mary knows that Venus is a planet, for instance, Mary has a mental state directed toward the proposition that Venus is a planet. According to intellectualists, the same goes for know-how: When Mary knows how to balance on a bike, Mary has a mental state directed toward a way of bike balancing, which is a proposition under a practical mode of presentation.[22]

If intellectualism is correct and collective procedural memory is literally collective know-how, then collective procedural memory involves collectives having mental states directed toward propositions. The United States' remembering how to build Saturn V rockets would involve the United States having a mental state directed toward a proposition about Saturn Vs. Collectives like the United States might have mental states distinct from the mental states of the people in them. However, this view is highly contentious. Unless there is significant compensating benefit to identifying collective procedural memory as literally a kind of collective know-how, accounts of collective procedural memory that avoid the controversies of the knowing-how and knowing-that distinction remain preferable.[23] The Ability Conception falls into this category: Objects can have abilities without having mental states (a copper wire has the ability to conduct electricity without having mental

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[21] See, Manier and Hirst (2008: 258–259), Erll (2011: 108), Michaelian and Sutton (2018: 141), and Cockayne and Salter (2021: 292–293).

[22] Intellectualists consider practical modes of presentation distinct from descriptive modes. They consequently do not consider knowing how to balance on a bike to consist in the kind of knowledge-that attainable by merely reading a manual on bike-balancing. For details, see Stanley and Williamson (2001: 429–431).

[23] The issue of controversiality arises for the account of group know-how proposed by Palermos and Tollefson (2018), which is currently the best such account available. While these authors favor an anti-intellectualist view of group know-how, they acknowledge that their account is tentative because its presuppositions are highly disputed (Ibid.: 125). Their paradigm cases of group know-how also involve highly coordinated activity (ibid.: 112, 122). As the examples of the sandhill cranes and Fijian islanders suggest, collective procedural memory does not always require extensive group coordination. For these reasons, Palermos and Tollefson's account of group know-how cannot be straightforwardly developed into an account of collective procedural memory that adequately fits our criteria.

states). It's also uncontroversial that groups can have abilities in the first place, such as when we say one soccer team has the ability to score against another.[24]

Alternatively, one could fall back on saying that collective procedural memory is a kind of collective know-how in a merely figurative sense. This characterization then becomes obscure. It presumably means that collective procedural memory is at most similar to the know-how that individuals possess. But similar in what way? Maybe all that is suggested is that collective procedural memory is primarily about a collective's doing something as opposed to standing in a cognitive relation to a proposition. After all, even if knowing-how is reducible to knowing-that, the former connotes acting more strongly than representing. Yet this association is already sufficiently gained by including 'procedural' in 'collective procedural memory' and without the controversy invited by referring to knowledge.

The strongest reason left in favor of identifying collective procedural memory with collective know-how is that doing so feels natural. And this account's ubiquity suggests many people find it natural indeed. However, the Ability Conception equally accommodates this sense of naturalness. Collective procedural memory is easily identified with collective know-how because both are associated with reliable production. If Mary knows-how to ride a bike, then she can reliably bring about bike-riding. Similarly, if the Simeulue islanders have a collective procedural memory of tsunami resilience, then they can reliably bring about tsunami-resisting. The Ability Conception captures this thought with the Reliability Condition, which specifies that a population cannot easily have failed to produce some act, given its members practices.

Let's consider instead the collective identity account. Some authors have suggestively characterized collective procedural memory as essentially related to group behaviors that endow a population with a sense of identity, such as the performance of rituals or the production of artifacts.[25] Collective procedural memory undeniably sometimes has this function. Remembering how to perform Catholic mass contributes to some people's sense of identity as Catholics.[26] And remembering how to build Saturn V rockets contributed to some people's sense of identity as United States citizens.

