

Culture and Memory

Cultural Identity Changes the Accessibility of Knowledge



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Culture plays a significant role in determining what people believe and claim to know. Here, we argue that, in addition to shaping *what* people come to know, culture influences the *accessibility* of that knowledge. In five studies, we examined how activating participants' American identities (a cultural identity) influenced their ability to retrieve well-known information: the 50 U. S. states. Activating participants' American identities—relative to other identities—led them to retrieve more U. S. states over brief periods of time; the effect disappeared over longer periods of time. Overall, our results suggest that the identity activated affects the speed with which relevant knowledge is retrieved, but that the effect is not large in magnitude (perhaps contributing to why we did not find the effect in Study 4). This work provides the first evidence that cultural identity influences not only what one knows but also its accessibility.

*Keywords:* Identity, Memory, Knowledge, Accessibility, Availability

**General Audience Summary**

Culture contributes to what people believe, how they interpret information, and what they claim to know. Here, we ask a novel question about knowledge and culture: Can activating one's cultural identity affect the likelihood that culturally-relevant information comes to mind? That is, rather than focusing on cultural differences in *what* people know, we focus on whether culture affects *when* information is retrieved. To test this, we examined the recall of the 50 U. S. states, knowledge for Americans that is well-known and unlikely to be associated with a specific learning context. Participants who wrote about their cultural identities as Americans—relative to their self identities, family identities, or no particular identity at all—recalled more U. S. states in a brief 2 min period. Another study suggests that writing about one's American identity speeds retrieval of culturally-relevant knowledge: Participants who wrote about their American identities—relative to their self identities—recalled more states when recall was limited to 2 min, but not when recall time was unlimited or when recall was extended to 7 min. Our findings suggest that activating one's cultural identity has consequences beyond influencing certain social behaviors in that it also affects the accessibility of culturally-relevant knowledge. Phonological and/or semantic cues are typically used to cue knowledge, but our results suggest a novel retrieval cue that influences knowledge accessibility and highlights the role of social context.

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There are cross-cultural differences in knowledge and beliefs. In some cases, these differences are integral to a group's culture, with shared knowledge (i.e., of songs, historical events, social norms, language) reflecting group membership (Soley & Aldan, 2020). Other differences in knowledge may simply reflect differences in exposure. For example, it is not surprising that U. S. bird experts are better at naming North American birds than Central American birds (Bailenson, Shum, Atran, Medin, & Coley, 2002). These and other cross-cultural differences in knowledge represent differences in the *availability* of information stored in memory. In contrast, here we focus on the *accessibility* of information stored in memory, asking the novel question of whether activating one's cultural identity affects which stored information comes to mind. That is, assuming the information is stored in memory, does one's ability to retrieve and use that knowledge depend upon the identity that is activated?

Tulving and Pearlstone (1966) classic distinction between *availability* (stored in memory) and *accessibility* (retrievability) set the stage for hundreds of studies exploring the ways in which retrieval cues shift across locations, physiological states, and memory tests, with consequent effects on the accessibility of memories (e.g., Eich, Weingartner, Stillman, & Gillin, 1975; Hudson & Austin, 1970; Kang, McDermott, & Roediger, 2007; Lee & Sternthal, 1999; Morrin & Ratneshwar, 2000; Schab, 1990; Nestojko, Bui, Kornell, & Bjork, 2014; Smith, Glenberg, & Bjork, 1978; Smith & Rothkopf, 1984). Most of this work has focused on event memories (remembering episodes from specific times and places in one's life), providing the groundwork for seminal theoretical contributions to the field like encoding specificity (Tulving & Thomson, 1973) and transfer appropriate processing (Morris, Bransford, & Franks, 1977). These ideas provide the foundation for much of modern research on memory, from examinations of the cues that bring involuntary memories to mind (Staugaard & Berntsen, 2019) to those that enhance the value of retrieval practice (e.g., Smith, Blunt, Whiffen, & Karpicke, 2016).

However, knowledge can similarly slip in and out of accessibility, as is the case with the common *tip-of-the-tongue* state (Brown & McNeill, 1966; Brown, 1991) where one feels certain one knows a word but cannot retrieve it (a state that William James famously compared to being on the brink of a sneeze). In what was likely the earliest empirical demonstration of shifting access to knowledge, Brown (1923) asked participants to recall the 50 U. S. states twice, 30 min apart. Brown (1923) wrote that he chose the U. S. states as the to-be-targeted information, because he assumed they were not newly learned (nor would one expect learning to occur between the two sessions). At time 1, participants recalled an average of 36 states; 30 min later, 34.4 states from time 1 were recalled as well as an additional five states not recalled earlier. Brown focused on the finding that a single recall attempt could not be treated as a definitive measure of what a person knew, and not on the "chance factors which vary from moment to moment" (p. 377) with consequences for what was recalled.

Almost 100 years later, two things have become clear. First, access to knowledge fluctuates over time (e.g., Bellezza, 1984a, 1984b, 1984c). Second, retrieval cues affect the accessibility of

stored knowledge. For example, consider long-term retention of the Spanish language in native English speakers who report very little use of Spanish in the years (sometimes decades) since leaving school. These former students score higher on recognition tests (which provide exact retrieval cues) than when asked to produce the Spanish language words (Bahrck, 1984; Semb & Ellis, 1994). A similar effect occurs when people are asked to list the names of the U. S. presidents; individuals can recognize more presidents than they can freely recall (Roediger & DeSoto, 2014, 2016). In both of these examples, the to-be-retrieved information was learned long ago and retrieval was examined in situations that did not allow new learning, meaning that any changes in the amount recalled must be attributed to changes in accessibility, and not in availability. That is, people did not suddenly learn more Spanish or presidents between recall attempts; rather, cues allowed them to reactivate *marginal knowledge* (Berger, Hall, & Bahrck, 1999; Butler, Black-Maier, Campbell, Marsh, & Persky, 2020; Cantor, Eslick, Marsh, Bjork, & Bjork, 2015). While it is clear that more cues are better (Solso & Biersdorff, 1975), less clear are the types of cues that increase the accessibility of stored knowledge. Past research suggests that semantic and phonological cues are useful (Solso & Biersdorff, 1975), and that changes in an individual's level of arousal can affect accessibility (Yang & Hasher, 2011).

