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Psychology & Psychological Research International Journal
ISSN: 2576-0319

Retrieval Induced Forgetting and Enhancement in Tertiary Law Examinations: Are Law Students Unique?

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Research Article

Volume 3 Issue 1

Received Date: January 17, 2018

Published Date: February 06, 2018

DOI: 10.23880/pprij-16000147

Abstract

An important facet of human cognition is the ability to retrieve information accurately and in sufficient detail across a wide variety of domains. This is particularly relevant in the domain of school examinations. It has been well established that successful retrieval of momentarily wanted information depends to some extent on the inhibition of unwanted, competing information. This phenomenon is termed *retrieval-induced forgetting* (RIF). The authors report three experiments investigating RIF in simulated law school examinations by using legal materials analogous to those used in law courses. The results indicate that retrieval practice strategies involving answering a sub-set of topic-related questions may be detrimental to exam preparation. The resilience of RIF to attenuation was also demonstrated. Providing a potentially pertinent schema during the initial study phase was ineffective in reducing RIF. Intriguing anomalies in the data suggest that the unique requirements of different fields of knowledge may play a role in the effectiveness of particular retrieval manipulations.

Keywords: Retrieval; Inhibition; Law; Schema; Consequence

Introduction

An important facet of human cognition is the ability to retrieve information accurately and in sufficient detail across a wide variety of domains. This is particularly relevant in the domain of school examinations. A transfer of learning occurs when knowledge acquired from one situation is transferred to a different situation. When learning from one situation assists learning in another, this is referred to as *positive transfer* [1]. In contrast, when learning from one situation interferes with learning in another situation, this is referred to as *negative transfer*. Negative transfer, which is usually detrimental to learning, has been relatively neglected as a research topic in the transfer of learning literature. Memory research has demonstrated that the act of remembering can also prompt forgetting, or more specifically, suppression of particular items in memory. This phenomenon is known as *retrieval induced forgetting* (RIF). The present experiments attempt to elucidate a particular strand of the negative transfer of learning whose occurrence is due to RIF [2-4].

The specific aim of the present experiments was to explore RIF in the novel domain of studying for law school examinations. Each of the experiments used legal

materials designed to be analogous to those used in law courses. Along with trying to determine if studying only a sub-set of these materials would ultimately impair performance on an exam, we also manipulated a "perspective taking" variable to see if typical RIF effects could be attenuated – thus potentially providing examinees with a metacognitive tool with which to overcome the typical impairment resulting from RIF. The study of law in tertiary institutions requires the reading of vast amounts of highly technical material about particular law cases. In order to make this material more manageable, students try to guess what information would be most critical on an examination and review only these selected facts about a case, while perhaps ignoring related case facts that they deem to be less important. As a consequence, law students sometimes struggle to answer exam questions that require the retrieval of these ignored case facts. These difficulties are consistent with findings by Anderson, Bjork & Bjork (1994; 2000), Anderson & Spellman (1995) and Macrae & MacLeod (1999) that suggest that the act of remembering certain facts may prompt the forgetting or inhibition of ignored related facts. These experiments are explored in-depth below in the context of a discussion of *inhibition* and *retrieval induced forgetting* (RIF) and theories dealing with the integration of information (i.e., whether it is possible to integrate memories in such a way that repeated retrieval of only certain memories *does not* affect the retrieval of related memories) [5,6]. This research suggests that there are certain conditions under which the forgetting of related items may be reduced or eliminated [7-10]. This work forms the foundation for the current experiments, which investigate whether the benefits of RIF extend to the unique characteristics of law education and can be retained without excessively limiting access to previously forgotten material that subsequently becomes relevant. Because the second and third experiments in the current study explore whether the robustness of forgetting related facts, when retrieving target facts, can be overcome by integrating the facts together, a discussion of this research provides an important framework for the present experiments.

Inhibitory Control

Anderson (2003) explored the manner in which interference causes the forgetting of memories. By this account, a process of inhibition exists that recruits an executive control mechanism to cause the forgetting of memories (hereafter referred to as the *inhibitory theory*). Anderson argues that it is not the storage of new memories that causes forgetting, but rather forgetting, whether subsidiary or intentional, is caused by the process of inhibition that is engaged because of the potential interference on new memories. Inhibition is recruited to overcome interference in memory retrieval by actively inhibiting competitors to a target memory [11-13].

Retrieval-Induced Forgetting

It is sometimes necessary to inhibit or forget bits of information in order to retrieve other information. *Retrieval-induced forgetting* refers to the suppression of potentially interfering items that are in competition with a sought after target item in memory. For example, to retrieve a friend's new phone number from memory, a person might momentarily need to inhibit the old phone number. A consequence of suppressing such interfering items, however, could be the future impairment of these items in a recall task. RIF has been found in an array of tasks including retrieval tasks involving semantic memory, long-term episodic memory, eyewitness memory, misinformation effects, and implicit memory [2,3]. These results illustrate how RIF research supersedes many of the assumptions of the classical interference theory, which argued that the answer to why memories fade involves the interference and storage of new memories replacing old similar memories [14].

In a study exploring the reliability of eyewitness testimony, MacLeod (2002) found that retrieval tasks performed by the participants relating to details of a mock crime scene produced RIF. Similarly, Saunders and MacLeod (2002) produced convincing evidence suggesting that an inhibitory control mechanism is recruited to inhibit and weaken the recall of original facts connected to an eyewitness event when misleading post-event facts are introduced. These types of studies have important ramifications for memory research as it indicates how RIF and the inhibitory control mechanism that mediates it can actually augment the fallibility of memory in everyday life. In their attempts to bring a demonstration of RIF closer to everyday learning experiences, Macrae and MacLeod (1999) tested participants in the context of impression formation of different individuals and produced the standard RIF results. In a further extension they investigated whether RIF would occur in the context of a mock academic exam, arguing that an examination situation might be perceived as having more personal consequence to the participant than impression formation.

