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Influence of general and specific autobiographical recall on subsequent behavior: The case of cognitive performance

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ABSTRACT

Two studies tested the impact of autobiographical recall of general versus specific academic success or failure on actual task performance. As expected, it was found that general memories of failure and specific memories of success resulted in worse performance than general memories of success and specific memories of failure. In Study 1, this performance pattern was obtained on a standard math test. In Study 2, it was replicated on a test of intellectual ability, and a mediation by fear of failure was documented. The present findings offer direct evidence that autobiographical memories of success and failure impact actual performance and also reveal the role of memory specificity in this influence.

Introduction

Autobiographical memory (AM) has been theorized to ground identity, influence current behaviour, and contribute to the development and maintenance of social relations (Bluck, 2003). Its functions in everyday life are thus diverse and represent a vast domain of research. However, some aspects of AM's influence on daily functioning are particularly understudied. One important question is its impact on cognitive performance. The present study aims to provide direct evidence of this impact, taking into account the content (success vs. failure) as well as the specificity (general vs. specific) of autobiographical memories. Previous work on the impact of autobiographical recall on performance being extremely scarce, we rely on the more abundant literature on the links between AM, self, and behavior.

AM, self, and behavior

Remembering one's past, and attributing past events to the self, is at the very basis of the sense of self (James, 2007). The relations of the self with AM are currently best described by the notion of *self-memory system* (Conway & Pleydell-Pearce, 2000; Conway, Singer, & Tagini, 2004). In this framework, the autobiographical knowledge base is a part of the long-term self that interacts with the episodic memory system to form autobiographical memories. As early as 1977, Markus (1977) suggested that autobiographical memories are integrated into self-schemas, that is, generalizations about the self derived from past social experience that organize and guide the processing of self-related information (see also Markus & Kitayama, 1991). Autobiographical memories are also thought to be at the core of identity (McAdams, 2001, 2004), providing unity and purpose to individuals' lives by allowing for the construction of personal life stories. Thus, the way we see ourselves and the way we interpret self-relevant information in everyday life depends on our previous experiences.

The interest in the role of AM in everyday life has grown, and a case has been made for a link between recollections of past events and subsequent behavior (e.g., Monteil & Huguet, 1999; Pillemer, 2003). Pillemer (2003) explicitly argued that autobiographical memories have a directive function, meaning that individuals can rely on their recollections of past self-related events in order to plan and execute subsequent actions. In this way, AM helps individuals to adapt quickly to routine (using memory of repeated events) or to new environments (using particular episodes as a guide). Consistent with this, AM research in the field of neurosciences shows that impaired AM provokes impaired self-regulation in everyday life, as illustrated by retrograde amnesia patients (Levine et al., 1998).

Furthermore, Scoboria, Mazzoni, and Jarry (2008) have shown that for an event to influence subsequent behavior it does not even necessarily have to be true. In their study, participants who were led to believe that they were sick on fruit yoghurt in childhood ate less yoghurt but not less crackers in a subsequent, ostensibly unrelated food tasting task, than those who were not led to believe this. These findings suggest that if only a person believes that a given event is part

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of his or her past, this can impact this person's subsequent behavior, independently of the actual veracity of this event.

The present research

Today, there is only indirect evidence that memories of successes and failures can impact one's performance (e.g., Brunot, Huguet, & Monteil, 2000; Huguet, Brunot, & Monteil, 2001; Monteil et al., 1996a, b, for a review, see Monteil & Huguet, 1999). In the study of Huguet et al. (2001), for example, students with a failure history in mathematics performed worse on a difficult cognitive task when it was characterized as a geometry test (likely to activate autobiographical memories of failure), than when it was characterized as a drawing test. In the geometry condition, these students also underperformed relative to those with a success history in math, a difference that was eliminated in the drawing condition.

Here, we aim to provide direct evidence of the influence of autobiographical memories of success versus failure on cognitive performances, while distinguishing between general and specific memories. General memories subsume a class of related or repeated past behaviors and are likely to lead to inferences of traits that can be attributed to the self (e.g., Klein, Loftus, & Sherman, 1993). In other words, these memories reflect individuals' *typical* behaviors. In contrast, specific memories concern episodic single events. These memories therefore do not impact how one defines oneself to the same degree as general memories, being more easily considered as describing exceptions (Brunot & Sanitioso, 2004; Klein et al., 1993).

