DISSOLVING THE ANALOGICAL PARADOX: RETRIEVAL UNDER A PRODUCTION PARADIGM IS HIGHLY CONSTRAINED BY SUPERFICIAL SIMILARITY

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ABSTRACT

Experimental studies on analogical retrieval have shown that interdomain retrieval is less frequent than intradomain retrieval. Using a production paradigm, Blanchette and Dunbar (2000) obtained opposite results. Dunbar (2001) hypothesized that when analogs are encoded in natural settings, retrieval is not constrained by superficial similarity. The study reported here complemented the production paradigm with two additional controls: 1) a survey of naturally encoded sources available in long-term memory, and 2) a measure of analogical retrieval that was less vulnerable to report bias. Comparison between available and retrieved sources demonstrated that retrieval under a production paradigm—just as retrieval under a reception paradigm—is strongly constrained by superficial similarity.

INTRODUCTION

Analogical reasoning supposes knowledge transfer from a known situation (source analog: SA) to a novel situation (target analog: TA) with the intention of improving the understanding of the latter.

Two situations are analogous when they maintain structural similarity, that is, when their elements are linked by similar systems of relations (Gentner, 1983; Holyoak & Thagard, 1995). In an interdomain analogy the compared situations belong to distant semantic domains, so their corresponding objects usually don’t share semantic similarity. In an intradomain analogy the compared situations belong to the same thematic field, therefore the matched objects are usually similar. This resemblance between objects is called superficial similarity. Intradomain analogies imply both structural and superficial similarity.

Several studies showed that retrieval of SAs from long-term memory (LTM) mostly occurs when analogs are superficially similar. Retrieval based solely on structural similarity—the case of interdomain analogies—is infrequent (Catrambone, 2002; Gentner, Rattermann, & Forbus, 1993; Gick & Holyoak, 1983; Keane, 1987). The procedure employed in these studies, which Blanchette and Dunbar (2000) termed reception paradigm, involves two distinct phases: an encoding phase and a retrieval phase. During encoding, participants are presented with one or more SAs interleaved with several distracters. In the retrieval phase, participants read TAs and experimenters assess to
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what extent the SAs were retrieved. Gentner et al. (1993), for instance, asked their participants to read the TAs, reporting which of the SAs from the previous phase these TAs reminded them of. In Gentner et al. (1993), intradomain SAs were retrieved in 59% of the trials, whereas interdomain SAs were only retrieved 21% of the cases. Results from the cited studies show that intradomain retrieval is between two and three times more likely than interdomain retrieval, and that the likelihood of retrieving an interdomain SA is rarely higher than 20%. These findings have been taken to prove that superficial similarity has a strong weight in analogical retrieval.

Using an alternative procedure, Blanchette and Dunbar (2000) obtained results that have challenged these findings. The authors provided participants with a TA consisting of a description of the zero-deficit strategy for reducing public debt, and then asked participants to generate persuasive analogies in favor or against the convenience of adopting a zero-deficit strategy. In the pro zero-deficit condition analogies should support a “cut the deficit no matter what the consequences” position. The anti zero-deficit condition analogies should support the continuity of social programs, regardless of the increases in the public debt. This production paradigm (Blanchette & Dunbar, 2000) elicited strikingly high relative and absolute amounts of interdomain retrieval: participants proposed a mean of 10.73 analogies, 80% interdomain and 20% intradomain (Blanchette & Dunbar, 2000, Experiment 2). The authors concluded that “retrieval of sources was not highly constrained by superficial similarity” (Blanchette & Dunbar, 2000, p. 116) and hypothesized that this could be due to the interaction of two factors (cf., Dunbar, 2001): 1) the persuasive analogy generation task promotes a structural encoding of TAs, and 2) natural settings promote an encoding of SAs which also stresses their structural features. As SAs and TAs are structurally processed, retrieval of SAs occurs even in the lack of superficial similarity.

In previous studies we tried to investigate whether the production paradigm used by Blanchette and Dunbar (2000) in fact induces retrieval mechanisms that are not highly constrained by superficial similarities, or whether the interdomain facilitation elicited by the production paradigm originates in factors different from analogical retrieval.