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The potential application of the *inhibitory theory* to exam preparation and performance would suggest that the repeated practice of selected information might not be the best strategy to ensure exam success. By implication from their impression formation experiments, Macrae and MacLeod (1999) proposed that retrieval practice of selected information might actually be harmful to exam preparation. Retrieval practice should only prove successful if the student chose precisely the correct information to practice, whereas, if unpracticed information appeared in the examination, it should suffer impairment. To test this retrieval practice prediction, the participants were presented with index cards conveying facts about two fictitious islands, Tok and Bilu. The experiment utilized four phases, a study phase, a retrieval practice phase, a distracter phase and a final test phase. Participants studied 10 cards for each island with each card containing the name of the island (e.g., Bilu) and a single fact (e.g., Bilu's main export is copper). The cards were divided into two subgroups of five for the purpose, consisting of practiced (Rp+) and unpracticed (Rp-) sets of items. The retrieval practice phase involved participants practicing half of the facts that described one of the islands. The ten facts describing the other island would be the non-retrieval practiced (Nrp) items. A control group was included to enable comparison of recall results from participants that engaged in retrieval practice with results from participants that did not. In the retrieval practice phase, the non-retrieval practice (control) group performed a recall task on geographical information, which was derived from a general knowledge base, such as the capital of Australia is C. The control group allowed Macrae and MacLeod to test the prediction that participants who performed retrieval practice would perform significantly worse on Rp- items than participants in the non-retrieval practice (control) group [15].

As expected, the results indicated that the experimental group recall of Rp+ items was significantly greater than the Nrp items, indicating the positive effects of retrieval practice on the target items. The results corroborated the standard finding from previous research and showed that the recall of Rp+ (practiced) items was significantly higher than Rp- (unpracticed) items for the experimental group in comparison to the control group [3]. It was also shown that the retrieval practice group's recall performance of Rp- items was significantly impaired compared with that of the control group performance on the same items, supporting Macrae and MacLeod's prediction regarding examination performance.

Integration of Encoded Information

Throughout this discussion, the executive inhibitory control argument has alluded to the possibility that RIF, through the process of inhibition, is consistently responsible for the forgetting of related items each time a target item is retrieved. However, there appear to be conditions under which RIF of information is either reduced or eliminated. For example, if information that is being encoded and practiced is self-relevant to an individual, the forgetting of any related items appears to be significantly reduced [16]. A recent study indicated that the effects of RIF were significantly reduced if participants were encouraged to integrate studied category members together, and in some cases RIF was eliminated altogether. Integration between conceptual facts appears to attenuate the competition between the facts allowing for increased retrieval of the facts in question. Studies involving integration indicate that by integrating facts together, there is more cohesion between the representations, which ultimately results in less interference relating to the retrieval of the facts. Therefore, the participants require the reduced use of an inhibitory mechanism and are able to retrieve more information [8].

Important early work on schema theory by Pichert and R. C. Anderson (1977) examined how taking a certain perspective when reading text results in inter-connected meaningful representations and increases the integration and accessibility of facts. They argue that when mature readers view text they will generally impose some type of personal structure or schema on the text. It is possible therefore that the propensity to impose a personal schema on text may in some cases change the author's intended structure of the text, indicating that text structure is not an invariant concept. In addition, the perspective or high-level schemata imposed by the reader will determine the level of significance placed on the different text elements and this level of significance of text elements can change with each different perspective. Pichert and Anderson hypothesized that by imposing a perspective, the resulting high-level schema may work as an effective retrieval framework in retrieving learned text elements. Enhanced retrieval in such situations may result from the schema providing implicit cues for the text elements that are considered important to the perspective taken by the reader [17].

In a follow-up article, R. C. Anderson, Reynolds, Schallert, and Goetz (1977) found that individuals with certain backgrounds tend to interpret text in a self-

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relevant way that is meaningful to their knowledge, skills, and experience. They found that when the music students read a passage of text that could be interpreted as either a woodwind ensemble rehearsal session or a card game evening, the music students significantly interpreted the passage of text as referring to the woodwind rehearsal session. Similarly, when reading a passage of text that could be interpreted as a wrestling competition or a prison break, physical education students interpreted the text as a wrestling match. Following the line of reasoning that perspective taking provides an effective retrieval method, it is feasible to argue that by taking a self-relevant perspective when viewing complex information such as exam information, there will be meaningful integration of the text facts and consequently the effects of RIF may actually be reduced or eliminated. As previously seen, however, the extensive research on the phenomenon of RIF suggests that this effect is exceptionally robust. It is therefore possible that, even with the addition of self-relevant perspectives attached to the encoding of exam information, RIF may nonetheless occur; an outcome that would support the idea that this phenomenon is highly resilient in certain memory retrieval contexts [18].

Research Questions & Hypotheses

In Experiment 1 a variant of Macrae and MacLeod's (1999) experiments was used to investigate whether law students engaging in retrieval practice of evidential facts and the relevant statute provisions in a fictional criminal case would produce RIF. Modifications to Macrae and MacLeod's experiments were made to accommodate the unique nature of case law materials. The hypotheses for Experiment 1 were that the retrieval practice of the evidential facts and statute provisions would cause the participants to recall significantly more Rp+ items (practiced items in a practiced category) in comparison to the Nrp items (unpracticed items in an unpracticed category) and significantly less Rp- items (unpracticed items in a practiced category) than the Nrp items. It was decided to include a control group in this experiment, as it was expected that a comparison between the control group and the experimental group's performance would provide further evidence of the detrimental effects of retrieval practice. Results from Macrae and Macleod's second experiment showed that the students engaging in the retrieval practice phase of geography facts, suffered recall impairment of Rp- (unpracticed) items compared with the baseline performance of the control group. It was therefore predicted, that if RIF occurs in this experiment, the experimental group should recall fewer Rp- items than the baseline performance of the control group. It was expected that there would be no significant difference between the experimental group's recall performance and the control group's recall performance on the Nrp items, indicating that retrieval practice has no recall effect on these items.

In Experiment 2 we investigated whether the instruction to participants to take a self-relevant perspective when encoding the evidential facts and statute provisions would reduce or eliminate the effects of RIF. A self-relevant perspective refers to a perspective that individuals perceive as being particularly relevant to them because of their knowledge, skills, or expertise. The specific hypothesis for Experiment 2 was that if the self-relevant perspectives were powerful enough to reduce the effects of RIF, the participants should recall an equal amount of Rp- items in comparison to the baseline recall performance of the Nrp items, indicating that the effects of RIF have been successfully reduced. However, if this was not the case and the effects of RIF proved to be resilient to the imposed self-relevant perspectives, there should be impaired recall of Rp- items for both of the perspective groups.