In our view, recalling general autobiographical memories might provoke fear of failure if failure is recalled. Indeed, general memories of failure would imply that the individual is relatively incompetent, and that failure is quite likely on the subsequent task. Ironically, recalling specific memories of success may also intensify fear of failure. Because these memories can be considered as exceptions, they are likely to call one's competence into question, especially when the task is difficult. If recalling specific instances of success intensifies fear of failure, then performance under this condition should not differ from that associated with recalling general memories of failure. On the other hand, recalling general memories of success can be expected to attenuate fear of failure on difficult tasks. This condition, therefore, should result in higher performance, compared with the two previous conditions (i.e., general memories of failure and specific memories of success). Recalling general memories of success should not differ, however, from the condition where a specific instance of failure is recalled. In this last condition, individuals can easily avoid inferences of incompetence, by considering the recalled instance of failure as an exception rather than the rule. In sum, general memories of failure and specific memories of success would result in worse performance than general memories of success and specific memories of failure, which leads to expect a crossover interaction between memory specificity and memory content. This interaction was tested here in two complementary studies.

In Study 1, task difficulty was manipulated. As suggested earlier in this paper, ability is more strongly challenged on difficult than on easy tasks. The predicted memory specificity by memory content interaction, therefore, should be limited to difficult tasks. When a task is easy, solutions are found quickly and there is no reason to question one's ability. In such a situation, recalled memories of successes or failures are relatively irrelevant to the task at hand. On the contrary, when a task is difficult, individuals may feel that they are reaching limits of their ability, which at that point comes into question. Under these conditions, recalled memories are more likely to act as relevant ability indicators and have the most pronounced effects. In Study 2, the mediating role of fear of failure was tested. We suggested earlier that fear of failure underlies the predicted memory specificity by memory content interaction. If this is true, then the influence of autobiographical memories on performance should be reduced, if not eliminated, when controlling for fear of failure.

Study 1

Participants were asked to recall general versus specific autobiographical memories of academic success versus failure prior to taking a math test. The test consisted of two parts, the second one being more difficult. It was expected that general memories of failure and specific memories of success would result in worse performance than general memories of success and specific memories of failure. If this influence reflects a self-related threat, we reasoned, then it should be limited to the difficult part of the test (where failure is more likely).

Method

Participants

Participants were 117 undergraduate psychology students (Geneva University). Their age varied from 18 to 48 ($M = 22.51$, $SD = 5.78$). There were 102(91.1%) females, 10 males, and 5 gender-unspecified participants.

Procedure

Autobiographical recall and related self-reports. Participants were run collectively, in groups of about 30 to 40. Two experimenters met participants in a regular classroom. Participants received envelopes with all the necessary materials and were informed that they would participate in two studies, each conducted by one of the experimenters. The first study was said to be about memories and the second about math. Participants first had to recall three general or specific autobiographical memories of either their past academic successes or failures (both specificity and content were manipulated between participants). Although the upcoming task was a math test, instructions for recall were purposefully unrelated to math: participants were simply asked to recall an academic or school success or failure (as a function of the experimental condition). Indeed, we aimed to test our prediction at a rather general level where the memories recalled are not specifically related to the forthcoming test. Four experimental conditions were thus created. Specificity was manipulated by varying the beginnings of each of the three sentences printed on the response sheet. Participants' task was to complete each sentence with their own past experiences of success or failure. For instance, in the « success-general » condition, one sentence began with « In general, I'm successful when… ». In the « failure-specific » condition, one sentence began with « I failed once when I had to… ».

When participants finished the recall task, they were informed that they would begin the math test ostensibly administered by the other experimenter. It was also said that supplementary questions about the recalled memories will be asked after the test for practical reasons. Participants were invited to read the test instructions but not to start before instructed to do so. After having read the instructions, they were told by the second experimenter that they had 10 minutes to do the test and that they should try to solve as many problems as possible in the allotted time. After the math test, two supplementary questions addressed some of the characteristics of each memory: "To what extent is this success/failure typical of you?" and "To what extent is this memory pleasant for you?" Responses were given for each memory separately on 7-point Likert-type scales ranging from 1 = not at all to 7 = extremely. These answers allowed us to check whether general recall elicited events perceived as more typical of the self than specific recall and whether memories of failure were less pleasant than memories of success. The last page of the booklet contained demographical information questions (age, sex, education). At the end of the session, participants were thanked and debriefed.