Two important weaknesses of the method employed by Blanchette and Dunbar (2000) deserve mention. One of them concerns the absolute availability of intra and interdomain SAs in LTM. If the number of intra and interdomain sources in memory were not equated, then the observed profusion of interdomain analogizing should not legitimately be taken as evidence of retrieval processes unconstrained by superficial similarities. It could be just reflecting a higher proportion of interdomain SAs in LTM. Second, as the persuasive analogy generation task involves several post-access processes like mapping and evaluation (Holyoak, Novick & Melz, 1994), it is possible that the raw report of proposed analogies—as used in the production paradigm—may miss a number of retrievals that didn’t make it into the analogical proposals. If it were the case that interdomain SAs already retrieved end up being reported more often than intradomain retrievals, then the abundance of interdomain proposals might be rooted in pre and post-access processes, rather than in mechanisms responsible for analogical retrieval.

Using a procedure that lies between a reception and a production paradigm, Trench, Oberholzer, Adrover, and Minervino (in press, Experiment 2) found evidence of strong editing processes during the analogy generation task. In the first phase of that procedure—as in most transfer studies—either an intradomain SA or an interdomain SA was provided by the experimenter, interleaved with several distractors. Participants, who were told they were taking part in a study on text comprehension, were asked to read carefully all stories so as to be able to answer questions without rereading the stories (this task was intended to induce a structural processing of the stories such as the one allegedly taking place in natural settings; Dunbar, 2001). All stories pictured real-world situations followed by a common outcome. For
example, while the intradomain SA described the threat posed by the disappearance of a test sample of foot-and-mouth disease, the interdomain SA recounted the potential danger generated by two Russian soldiers who sold nuclear weapons to Eastern countries. During a second phase, which took place 30 min after the first one, different experimenters from those administering the previous phase asked participants to take part in a study on the use of analogy in persuasion. Participants were given a TA that was isomorphic to the SAs, but admitted two mutually exclusive solutions. They were asked to use analogies to persuade one of the characters to solve the situation in a particular way. Following with the example given above, the TA pictured a researcher who needed to decide what to do with the last samples of the smallpox virus. While on the one hand he considered their value for research, on the other hand he evaluated their potential risk for epidemics. Participants had to write down all the analogies that they thought of to convince him to destroy the samples. Ten different sets of a TA and two derived SAs were built.

The third phase was aimed at detecting the cases in which participants remembered the critical SA, but did not include it in their analogies (cf., Chen, Mo, & Honomichl, 2004; Keane, 1987). Participants were shown 10 short references to each of the stories read in the first session, and were asked to mark those stories that had come to mind, albeit briefly, during the analogy generation task, and to write them down in detail. A comparison between this measure of analogical retrieval and the record of analogies finally proposed revealed not only that most retrievals were not included among the proposed analogies, but also that there is an important bias in post-access selection of SAs after retrieval: while 60% of the interdomain retrievals were finally included, only 17% of the intradomain cases made their way into the proposals. Most important, this measure of analogical retrieval showed that while intradomain SAs were retrieved in 60% of the cases, interdomain SAs were only retrieved in 26% of the trials, proportions that closely resemble those of traditional studies on analogical retrieval (e.g., Gentner et al., 1993). Results thus suggested that when the initial availability of intra and interdomain SAs is equated (as in traditional transfer paradigms, we provided either an intradomain SA or an interdomain SA) and a less biased measure of analogical retrieval is used (as in Keane, 1987, we distinguished retrieval from utilization of SAs), the likelihoods of retrieving intra and interdomain SAs under an analogy generation task do not differ from the likelihoods of retrieving such SAs under a reminding task (e.g., Gentner et al., 1993). However, these conclusions had the limitation of having been derived from the retrieval of SAs that were provided by the experimenters. Even though our encoding task was aimed at promoting a structural encoding of the SAs, it could still fall short of reproducing the structural encoding allegedly taking place in natural settings (cf., Dunbar, 2001). The naturalistic study presented in this paper was designed to extend the above findings to the retrieval of naturally encoded source analogs.