Here, we investigate whether a novel cue increases the accessibility of stored knowledge, asking whether the particular identity active at a given point in time influences what information comes to mind. Although some theorists have approached the self-concept as a relatively unitary construct, other theorists have argued that the self-concept is comprised of many different, contextually-activated constructions (Marsh & Hattie, 1996; McConnell, 2011). On this latter view, a collection of different identities is stored in memory, and different identities can be active at different times. For example, a person's occupational identity as an accountant might be active at work during a particularly busy day in tax season, but that same person's identity as a sister might be active when visiting with her sibling who is going through a personal crisis. At yet another time, an individual's cultural identity as an American might be active when voting for the next president of the United States. Critically, simple writing tasks can be used to prime one of an individual's identities in the laboratory, activating for example, a Hong Kong student's Chinese versus Western identity (Ye & Ng, 2019), an Asian American's collective versus private self identity (Wang & Ross, 2005), or a biracial participant's White versus Black identity (Gaither, Remedios, Schultz, & Sommers, 2015). The identity primed has consequences for a wide range of behaviors, including well-being (Ye & Ng, 2019), social connectedness (Ng & Lai, 2009), and stereotyping (Gaither et al., 2015).

In five studies, we explore whether activating one's cultural identity influences the accessibility of relevant knowledge. For convenience, we focused on the effects of activating American identities among samples of United States citizens. The American identity is an ideal cultural identity, because it is a particularly strong and salient one for U. S. citizens (Citrin, Wong, & Duff, 2001), and because it provides an easily scored dependent measure used in past research—the recall of the 50

U. S. states. Knowledge of the states can be assumed to be equal across experimental conditions, and to be high given that the U. S. states are integral to much of American history (another name for the U. S. Civil War is the War Between the States) and values (as exemplified in debates about states' rights). They are also well-known to Americans, who have likely been exposed to the names hundreds of times over their lifetimes (in the news, through travel, on maps, on jigsaw puzzles, as featured on coins through the United States Mint's 50 State Quarters Program and on postage stamps by the US postal service, etc.). Many Americans also explicitly learned the capitals of the 50 states in late elementary school or middle school. The states are also ideal because the size of the set means that performance is unlikely to be at ceiling in free recall, providing room to examine the impacts of a manipulation of cultural identity (as opposed to a recognition test, where the power of exact retrieval cues would likely lead to ceiling effects). Using the states allows us to ask people to recall the exact same information and look for differences as a function of active cultural identity. While we did not expect large effects with well-known information, such information can still shift in and out of accessibility, such as when one calls a family member by the wrong name (Deffler, Fox, Ogle, & Rubin, 2016).

We compared the effects of activating a collectively- and culturally-focused American identity on recall relative to activating individualistically-focused identities that all Americans have (at least to some extent): self identity (Study 1), a family identity (Study 2), or no identity whatsoever (Study 2). In Study 3, we examined the generality of the effect, discovering that the effect occurs when retrieval is speeded but not when time is unlimited. In Study 4, we further examine this pattern, comparing recall of U.S. in conditions given different amounts of time to recall. Study 5 more directly addressed a proposed underlying psychological mechanism driving the effects of activating an American identity, namely that the cultural identity makes speeds the accessibility of relevant information. We examined the time-course of the accessibility of state knowledge as a function of active identity (American identity vs. self identity), showing that the identity manipulation speeds retrieval of relevant knowledge.

### Study 1

In Study 1, we investigated whether activating an American identity, relative to a different identity, renders relevant knowledge (i.e., knowledge of the 50 states) more accessible in memory. Brown (1923) gave participants 5 min to recall the 50 states; we reduced recall time to 2 min to ensure that the time allotted would be a challenge to participants and to maximize our chances of seeing an effect. That is, to the extent an American identity activates relevant knowledge, we predicted that people in that condition would retrieve more U. S. states than people who wrote about their self identities.

### Materials and Method

**Participants.** A total of 217 American residents with at least 50 completed HITs and an approval rating above 90% volun-

tarily participated in this study on Amazon's Mechanical Turk (AMT) for monetary compensation. Fourteen participants were excluded from analyses for failing the attention check at the end (see below for details), for not responding to the identity prompt, or for typing unrelated nonsense when prompted to recall states (e.g., "this is a very nice idea"). So, data were analyzed with the remaining 203 individuals ( $M_{\text{age}} = 39$ ,  $SD = 13$ , age range = [18–74], 95 males, 106 females, 1 non-binary). We recruited enough participants to obtain sufficient power (.80) to detect medium-sized effects (Cohen's  $d = .40$ ) for an independent samples  $t$ -test with an  $\alpha$  set at .05 (two-tailed), after exclusions. We recruited participants through AMT for all studies reported herein to obtain more representative samples of the United States population than traditional convenience samples obtained through undergraduate participant pools. The Duke University Campus Institutional Review Board approved all procedures for all studies reported in this manuscript.

**Procedure.** After providing informed consent, we manipulated, in a between-subjects fashion, the salience of participants' unique self identity or American (United States) identity. Participants randomly assigned to the "self identity" condition were asked to write 2–5 sentences describing why and how their own unique self identity is important to them. In contrast, participants randomly assigned to the "American identity" condition were asked to write 2–5 sentences describing why and how their American identity is important to them. Table 1 shows de-identified examples of participants' responses to the self identity and American identity cues. Then, participants were given 2 min to freely recall as many states as they could. Participants were instructed to type each state recalled into a box, and to remain focused on the task for the full 2 min. Once the 2 min had passed, participants were automatically moved on to the next page. We assume that our American participants had similar knowledge of the states between conditions, and that this information was over-learned for most participants. On our view, knowledge that is over-learned is not necessarily fully and consistently accessible at any given point in time. Over-learned knowledge can still shift in and out of accessibility.