Numeric aptitude test. This was a standard math test taken from the (French) Fundamental Aptitudes Battery (*Batterie d'aptitudes fondamentales* or *BAF*, Center for Applied Psychology [France], 1992) that can be used with adolescents or adults and can be administered collectively or individually. We reduced the usually allotted 15 minutes for this test to 10 minutes to increase its difficulty. The test consisted of 18 mental calculation items and 7 numeric reasoning items, selected for their discriminating power and their increasing difficulty. Indeed, numeric reasoning items, presented at the end of the test, were more difficult than mental calculation items. Each correctly solved problem was worth 1 point, the maximum possible score being 25.[1]

Results

Type of memories

Three participants who did not recall all three memories were excluded from the analyses. Most memories concerned learning methods or general school and academic performance (54.44%, e.g., "Generally, I am successful in understanding instructions and providing the requested work"). Some concerned academic or school performance in a given domain (25.15%, e.g., "Once, I was successful when I had to analyze literature that I had read in the past and to relate it to very specific questions"). Others concerned mathematics (11.54%, e.g., "Usually, I'm very bad at solving equations"—the exclusion of participants who recalled math performance does not substantially change the results pattern), and a few concerned performance in nonacademic domains (8.88%, e.g., "Generally, I am not successful when I have to pick a present for someone I like a lot. I am afraid of choosing something that the person would not like").

Self-reports on memories

Memory valence. To ensure that failure memories are less pleasant than success memories, we submitted memory valence (as indicated by participants' responses) to a two (memory content: success vs. failure) × two (memory specificity: general vs. specific) ANOVA. There was only a main effect of memory content, $F(1,108) = 138.86$, $p < .001$, $\eta^2 = .56$, indicating that (unsurprisingly) success memories were more pleasant ($M = 5.58$, $SD = 1.22$) than failure memories ($M = 2.99$, $SD = 1.02$).

Perceived self-typicality of memories. We assumed that participants would recall performance experiences perceived as more typical of themselves in the general than in the specific recall conditions. Thus, we submitted the perceived self-typicality of the memories to the same ANOVA as before. Only a main effect of memory specificity emerged, $F(1,108) = 47.67$, $p < .001$, $\eta^2 = .31$. As expected, participants recalled events that they considered as more typical in the general recall conditions ($M = 5.22$, $SD = .93$) than in the specific recall conditions ($M = 3.94$, $SD = 1.02$).

Performance (percentage of correct responses)

Our general hypothesis was tested by a set of three orthogonal contrasts. The first contrast simply verified that participants' performance was similar after recalling general memories of failure and specific memories of success. Likewise, the second contrast verified that performance was similar after recalling general memories of success and specific memories of failure. Finally, the third contrast tested whether general memories of failure and specific memories of success result in worse performance than general memories of success and specific memories of failure (this contrast corresponds to the crossover interaction). Because autobiographical effects were expected only on the more difficult part of test (numeric reasoning problems), this series of contrasts was tested on each part of the test separately. Since the two parts of the test had a different number of problems, we used the percentage of correct responses as a dependent variable.

On the first (easier) part of the test, none of the contrasts was significant. The "general-failure" condition ($M = 65.60$, $SD = 14.06$) did not differ from the "specific-success" condition ($M = 63.60$, $SD = 17.54$), $t(110) = -.48$, ns, nor did the "general-success" condition ($M = 65.56$, $SD = 15.05$) differ from the "specific-failure" condition ($M = 62.64$, $SD = 14.31$), $t(110) = .73$, ns. Finally, the "general-failure" and "specific-success" conditions ($M_{\text{averaged}} = 64.55$, $SD = 15.88$) did not differ from the "general-success" and "specific-failure" conditions ($M_{\text{averaged}} = 64.12$, $SD = 14.64$), $t(110) = -.17$, ns.

As expected, on the second (more difficult) part of test, "general-failure" ($M = 27.47$, $SD = 20.91$) and "specific-success" ($M = 28.57$, $SD = 25.61$) conditions did not differ from each other, $t(110) = -.17$, *ns*, nor did "general-success" ($M = 39.05$, $SD = 24.29$) and "specific-failure" ($M = 36.95$, $SD = 24.30$) conditions, $t(110) = .34$, ns. Importantly, also in accordance with our predictions, performance was significantly worse in "general-failure" and "specific-success" conditions ($M_{\text{averaged}} = 27.25$, $SD = 23.75$) than in "general-success" and "specific-failure" conditions ($M_{\text{averaged}} = 37.86$, $SD = 23.94$, see Fig. 1), $t(110) = 2.22$, $p < .03$.

