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ABSTRACT

The author's stated purpose is to convince the reader that there is practical and theoretical importance in a general principle whereby the greater the amount of interference present during the initial learning of a particular task, the better the subsequent retention to new situations. The author attempts to convince the reader with empirical data showing that interference during learning facilitates subsequent retention or transfer, and also attempts to describe this relationship in a way that makes good intuitive sense. On the basis of the empirical evidence presented, it is concluded that these psychological experiments on the effects of intratask interference during original learning on subsequent retention or transfer, leaves no alternative but to take seriously the facilitative nature of these effects. The need is also expressed for research conducted in educational and applied-learning settings, rather than the psychological laboratory, to determine whether the principle can in fact be generalized to nonlaboratory situations. (BW/Author)

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INTERFERENCE DURING LEARNING AS A SOURCE OF FACILITATION IN SUBSEQUENT RETENTION AND TRANSFER

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My purpose here is to try to convince as many people as I can of the reality, and practical as well as theoretical importance, of a general principle whereby the greater the amount of interference present during the initial learning of a particular task, the better the subsequent retention of that learning or its transferability to new situations. That's right, there is no misprint in the title of this presentation, "Interference during learning is a source of facilitation in subsequent retention and transfer," or at least this is the argument I am going to try to make here.

This principle, specifying an inverse rather than the usually assumed direct relationship between difficulty of learning something and difficulty of remembering it after it has been learned, has everything that would cause you to disbelieve it. Your initial inclination may even be to dismiss it as something that could only have been dreamed up by some crackpot, who couldn't possibly have any evidence to support it. All of us, whether experimental psychologists doing basic research in learning and memory, educational researchers or practitioners, or ordinary laymen, tend to think intuitively of interference during learning as something that is universally bad, and is to be minimized or avoided completely, if possible. Given this kind of view, it would be completely counterintuitive that anything which interferes with learning could possibly do anything other than interfere also with subsequent retention or transfer of the learned material.

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Thus our usage of the concept of "interference", which currently has achieved a high level of unpopularity among learning and memory researchers as well as practitioners, will probably also interfere with anyone taking seriously the position I am advocating. The recent widely publicized failures of interference theories of forgetting have undeniably led to widespread disfavor, although this has been true only during the later stages of our decade of research in this area. Parenthetically, I should mention that at least some of the alleged failures of the Underwood-Postman type of interference theory of forgetting can be attributed to their failure to consider the important role played by intratask interference during learning, although I have had a distinct lack of success in convincing either Underwood or Postman of this. However, I am prepared to argue that if our principle is properly taken into account, many of the apparent difficulties with interference theories of forgetting become converted instead into evidence that is entirely consistent with such theories.

In any event, my argument here suffers not only from being counterintuitive, but also from its reliance upon an interference concept which currently is in somewhat ill repute. This puts me in the position of not only having to try to convince you with empirical data showing that interference during learning facilitates subsequent retention or transfer, but also having to try to describe this relationship in a way that makes good intuitive sense. Furthermore, it appears that I must undertake the latter before I am likely to have any success in getting you to take the data seriously. Consequently, I will begin by spending a few minutes trying to characterize this principle so that it makes sense intuitively, although I should confess that this is something that was developed only after we had obtained substantial empirical evidence supporting the principle. I will follow this by describing for you a couple of the most convincing of the many experiments we and others have done which show that subsequent retention or transfer is better if original learning has taken place under conditions of high intratask interference.

Following this attempted empirical exposition, I will say a few words about what we think happens during learning under high intratask interference that leads to improved retention or transfer, followed by a brief discussion of what I see as the implications all this has for education. Finally, I will talk about the range of application of this principle, and the types of interference conditions where it seems to be most extensively applicable. All of this should not require all of the 45 minutes allotted to me by the program committee, after which you will have the opportunity to leave for lunch, hopefully less negative toward my position than you are now. I hope at least some of you will stay to ask for more evidence or more detailed discussion of any of the points I am trying to make, or to try to convince me that I am wrong, any or all of which I hopefully will be prepared to undertake during the remainder of the session.