The study ended with an attention check question: "Do you feel that you paid attention, avoided distractions, and took the survey seriously?" Participants selected one of five answers: (1) no, I was distracted; (2) no, I had trouble paying attention; (3) no, I didn't not take the study seriously; (4) no, something else affected my participation negatively; or (5) yes. Participants were assured that their responses would not affect their payment or their eligibility for future studies. Only those participants who selected (5) were included in the analyses. This same attention check question has been used in published research (Stanley, Yin, & Sinnott-Armstrong, 2019). Upon completion, participants were monetarily compensated for their efforts.

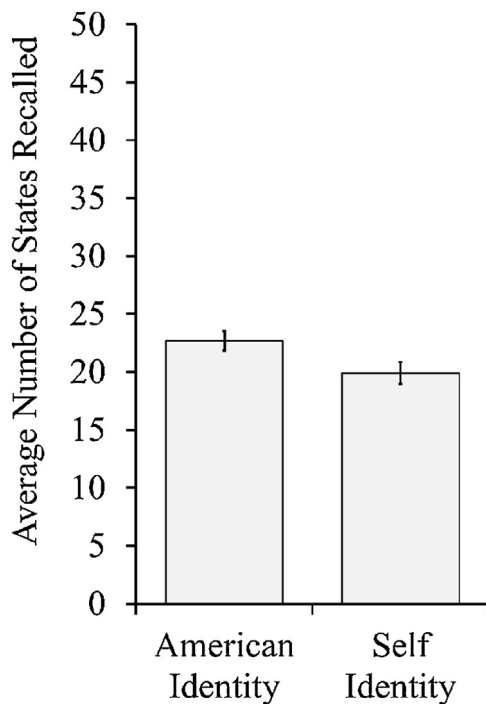
### Results

We hypothesized that the particular identity activated would influence the accessibility of relevant knowledge. To address this hypothesis in Study 1, we examined whether, when participants'

**Table 1**  
Example Responses From Participants to the Self Identity and American Identity Cues.

Self identity	American identity
1. My personal identity is important to me because without it I wouldn't be a unique person. My personal identity is a culmination of my life experiences. My personal identity helps me decide morally what side of the fence I'm on.	1. Being an American is important to me because we have upheld freedom and democracy for over two hundred years. Americans haven't always gotten it right, but when we screw it up, we can fix it. Americans are hard working and up to the task at hand.
2. I think its important to have a strong sense of who you are. I like knowing what I stand for, what I believe in, what types of morals or ethics I have. I need to know my likes and dislikes so that I'm doing the things I want to be doing	2. I am very proud of my country. It's a country of freedom and opportunity. We have people with all ethnic backgrounds that work together. We can achieve anything in this great country
3. I am a very introverted person. I am quiet, reserved, and well spoken. I do not talk much with strangers, but I am always helpful and nice when I meet new people. My self identity is important to me, because I believe if I am kind, others are more likely to be kind back to me. I believe one act of kindness starts another act of kindness, and that is what I aim to do.	3. I've lived in America all of my life. My parents and their parents did as well. America is the place I call home. While I may visit other countries, for business or pleasure, I will always look forward to returning back to my birthplace.
4. I would want people to know that I am a kind, honest individual. I like to help people out when they need it. I don't like arguing. I am an animal lover, and love being in nature. Overall, I would describe myself as a kind, caring, non-violent individual.	4. My American identity is important to me is because it's where my family is from. It's where I was raised and how I became who I am. It defines the values that I have.
5. I think I am a person who cares for others that care very little about him. I think ever since I was a kid, I was a real people pleaser. I wanted to make sure that people didn't have any reason to hate me, and I would make sure of that. I just want to do my part to make people happy.	5. My identity as an American is important because I have the freedom to express myself. I have the freedom to be creative. I have the freedom to be spiritual. I have the freedom to travel. I have the freedom to live.

American identity is active relative to their unique self identity, participants recall more states over a brief duration of time (2 min). An independent samples *t*-test revealed that participants in the American identity condition ( $M = 22.68$ ,  $SD = 8.50$ ) recalled more states than participants in the self identity condition ( $M = 19.90$ ,  $SD = 9.50$ ;  $t(201) = 2.20$ ,  $p = .029$ , 95% CI [.29, 5.29],  $d = .31$ ). Figure 1 graphically depicts these results.



**Figure 1.** For Study 1, means and standard errors are depicted for the average number of unique states recalled in 2 min, grouped by the identity activated (American identity vs. self identity).

## Study 2

The results from Study 1 are consistent with our hypothesis that activating a certain identity makes relevant knowledge more accessible in memory. In Study 2, we further investigated this hypothesis using different contrasts to the American identity—specifically, a family identity or no particular identity. The purpose in doing so was to ensure that the effects obtained in Study 1 are not the product of an idiosyncratic effect of comparing the number of states recalled when an American identity, relative to a unique self identity, is active. Our more general theoretical position is that activating a particular cultural identity should render relevant knowledge more accessible—relative to activating any other identity for which the knowledge under consideration is not directly relevant. As such, comparing the accessibility of state knowledge under an active American identity to multiple other identities (i.e., self identity and family identity) will allow us to draw more generalizable conclusions about the role of an active identity in knowledge accessibility. Additionally, the inclusion of a control condition in which no particular identity is active provides a baseline measure of the accessibility of U. S. states (but note that this baseline condition does not provide a measure of what is available in memory; it is assumed people know more states than they can freely recall).