The problem is that collective procedural memory does not necessarily play this role. Suppose Big Company must use widgets to make its classic Flagship Computer. Some population clearly has a collective procedural memory of how to make the Flagship computer, and whatever population it belongs to must contain at least the populations of Big Company and Widget Makers. Suppose also that Widget Makers sell their products to buyers like Big Company without knowing how they will be used. Widget Makers are consequently essential to a population with a collective procedural memory of how to make the Flagship Computer, even though they do not think of themselves as having this identity.

Defenders of the collective identity account might reply that populations can have identities without their members thinking of themselves in such terms. It is

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[24] Sen (2009: 244).

[25] See, for instance, Manier and Hirst (2008: 253, 258–259) and Aleida Assmann (2006: 215–216).

[26] Manier and Hirst (2008: 258–259).

nevertheless doubtful that any notion of identity can ground a practically useful and intellectually fruitful account of collective procedural memory without requiring an awareness of its possession for those who have it. There may be a common sense in which Widget Makers become Flagship Computer Makers by making Flagship Computers and churchgoers become Catholics by participating in Catholic mass. But how the former relate to their identity is vastly different from the latter. The only apparent commonality is that 'Flagship Computer Makers' and 'Catholics' are terms that *identify* some people without necessarily referring to their *identity* in the sense of what essentially constitutes what they are. Yet if being a means of identification suffices for something to count as a collective procedural memory, all group behavior falls under this concept. Robbing a local back would count as a collective procedural memory of a gang insofar as it is a means of identifying its members, even if they were extremely lucky to pull off the crime and unwilling to do so again because of being rehabilitated in prison. Making identification a necessary condition for collective procedural memory is similarly uninformative.

If collective procedural memory does not always contribute to a population's identity, what makes this view plausible in the first place? A major reason is presumably that it provides grounds for calling a procedural memory 'collective'. But in light of the above discussion, what instead seems to provide this ground is that we often observe some product—whether an object, group behavior, or something else—being reliably produced by a population without any single individual being responsible. Participating in reliable production may sometimes endow members of a population with a sense of identity, but such cases are better considered interesting kinds of collective procedural memory rather than paradigmatic examples. The Ability Conception permits this classification without having the same extensional problems as the collective identity account, making it the preferable view.

4 Applications

At this point, we can see that there are many reasons to adopt the Ability Conception. We find even more when we take into account its applications. I consider three in this section: The first is to a novel dynamic of collective memory that I call the saeculum effect. The second is to the ethics of memorialization. And the third is to social epistemology.

4.1 The saeculum effect

A *saeculum* is the length of time since an event after which everyone who directly experienced it no longer exists. A saeculum is accordingly relative to the lifespan of individuals in a population. The *saeculum effect* is the tendency of a population to exhibit an increase in vulnerability to a given type of hazardous event—whether natural or social—a saeculum or more after its last occurrence. Remembering disasters so that they never happen again consequently requires avoiding the saeculum effect.

There is convergent evidence that the saeculum effect exists. Geo-archeological investigations by Fanta et al. show that some populations exposed to floods of a magnitude that happen roughly every 100 to 200 years respond by initially settling in higher elevations, only to return to the fertile flood plain after a couple generations and be subjected to the next event.[27] Historical surveys of medieval and renaissance Europe by Turchin and Nefedov support the existence of cycles of social violence that repeat every 40 to 60 years. Their basic explanation for these cycles is that populations with continued incentive to conflict oscillate between periods of relative violence and peace depending on how much direct experience successive generations have with civil strife.[28] Disaster planning experts comment that the tendency of populations to forget events after about three generations contributed to the destructiveness of the Tohoku earthquake and tsunami in March, 2011. Prior tsunami events that happened within living memory were not of comparable size.[29]

Each of these examples involves a series of steps. First, a population reacts to a hazardous event, such as by relocating to high ground after a flood. Second, the population fails to maintain some kind of memory of the event as the proportion of individuals who directly experienced it declines. And third, something lures the population back into a position of vulnerability, for instance the attraction of easier living on a fertile flood plain.