**STUDY**

In order to assess the likelihood of naturally encoded intra and interdomain SAs getting retrieved during the analogy generation task, it would be highly desirable to know the absolute or the relative quantities of the intra and interdomain SAs potentially retrievable from LTM. Since neither option is amenable to realistic psychological exploration, straightforward calculation of intra and interdomain retrieval likelihoods is impossible. However, calculation of retrieval likelihoods does not require surveying the absolute number of such SAs in LTM. The strategy followed in the present study consisted in verifying the availability of a set of intra and interdomain SAs in the LTM of each participant, and tracking their eventual retrieval during the generation task. This procedure is reminiscent of techniques used in marine migration studies, in which the likelihood of a mother whale departing from California finally making it to Alaska can be compared to that of a newborn whale without necessarily
labeling all existing whales with satellite transmitters. When calculating these likelihoods, the relative proportion between labeled mothers and labeled babies need not faithfully reproduce the mothers/babies ratio in the whale population. Likelihood calculation only requires taking the quotient between the number of mother whales labeled in California and the number of such labeled mother whales finally transmitting in Alaska and comparing it to an analogous quotient corresponding to the newborn whales. Using the same logic, we identified a number of intra and interdomain SAs that were available in the LTM of each participant prior to the analogy generation task, and tracked their retrieval (or lack of) during the generation task. We used the same target analog used in Blanchette and Dunbar (2000)—i.e., the zero-deficit issue—and the same analogy generation task, but—unlike the above authors—we complemented this production paradigm with two recognition tasks conformed by a set of 20 common situations analogous to the zero-deficit, selected by virtue of their prevalence in the population under study (see details of this selection process under Materials). One of these recognition tasks, which we called availability questionnaire, was intended to detect SAs that were available in LTM to be potentially retrieved. The other recognition task, which we called the retrieval questionnaire, was intended to detect which of the abovementioned available SAs were retrieved during the analogy generation phase. As in the whale example, comparison of these measures affords calculation of the likelihood of SAs getting retrieved during the analogy generation task.

With respect to the probability of retrieving an available SA during the generation task, we predicted—in line with Trench et al., (in press, Experiment 2), and contrary to Dunbar (2001)—that an available intradomain SA would be more likely to get retrieved than an interdomain SA. Regarding the likelihood that a retrieved SA will finally be included among the analogy proposals, we predicted that, just as in Trench et al., (in press, Experiment 2), interdomain retrievals would have more chances of being finally included in the analogy proposals than intradomain retrievals. If these predictions are met, then the profusion of interdomain analogizing observed under a production paradigm would not be rooted in retrieval processes unconstrained by superficial similarity, but rather in the fact that the production paradigm overlooks both the initial availability of sources, and the uneven likelihood of intra and interdomain retrievals being finally selected for use.

Method

Participants. Thirty 2nd year students at University of Buenos Aires took part in the study. Procedure. The administration consisted of three distinct phases. During the first phase—just as in Blanchette and Dunbar (2000, Experiment 2)—participants were given an explanation on the use of analogies in persuasion, followed by an explanation on the zero-deficit strategy for controlling public spending. Then they were asked to come up with as many analogies as they could to convince the population about the convenience of adopting such strategy (see the zero deficit explanation and the analogy generation instruction in Table 1). They were told they had a maximum of 1 hr for the task, but after 20 min experimenters allowed those who ran out of ideas to begin the next phase of the study right away. During this second phase participants received the retrieval questionnaire, and were allotted 20 min to complete it. After a 5 min break, participants were given the availability questionnaire and were given 30 min to complete it. Materials. The instructions on the use of analogies in persuasion, which was similar to Blanchette and Dunbar’s (2000), included the presentation of two examples of the use of analogies in persuasion: one intradomain and one interdomain. The explanation of the zero-deficit issue and the analogy generation instructions can be seen in Table 1. The retrieval questionnaire included 20 schematic situations analogous to the zero-deficit, with lengths of less than 30 words (e.g., “a situation in which a
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An important problem faced by most governments is controlling budgetary deficits. The income of governments mainly comes from taxes and government owned industries. The spendings are devoted to health services, education, and support for those who need it. When spending is greater than incomes, the governments have to borrow money from banks or lenders outside the country. Interest runs on this debt, and the government has to pay this interest or else increases the amount of the debt. Annual deficits accumulate and produce an enormous debt which means more interests to pay, and ultimately more borrowing.