## Materials and Method

**Participants.** A total of 407 American residents with at least 50 completed HITs and an approval rating above 90% voluntarily participated in this study on Amazon's Mechanical Turk (AMT) for monetary compensation. Twenty-two participants were excluded from analyses for failing the attention check at the end (see below for details), for not responding to the identity prompt, or for typing unrelated nonsense when prompted to recall states. So, data were analyzed with the remaining 385

individuals ( $M_{\text{age}} = 40$ ,  $SD = 13$ , age range = [18–81], 192 males, 191 females, 1 non-binary). We recruited enough participants to obtain sufficient power (.80) to detect small-to-medium sized effects ( $\eta_p^2 = .03$ ) in a one-way between-subjects ANOVA with three levels with  $\alpha$  set at .05 (two-tailed), after exclusions. This sample size was based on the size of the effects from Study 1, and the total sample size increased from Study 1 to Study 2 because there are three between-subjects conditions in Study 2 instead of two.

**Procedure.** After providing informed consent, participants were randomly assigned to one of three conditions in a between-subjects fashion: a family identity condition, an American (United States) identity condition, or a no identity condition. Participants assigned to the family identity condition were asked to write 2–5 sentences describing why and how their own family identity is important to them. Participants assigned to the American identity condition were asked to write 2–5 sentences describing why and how their American identity is important to them. Finally, participants assigned to the no identity condition received no instruction to think about or write about any identity. Then, as in Study 1, participants were given 2 min to recall as many states as they could. They were instructed to type each state recalled into a box, and to remain focused on the task for the full 2 min. Once the 2 min had passed, participants were automatically moved on to the next page.

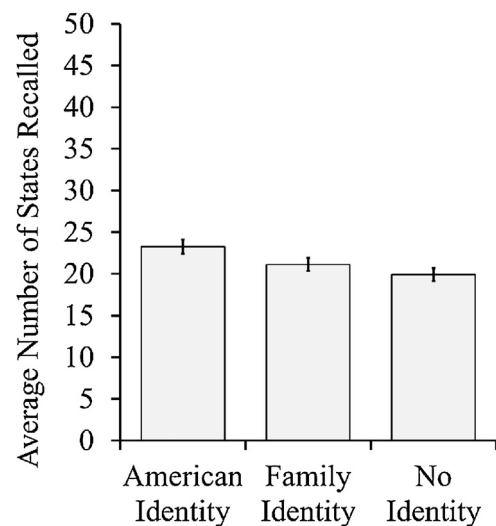
Participants then answered the same attention check at the end as in Study 1, to allow exclusions for distractions. Upon completion, participants were monetarily compensated for their time.

## Results

In Study 2, we further address the hypothesis that participants' active identity might influence the accessibility of relevant knowledge. To this end, we examine whether when participants' American identity is active relative to their family identity or no particular identity, participants then recall a greater number of states over a brief 2 min time span. A one-way ANOVA with condition (family identity, American identity, or no identity) on the number of states recalled revealed a significant effect of condition,  $F(2, 382) = 4.35$ ,  $p = .013$ ,  $\eta_p^2 = .022$ . Post-hoc analyses revealed that participants in the American identity condition recalled significantly more states than participants in the no identity condition ( $M_{\text{diff}} = 3.35$ ,  $SE_{\text{diff}} = 1.14$ ,  $p = .004$ , 95% CI [1.10, 5.60],  $d = .36$ ) and somewhat more states than participants in the family identity condition ( $M_{\text{diff}} = 2.14$ ,  $SE_{\text{diff}} = 1.17$ ,  $p = .067$ , 95% CI [-.15, 4.43],  $d = .24$ ). There was no difference in the number of states recalled between the family identity and no identity conditions ( $M_{\text{diff}} = 1.21$ ,  $SE_{\text{diff}} = 1.12$ ,  $p = .28$ , 95% CI [-.98, 3.40],  $d = .13$ ). Figure 2 graphically depicts these results.

### Study 3

The previous two studies suggest that activating a particular identity can render relevant knowledge more accessible in memory; participants with an active American identity (relative to a different identity or no particular identity) recalled a



**Figure 2.** For Study 2, means and standard errors are depicted for the average number of unique states recalled in 2 min, grouped by the identity activated (American identity, family identity, or no identity).

greater number of states over a brief 2 min time span. In Study 3, we explored whether these effects persist over longer periods of time, given that recall time was deliberately restricted to brief time periods (2 min) in Studies 1 and 2 in order to increase our chances of finding an effect. One possibility is that the effect will not depend upon recall time, with the active cultural identity influencing the amount of relevant information accessible similarly across shorter and longer periods of time. That is, active cultural identity might influence the *quantity* of relevant knowledge that is accessible. A second possibility is that the active cultural identity *speeds* retrieval—rather than affecting absolute accessibility—in a similar way to semantic priming studies where people retrieve a word faster after reading a related word (Meyer & Schvaneveldt, 1971). For example, it is not that people cannot read “bread” after reading “nurse” in semantic priming research; instead, they do so more slowly than if they had read “butter” beforehand. Analogously, the activation of an American identity might make people recall related information (i.e., the states) more quickly, but regardless of the identity active, people will still be able to recall a similar number of states if they are given sufficient time.

To disentangle these two possibilities, we added a condition in Study 3 where participants had an unlimited amount of time to recall as many states as possible. In short, Study 3 involved experimentally activating either a self identity or an American identity (as in Study 1) and varying, in a between-subjects fashion, the amount of time participants had to recall states (2 min vs. unlimited time).

## Materials and Method

**Participants.** A total of 655 American residents with at least 50 completed HITs and an approval rating above 90% voluntarily participated in this study on Amazon’s Mechanical Turk (AMT) for monetary compensation. Nineteen participants were excluded from analyses for failing the attention check at the

end (see below for details), for not responding to the identity prompt, or for typing unrelated nonsense when prompted to recall states. So, data were analyzed with the remaining 636 individuals ( $M_{\text{age}} = 37$ ,  $SD = 12$ , age range = [19–78], 354 males, 277 females, 3 non-binary). Because one of the possibilities involved an interaction between active identity (American identity vs. self identity) and time allotted to recall states (2 min vs. unlimited time), we recruited enough participants to obtain sufficient power (.80) to detect a small interaction effect ( $\eta_p^2 = .01$ ) in a  $2 \times 2$  between-subjects ANOVA with  $\alpha$  set at .05 (two-tailed) after exclusions.