This process might involve an erosion of knowledge that the previous event occurred. But what is necessary for the saeculum effect to exist is the loss of a population's memory of how to be resilient to some kind of hazardous event. In other words, the saeculum effect requires loss of a population's collective procedural memory. The problem of avoiding the saeculum effect is consequently the problem of preserving a population's collective procedural memory of hazard resilience.

How we can preserve this collective procedural memory is opaque on the collective know-how and collective identity accounts. The first conceptualizes the problem of avoiding the saeculum effect as a matter of preserving collective know-how. But any indication of how this is achieved—not to mention a precise specification of what collective know-how is—is absent from this account. The second account conceptualizes the problem of avoiding the saeculum effect as a matter of preserving some kind of collective identity. This again provides us little guidance on how the effect can be avoided. It is furthermore implausible. After all, the kinds of interventions that plausibly contribute to avoiding the saeculum effect in many cases, such as the construction of dams and tsunami walls, do not obviously involve significant changes to or the continuation of a population's sense of identity.

The Ability Conception is more useful. It specifies that avoiding the saeculum effect requires identifying the practices that best support a collective ability to be resilient to the event in question. For an example of what this might involve, we can again look to the Simeulue islanders.

The Simeulue islanders are noteworthy for avoiding the saeculum effect. When the tsunami hit their island in 2004, at least a saeculum had passed since the last

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[27] Fanta et al. (2019).

[28] Turchin and Nefedov (2009: 27).

[29] Alabaster (2011).

similar event in 1907. We cannot attribute their success simply to their practice of telling the *Smong* story, however. This is because the story existed in multiple versions among the Simeulue islanders.[30] Some heard the story as just a story—a historical or mythical account of a past event. Others encountered it as an expression of a traditional story-form found within Simeulue culture called a *Nafi-nafi*.[31] A *Nafi-nafi* aims to teach a lesson by focusing on past events and giving advice about how to react to similar ones.

Both versions of the *Smong* story were arguably not equally effective. Individuals who were exposed to the *Smong* story as a *Nafi-nafi* were more knowledgeable about how to identify and respond to an incoming tsunami.[32] This is evidence that, relative to the culture of the Simeulue islanders, the practice of telling the *Smong* story as a *Nafi-nafi* is superior at maintaining a collective procedural memory tsunami resilience than the practice of telling the *Smong* story as just a story.

It is natural to ask further why information expressed through the practice of telling the *Smong* story as a *Nafi-nafi* has a superior tendency to be preserved. This question deserves a more detailed investigation than I can provide. Yet suffice it to say that this result is consistent with anthropological findings that societies tend to better preserve information about events occurring more than a saeculum in the past through traditions of ritual and myth-telling than through general common knowledge.[33] In short, performing rituals and recounting myths appear to be basic practices that people in many contexts are motivated to reproduce. Any explanation of particular collective procedural memories in terms of the Ability Conception plausibly must bottom out in practices that are basic in this way, with the practices that count as basic depending on cultural context.

Because of this variability, it is unlikely that one kind of practice suffices to counter every instance of the saeculum effect. But even if the Ability Conception does not lead us to a one-size-fits-all solution, it still helps us conceptualize the problem and provides better guidance on its prevention than its competitors.

4.2 The ethics of memorialization

In addition to helping us decide whether we should establish novel practices in response to hazardous events, the Ability Conception helps us morally evaluate ones we typically adopt. Memorialization is a prominent example. This practice involves erecting monuments and plaques, creating songs, stories, and digital artifacts, establishing holidays, naming streets, performing ceremonies, and so forth, in order to preserve memory of an event.[34] One purpose of doing so can be to promote hazard resilience: memorials sometimes warn the public to prevent tragedy from

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[30] Rahman et al., (2018: 19).

[31] ibid. (2018: 20).

[32] ibid. (2018: 20).

[33] Jan Assmann (2008: 112).