Two basic views oppose one another on how to deal with the annual deficit. One is that reducing the deficit should be the number one and most urgent priority. The government has to spend only what it earns, no matter if this entails massive cuts in social assistance, health services or education. If these cuts are not made, later the cuts will be more dramatic. The opposing view considers that it is important to reduce the deficit, but not at any cost. They argue that poverty, insecurity, and violence will result from the elimination of social support systems. Therefore is preferable to take longer to attain zero deficit, but not to sacrifice the social security net along the way.

**Task:** You have been hired by the National Association of Responsible Citizens (NARC) to come up with analogies that could be used to persuade the population that the reduction of the deficit should be a number one priority. They think that governments do not have a choice, because not cutting the deficit in the present will entail even more drastic cuts in the future. They want you to provide analogies that support and illustrate this position. You should write down each analogy you come up with, regardless of how good you think it is. You have 1 hr. for the task.

The availability questionnaire included the same items as the retrieval questionnaire, but presented in a different order. They were preceded by an instruction asking participants to mark exclusively those situations they had encountered prior to the experimental session, be it through personal experience, heard from others, or whatever source. Participants were further asked to describe each of such situations in detail. As in Gentner, Loewenstein, and Thompson (2004) we also asked participants to state the source of the situations indicating, when possible, a way (direct or indirect) through which the experimenters could verify the authenticity of each situation.

The pool of SAs to be included in the retrieval and availability questionnaires was built along the following procedure: an independent group of students (n=100) received the zero-deficit explanation and was asked to propose analogies in favor of the zero-deficit strategy. Two independent judges were required to classify responses into analogical/nonanalogical. Experimenters took all analogical proposals and deleted multiple repetitions of conceptually identical analogical responses (e.g., two cases in which an infection that was not treated in time became worse, so that later treatment was harder than it needed to be) and rephrased the resulting sources to be shorter than 30 words. The same judges received this pool of sources and classified them as intra/interdomain, following a criterion proposed by Blanchette and Dunbar (2000), which regards as intradomain all situations belonging to the domains of politics, economics and personal finances. Finally a second independent group of participants (n=30), who were unfamiliar with the zero-deficit, received these sources with the instruction of indicating those situations they had encountered in their life, be it through personal experience, heard from others, or through whatever source. In order to 1) obtain results amenable of statistical analysis, and 2) assure that interdomain and intradomain situations were roughly equated in terms of their prevalence among the population under study, the pool finally included in the questionnaires compiled all SAs marked as known by at least 1/3rd of this second sample. Six of them had been previously classified as intra-
domain and 14 of them as interdomain by the judges.

Data analysis. Two new judges received instruction on the concept of analogy, as well as on the above criterion for distinguishing intra-domain from interdomain analogies. Judges were then handed the answers to the availability questionnaire, and were asked to decide, for each schematic situation marked as “previously known” by a participant, if the description given by him or her about the particulars of his/her known situation was in fact an instance of that schema. The cases which were regarded as “non-instances” of such schematic situations were dropped from further analysis. A subset of the cases regarded as instances (20%) was further checked for authenticity using a criterion similar to the one deployed by Gentner, Loewenstein, and Thompson (2004). Since more than 87% of the referred instances were proven authentic by the judges, all referred instances were regarded as available SAs in LTM.

To assess in which cases an available instance of a schematic situation was retrieved during the analogy generation task, the judges compared each available instance against the corresponding situation listed by participants in the retrieval questionnaire. For each participant, an available instance of a schematic situation was coded as “retrieved” if it referred to the same situation as its corresponding description in the retrieval questionnaire.