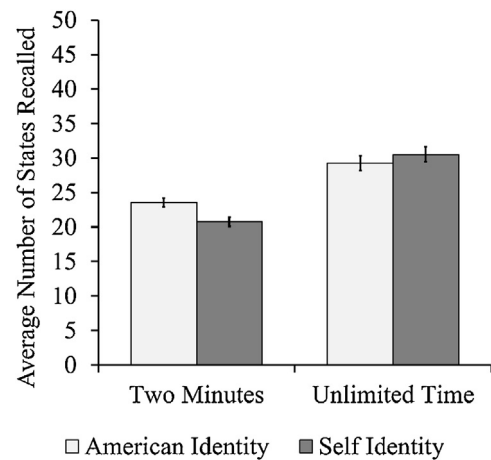
**Procedure.** We manipulated the participants' active identity (American identity vs. self identity) and the time allotted to recall states (2 min vs. unlimited time), according to a  $2 \times 2$  between-subjects design. After participants wrote about either their American identity or self identity (as in Study 1), they received either 2 min or an unlimited amount of time to recall as many states as they possibly could. Participants in both conditions were instructed to type each state recalled into a box. For participants in the 2 min condition, they were instructed to remain focused on the task for the full 2 min (as in previous studies). For participants in the unlimited time condition, they were instructed to recall as many states as they could and to move to the next page only when they were unable to recall any more states.

Participants then answered the same attention check at the end of the experiment as in the previous studies, to allow exclusions for distractions. Upon completion, participants were monetarily compensated for their time.

## Results

The previous two studies provided evidence that activating an American identity renders knowledge of states more accessible in memory, such that activating an American identity (relative to a different identity) leads to a greater number of states recalled over a brief 2 min time span. To examine whether this effect of activated identity depends on the amount of time provided for recall, we first computed a 2 (active identity: American identity vs. self identity)  $\times$  2 (time: 2 min vs. unlimited) between-subjects ANOVA with the number of states recalled as the outcome variable. There was a significant main effect of time allotted to recall states,  $F(1, 632) = 72.72$ ,  $p < .001$ ,  $\eta_p^2 = .103$ , no significant main effect of active identity,  $F(1, 632) = .69$ ,  $p = .41$ ,  $\eta_p^2 = .00$ , and a significant interaction between time allotted to recall states and active identity,  $F(1, 632) = 4.86$ ,  $p = .028$ ,  $\eta_p^2 = .01$ .

Subsequent tests of simple main effects revealed that, for participants only given 2 min to recall states, those in the American identity condition ( $M = 23.55$ ,  $SD = 8.02$ ) recalled more states than those in the self identity condition ( $M = 20.80$ ,  $SD = 8.72$ ;  $t(315) = 2.91$ ,  $p = .004$ , 95% CI [.89, 4.60],  $d = .33$ ). In contrast, for participants given an unlimited amount of time to recall states, there was no difference in the number of states recalled in the American identity condition ( $M = 29.27$ ,  $SD = 14.19$ ) relative to the self identity condition ( $M = 30.51$ ,  $SD = 13.26$ ;  $t(317) =$



**Figure 3.** For Study 3, means and standard errors are depicted for the average number of unique states recalled, split by the time allotted to recall states (2 min vs. an unlimited amount of time) and the identity activated (American identity vs. self identity).

.81,  $p = .42$ , 95% CI [-4.28, 1.79],  $d = .09$ ). Figure 3 graphically depicts these results.

## Study 4

Study 4 builds on Study 3 to further investigate whether the effect of activating participants' American identity leads to more states recalled in shorter durations of time relative to longer durations of time. However, instead of comparing a 2 min recall period to an unlimited amount of time, participants in Study 4 received either 2 min or 7 min to recall states. By fixing recall time at 7 min instead of allowing participants to self-space recall, we aimed to reduce variance due to differences in motivation across participants. Some participants in the unlimited time condition of Study 3 spent less than 1 min recalling states, whereas others spent more than 11 min (mean time = 5 min). This might suggest that many participants lacked a compelling incentive to persevere on the task (even if they could readily recall more U.S. states than they actually provided). In addition, people often err when deciding that they are done recalling information, as they continue to recall additional information when forced to spend more time on the task (Roediger & Thorpe, 1978). As such, we expected that a fixed 7 min block as a comparison condition would reduce noise and offer a more straightforward contrast to the condition in which participants were allotted 2 min to recall states. We expected 7 min to provide participants with sufficient time to recall as many of the 50 states as they could, given Brown's (1923) prior use of a 5 min interval.

## Materials and Method

**Participants.** A total of 776 American residents with at least 50 completed HITs and an approval rating above 90% voluntarily participated in this study on Amazon's Mechanical Turk (AMT) for monetary compensation. Thirty-one participants were excluded from analyses for failing the attention check at the end (see below for details), for not responding to the iden-

tivity prompt, or for typing unrelated nonsense when prompted to recall states. So, data were analyzed with the remaining 745 individuals ( $M_{\text{age}} = 37$ ,  $SD = 12$ , age range = [18–75], 368 males, 369 females, 2 non-binary). We increased our sample size from Study 3 to Study 4 to increase power (.85) to detect a small interaction effect ( $\eta_p^2 = .01$ ) in a  $2 \times 2$  between-subjects ANOVA with  $\alpha$  set at .05 (two-tailed) after exclusions.