Now, let's see if I can translate our principle, that intratask interference during learning leads to facilitated subsequent retention or transfer, into a format that hopefully will make more sense to you. Like most allegedly new or different ideas, this one is not really new, and bears more than a passing resemblance to such age-old adages as "You have to work hard to learn or accomplish anything worthwhile" or to a quotation from Booker T. Washington that "Achievement is measured not so much by the success one reaches in life, as by the obstacles overcome in trying to succeed." Also, the firmest conclusion emerging from research on the most important factors related to memory and forgetting, that degree or level of original learning is by far the most important of these, seems not at all inconsistent with our principle.

The most effective way I know of talking about this principle is in terms of interference from other learning or activity as the principal reason why people forget things they have learned, and I would contend that any shortcomings in such "interference theories" of forgetting in no way challenge the basic validity of this position.

For our purposes here, we can turn this around to say that if forgetting is primarily the result of interference from other activities, then the best way to prevent such forgetting is to provide for learning under conditions that offer maximal resistance to subsequent interference-produced forgetting. How better can this be accomplished than to require that original learning take place under conditions where the interference that normally would lead to forgetting is actually present during the learning, so that once learning is accomplished it has already overcome this interference and subsequently will be resistant to it? And this latter contention reduces to just another way of formulating our basic principle, that intratask interference during original learning leads to facilitation of subsequent retention or transfer. Or, in somewhat less technical terms, if there is something that would normally produce forgetting of what you have just learned, learning under conditions where this source of forgetting is actually present may serve to prevent forgetting. Translated into the educational situation, if you want the student to remember what he has learned or been taught, the learning situation should include also any other learning or activity that possesses sufficient interfering potential to bring about subsequent forgetting of what has been taught.

I should also make explicit that our principle is not dependent on any particular assumptions about what processes or factors are involved in learning, or what happens when people forget. It applies equally to learning viewed as gradual strengthening of responses or associations by reinforcement, as the processing of information, or as the development of insightful or cognitive strategies or rules. It also applies equally to forgetting conceived as the gradual decay or unlearning of responses or associations, as insufficient storage or encoding of information, or as the loss of retrieval cues or strategies adequate to recover the stored information when it is needed. This is not to say that such basic issues are unimportant, or that I have no position concerning them, but merely that interference during learning as a source of facilitation of subsequent retention or transfer is equally compatible with any of the currently prevailing views of what processes operate during learning and forgetting.

All we are claiming is that whatever the nature of the learning processes, and whatever happens during forgetting, subsequent retention will be better to the extent that the sources of interference which bring about forgetting are present and overcome at the time learning is taking place.

Stated in this manner, our principle may appear to be no more than an indirect way of saying that learning is less likely to be forgotten if more time is devoted to the learning or if the learner is required to learn the material better. Certainly it is true that the more intratask interference is present, the longer it typically takes to learn the material to a given level or criterion, so that any improvements in retention could be attributed merely to the greater time or difficulty required for learning rather than to any facilitative effects of the intratask interference per se. Our research on this problem, however, has made it quite clear that facilitated retention or transfer resulting from original learning under conditions of high intratask interference cannot be attributed solely to the greater time or effort involved in learning. Thus in my efforts now to try to convince you of the reality of this principle in terms of the experimental support for it, I will focus primarily on two of our several experiments where facilitated retention or transfer resulted from learning under high intratask interference which did not involve more time devoted to original learning.

Although I won't try to summarize all of the experimental evidence relevant to our principle as part of my formal presentation, I will be prepared to do so after the talk is over if so requested. For anyone interested in reading more about this, I can refer you to a chapter I recently wrote for a book published by Academic Press this year, edited by R. F. Thompson and J. F. Voss, and entitled Topics in Learning and Performance, in which I have covered in some detail not only our own research concerning this principle, but also experiments from several other laboratories which offer support for it.