In line with the Anderson, Reynolds, Schallert and Goetz (1977) argument that people tend to impose a self-relevant perspective to text based on their knowledge base, it would seem natural that the law students could interpret the text using some type of legal perspective. Therefore, one of two self-relevant legal perspectives was assigned to participants in the perspective groups. In one of the self-relevant perspectives, a *criminal defence lawyer* is representing a sibling in a criminal case where the consequence of losing the case results in the life imprisonment of the sibling. As this perspective may be deemed an unlikely or infrequent occurrence in real life, a second, more common, self-relevant perspective as a *public defender* was used in an attempt to test the generality of any potential effects of perspective taking in the reduction of RIF [18].

In Experiment 3 we examined whether enhancing the retrieval practice phase used in Experiments 1 and 2 would enhance RIF effects, since active probing tasks in the retrieval practice phase (e.g. the main export of Bilu is C) have been shown to produce RIF [6]. More specifically, we predicted that by making the retrieval practice task more active the participants would show a significant difference between the recall of Rp+ items and Nrp items and also show impaired recall of Rp- items. A perspective

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group was included in this experiment to examine whether modifying the retrieval practice phase to be more active would make any difference to the recall performance of the Rp- items. It was expected that if the perspective was powerful enough to integrate the evidential facts and statute provisions, the perspective group would show a reduction in the effects of retrieval practice (i.e., RIF) in comparison to the non-perspective group. However, if this was not the case and the perspective failed to integrate the information, it was predicted that the perspective group would show a similar result to the non-perspective group in their impaired recall of Rp- items.

Experiment 1

Method

Participants: Thirty-two undergraduate law students served as participants in this experiment. Participation was voluntary and elicited through campus flyers in the University of Canterbury Law department advertising a free chocolate bar and entry into a draw for one of three dinner vouchers to a restaurant.

Procedure and Materials: The procedure emulated Macrae and Macleod's (1999) study and consisted of four phases including a study phase, a retrieval practice phase, a distracter phase and a final recall phase. Participants were instructed that they would complete a law test recalling evidential facts and relevant statute provisions about a criminal case, and that it was important that they consider the test as a valid assessment. A fictitious criminal case was created to avoid any previous participant knowledge of an existing case that could contaminate the results. The fictitious case and instructions for participants are presented in Appendix A.

In the study phase, participants initially read the fictitious criminal case and were then presented with 20 evidential facts and statute provisions related to the case (the facts and provisions are presented in Appendix B). Each of the evidential facts and statute provisions was presented for 15 seconds by way of a power point presentation. The facts and provisions were split into two categories and designed to be either an *advantage* (10 facts) or a *disadvantage* (10 facts) to the defendant. In the retrieval practice phase, one of the categories was divided into two subgroups to create a practiced set (5 Rp+ items) and an unpracticed set (5 Rp- items), the other category created the Nrp items (non-retrieval practice) condition. See Figure 1 for a schematic of how this scenario might map onto the original RIF paradigm.

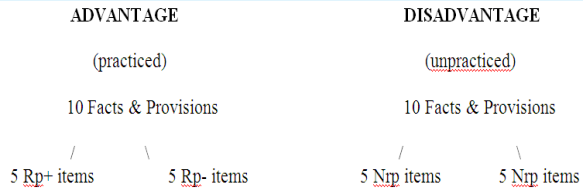


Figure 1: Diagram of how the design of our study maps onto the original Retrieval Induced Forgetting paradigm.

The evidential facts and statute provisions that are of an advantage and disadvantage to the defendant were counterbalanced to ensure that the facts appeared equally as often in the Rp+ items, the Rp- items, and Nrp items. For the retrieval practice phase, the retrieval practice participants were presented with a series of power point slides to aid their recall of 5 of the evidential facts and provisions. They were instructed to read and mentally practice each of the 5 slides. Each of the 5 slides was presented three times in a random order, totaling 15 retrieval practice trials. In contrast, the control group engaged in a no-retrieval practice condition in which the students viewed 15 generic facts about the New Zealand legal system (e.g., the High Court is superior to the District Court). All of the participants, after completing the retrieval practice phase, engaged in a distracter phase in which they were asked to perform basic mathematical calculations for a duration of five minutes. During the final recall phase, the participants were asked to recall as many evidential facts and statute provisions about the criminal case as they could recall (i.e. report in a written format) and they were given unlimited time to complete this phase.

Results

To determine whether RIF had occurred in the retrieval practice group, recall performance between the unpracticed items from the practiced category (Rp- items) was compared with the recall performance of the unpracticed items from the unpracticed category (Nrp items). To establish if this happened, a mixed ANOVA was first conducted to indicate whether there was a significant difference in the repeated measures factor of item types, i.e. Rp+ items (practiced items from a practiced category), Rp- items (unpracticed items from a practiced category), and Nrp items (unpracticed items from an unpracticed category) for the two groups. The results indicated a significant interaction, F (2, 60) = 23.83, $p < 0.001$, and therefore, a single factor ANOVA was conducted for each group separately. As expected, a single factor (item types:

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Rp+, or Rp-, or Nrp) repeated measures ANOVA indicated a main effect for the retrieval practice group, F (1, 45) = 37.99, p< 0.0001. In addition, a single factor repeated measures ANOVA conducted on the control group showed there was no significant difference between the recall means of the different items (i.e., Rp+, Rp-, or Nrp), F(1, 45) = 0.53.

Figure 2 shows the mean number of correctly recalled items for the different item types (i.e., Rp+, Rp-, and Nrp) for the retrieval practice group. Figure 2 also shows a control group comparison analysis of the mean number of each of the recalled item types without any retrieval practice. The vertical bars indicate the standard error for each item type for the retrieval practice group and the control group.