**Procedure.** We manipulated participants' active identity (American identity vs. self identity) and the time allotted to recall states (2 min vs. 7 min), according to a  $2 \times 2$  between-subjects design. The manipulation of participants' active identity in Study 4 was the same as in Studies 1 and 3. After participants wrote about either their American identity or self identity, they were allotted either 2 min or 7 min to recall as many states as possible, and they typed the states they recalled into a box. Participants were instructed to remain focused on the task for the full duration allotted (2 min or 7 min).

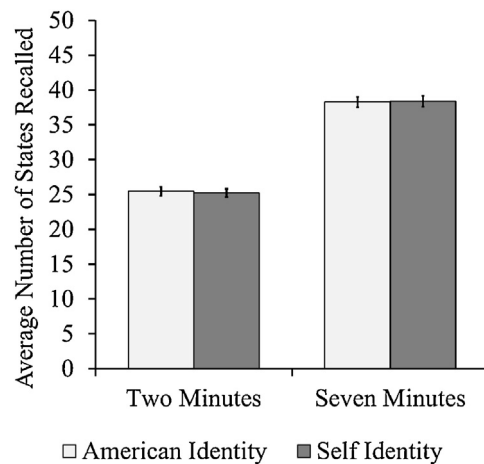
Participants then answered the same attention check at the end as in the previous studies, to allow exclusions for distractions. Upon completion, participants were monetarily compensated for their time.

## Results

To examine whether the effect of an active American identity depended on how long participants received to recall states, we first computed a  $2$  (active identity: American identity vs. self identity)  $\times 2$  (time: 2 min vs. 7 min) between-subjects ANOVA with the number of states recalled as the outcome variable. This revealed a significant main effect of time allotted to recall states,  $F(1, 740) = 337.77$ ,  $p < .001$ ,  $\eta_p^2 = .313$  such that participants given 7 min to recall states ( $n = 373$ ,  $M = 38.32$ ,  $SD = 10.56$ ) ended up recalling more states than participants given 2 min ( $n = 371$ ,  $M = 25.33$ ,  $SD = 8.57$ ). However, there was no significant main effect of active identity,  $F(1, 740) = .01$ ,  $p = .91$ ,  $\eta_p^2 = .00$  and no significant interaction between time allotted to recall states and active identity,  $F(1, 740) = .06$ ,  $p = .81$ ,  $\eta_p^2 = .00$ . It is not clear why we failed to replicate our earlier finding in the 2 min condition (a point we will return to in the General Discussion). Figure 4 graphically depicts these results, which we include to keep the experimental record clear and as evidence regarding the size of the effect.

### Meta-Analysis Across Studies 1–4

We meta-analyzed Studies 1–4 using a fixed-effects approach in which the mean effect size (Cohen's  $d$ ) was weighted by sample size (Goh, Hall, & Rosenthal, 2016). This meta-analysis is valuable especially since we found no statistically significant effect of active identity on state recall in Study 4 over the 2 min time period. In a first meta-analysis, we included only effect sizes based on differences between the American identity and another identity when participants were given 2 min to recall states. Note that we did not include the effect size from the American identity versus no identity conditions in Study 2 in order to be conservative and to ensure that the meta-analysis is based on differences in particular active identities (if we were to include the American identity vs. no identity effect in Study 2, the mean weighted



**Figure 4.** For Study 4, means and standard errors are depicted for the average number of unique states recalled, split by the time allotted to recall states (2 min vs. 7 min) and the identity activated (American identity vs. self identity).

$d$  would be larger than what is reported below). So, we included the effect sizes of the differences between the American identity and self identity in Studies 1, 3, and 4 along with the difference between the American identity and family identity in Study 2. Overall, the results of the meta-analysis indicate that the effect of identity (American vs. other) on the number of states recalled is significant (Mean weighted  $d = .21$ , SE of mean weighted  $d = .06$ ,  $Z = 3.50$ ,  $p < .001$ , 95% CI = [.09, .33]). For comparison, we conducted a second meta-analysis for the effect sizes obtained between American and self identity conditions when participants were given unlimited time (Study 3) or 7 min (Study 4) to recall states. The results of this second meta-analysis indicate that the effect of identity (American vs. self) on the number of states recalled is non-significant (Mean weighted  $d = -.04$ , SE of mean weighted  $d = .09$ ,  $Z = -.47$ ,  $p = .64$ , 95% CI = [-.21, .13]).

## Study 5

In Study 5, we further investigated whether activating an American identity, relative to a different identity, renders knowledge of the 50 states more accessible in memory. However, in contrast to previous studies, we implemented a new experimental paradigm to record the number of states recalled in each of six separate but consecutive 1 min blocks. Similar strategies have been employed in prior research to track recall over brief, consecutive blocks of time (e.g., Roediger & Thorpe, 1978). This paradigm allows us to investigate the time-course of the accessibility of states as a function of active identity (American identity vs. self identity). We expected that activating participants' American identities, relative to their self identities, would lead to the recall of more states in the initial blocks, but not in the later blocks. We examine this hypothesis using two different but complementary outcome measures: (1) the number of unique states recalled in each discrete block and (2) cumulative recall of states over the course of the blocks.

## Materials and Method

**Participants.** A total of 452 American residents with at least 50 completed HITs and an approval rating above 90% voluntarily participated in this study on Amazon's Mechanical Turk (AMT) for monetary compensation. Sixty-nine participants were excluded from analyses for failing the attention check at the end (see below for details), for not responding to the identity prompt, or for typing unrelated nonsense when prompted to recall states. So, data were analyzed with the remaining 383 individuals ( $M_{\text{age}} = 39$ ,  $SD = 12$ , age range = [18–72], 207 males, 172 females, 1 non-binary). We recruited enough participants to obtain sufficient power (.80) to detect small-to-medium sized effects (Cohen's  $d = .30$ ) for an independent samples  $t$ -test with an  $\alpha$  set at .05 (two-tailed) after exclusions.