[34] Viejo-Rose (2011: 466).

recurring.[35] But there are many other functions we frequently expect memorials to perform, such as honoring the victims of tragedy,[36] providing (at least symbolic) reparation,[37] helping people recover from loss and trauma,[38] creating solidarity with victims,[39] educating the public about history,[40] and motivating the public to address ongoing injustice,[41] among others.

The Ability Conception prompts us to consider how these functions, although individually legitimate, easily conflict. It specifies that maintaining a collective procedural memory of hazard resilience requires adopting practices that support this end. The problem is that memorialization practices are frequently at odds with hazard resilience because of how they relate us to the past. By merely reporting past events, memorials can easily elide important differences with the present.[42] Memorials designed to aid recovery from loss and trauma risk becoming irrelevant as demographic changes driven by birth, death, and immigration inevitably reduce the number of people directly impacted by tragedy.[43] And various writers worry that creating memorials leads to forgetting, whether because they make collective memory overly passive,[44] aim for a sense of closure,[45] or create a symbolic break with the past that encourages us to feel distant from it.[46]

This is not to suggest that preventing tragedies from recurring is more important than all memorialization's other functions, or that it necessarily conflicts with them. But given our responsibility to avoid preventable harm to future generations, we should at least consider the goal of maintaining a collective procedural memory of hazard resilience when designing memorials and so how to circumvent the conflicts just mentioned. The Ability Conception is again valuable here. By emphasizing action, it encourages us to be skeptically aware of whether our practices effectively address these conflicts.

Consider the worry that memorials provide inadequate disaster resilience because they often elide important differences between past and present. A *prima facie* solution is simply to fill the gap by designing memorials to store even more information. However, this solution presupposes a questionable relation between different kinds of collective memory. In particular, it presupposes that preserving a population's access to or knowledge of a sufficient amount of propositional information relevant to an event—what some have called *collective semantic memory*—is an effective

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[35] Winter (2014: 9); Garnier and Lahournat (2021); Atkinson-Phillips (2022: 949).

[36] Scarre (2014: 336).

[37] Atkinson-Phillips (2022: 954).

[38] Winter (2014: 95–96).

[39] Gómez-Barris (2010: 31).

[40] Young (2008: 357).

[41] Wasserman (1998: 47).

[42] Scarre (2014: 328–329).

[43] Monteil et al., (2020: 295–296).

[44] Young (2008: 360).

[45] Atkinson-Phillips (2022: 955).

[46] See Winter (2014: 115) and Monteil et al., (2020: 295–296).

means to preserving collective procedural memory of resilience to that event.[47] This presupposition is questionable because there is no simple path from knowledge to adequate action. As the example of variations of the Simeulue islanders' *Smong* story illustrates, differences in the presentation of the same information impacts how well collective procedural memory is preserved.

Any memorial that aims to provide hazard resilience should take this phenomenon into account, for instance by encouraging people to consider that the events it commemorates may happen again in a significantly different way. One that arguably does this well is the National Memorial for Peace and Justice in Montgomery, Alabama. This memorial not only presents contemporary racial injustice as a continuation of the history of lynching in the southern United States but pairs this information with sculpture, photography, first-person narratives, and suggestions of volunteer opportunities. The result is that visitors learn various ways the present can repeat the past while being symbolically put "in the position of the callous spectators in old photographs of public lynchings" to motivate them to take responsibility for addressing the issues it raises.[48]

By incorporating these design elements, the National Memorial for Peace and Justice exemplifies what the historian Atkinson-Phillips argues is an international trend for memorials to focus on the lived experience of persons involved with tragedy, as opposed to merely recording the fact of death and trauma.[49] This trend stands to address additional conflicts mentioned above. Imagining oneself impacted by a tragic event is both an active way of remembering and decreases felt distance to the past. Yet the Ability Conception again prompts us to be cautious in assuming this practice supports a collective procedural memory of hazard resilience. Empirical research suggests that directly experiencing past hazardous events can make people worse at responding to similar ones. For example, people who lived through several floods of rivers in their area tended to be especially vulnerable to above-average flooding events because what they knew from direct experience biased them toward over-confidence about what kind of flooding to expect.[50] A memorial encouraging visitors to imagine themselves as victims of an average flood risks creating a similar vulnerability.