Newman-Keuls post-hoc comparisons for the retrieval practice group indicated that the recall of Nrp items was significantly higher than the recall of Rp- items (M = 3.75 vs. 1.75) suggesting that RIF had occurred. However, the retrieval practice group recall performance of Rp+ items was not significantly greater than the recall of Nrp items (M = 3.44 vs. 3.75), bringing into question the appropriateness of the retrieval practice phase of the experiment and whether the aforementioned Rp- result occurred due to RIF. The predicted result of Rp+ items being significantly greater than the Nrp items is generally important as it demonstrates the benefits of retrieval practice, which in turn may lead to a demonstration of the consequences of retrieval practice, i.e. RIF of the related items (Rp- items).

With the inclusion of a control group, it was possible to further compare the effects of retrieval practice on recall performance. A series of independent samples t-tests was conducted to examine the differences between the recall performance of the retrieval practice group and the baseline performance of the control group. As predicted the retrieval practice of study items increased the recall of the Rp+ items, (M = 3.44 vs. 2.50), t (30) = 3.64, p < 0.001. With regard to the Rp- items, the results showed that there was recall impairment of these items as an effect of retrieval practice, (M = 1.75 vs. 2.66), t(30) = 3.99, p < 0.001. However, again there was an unexpected finding involving the increased recall performance of the Nrp items for the experimental group in comparison to the control group, (M = 3.75 vs. 2.72), t(30) = 3.57, p < 0.001. Because of the typical findings in RIF experiments, it was predicted that there would be no significant difference between the recall of the Nrp items for the two groups, indicating that the retrieval practice of study items has no effect on Nrp items.

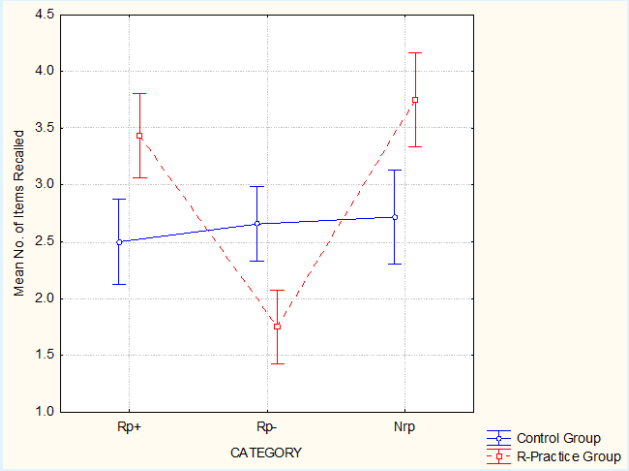


Figure 2: Mean recall for the retrieval practice and control group as a function of item type. Error bars indicate standard errors.

Discussion

The results from Experiment 1 produced several potentially important findings in the context of law examination preparation. The experimental group's recall of the Rp+ items in comparison to the control baseline performance suggests that there are benefits to retrieval practice. The results also revealed that the experimental group's recall of the Rp- items was significantly impaired in comparison with the control group's baseline performance. Both of these results suggest that RIF has occurred. However, because there was a non-significant effect between the experimental group's recall performance of the Rp+ items and the Nrp items, it is questionable whether the retrieval practice phase of this experiment was valid. The retrieval practice phase was designed to replicate as realistically as possible the "best guess" method in which law students study only a selected subset of case law facts. To emulate this, the participants were instructed that they would be given the opportunity to read and mentally practice a subset of five of the evidential facts and statute provisions. The method of study where students simply bullet point case law information, sometimes months in advance, and then read it once or twice before the exam, is in contrast to a more active retrieval of information, wherein students might retrieve information several times by using cues that probe their memory for the information.

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Previous research has indicated that for the benefits of retrieval practice to occur, a more active method of retrieval may be necessary in comparison to the method of repeated study exposure to the practiced items (Rp+ items). For example, in their mock examination experiment, Macrae and MacLeod (1999) cued their participants in the retrieval practice phase by presenting partial information about a practiced item (Rp+ item). Instead of displaying the item *Bilu's only export is copper*, the participants were presented with *Bilu's only export is* C. This technique ensured that the participants needed to actively retrieve the study items. Ciranni and Shimamura (1999) found that mere extra study exposures to the practiced items (Rp+ items) did not lead to the impairment of the related items (Rp- items). However, although there was no apparent impairment of the related items, they did find that the exposure to study items did increase the recall performance of these practiced (Rp+) items. The interesting point to note with Experiment 1 in the current study is that the opposite results were obtained. There was no significant recall difference between the Rp+ items and the Nrp items. Furthermore, the experimental group's recall performance of the Rp- items was significantly impaired in comparison to: 1) the practiced items from the practiced category (Rp+ items); 2) the unpractised items from the unpractised category (Nrp items); and 3) the control group's recall performance of the Rp- items.

An explanation for the non-significant difference between the experimental group's recall of Rp+ and Nrp items may involve the type of recall task that the participants completed during Experiment 1. To help explain the significance of this recall task, consider that in their second experiment, Macrae and MacLeod's (1999) experimental materials included two different categories (i.e., two different islands, Bilu and Tok) with ten attached exemplars (i.e., 10 geographical facts about each island). The ten geographical facts belonging to each island were independent in their content and had no implicit connection to each other, other than the category they ended up in (i.e., unpracticed items in a practiced category, Rp- items) and that they were facts about geographical issues. For example, 'Bilu's main export is copper' has no implicit connection to 'the official language in Tok is French' other than the connections mentioned above.

In contrast, the categories in the present study may have engaged an implicit legal connection, which might explain the unusual finding that there was no significant difference between the experimental group's recall task of the Rp+ items and the Nrp items. There is a fundamental principle of witness cross-examination that is reiterated on a regular basis throughout the university study of law [19-21]. The principle demands that law students consistently search for arguments that counter any stated witness evidence. It is therefore very common for law students to quickly develop an ability to derive counterarguments to the arguments they put forward in their defence or prosecution of the accused. It is possible that the law students' propensity to seek counterargument information linked the recall practice of Rp+ items with the unstudied Nrp counterarguments. This may explain why no significant difference was obtained between the Rp+ items and the Nrp items.