**Procedure.** As in previous studies, after providing informed consent, we manipulated, in a between-subjects fashion, the salience of participants' unique self identity or American (United States) identity. The manipulation of participants' active identity in Study 5 was the same as in Studies 1, 3, and 4. After participants wrote about either their American identity or self identity, participants were told that they would recall as many U. S. states as they could, and that the screen would refresh each time one minute passed (i.e., at the end of minute one, at the end of minute two, and so on). Each time the screen refreshed, participants were presented with the states they had already recalled in the previous block(s), and they were instructed to only recall new states (i.e., those they had yet to type in) in each new block. Any repeated states typed in by participants were removed prior to data analysis. Participants were instructed to remain focused on the task for the full duration of each block. We intended to have seven separate one-minute blocks (to better complement Study 4), but due to a programming error, participants were only provided with six separate one-minute blocks.

Participants then answered the same attention check at the end of the experiment as in the previous studies, to allow exclusions for distractions. Upon completion, participants were monetarily compensated for their time.

## Results

We hypothesized that there would be an effect of an active American identity, relative to an active self identity, on the number of states recalled in the initial blocks but not in the later blocks. Below, we address this hypothesis using discrete recall (the number of states recalled in each block separately) and cumulative recall over time. Table 2 provides descriptive statistics for the number of states recalled in each discrete one-minute block and for cumulative recall across the blocks. Figure 5 graphically depicts the number of states recalled in each block separately (Panel A) and cumulative recall over time (Panel B) as a function of active identity (American identity vs. self identity).

**Discrete recall.** We computed a series of independent samples  $t$ -tests with active identity (American identity vs. self identity) on the number of states recalled in each individual block. The results indicate that an active American identity, relative to an active self identity, led to the recall of more states in the first block (i.e., first minute;  $t(381) = 2.23$ ,  $p = .027$ , 95%

CI [.16, 2.58],  $d = .23$ ). There was no difference in the number of states recalled between the American and self identity conditions in the second block,  $t(381) = 1.25$ ,  $p = .21$ , 95% CI [-.33, 1.47],  $d = .13$ , third block,  $t(381) = .26$ ,  $p = .80$ , 95% CI [-.63, .82],  $d = .03$ , fourth block,  $t(381) = .74$ ,  $p = .46$ , 95% CI [-.35, .77],  $d = .08$ , or sixth block,  $t(381) = 1.53$ ,  $p = .13$ , 95% CI [-.10, .77],  $d = .16$ . Interestingly, participants in the self identity condition, relative to the American identity condition, recalled a greater number of states in the fifth block,  $t(381) = 2.08$ ,  $p = .038$ , 95% CI [.03, 1.02],  $d = .22$ . However, this result should be interpreted with caution given that it barely reached statistical significance, the distributions were skewed, and it has yet to be replicated.

**Cumulative recall.** We then computed a series of independent samples  $t$ -tests to examine the effects of active identity on cumulative recall across the blocks. Note that discrete recall and cumulative recall statistics were identical for the first block. The results indicate that an active American identity, relative to an active self identity, led to the cumulative recall of more states after the second block (i.e., total number of states recalled after the first two minutes;  $t(381) = 2.02$ ,  $p = .044$ , 95% CI [.05, 3.83],  $d = .21$ ). However, there was no difference in cumulative recall between American and self identity conditions after the third block,  $t(381) = 1.77$ ,  $p = .078$ , 95% CI [-.23, 4.30],  $d = .18$ , after the fourth block,  $t(381) = 1.95$ ,  $p = .053$ , 95% CI [-.03, 4.52],  $d = .20$ , after the fifth block,  $t(381) = 1.53$ ,  $p = .13$ , 95% CI [-.49, 3.93],  $d = .16$ , or after the sixth and final block,  $t(381) = .78$ ,  $p = .44$ , 95% CI [-1.32, 3.05],  $d = .08$ .

## General Discussion

Across five studies, we investigated whether activating one's American identity (as opposed to other identities or no particular identity whatsoever) would influence the accessibility of relevant knowledge. In Studies 1 and 2, we found evidence that activating participants' American identities—relative to their self identities, family identities, or no particular identity at all—led to the recall of more U. S. states over a brief period of time (2 min). The results from Studies 3 and 5 suggest a more nuanced version of the accessibility account: Participants who activated their American identities—relative to their self identities—recalled more states over a brief duration of time (1 or 2 min); but with more time to recall states, the identity activated did not affect the total number of states recalled. Study 5 more directly examined the time-course of the effect, showing that, in the first minute of state recall, participants with an active American identity recalled more states than participants with an active self identity. However, in the subsequent blocks, we found no statistically significant differences in the number of unique states recalled as a function of active identity. These results from Study 5 confirm that the effect of active identity on knowledge accessibility is more pronounced when recall is speeded.

Overall, our results suggest that the identity activated affects the accessibility of relevant knowledge, but the effect size of active identity on the accessibility of relevant knowledge is small by current conventions (Cohen, 1988) and limited to short recall sessions. Given the small effect sizes and the fact that at least one



**Table 2**  
Means (SDs) for Discrete and Cumulative Recall of States as a Function of Identity Condition (American Identity vs. Self Identity).