Finally, judges were handed the analogical proposals written by participants during the analogy generation task, and were asked 1) to classify them as analogical/nonanalogical, 2) to check, for each participant, which of his/hers analogical responses corresponded to any of that participant’s available SAs, and 3) to further classify these proposals as intra or interdomain.

Judges agreed in 82% of the cases regarding the availability of SAs in LTM, in 92% of the cases regarding retrieval of such available SAs during the generation task, in 87% of the cases regarding the analogical status of final proposals, in 78% of the cases regarding a match between reported and available SAs, and in 94% of the cases regarding their intra/interdomain nature. Disagreements between judges were resolved by open discussion.

Results

Analogs available for retrieval. The answers to the availability questionnaire revealed that at least 154 intradomain SAs (M = 5.13; SD = 0.62) and 325 interdomain SAs (M = 10.83; SD = 1.43) were available in LTM to be retrieved.

Analogs retrieved. The answers to the retrieval questionnaire revealed that at least 69 intradomain SAs (M = 2.30; SD = 0.71) and 40 interdomain SAs (M = 1.33; SD = 0.79) were retrieved during the generation task.

Comparison between retrieval and availability. The main focus of this study was the contrast between the amount of intra and interdomain SAs retrieved during the analogy generation task and the number of such SAs available in LTM. These quotients revealed that, on average, a specific SA gets retrieved in 22.75% of the cases. While available intradomain SAs were retrieved in 44.80% of the cases, interdomain SAs were retrieved in 12.30% of the cases. These values resemble those obtained by studies using a reception paradigm (e.g., Gentner et al., 1993) and show a clearly detrimental effect of semantic distance between the SA and the TA on its likelihood of being retrieved, $\chi^2 (1, N = 479) = 60.94, p < .001$. Results thus reveal that retrieval under a production paradigm—just like retrieval under a reception paradigm—is highly constrained by superficial similarity.

Analogies proposed by participants. During the analogy generation phase, participants (n = 30) produced 88 analogy proposals for the zero-deficit (M = 2.93, SD = 1.48). Fifty-four were classified as analogical responses (M = 1.80, SD = .96) and 34 as non-analogical responses. These absolute levels of proposals are much lower than those obtained by Blanchette and Dunbar (2000), probably due to the fact that their participants had heard several analogies in
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the media during the months prior to their study (Trench et al., in press). Forty-four out of the 54 analogical responses matched an available SA among the proponent’s answers to the retrieval questionnaire. Thirty-one (70.45%) were interdomain and thirteen (29.45%) were intradomain. As in Blanchette and Dunbar (2000), participants proposed more interdomain than intradomain analogies, \( Z = 3.62, p < .001 \).

Table 2. Number of available, retrieved and used source analogs.

<table>
<thead>
<tr>
<th>SAs</th>
<th>Available</th>
<th>Retrieved</th>
<th>Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrado-</td>
<td>154</td>
<td>69 (44%)</td>
<td>13 (19%)</td>
</tr>
<tr>
<td>main</td>
<td>(M= 5.13)</td>
<td>(M=2.30)</td>
<td>(M=0.43)</td>
</tr>
<tr>
<td>Interdo-</td>
<td>325</td>
<td>40 (12%)</td>
<td>31 (77%)</td>
</tr>
<tr>
<td>main</td>
<td>(M=10.80)</td>
<td>(M=1.33)</td>
<td>(M=1.03)</td>
</tr>
</tbody>
</table>

* Percentage of retrieved SAs used in the analogies

**Comparison between retrieval and use.** A general comparison between the amount of retrieved SAs and the number of such SAs that were included in the proposals revealed that only 40.37% of retrieved SAs were finally included in the proposals. This confirms that the analysis of the reported analogies—as used in the production paradigm—lacks sensibility as a measure of analogical retrieval. While retrieved intradomain SAs were selected in the 18.84% of the cases, retrieved interdomain SAs were selected in the 77.50% of the cases, which shows a clear effect of semantic distance between a retrieved SA and the TA on its likelihood of being finally included among the analogy proposals, \( \chi^2 (1, N = 109) = 33.80, p < .001 \). These results show that the sole analysis of reported analogies, as a measure of analogical retrieval, grossly overestimates the relative proportion of interdomain retrievals.