To expand on this counterargument point, consider that the two categories in this experiment provided exemplars (i.e., evidential facts and statute provisions) that were either an *advantage* or *disadvantage* to the defendant (i.e., ten facts and provisions belonged to the *Advantage* category; the other ten belonged to the *Disadvantage* category). However, although Advantage and Disadvantage are independent categories, (similar to Bilu and Tok) there is still an implicit link connecting the materials in that, one category helps to prove the innocence of the accused (i.e., advantage), and the other category helps to prove the guilt of the accused (i.e., disadvantage). Because law students generally develop an ability to generate the information needed to counter their legal arguments, their retrieval practice of study items in Experiment 1 could systematically bring to mind the counterarguments to these study items. In other words, when law students practice evidential facts and statute provisions that are for example, an *advantage* to the accused, this would be akin to the students also practicing the facts and provisions that are a *disadvantage* to the accused. Due to the passive retrieval design of this experimental task and the law student's propensity to generate counterarguments, the finding of no significant difference between the Rp+ items and Nrp items may have a plausible explanation. The lack of a significant difference between the experimental group's recall of the Rp+ items and the Nrp items, coupled with the anticipated RIF finding that extra study exposures did impair the recall of the Rp- items in comparison to the baseline performance of the control group, highlights the importance of testing the benefits of study methods for different disciplines and examination materials.

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Experiment 2

Experiment 2 uses the same materials as those in Experiment 1, but adds a perspective component to the instructions. According to Pichert and Anderson (1977), when individuals take a certain *perspective* before encoding meaningful information, the perspective assists the integration of the meaningful facts, which results in the easier retrieval of the information later. Anderson, Reynolds, Schallert and Goetz (1977) argued that individuals tend to naturally impose a self-relevant perspective to a passage of text that is congruent with their beliefs, knowledge, and personal history. Experiment 2 was conducted to explore whether imposing self-relevant perspectives to the encoding of the experimental materials (i.e. the evidential facts and the statute provisions) would affect the recall of the unpracticed items from the practiced category (Rp- items). The imposed perspectives included the identity of a 'criminal defence lawyer' representing a sibling and the identity of a 'public defender' representing an unknown person. It was thought that the participants would deem these particular perspectives as self-relevant as the participants were law students studying for a law degree. It was also expected that any effects of the perspectives on recall performance would generalise across perspectives, because in both perspectives they would be motivated to remember pro and counterarguments that would help them win their case. There was also an interest in determining whether one perspective produced stronger results than the other. If the perspectives were powerful enough to integrate the evidential facts and the statute provisions, the effects of RIF would be reduced and this would be indicated by the perspective participants recalling an equal amount of Rp- items to that of the Nrp items. However, if the perspectives were not powerful enough to integrate the complexity of the evidential facts and the statute provisions, the perspective participants would show an impaired recall of the Rp- items, similar to the non-perspective participants.

Method

Participants: Forty-eight undergraduate students served as participants in this experiment. Participation was voluntary and elicited through campus flyers in the University of Canterbury Law department. They received either entry into a draw for dinner vouchers and a free chocolate bar or a cash payment of $5.00.

Procedure and Materials. This experiment employed a procedure similar to that of Experiment 1. The participants read the same fictional criminal case and were presented with the same 20 evidential facts and statute provisions as in Experiment 1. However, in the study phase two experimental groups were instructed to take either a 'criminal defence' perspective or a 'public defender' perspective when encoding the facts and provisions. The instructions for both perspectives were in a standardized written format and are presented in Appendix C.

The non-perspective group was given no perspective and instructed to simply review the presented evidential facts and statute provisions. The same counterbalancing method for the evidential facts and provisions in the Rp+, Rp-, and the Nrp item categories was used as in Experiment 1. Following the study phase, as part of the retrieval practice phase, the non-perspective group and the perspective groups viewed 5 facts and provisions (Rp+ items) three times, providing a total of 15 retrieval practice trials. It was predicted that with the added condition of self-relevant perspectives when encoding the practiced items, the perspective participants would show a superior recall of the practiced items (Rp+ items), as there was a heightened importance to recalling these items. With the inclusion of a non-perspective retrieval practice group, a comparison between the recall performances of the Rp+ items could be made to see if there was any significant difference between the perspective groups and the non-perspective group.

Following the distracter phase (the same task as Experiment 1), all three groups of participants engaged in a final recall task and were instructed to recall as many evidential facts and statute provisions as possible. However, the perspectives groups received an additional recall instruction to that of the non-perspective group. The final recall instruction enhanced to a greater degree the dire consequences of losing the case, and therefore the importance of recalling all of the evidential facts and the statute provisions (see Appendix D for the final recall instruction).

Results

A mixed 3 (perspective: criminal defender, public defender, non-perspective) x 3 (item types: Rp+, Rp-, and Nrp) ANOVA was conducted to determine whether the instruction to take a self-relevant perspective when viewing the information reduces or eliminates the occurrence of RIF and whether any effects of the

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perspective taking generalised across the perspectives. The ANOVA showed a significant main effect for item types: Rp+, or Rp-, and Nrp on recall performance, F (2, 90) = 36.88, p< 0.0001. However, there was no interaction, indicating that there was no significant difference between the recall means among the groups on the different item types, F (4, 90) = 0.19.

Figure 3 shows the mean number of correctly recalled items for the different item types (i.e., Rp+, Rp-, and Nrp) for the two perspective groups (i.e., criminal defence and public defender) and the non-perspective group. The vertical bars indicate the standard error for each item type for the perspective groups and the non-perspective group.

Additional analyses were conducted to determine whether RIF had occurred in the non-perspective group's recall performance of the unpracticed items from the practiced category (Rp- items). Newman-Keuls post-hoc comparisons revealed that the non-perspective group's recall of Nrp items was significantly higher than the recall of Rp- items (M = 3.65 vs. 1.81) suggesting that RIF had occurred. However, similar to Experiment 1, the non-perspective group's recall performance of Rp+ items was not significantly greater than the recall of Nrp items (M = 3.44 vs. 3.75).