The fact that our third contrast was significant only on the difficult part of the test may imply a three-way interaction between memory content, memory specificity, and test composition. This was indeed the case, as shown by a two (memory content: success vs. failure) × two (memory specificity: general vs. specific) × two (test composition: first vs. second part) ANOVA on the percentage of correct responses, $F(1,110) = 3.87$, $p = .052$, $\eta^2 = .034$. In addition, a main effect of test composition confirmed that the second part of the test ($M = 33.21$, $SD = 24.15$) was more difficult than the first ($M = 64.33$, $SD = 15.18$), $F(1,110) = 138.53$, $p < .001$, $\eta^2 = .56$. The interaction between content and specificity was marginal, $F(1,110) = 3.15$, $p < .08$, $\eta^2 = .028$ (all other effects were not significant).

Discussion

As expected, general memories were perceived as more typical of the self than specific memories, whatever their valence. More importantly, on the more difficult part of the test, general memories of failure and specific memories of success resulted in worse performance than general memories of success and specific memories of failure. This pattern offers direct evidence that memories of success

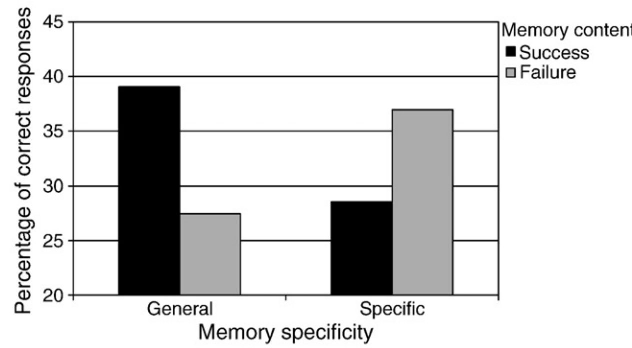

Fig. 1. Performance on the second part of the math test as a function of memory content and memory specificity.

[1] We added one sentence to the instructions stating that previous studies show no gender differences in performance on this test, an instruction that has proved to be efficient in removing stereotype threat from the performance situation (Spencer et al., 1999; for a review, see Ben-Zeev, Duncan, & Forbes, 2005). Women typically underperform relative to equally qualified men on difficult standard math tests when simply told that they measure math skills, but perform as well as men when told that the test is gender-fair.

and failure can impact one's performance. Because participants were mostly females faced with a math test, one may wonder whether stereotype threat (Spencer, Steele, & Quinn, 1999; Steele, 1997) is a precondition for this pattern to occur. This is unlikely, as the negative gender stereotype about math was nullified in all conditions based on "gender-fair" instructions (see Footnote 1). Yet, we conducted an additional study to exclude this, as well as other potential limitations. Study 2 was very similar to Study 1, but performance was measured via a challenging test of intelligence assessing different ability domains excluding math, and the sample consisted of a more reasonable mixture of men and women. An important contribution of this additional study was to examine whether fear of failure mediated the effect of memory recall on performance on a difficult test. To address this point, the test was intentionally consistently challenging (across ability domains), so that we can predict an effect of memory recall on the overall performance and include a measure of fear of failure in relation to the whole test.

Study 2 also included measures of subjective difficulty of recall, causal attributions of the recalled performance outcomes, as well as self-efficacy in relation to the forthcoming test. Brunot and Sanitioso (2004) found that people tend to recall general rather than specific memories related to attributes that they desire. Therefore, people probably dislike recalling general failures and specific successes because both would suggest that they possess the general quality of being incompetent. Not only would people probably dislike these recall tasks, but as Sanitioso and Niedenthal (2006) also showed, people tend to alter their perception of the difficulty of recall in a self-serving direction. It may be, then, that participants in our own research experienced the "general-failure" and "specific-success" recall conditions as more difficult than the other two conditions (general success and specific failure), because the former would suggest failure as a general attribute of the self. Having just completed a memory task that they found difficult may also have undermined their self-efficacy in completing subsequent tasks, thereby reducing their ability to solve difficult math problems. Attribution theory offers a similar explanation. People tend to attribute their successes to general causes, such as ability, and their failures to specific causes, such as mood or lack of preparation (e.g., Campbell & Sedikides, 1999). The tendency to think about the causes of successes in more general terms (the rule) and failures in more specific terms (exception to the rule) might interfere with recalling general failures or specific successes. Again, recall may be perceived as difficult in these latter circumstances, thereby undercutting self-efficacy and performance on a task that follows. For all these reasons, Study 2 integrated measures of perceived difficulty of recall, self-efficacy, and causal attributions for the events recalled. [2]

Study 2

Method

Participants

They were 82 French high school students (58 males and 24 females, mean age = 15.65, SD = .63), who were randomly assigned to the same four experimental conditions as before.