The first of the two experimental demonstrations of this principle which I want to focus on here represented a 1964 Ph. D. dissertation under my direction at Virginia by Russell Johnson, the results of which were largely responsible for my realization that intratask interference during learning as a source of facilitation in subsequent transfer and retention was potentially important and deserved to be considered seriously. Johnson's experiment regrettably has never been published, although a description of its essentials was included in my 1966 chapter on "Facilitation and Interference" in Bilodeau's Acquisition of Skill (published by Academic Press), which represented my first published formulation of this principle.

In Johnson's experiment, there were two stages, the first representing a paired-associate type of pretraining task with nonsense shapes as stimuli and common English words as responses. The second stage involved multiple-choice recognition tests of the stimulus shapes, which can be considered as measuring shape-recognition transfer, or retention, or both.

The critical variable in Johnson's experiment represented amount and type of intratask interference present in the first pretraining stage. There were three types of interference producing variations. At the stimulus-shape level, 9 mutually dissimilar shapes provided low-interference conditions, while 3 dissimilar subsets each consisting of three highly similar shapes constituted high-interference conditions. At the response level, low-interference conditions involved only 3 dissimilar response labels, each paired with 3 of the shape stimuli, while high-interference conditions represented 9 different responses with three each belonging to each of 3 different exhaustive categories, these being army-navy-marine, ampere-volt-ohm, and masculine-feminine-neuter. At the level of the shape-word pairs, there were systematic variations in the consistency or congruence with which similar shapes were paired with the same or similar responses. At the low-interference extreme, each of the three similar shapes were paired with the same one of the 3 response labels. At the opposite high-interference extreme, each of the 9 response labels was paired with the similar stimulus shapes such that each similar shape had a response label from a different exhaustive category, and each of the 3 response labels from each category was paired with shapes from different stimulus categories.

In this experiment, all conditions had exactly the same number of pretraining pair presentations, so that correct labelling responses on the last trial block of the pretraining task varied from 96.3% for the minimal interference condition with each of 3 response labels attached to all 3 similar shape stimuli, to only 70.5% for the highest interference condition with 9 similar shapes and 9 response labels incongruently paired together. Despite these differences in original learning, however, subsequent shape-recognition accuracy was only 31.9% for the minimal interference condition, increasing to 42.2% for the highest-interference condition. Said another way, with maximal interference on the pretraining task, terminal pretraining performance was only 73% as high as for the minimal-interference conditions, but subsequent recognition performance was nonetheless 32% better than the minimal-interference conditions. This relationship pervaded throughout the range of the 14 different pretraining conditions in Johnson's experiment, as shown by a significant <u>negative</u> correlation of .58 between pretraining and recognition performance. When conditions differing in ways not related to intratask interference during pretraining were pooled together, this negative correlation increased to over .91. These correlations seem even more impressive when it is considered that the recognition measures represented a combination of two different types of individual recognition tests which correlated only .25 with one another across groups.

The evidence from Johnson's experiment seems quite clear in showing that subsequent recognition of stimulus shapes was substantially improved if they had been used as stimuli in a pretraining task involving substantial levels of intratask interference, despite the lower levels of terminal learning achieved on the pretraining task as intratask interference was increased.

The second of the two major experimental demonstrations of our principle which I want to tell you about is of much more recent vintage, representing a Master's thesis completed in my laboratory a little over a year ago by James Pellegrino, which was published in the January, 1972 issue of the <u>Journal of Experimental Psychology</u>.