The post hoc comparisons revealed that the results from the perspective groups do not support the prediction that perspective taking integrates the study items and reduces impairment of the Rp- items. The recall of the Nrp items was significantly higher than the recall of the Rp- items for both perspectives (criminal defence M = 3.91 vs. 1.75; public defender M = 3.88 vs. 1.94). The results also indicated that there was no significant difference between the recall of the Rp+ items and the Nrp items for both perspectives (criminal defence M = 3.50 vs. 3.91; public defender M = 3.63 vs. 3.88). This contradicts the prediction that the perspective groups would show a significant difference between the Rp+ items and the Nrp items as the perspectives were expected to increase the recall retrieval of the Rp+ items. With the inclusion of a non-perspective group, it was possible to further compare the effects of retrieval practice on recall performance when taking a perspective. A series of independent samples t-tests was conducted to examine the differences between the recall performance of the perspective groups and the baseline performance of the non-perspective group. The results indicated that there was no significant difference between the recall means of the non-perspective group and the 'criminal defence' perspective Rp+ items, t(30) = 0.001. Similarly, there was no difference between the recall means of the non-perspective group and the 'public defender' perspective Rp+ items, t(30) = 0.37. It was expected that the participants taking a perspective would show an increase in the number of recalled study items (Rp+ items) in comparison to the baseline performance of the non-perspective group.

Independent t-tests indicated that there was no significant difference between the three groups and their recall of the Rp- items. This was true for both perspectives as the results indicated that there was no difference between the recall means of the Rp- items for participants assigned to the criminal defence lawyer defending a sibling perspective and the more generalised perspective of public defender, t(30) = 0.55. There was no difference between the mean for the non-perspective group and the mean for the criminal defence group, t (30) = 0.20, and the result between the non-perspective group and the public defender group also showed no difference between the means, t (30) = 0.46. This indicates that there was a problem with the prediction that the two assigned perspectives should reduce the effects of RIF. Perhaps the participants either did not perceive these perspectives as self-relevant or, based on their law training, already had a propensity to put themselves in the roles of a prosecutor and defender and thus integrate both pro and counterarguments. Research on RIF has shown that information that is integrated can become more resistant to being inhibited [22].

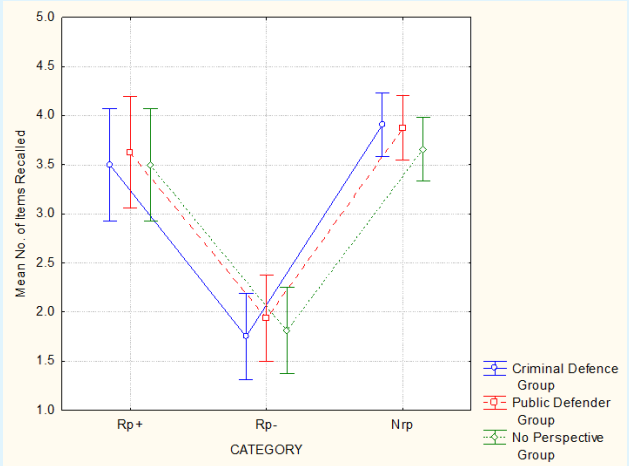


Figure 3: Mean recall for the criminal defence, public defender, and no perspective group as a function of item type. Error bars indicate standard errors.

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Discussion

Experiment 2 produced important results relating to both the non-perspective group and the perspective groups. The results for the non-perspective group replicated the results from Experiment 1 in that, it appears that RIF is occurring because of retrieval practice. It also replicated the non-significant result between the recall of the Rp+ items and the Nrp items and lends support to the idea that law students are demonstrating their ability to generate counterarguments from the Nrp items.

Regarding the perspective groups, while the results do not appear to support the idea that perspective taking reduces the effects of retrieval practice (i.e., impairment of the Rp- items) there was a potential modifying factor because of the implicit perspective taking emphasized in law training. This is in line with the argument made be Anderson, Reynolds, Schallert and Goetz (1977) that individual with particular knowledge and skills interpret text in a way that is compatible to their background experience. If the law students are imposing a self-relevant perspective to the text that is congruent with their experience and knowledge, then this perspective may include the ability to generate counterarguments to the Rp+ items. It appears that the legal knowledge and counterargument skills that the law students possess facilitate the integration of the Rp+ items and the Nrp items. However, even with the assigning of self-relevant perspectives (i.e. criminal defence lawyer and public defender) and the ability to generate counterargument information, the students still appear to fall victim to the decreased memory recall of the Rp- items. This finding appears to indicate the robustness of the phenomenon of retrieval-induced forgetting.

Experiment 3

Experiment 3 investigated the issue of whether modifying the retrieval practice phase of Experiments 1 and 2 to require more active processing of practiced items would result in a significant difference between the recall performance of the Rp+ items and the Nrp items. Research has indicated that mere extra study exposures to study items can be ineffective in producing the benefits of retrieval practice (i.e., a significant enhancement of recall for practiced items from a practiced category, Rp+ items, compared to the unpracticed items from an unpracticed category, Nrp items) [23]. This supports the important contention by Anderson, Bjork, and Bjork (2000) that the inhibitory control mechanism is recall-specific. Therefore, by designing the retrieval practice phase to be more active, the memory resources allocated to encoding the study items (Rp+ items) during the retrieval practice phase should reduce the law students' ability to generate counterarguments from the Nrp items. This, however, may be confounded by the propensity of law students to automatically link arguments with counterarguments. In other words, if this propensity can be overcome, the effect of having a more active form of recall during retrieval practice would exhaust the availability of resources needed to generate counterarguments and the non-perspective group should show a significant difference between the recall of the Rp+ items and the Nrp items. If this manipulation is successful and lessens the ability to generate counterarguments, the typical RIF effects should emerge (i.e., compared to the Nrp, there should be both Rp+ enhancement and Rp- decrement in recall).

A perspective group was included to test whether enhancing the retrieval practice phase would have any effect on the recall performance of the Rp- items. If the perspective taking integrated the evidential facts and the statute provisions, it was expected that the participants would show an increase in recall performance for the Rp- items in comparison to the non-perspective group. However, if the perspective taking again failed to integrate the complexity of the facts and provisions for whatever reason, it was predicted that there would be similar recall between the two groups.

Method

Participants: Thirty-two undergraduate University of Canterbury law students voluntarily served as participants in this experiment. Recruitment was via campus flyers in the University of Canterbury Law department and each participant received a cash payment of $5.00.