Overall, it's tempting to justify memorial design choices by appealing to the maxim of folk wisdom that forgetting the past dooms one to repeat it. Yet the examples of this section reveal this maxim to be overly simplistic. Not just *that* we remember history makes us vulnerable to its repetition but *how* we remember it. In addition to helping us think more clearly about the moral trade-offs of memorialization, the Ability Conception promotes better adherence to this maxim in at least two ways: by keeping different kinds of memory distinct (namely collective procedural memory and collective semantic memory) and by encouraging us to think critically about whether our memorialization practices in fact lead to hazard resilience.

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[47] Manier and Hirst (2008: 257–258).

[48] Campbell (2018, April 25).

[49] Atkinson-Phillips (2022: 959).

[50] Kuhlicke et al., (2011: 803).

4.3 Social epistemology

Mentioning the distinction between collective procedural memory and collective semantic memory brings us to applications of the Ability Conception to social epistemology. Epistemology has traditionally investigated how individuals acquire knowledge through perception, personal memory, and individual reasoning.[51] Social epistemology, by contrast, investigates both how individuals acquire knowledge by depending on groups and how groups acquire knowledge as agents in their own right.[52] In either case, collective procedural memory is indispensable for social epistemology.

Collective procedural memory is presupposed in many cases where groups are involved in acquiring knowledge. Much of the knowledge gained about the moon during Nasa's Apollo space program depended on the United States' collective procedural memory of how to build the Saturn V rocket. The availability of knowledge to many populations depends on the collective procedural memory of how to store information in libraries and on the internet. Issues like the replication crisis and commodification of science make salient that producing scientific knowledge for the common good requires a collective procedural memory of how to maintain various institutions and research standards.[53] And so on. As these examples show, investigating the central concerns of social epistemology often requires understanding the intimate connection between collective procedural memory and how groups relate to propositional knowledge.

The Ability Conception is well-positioned to contribute to this task. First, we have already seen that it provides a clearer and less controversial account of collective procedural memory than alternatives. Second, it is consistent with the general methodology of philosophers like Alvin Goldman and Lorraine Code who also advocate for a practice-based approach to investigating social–epistemological questions.[54] And third, the Ability Conception is helpful in formulating new research topics in social epistemology.

One topic is what we may call the *priority problem*, which roughly parallels the debate between intellectualists and anti-intellectualists concerning individual knowhow. The problem is to determine whether the existence of collective procedural memory necessarily depends on some kind of semantic memory. Counting the self-camouflaging of alingual creatures like sandhill cranes or the propensity of human populations to annually eat k kilograms of food as collective procedural memories seems to quickly justify a negative answer. Yet what stance to take on the problem is not so obvious for collective procedural memories that are not expressions of genetic endowment or externalities of intentional action but that instead involve deliberate coordination. After all, the Simeulue islanders' tsunami resilience seemingly involves group coordination and semantic memories in a way these other collective procedural memories do not.

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[51] Code (2010: 28).

[52] Goldman (2011: 14, 16).

[53] On these two issues, see Romero (2019) and Weatherall et al. (2020), respectively.

[54] See Code (2006: 67) and Goldman (1999: viii, 79, 87).