Procedure

Participants were tested collectively in their ordinary classroom setting. They were handed a booklet each, containing all the necessary material for the experiment. On the front page, they were informed that they would participate in two separate and unrelated studies: one on memories and one on general knowledge. They were instructed to answer the questions in a certain order, to work individually, and to stay silent until the end of the session. Each questionnaire was associated with a specific anonymous code that later allowed us to pair each participant's answers with their past school marks (provided by the school authorities).

Autobiographical recall and related self-reports. In this part of the questionnaire, described as the first session, participants were asked to recall three autobiographical memories of school experiences, exactly as in Study 1. After each memory was recalled, participants answered several questions about it: if they felt similar to whom they were in the recalled experience, if their current school experiences corresponded to the recalled one (both assessing self-typicality), and if the recalled experience was pleasant for them (assessing memory valence). They also rated whether it took them much time to recall the experience (subjective difficulty of recall) and whether they attributed the recalled events to their capacities (general causes) or to their efforts, mood, or physical condition (specific causes). All responses were given on 7-point Likert-type scales ranging from 1 (not at all) to 7 (extremely). Answers to these questions were subsequently averaged across the three memories.

Cognitive ability test and related self-reports. Following recall, participants moved on to what was described as the second session and a test supposedly measuring "general knowledge." This test consisted of three tasks, each relying on a different ability, namely verbal, spatial, and abstract reasoning. The items were selected from a standardized French version of the fifth edition of *Differential Aptitude Tests* (Bennett, Seashore, & Wesman, 1974; for the French version see Center for Applied Psychology [France], 2002). The order of the three tasks of the cognitive ability test was counterbalanced. Three orders were used: verbal–spatial–abstract, abstract–verbal–spatial, and spatial–abstract–verbal. In this way, each of the ability domains was first in one of the versions of the test. Participants were randomly assigned to order conditions, and each experimental condition had approximately the same number of tests containing each order of ability domains. For each domain, the task itself was preceded by detailed instructions and description of the problems, one example with the correct solution followed by an explanation why this solution is correct, and another example without the solution. Each task consisted of six problems (with scores ranging from 0 to 6). The total score on the ability test was the sum of scores obtained on each task, and could thus range from 0 to 18. Participants had 4 minutes for each task of the ability test.

For each item in the *verbal reasoning* part, participants had to choose the correct solution (out of the five solutions proposed) by thinking analogically. In the example problem given to the participants: "… is to barking as cat is to …," the correct solution to this item is "dog……………….meowing." In other words, dog has the same relation to barking as cat has to meowing.

In the *spatial reasoning* part, an image of an unfolded surface was presented in each problem. Some areas of this surface were tainted, others were white. The possible solutions (four for each item) consisted of images of 3-dimensional figures (with some surfaces of the figures tainted and others white). Participants had to decide which of the proposed solutions would be obtained if the surface that they saw unfolded were folded.

In the *abstract reasoning* part, problems consisted of an array of four figures. Participants' task was to choose, among five solutions, which figure logically continued the array. For instance, the example problem presented an arrow pointing up, then an arrow pointing to the right, then down, and finally to the left. Each of the proposed solutions was an arrow, but they all pointed in different directions. Participants had to infer a rule from the problem array (i.e., "the arrow turns clockwise") to be able to choose the correct solution (in this case, another arrow pointing up).

[2] We thank Denise Beike for suggesting this possibility when reviewing an earlier version of this paper.

After they had read the instructions and seen example problems for each part of the test, but before they proceeded to the test, participants rated their level of self-efficacy ("Do you feel capable of solving this test?") and fear of failure ("Are you afraid of failing this test?"). Each rating was made three times (one for each of the three ability domains) on 7-point Likert-type scales ranging from 1 (not at all) to 7 (extremely).

At the end of the task session, participants indicated their sex and their age. They were then thanked and debriefed.

Results

Type of memories

As previously, substantial percentages of memories recalled by participants in the four experimental conditions concerned learning methods or general school performance (43.75%) or specific (other than math) performances (40.18%). A much smaller part of memories were related to math performance (12.50%). Finally, a very small proportion of memories concerned domains unrelated to school (3.57%, e.g., "Once, I succeeded in saying what I really thought to someone").