Procedure and Materials: Experiment 3 was conducted with two groups of participants, a perspective group and a non-perspective group. As there was no indicated difference in Experiment 2 between the results for the two perspectives, to avoid unnecessary complication it was decided to have only one perspective group and to instruct all the perspective participants to envision themselves as a 'public defender'.

This experiment, as in Experiments 1 and 2, employed a modification of the Macrae and MacLeod's (1999) task. However, in contrast to Experiments 1 and 2, the retrieval

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practice phase was modified to enhance the participant's retrieval of the Rp+ items. In the retrieval practice phase, all of the participants were instructed that they would review a subset of the evidential facts and statute provisions three times. They were initially instructed for the first power-point screening to write down each of the different facts and provisions. For the second and third power-point screenings of the facts and provisions, the participants were instructed to use these additional reviewing times to modify or correct anything that had been incorrectly written down about each fact and provision, thus inducing additional memory retrieval attempts.

Although the retrieval practice phase in this experiment was designed to ensure a more active form of retrieval, it still captures the way law students prepare for exams. When preparing for law examinations, law students tend to bullet point information from law reports that they consider important to the legal topic that they are studying. It was therefore considered important to replicate this technique in the retrieval practice phase of this experiment.

In addition to enhancing the active nature of the retrieval practice phase, it was decided to add an extra fact or provision to each item types condition (Rp+, Rp-, and Nrp) as this would potentially heighten the likelihood of finding a difference between the Rp+ and the Nrp items. The additional evidential facts and statute provisions are as presented in Appendix E. The distracter phase and the final recall phase remained the same as in Experiments 1 and 2.

Results

A 2 (perspective: public defender, non-perspective) x 3 (item types: Rp+, Rp-, and Nrp) mixed ANOVA with repeated measures on the second factor was conducted. This analysis attempted to determine whether the instruction to take a perspective when reviewing the facts and provisions had any effect on recall performance in comparison to the non-perspective group. The ANOVA showed a significant main effect for item types (Rp+, Rp-, and Nrp) on recall performance, $F(2, 90) = 207.35$, $p < 0.0001$. However, as with Experiment 2, there was no interaction, indicating that there was no significant difference between the recall means for the two groups on the different item types, $F(4, 90) = 1.42$.

Figure 4 shows the mean number of correctly recalled items for the different item types (i.e., Rp+, Rp-, and Nrp) for the perspective group and the non-perspective group. The vertical bars indicate the standard error for each item type for the perspective group and the non-perspective group.

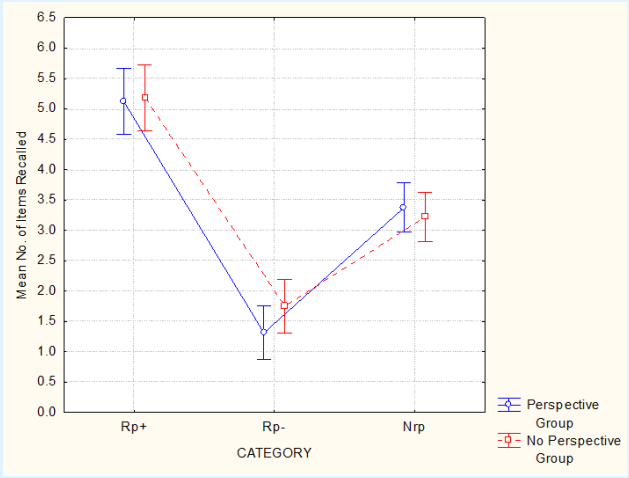


Figure 4: Mean recall for the perspective and non-perspective group as a function of item type. Error bars indicate standard errors.

Additional analyses were conducted to determine whether RIF had occurred in the non-perspective group's recall performance of the unpracticed items from the practiced category (Rp- items). The results were also examined to establish whether the enhanced active nature of the retrieval practice phase produced a significant difference between the recall performance of the Rp+ items and the Nrp items for both groups. Newman-Keuls post-hoc comparisons for the non-perspective group indicated that the recall of Nrp items was significantly higher than the recall of Rp- items (M = 3.38 vs. 1.75) suggesting that RIF had occurred. More importantly, the comparisons revealed that the recall performance of the Rp+ items was significantly higher than the recall of the Nrp items (M = 5.19 vs. 3.22), indicating the benefits of active retrieval practice. As stated earlier, this result is generally important because it shows the advantage of actively retrieving information and it supports the argument that the significant recall performance of the Rp+ items can ultimately lead to the inhibition of related items.

A series of independent t-tests was conducted to establish whether there were any significant differences between the recall performance of the non-perspective

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group and the perspective group. Comparable to Experiment 2, the results showed that the perspective participants received a similar impaired recall mean for the Rp- items to that of the non-perspective group (M = 1.31 vs. 1.75), $t(30) = 1.43$. Regarding the practiced items from the practiced category, the results revealed no significant difference between the non-perspective group's recall mean of the Rp+ items and the perspective group's recall mean of the Rp+ items, (M = 5.19 vs. 5.13), $t(30) = 0.17$. Taken together, these results suggest that, as with Experiment 2, the participants either failed to take on the self-relevant perspective (possibly because of already thinking in a defender/prosecutor perspective), or because of the insufficiency of the manipulation, or the self-relevant perspective failed to facilitate retrieval. Chan (2009) demonstrated that a lack of improvement in self-relevant conditions points to problems with participants taking on a self-relevant perspective rather than any kind of RIF resistance to the integration of information [24].

Discussion

Overall, the results from Experiment 3 produce strong evidence that the retrieval practice of selected study items in preparation for exams has both positive and negative effects. On one hand, students are quite clearly advantaged if they have chosen the correct information to study and are able to answer the exam questions with clarity. However, if the questions require retrieved knowledge from related unpracticed information, it appears that students are placed in a disadvantaged position. The results from this experiment suggest that the retrieval practice of selected study items produces RIF resulting in the detrimental inhibition of related study items. This suggests that the strategy of answering selected exam questions may not be the best strategy for exam preparation. It also appears that, in the context of law students studying information from legal cases, the use of perspectives is ineffective and possibly redundant.