**DISCUSSION**

A long tradition of experimental studies employing transfer paradigms has shown that interdomain retrieval is low both in absolute terms and in comparison to intradomain retrieval. The standard interpretation of these results is that analogical retrieval rests heavily on superficial similarity between the analogs. Using a production paradigm—which consisted in presenting a real-world target problem and allowing participants to draw on their own knowledge to generate persuasive analogies—Blanchette and Dunbar (2000) found a contrasting pattern of results: high absolute and relative rates of interdomain analogizing. They interpreted these results in terms of retrieval processes not highly constrained by superficial similarities, and suggested that such unconstrained retrieval resulted from the interaction of two factors: 1) the persuasive analogy generation task promotes a structural encoding of the target analog, and 2) the natural encoding of base analogs—as opposed to that of most laboratory studies—promotes their structural processing. Trench et al. (in press, Experiment 2) assessed the effectiveness of the analogy generation task to elicit high rates of interdomain analogizing, but controlling two uncontrolled factors in Blanchette and Dunbar (2000, Experiment 2): The potentially uneven availability of intra and interdomain sources available in LTM, and a possible report bias favoring the report of interdomain retrieved sources over intradomain retrieved sources. Their procedure consisted in embedding a persuasive analogy generation task between two other phases: an uninformed provision of applicable sources prior to the analogy generation task, and a retrospective questionnaire aimed at detecting the cases in which the sources presented during the first phase were retrieved during the generation task, regardless of their inclusion (or not) among the analogical proposals. Trench et al. (in press, Experiment 2) found that although the intradomain sources were more frequently retrieved during the generation task, participants ended up reporting a higher proportion of interdomain sources. The authors concluded that, at least for the experimentally given sources, the retrieval processes triggered by the analogy generation task are highly constrained by superficial similarity. However, a possible limitation of such results resides in having been derived from retrieval
rates of sources provided by the experimenters. It could be the case, as Dunbar (2001) suggested, that naturally encoded sources receive a more structural encoding than experimentally encoded sources, thus increasing their chances of retrieval.

The study reported in this paper was performed to extend previous results to naturally encoded sources. The logic of this study resembled techniques used to investigate marine migration. As in Blanchette and Dunbar (2000) our participants received an explanation of the zero-deficit strategy for eliminating public deficit, and were asked to generate as many analogies as they could to persuade citizens and politicians of the urgency of supporting such policy. However, unlike Blanchette and Dunbar (2000), we complemented this task with two recognition tasks: one of them was intended to detect the availability of source analogs to the zero-deficit that were potentially available in the LTM of participants, and the other was directed to detect which of those sources were recalled, albeit briefly, during the analogy generation task (cf., Chen, Mo, & Honomichl, 2004; Keane, 1987; Ripoll, 1998). Results showed that the likelihood of reporting a retrieved source is more than three times higher when such source is interdomain, as compared to when such source is intradomain. Most importantly, the likelihood of retrieving a naturally encoded source is three times higher when that source is intradomain, as compared to when it is interdomain. This demonstrates that under a production paradigm—just as under a reception paradigm—the retrieval of a naturally encoded source analog is highly constrained by superficial similarity. One possible objection to the calculated likelihoods of retrieving SAs could be that they are based on an inexact measure of analogical retrieval. The answers given to the availability questionnaire were checked for authenticity. However, the answers given to the retrieval questionnaire could have fallen prey to false recognitions—i.e., participants could retrieve an instance of a schematic situation while responding to the retrieval questionnaire, and report it as if it were recalled during the analogy generation task. In case there was a general overestimation, the real likelihoods of retrieving SAs would be lower than those typical of classical experiments, something that would be easily explainable in terms of a greater contextual separation between encoding and retrieval, as well as of a less perfect isomorphism between target and the sources. Nevertheless, the higher proportion of intradomain retrieval would remain unaffected. Such relative likelihoods would only be threatened if the intradomain items of the retrieval questionnaire elicited more false-positive responding than the interdomain items. However, since such situations are not intrinsically intra or interdomain—but only in relation to the target issue, which is not at stake when responding to each of the items listed the retrieval questionnaire—we failed to envision any plausible mechanism through which such a selective false-positive responding could arise.