Self-reports on memories

Memory valence. To verify if failures were experienced as less pleasant than success memories, we submitted memory valence to a two (memory specificity: general vs. specific) × two (memory content: success vs. failure) ANOVA. Only a significant main effect of memory content emerged, $F(1,78) = 120.48$, $p < .001$, $\eta^2 = .61$. As expected, memories of failure ($M = 2.60$, $SD = 1.39$) were less pleasant than memories of success ($M = 5.64$, $SD = 1.15$).

Perceived self-typicality of memories. The same ANOVA was conducted on perceived self-typicality of the memories (based on the average of the two related items, $r(82) = .65$, $p < .001$). This analysis yielded a main effect of content, $F(1,78) = 12.76$, $p < .001$, $\eta^2 = .14$, indicating that participants considered their success experiences as more typical of them ($M = 4.29$, $SD = 1.51$) than their failure experiences ($M = 3.29$, $SD = 1.40$), probably due to a self-enhancement motive (e.g., Greenwald, 1980). Importantly, a significant main effect of memory specificity was also observed, $F(1,78) = 21.30$, $p < .001$, $\eta^2 = .21$. As before, participants reported the general experiences that they recalled to be more typical of them ($M = 4.44$, $SD = 1.55$) than the specific experiences ($M = 3.13$, $SD = 1.20$). The content by specificity interaction was not significant.

Subjective difficulty of recall. The same analysis on subjective difficulty of recall yielded no significant effects, all F values < 1, indicating that participants did not feel that some memories were more difficult to recall than others ($M = 2.91$, $SD = 1.35$ overall).

Causal attributions. A 2 × 2 MANOVA conducted on the four causal attributions (capacity, effort, mood, and physical condition) revealed only main effects of content and specificity on capacity and effort ratings. Consistent with the idea of a self-serving bias in causal attribution, recalled successes ($M = 4.82$, $SD = 1.37$) were attributed to capacities (i.e., a general cause) much more than recalled failures ($M = 2.29$, $SD = 1.38$), $F(1,78) = 74.36$, $p < .001$, $\eta^2 = .49$. To a lesser extent, similar results were observed on attributions to effort ($M = 4.78$, $SD = 1.61$ and $M = 3.82$, $SD = 1.87$, respectively for successes and failures), $F(1,78) = 6.02$, $p < .02$, $\eta^2 = .07$. Likewise, general memories were attributed to capacity ($M = 3.90$, $SD = 1.86$) more than specific memories ($M = 3.31$, $SD = 1.85$), $F(1,78) = 5.01$, $p < .03$, $\eta^2 = .06$, whereas specific memories were attributed to effort ($M = 4.87$, $SE = 1.70$) more than general memories ($M = 3.83$, $SE = 1.75$), $F(1,78) = 7.59$, $p < .008$, $\eta^2 = .09$.

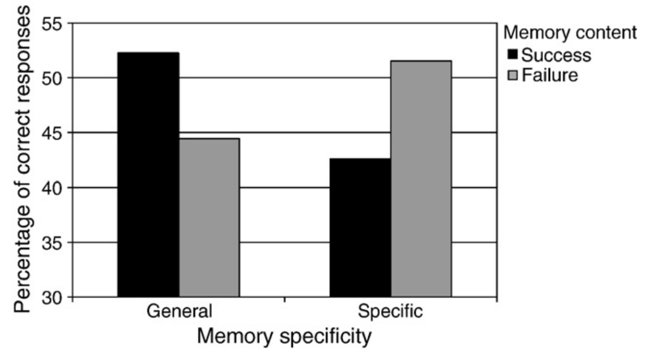

Fig. 2. Performance (ability test) as a function of memory content and memory specificity

Performance (percentage of correct responses)

A two (memory specificity: general vs. specific) × two (memory content: success vs. failure) × three (ability domain: verbal vs. spatial vs. abstract) ANOVA on the percentage of correct responses revealed no interaction of ability domain with the other two factors. Therefore, subsequent analyses were conducted on students' global performance. Although this global performance ($M = 47.63$) was slightly higher than that observed on the difficult part of the test in Study 1 ($M = 33.21$), it clearly showed that the test used in Study 2 was difficult.