General Discussion

The present study focused on three objectives: 1) to establish whether the phenomenon of *retrieval-induced forgetting* exists in the context of tertiary law examination; 2) to determine whether assigning self-relevant perspectives to legal information has any effect on the occurrence of *retrieval-induced forgetting*; 3) to ascertain whether making the retrieval practice task more active enhances recall of practiced items from a practiced category (Rp + items), compared to the recall of unpracticed items in the unpracticed category (Nrp items). The motivation for the exploration of *retrieval-induced forgetting* (RIF) in the context of tertiary law examination preparation began with findings from Anderson and Spellman (1995) using lists of word pairs, and Macrae and MacLeod (1999) in the context of a mock Geography exam [3,6]. These studies found that the act of remembering certain information could prompt the forgetting of related items in memory. Anderson (2003) argued that the forgetting of related items is the result of an inhibitory mechanism engaged to deal with the potential competitors to target items in memory [11].

Our experiments produced several important findings. The replication of RIF in a new context, (i.e., the study of tertiary law) was successfully achieved and adds to the increasing number of social situations in which the phenomenon occurs. It appears that the retrieval practice of a subset of evidential facts and statute provisions connected to a criminal case can lead to the impaired recall of related facts and provisions. This finding supports previous research that suggests that an exam study technique requiring the repeated answering of selected questions may be detrimental to retrieving material that was not selected for additional study.

An unusual finding in this study showed that the retrieval practice of study items (Rp+ items) for some reason had an enhancing recall effect on the Nrp items (unpracticed items from an unpracticed category). Retrieval practice of study items usually has no effect on Nrp items. Contrary to other social applications of RIF (e.g., impression formations), the study of law seems to produce the propensity to recall counterargument information from the unpracticed category (i.e., Nrp items). It appears that in the present study the participants' retrieval practice of the study items (e.g., evidential facts and statute provisions that are an *advantage* to the accused) helps to retrieve the counterarguments to these study items (e.g., evidential facts and statute provisions that are a *disadvantage* to the accused). The approach to studying cases employed by law students thus appears to involve an implicit form of schema or perspective taking that encourages them to see a case from both the perspective of a defence attorney and a prosecutor. This dual perspective helps explain the enhanced recall of Nrp items. Additionally, the failure of the explicit perspective taking instruction in Experiments 2 and 3 to counteract RIF may be due, in part, to the pre-existence of this dual perspective schema. Nonetheless, the failure of both implicit and explicit perspective taking to counteract *RIF* in this domain demonstrates its

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robustness and the strength of the resulting negative transfer of learning.

Implications for Inhibition in the Context of Law Study

Preparation for tertiary law examinations demands the laborious task of identifying the important points from massive amounts of legal information. The 'question spot' approach (i.e., best-guess heuristic as to possible exam questions) that allows law students to reduce the amount of encoded information appears to have both positive and negative consequences. The retrieval practice of selected facts leads to an increased ability to recall this information. However, the downside of this is the negative transfer of learning resulting from impaired recall performance of non-selected, but potentially important information relevant to exam questions. An implication from the current study, therefore, suggests that if law students study only selected legal facts, their ability to retrieve related legal facts is weakened by a recruited inhibitory mechanism. Furthermore, it appears that the inhibition of related facts may occur from the more passive study technique of reviewing extra study exposures to the study items. This finding contrasts with previous research that suggests that extra study exposures will not result in the impaired recall of related information.

Another potentially valuable implication from the current study is that the type of recall task and sample population used may have a significant bearing on recall performance. It appears that the retrieval practice of study items (Rp+ items) by law students can assist the retrieval of unpracticed information (Nrp items) when the recall task involves the retrieval of legal evidence in a criminal case. In contrast to disciplines that emphasise a one-directional prediction relating to the cause and effect of an event, the study and practice of law requires the ability to argue both sides of an issue. Our results suggest that the type of analytical thinking that law students consistently engage in can lead them to retrieve unpracticed information contained in the Nrp items when these items consist of the counterarguments to practiced (Rp+) items.

With the current finding that assigning self-relevant perspectives to participants did not reduce the impairment of the Rp-items, there appeared to be no support for the prediction that taking a perspective should provide an effective retrieval framework for the integration of all the study items [17]. Instead, the present findings show how resilient *RIF* can be in certain situations. This is in contrast to findings by Anderson and Bell (2001) who produced evidence showing the successful integration of learned complex propositions (e.g., the actor is looking at the tulip) using an alternative integration procedure to assigning a perspective. It is suggested that attempts be made to broaden these findings in the context of other varieties of specialized university study as it may provide valuable insight into appropriate study techniques that may differ across disciplines. It does appear that the current findings from Experiments 1 and 2 (i.e., there was no significant recall difference between the Rp+ items and the Nrp items) map onto the Anderson, Reynolds, Schallert and Goetz (1977) self-relevant schema argument [18]. They argued that individuals tend to interpret text according to their personal experience and knowledge base. In the case of the law students participating in the current study, they appear to be recalling counterargument items (Nrp items) to the Rp+ items, in a schematic manner that is consistent with what they are taught to do in the tertiary study of law.

Inhibition in Selective Memory Retrieval

A review of existing research in RIF suggests that occasionally it is necessary for us to forget certain facts in order to remember other facts. Because a representation in long-term memory may lead to numerous associated memories, it seems reasonable that there is some type of inhibitory mechanism that is recruited to deal with the unwanted memories. In light of the findings from the current study, it appears that the same inhibitory mechanism that is responsible for making our lives easier when it comes to ignoring irrelevant information, is also responsible for the impaired accessibility of information that may be needed at a later time (see also Li, Neumann, & Chen, 2017) [25-41].

Conclusion

The current study clearly shows that the effects of retrieval practice (i.e. RIF) generalize to the social domain of law study. The domain of tertiary law, thus, becomes a new addition to the other social domains where the existence of RIF has been established (e.g., eyewitness testimony, misinformation effects, impression formations, and mock geography examinations). This extensive body of converging evidence implies that a common inhibitory mechanism is responsible for both aiding the retrieval of desired information and for the sometimes detrimental forgetting of competitive related items.

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