Concerning the interpretation of our results, a possible caveat would be that the observed intradomain advantage at retrieval was not totally determined by the higher superficial similarity between our TA and the naturally encoded intradomain sources. Several authors (e.g., Gentner, 1989; Medin & Ortony, 1989; Wattenmaker, Nakamura, & Medin, 1988) have pointed out that human reliance on superficial similarities is grounded in the fact that such similarities are usually highly correlated with deeper causal relations. Thus, real-world intradomain SAs—as opposed to what happens with artificially generated sets of stories; e.g., Catrambone, 2002; Gentner et al, 1993—might surpass real-world interdomain SAs in both superficial and structural similarity with the TA. If this were the case, albeit paradoxically, some partial credit should be given to the effect of structural similarities on the intradomain advantage shown in our results. However, this irreducible confounding seems to us a low price to pay in the necessary transition from dealing with artificial stimuli to dealing with the meaningful situations we typically encounter in real life.

If retrieval of natural sources is mostly driven by superficial similarity, what might
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have led Blanchette and Dunbar (2000) to extract the opposite conclusion? We believe that the report bias, although intense, was only part of the story. The rest lies in an inadverted tendency of the authors—like the ratio bias described by Denes-Raj, Epstein and Cole (1995)—to consider absolute values rather than ratios. An analogy proposed by Gentner will help illustrate this point. Gentner (1989, p. 231) compared analogical retrieval to fishing: “One can bait the hook—that is, set up the working memory probe—as he or she chooses, but once the line is thrown into the water it is impossible to predict exactly which fish will bite”. Extending this analogy, one could represent classical experiments on analogical retrieval as fishing in a fishbowl: An interdomain and an intradomain fish are placed on a fishbowl either separately (e.g., Catrambone, 2002; Gentner et al, 1993; Gick & Holyoak, 1983) or together (e.g., Wharton et al., 1994); What matters is assessing the likelihood of each type of fish eventually biting the hook. Traditional studies consistently show that, all other things being equal, a fish coming from a distant domain will be less likely to get caught. As opposite, the production paradigm can be represented as fishing in an unknown lake, in which the proportion of intradomain and interdomain fish is unknown (and perhaps unknowable). Suppose you end up fishing mostly interdomain fish, would you readily conclude that your gear was especially effective for getting this type of fish? Probably not. Unless you knew the amounts of intra and interdomain fish in the lake (or you had previously marked a sample of each type) you cannot draw conclusions from the number of intra and interdomain fish that were taken from the lake.

And what about the analogical paradox at large, that is, the general claim that in natural settings—as opposed to laboratory settings—people can easily use structure to retrieve sources? In principle, this claim could hold regardless of what really goes on in the production paradigm. Dunbar (2001) cites a corpus of seemingly compelling evidence favoring of the hypothesis that the available experimental studies have grossly underestimated people’s ability to draw analogies based on structural features. Blanchette and Dunbar (1997), for instance, have shown that 80% of the political analogies dealing with the referendum for the independence of Quebec were taken from domains different from politics. However, re-reading this naturalistic evidence in light of the present results affords the supposition that the retrieval processes implied in such activities were at least as constrained by superficial similarity as the ones reported here. If our participants, who were asked to report all their remindings, could not help editing out intradomain remindings, what can be expected from a journalist bearing no other restriction than being persuasive? The other cited evidence—which comes from observation of real-world molecular biologists as they work in their labs (e.g., Dunbar, 1997)—showed that analogy was frequently used during lab meetings. However, the fact that 97 out of the 99 analogies produced in the molecular biology labs were either local or regional doesn’t look to us as evidence for unconstrained retrieval either. We prefer to think of it as revealing strong superficial constraints on analogical reminding. In sum, if there really is a dissociation between the way artificial and natural settings affect analogical retrieval, the above evidence does not seem to be the right source of support for it.

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