To test our hypothesis, we conducted the same set of contrasts as in Study 1. As before (Study 1), "general-failure" ($M = 44.44$, $SD = 18.26$) and "specific-success" ($M = 42.59$, $SD = 14.84$) conditions did not differ from each other, $t(78) = .36$, *ns*, nor did "general-success" ($M = 52.27$, $SD = 17.87$) and "specific-failure" conditions ($M = 51.54$, $SD = 15.92$), $t(78) = .14$, ns. Also as predicted, performance was significantly worse in the "general-failure" and "specific-success" conditions ($M_{\text{averaged}} = 43.52$, $SD = 16.55$) than in the "general-success" and "specific-failure" conditions ($M_{\text{averaged}} = 51.94$, $SD = 16.99$), $t(78) = -2.25$, $p = .03$. (Fig. 2).[3]

Self-reports on the ability test. To assess the potential mediating role of fear of failure, the same three contrasts as those conducted on performance were also tested on this variable. Although the mean scores of fear of failure were low in all conditions, they mirrored the results pattern observed on performance. "General-failure" ($M = 1.98$, $SD = 1.14$) and "specific-success" ($M = 2.12$, $SD = 1.66$) conditions did not differ from each other, $t(35.42) = .32$, *ns*, nor did "general-success" ($M = 1.33$ $SD = 0.57$) and "specific-failure" conditions ($M = 1.63$, $SD = 1.08$), $t(24.69) = -1.05$, ns. However, fear of failure was higher in "general-failure" and "specific-success" conditions ($M_{\text{averaged}} = 2.06$, $SD = 1.40$) than in "general-success" and "specific-failure" conditions ($M_{\text{averaged}} = 1.47$, $SD = .80$), $t(56.72) = -2.20$, $p = .032$.[4] For exploratory reasons, the same three contrasts were also tested on self-efficacy. None of them was significant, emphasizing fear of failure as the key potential mediator.

[3] We also checked whether participants had similar academic achievement in each condition (using past academic grades from most important courses averaged for the two previous trimesters, T1 and T2), to exclude the possibility of a sampling bias. The content by specificity ANOVA on past grades showed no significant or even marginally significant effects. Thus, there was no sampling bias related to previous academic achievement. In addition, in a complete content by specificity by domain by order by sex ANOVA conducted on the percentage of correct responses on the ability test, there was a main effect of domain, $F(2,116) = 7.49$, $p < .02$, a specificity by sex interaction, $F(1,58) = 4.73$, $p < .04$, and a content by order interaction, $F(2,58) = 3.18$, $p < .05$, theoretically (and statistically, see below) irrelevant to our hypothesis. There were no other significant two-way interactions, except the content by specificity interaction that remained significant, $F(1,58) = 6.00$, $p < .02$ in this analysis.

[4] Numbers of degrees of freedom in these tests correct for the heterogeneity of variance, *Levene's* $F(3,78) = 6.47$, $p < .001$.

Mediation analysis

To test whether fear of failure mediated the effects of memory recall on performance (in accordance with our assumption that these effects are threat-related), a mediation analysis was performed using a bootstrapping procedure (Hayes, 2009; Preacher & Hayes, 2004). We entered the content by specificity interaction (corresponding to our third contrast) as the predictor, while including the main effects of content and specificity, performance as the dependent variable, and fear of failure as the mediator. The analysis was set to 5000 iterations and confidence interval to 95%. The total effect of the interaction on performance was significant, $B=16.78$, $SE=7.45$, $t(81)=2.25$, $p<.03$, as well as its effect on fear of failure, $B=-1.15$, $SE=.52$, $t(81)=-2.20$, $p<.04$. Fear of failure significantly predicted performance, $B=-3.54$, $SE=1.58$, $t(81)=-2.24$, $p<.03$. Finally, with fear of failure controlled for, the direct effect of the content by specificity interaction on performance was no longer significant, $B=12.71$, $SE=7.49$, $t(81)=1.70$, $p=.10$. This drop in statistical significance was confirmed by the confidence interval that ranged from .36 to 10.26. Because zero is not in this interval, it can be concluded that the interaction effect on performance was mediated by fear of failure.

General discussion

Taken together, the present findings show how powerful autobiographical memories can be in the determination of one's current task performances. As noted earlier in this paper, there was only indirect evidence of this influence in past relevant research. Relying on the literature on the links between AM, self, and behavior, it was expected that general memories of failure and specific memories of success would result in worse performance than general memories of success and specific memories of failure. This is exactly what we found across two independent samples and several ability domains. Moreover, contrary to what might be intuitively expected, the present findings suggest that under certain conditions, memories of success and memories of failure can have a similar effect on performance, as indicated by the fact that general memories of failure and specific memories of success on one hand, and general memories of success and specific memories of failure on the other hand influence performance in the same way. This performance pattern, we reasoned, might reflect increased fear of failure after recalling general memories of failure and specific memories of success, compared with general memories of success and specific memories of failure. Consistent with this reasoning, the expected performance pattern was limited to the most difficult part of the test in Study 1. More importantly, Study 2 offered direct evidence that general memories of failure and specific memories of success induced fear of failure, which proved to play a mediating role in the performance pattern.