According to what we may call *strong collective semanticism*, collective procedural memories involving group coordination always depend to some extent on collective semantic memory about the practices supporting them. The strong collective semanticist might hold, for instance, that practices can support a collective procedural memory of hazard resilience only if a majority of individuals know the practices have this purpose. Similarly, *strong individual semanticism* is the view that coordinated collective procedural memories always depend to some extent on individual semantic memory about the practices supporting them. The strong individual semanticist might hold that practices support a collective procedural memory of hazard resilience only if at least some individuals know the practices have this purpose. *Anti-collective* and *anti-individual semanticism*, by contrast, are the views that coordinated collective procedural memories sometimes do not depend on collective or individual semantic memory about their supporting practices.

Thinking about the priority problem is important because its investigation may show that relying on semantic memory is a poor way to preserve collective procedural memory. There are at least a couple significant reasons to think this. First, strong collective semanticism threatens a vicious regress.[55] Sometimes, as with the tsunami resilience of the Simeulue islanders, collective procedural memory can exist across multiple generations. If collective procedural memory depends on some kind of collective semantic memory in such cases, then this semantic memory must also be reliably reproduced. But this reliable reproduction plausibly cannot occur without a collective procedural memory of how to perform this reproduction that is accomplished by group co-ordination. This collective procedural memory requires separate practices for its support. By the assumption of strong collective semanticism, this collective procedural memory depends on a further instance of collective semantic memory. The regress is then underway. It is avoided only if the basic practices supporting some instances of collective procedural memory do not depend on collective semantic memory.

Second, strong individual semanticism seems unable to account for how collective procedural memory can exist even when individuals lack or have mistaken beliefs regarding their practices. The Fijian hut-builders described in Sect. 2 provide one example. Again, these individuals reportedly possess a collective procedural memory of how to build cyclone-resilient huts without having an extensive semantic memory of why their practices are successful. The songlines of aboriginal peoples in Australia provide another example.[56] A songline is a creation story about how mythical beings like giant snakes and other animals moved about to create various geological features in the landscape. Songlines function as important navigational devices. By recounting the mythical stories they contain, a person can follow a path of geological features to reliably travel between locations that are hundreds and even thousands of miles away. And yet these myths are false. Songlines consequently represent an impressive collective procedural memory of how to navigate the land that is supported by propositional beliefs that have negative epistemic value. If collective procedural memory cannot exist without some individuals remembering that the

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[55] Cf. Ryle (2009: 19–20).

[56] See Nunn and Reid (2016).

practices supporting it play this role, then this awareness should be more widespread in societies that rely on oral tradition than what these examples suggest.

Investigating the priority problem may ultimately reveal that collective procedural memory is best preserved with the aid of myth, tradition, or emotive social sanction. It may even reveal that the practices that best preserve collective procedural memory must be able to survive sustained objections to their existence from the majority of the public. Results like these would be especially consequential for Western liberal democracies. These societies are often rightfully skeptical of myths and traditions, and their members often object to achieving collective outcomes by means other than exercising individual responsibility. The collective procedural memory necessary to sustain multi-generational projects (like combatting climate change) and resilience to recurring hazardous events (like pandemics and the threat of authoritarian political regimes) may be especially hard for these societies to produce.

5 Conclusion

Overall, the Ability Conception fits our criteria for what an account of collective procedural memory ought to look like. It ensures that 'collective procedural memory' applies to a plausible range of cases. It is less controversial than accounts appealing to know-how or collective identity. It is also useful. The Ability Conception specifies that changing and evaluating collective procedural memories is a matter of changing and evaluating the practices on which they are based. Finally, the Ability Conception is intellectually fruitful, raising new questions about the ethics of memorialization, social epistemology, and dynamics of collective memory such as the saeculum effect.

We cannot adequately satisfy demands to remember without adequately understanding collective procedural memory. Even if the Ability Conception falls short of being an ideal account, it at least brings us significantly closer to this end. Perhaps because of the multi-generational timeframes involved, the idea of meeting many demands to remember appears far-fetched. However, it is plausibly too early to draw this conclusion. As our ability to store, sort, and access large amounts of information continues to grow, understanding and controlling our society's collective procedural memories is likely to become increasingly within reach.

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