Recall	Identity condition	First minute	Second minute	Third minute	Fourth minute	Fifth minute	Sixth minute
Discrete	American	12.29 (6.39)	8.91 (4.69)	6.65 (3.52)	4.40 (2.92)	2.72 (2.26)	2.07 (2.03)
	Self	10.92 (5.63)	8.34 (4.28)	6.56 (3.68)	4.19 (2.63)	3.25 (2.63)	2.41 (2.24)
Cumulative	American	12.29 (6.39)	21.21 (9.72)	27.86 (11.20)	32.26 (11.21)	34.98 (10.87)	39.78 (10.52)
	Self	10.92 (5.63)	19.27 (9.06)	25.83 (11.35)	30.02 (11.38)	33.26 (11.09)	38.92 (11.22)

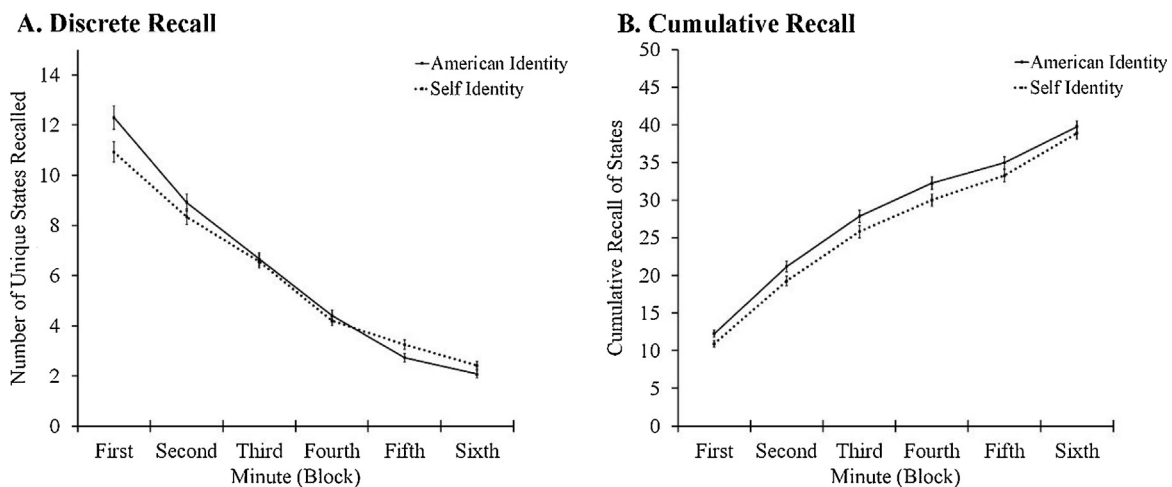
case of Type II error is likely to occur over five studies, the failure to replicate the basic effect in Study 4 is not too surprising. Across different active identities, the difference in the number of states recalled was only between zero and three. However, this absolute number becomes more impressive when one considers that the U. S. states represent well-known information, and that no additional learning occurred during the study. In other words, we would not expect these effect sizes to be moderate or large by conventions provided by Cohen (1988) because we are concerned with the retrieval of well-known information (with no additional learning or reminders). In this context, a mean difference of three states between conditions seems qualitatively substantial.

Furthermore, it should be reiterated that such knowledge differs from event memory in that it is often de-contextualized (Barber, Rajaram, & Marsh, 2008; Marsh & Stanley in press). That is, few people would likely be able to recollect the specific instance(s) of learning the names of the states, and thus, contextual cues are less likely to cue this type of information. To date, researchers have focused on semantic and phonological cues for activating knowledge (Solso & Biersdorff, 1975) as well as an individual's level of arousal (Yang & Hasher, 2011). Our findings provide a novel insight into another cue that might influence the accessibility of knowledge—the particular identity that is active at any given time.

Our findings complement the larger body of work on how culture, identity, and language influence the retrieval of memories of specific events. For example, autobiographical memories are more accessible when the language used at retrieval (e.g.,

Russian) matches the language used at encoding (Marian & Neisser, 2000; for related results, see Larsen, Schrauf, Fromholt, & Rubin, 2002, as well as Schrauf & Rubin, 1998). Similarly, cultural identity can influence which autobiographical memories are retrieved. In one study, Asian Americans were primed to think about either their Asian or their American identity, before retrieving their most important memories (Wang, 2008). Having thought about one's Asian identity was associated with the retrieval of more collective memories whereas thinking about one's American identity was associated with the retrieval of more self-focused events. More generally, cross-cultural research has identified cultural differences in the accessibility of event memories between Asians and European Americans, with European Americans exhibiting a greater ability to access temporally-specific events than Asians (Wang & Conway, 2004; Wang & Ross, 2005; Wang, 2008, 2013). Our findings contribute to a relatively unexplored area of research examining why shifts in the accessibility of knowledge—as opposed to event memory—occur.

Our work brings together two areas of research that are normally rather disparate, and it opens up several avenues for future directions. For example, people have multiple different identities within a self that might influence the accessibility of beliefs and knowledge (Marsh & Hattie, 1996; McConnell, 2011; Rydell, McConnell, & Beilock, 2009), and our demonstration was limited to one particular identity (i.e., American) and its relationship to one particular kind of knowledge (i.e., the 50 states). Future work could examine the extent to which these findings generalize and extend to other identities and other kinds of knowledge, but



**Figure 5.** For Study 5, means and standard error bars are depicted for the mean number of unique states recalled in each of the six discrete time periods (A) and for the mean number of states cumulatively recalled over the course of the experiment (B), split by identity activated (American identity vs. self identity).

we see no reason to expect the effects to be limited to the American identity and knowledge. For example, activating a Catholic identity might make certain biblical passages more immediately accessible. Future work could also examine how shifts in knowledge accessibility influence judgment, decision-making, and explanation generation (Hussak & Cimpian, 2018; Schwarz, 1998, 2004). That is, to the extent an active identity influences the particular knowledge active at the time of a judgment or decision, it may change these behaviors—at least under speeded conditions. Activating one's American identity, for example, might influence the facts that come to mind when thinking about a contemporary political issue or when trying to understand the actions of government officials in another country (at least when people are pressed for time). This could potentially influence the political judgments, decisions, and explanations that are offered. Overall, exploring the effects of culture and identity on autobiographical and event memories has yielded useful and valuable insights, and our work represents a first step into the domain of knowledge, a less contextualized form of memory.

### Author Contributions

M.L.S. and E.J.M. developed the study concept and design. Data collection and analysis were performed by M.L.S. and M.K.T. All authors helped to draft the manuscript and provided critical revisions. All authors approved the final version of the manuscript for submission.

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