Study 2 also ruled out alternative explanations. By indicating that the predicted interaction pattern can be found in domains other than math, it makes the stereotype threat explanation irrelevant. Explanations based on subjective difficulty of recall, causal attribution of recalled performance outcomes, and self-efficacy proved to be irrelevant as well. As noted earlier, there are good reasons to believe that participants may have experienced the general failure and specific success recall conditions as more difficult than the other two conditions (general success and specific failure), which may have undermined their self-efficacy in completing difficult tasks. However, our findings did not provide evidence that participants felt that some memories were more difficult to recall than others. No effects were found on self-efficacy either, while effects observed on causal attributions did not mirror the performance pattern and thus appeared as irrelevant as an explanatory factor thereof. Therefore, fear of failure seems to be the best candidate to explain the present performance pattern.

One may still wonder whether the effects of AM on performance reflect behavioral priming. It has been shown that priming categories (e.g., professors) leads to behavioral assimilation whereas priming exemplars (e.g., Albert Einstein) leads to behavioral contrast (e.g., Dijksterhuis et al., 1998; Haddock, Macrae, & Fleck, 2002). In this view, general memories (i.e., behavioral categories) can be expected to lead to assimilation and specific memories (i.e., behavioral exemplars) to contrast, which would result in the same performance pattern as that reported here. However, the fact that this pattern was both sensitive to task difficulty (Study 1) and mediated by fear of failure (Study 2) is hardly consistent with a priming approach.

Future research may help clarify whether fear of failure exerts its influence on performance by tapping working memory resources, as is the case for stereotype threat (Beilock, Rydell, & McConnell, 2007; Croizet et al., 2004; Johns, Inzlicht, & Schmader, 2008; Régner et al., in press; Schmader & Johns, 2003). Under general failure and specific success recall conditions, individuals may try to control their emotional state (fear of failure) at the expense of the executive resources generally required for successful performance on difficult tasks. Another intriguing question is whether the threat versus challenge distinction that proved useful in the literature on psychosocial stress and performance (e.g., Vick, Seery, Blascovich, & Weisbuch, 2008) also applies in the present context. That general memories of failure and specific memories of success are self-threatening may indeed not be the whole story. The present performance pattern may also reflect the effect of challenge when recalling general memories of success or specific memories of failure. Future research might also help clarify this important issue.

Although the phenomenon documented by the present studies is unrelated to stereotypes, speculations can be made with regards to connections between threats activated by memories and threats activated by stereotypes. As mentioned above, these two phenomena could share some underlying processes, such as working memory deficits or threat task appraisals. In addition, the effect documented in the present studies could have a role in stereotype threat. For example, stereotype salience may activate memories of failure in the stereotyped domain, which could play a role in stereotype-related effects on performance. Such effects would be in line with results yielded by other lines of research showing that stereotype salience may bias autobiographical recall in a stereotype-consistent manner (e.g., Chatard, Guimond, & Selimbegović, 2007). In any case, even if stereotype threat is not mediated by autobiographical recall, it may be moderated thereby, such that if general memories of failure are recalled when stereotypes are salient, performance should suffer more than if this is not the case.

The major strength of the present findings is that they provide direct evidence that autobiographical memories impact one's current performances. It is worth noting that this effect is generalizable across performance domains. In Study 1, although most of the memories recalled by participants were not specifically related to math, they impacted math performance. Similarly, in Study 2, participants' memories impacted their performance in verbal, spatial, and abstract reasoning. It seems therefore that the content of autobiographical memories does not need to be related to the upcoming task to influence performance, which may have strong implications in education, for example. Based on the present findings, it can reasonably be assumed that conducting students with a history of failure in a given academic domain to recall general memories of success in another domain (academic or non academic) may help them improve their performance in the former (perhaps due to a self-affirmation mechanism, see Steele & Liu, 1983). Future research should clarify this additional point by specifying to the participants the dimensions of autobiographical recall (same vs. different compared with the upcoming task).

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