Pellegrino's experiment complements Johnson's very nicely in a number of ways, although it was carried out in the context of the classical paired-associate retroactive-interference paradigm, with variations in response formal similarity as his key intratask-interference producing variable. Two levels of response similarity were used, the low-interference level involving 12 consonant-vowel-consonant words using all vowels and with 12 different first and third consonant letters. For the high-interference responses, only four consonants and two vowels were used for the 12 words, for example, BAG, BAT, BUM, GAB, GUM, GUT, MAG, MAT, MUG, TAB, TAM, and TUB.

Despite the apparent difficulty in learning pairs consisting of 12 highly similar words like these, we were surprised to find that paired-associate learning of the crucial first list in this experiment to a criterion of one errorless trial required only a little over half an additional trial, on the average, than the first list with low-similarity responses. The high-interference list did, however, produce a significantly higher proportion of presentations after the first correct response to a pair on which errors were made, and such "after errors" represent the best index of intratask interference in this type of task, according to our previous research. Consequently, as in Johnson's experiment, Pellegrino was able to produce differences in intratask interference without involving larger amounts of practice for the high-interference conditions, and in addition had near equivalence of high- and low-interference conditions in terminal performance level, which Johnson didn't have.

Following the usual retroactive interference paradigm, Pellegrino's experimental groups all learned two paired-associate lists in succession followed by a series of retention tests focussing primarily on the first list, while his control groups learned only the first list, worked on a pyramid puzzle for the time required by the experimental subjects for second-list learning, and then were tested for first-list retention. Both high- and low-interference first lists were used, each for four of the eight experimental groups and one of the two control groups. The 4 experimental groups within each first-list interference condition represented the four possible combinations of low and high interference second lists, with either the same or completely different stimuli used in the two lists.

Since the second-list responses were always different from those of the first list this meant that the experiment included both the A-B, A-D and A-B, C-D transfer paradigms typical of retroactive-interference research, with all possible combinations of low or high interference first and second lists represented within each of these paradigms.

According to our principle, the groups learning high-interference first lists should show less forgetting than the groups with low-interference first lists. For the experimental groups, this is exactly what happened. Recall measures of forgetting showed nearly twice as many items forgotten by the low as the high interference experimental groups. Even when measured by a response-recognition test, the low-interference groups showed nearly half again as much forgetting as the high-interference groups, 19% as compared with 13%. In short, Pellegrino's results offered particularly impressive evidence that forgetting produced by retroactive interference is substantially less for lists with high than with low intratask interference during learning, or, retention was clearly facilitated for lists learned under high intratask interference conditions.

In addition to demonstrating the basic validity of our principle, Pellegrino's experiment also provided a great deal of additional information concerning other aspects of its operation, which can be summarized in terms of five separate but related points. First, the reduced forgetting for high-interference first lists was just as evident for the A-B, C-D paradigm as it was for the classical A-B, A-D paradigm usually considered as maximizing retroactive interference. In other words, the principle operates irrespective of whether the same or different stimulus words were used in the two lists.

Second, there were no differences in first-list retention between the high- and low-interference control groups, suggesting that intratask interference may facilitate subsequent retention only if there is subsequent interfering learning or activity sufficient to bring about substantial forgetting.

Third, at least for the basic MMFR (Modified-modified-free-recall) measure usually used in retroactive-interference experiments, high-interference second lists produced significantly more forgetting of the first list than did low-interference second lists. Thus the groups with low-interference first lists followed by high-interference second lists showed 26% forgetting, nearly three times as much as the 9% forgetting for the groups with high-interference first lists followed by low-interference second lists. Clearly lists learned under high intratask interference are not only better retained themselves, but also interfere more with the retention of other previously learned materials.

Fourth, the several retention tests employed in Pellegrino's experiment offered some evidence as to just what processes are facilitated or strengthened under high-interference conditions. The results showed clearly that learning and differentiation of both stimulus and response terms were substantially strengthened, although it was unclear whether or not stimulus-response associations were similarly facilitated. To quote Pellegrino, "The present Ss seemed to rely on any type of process providing a way of overcoming intratask interference effects." Said somewhat differently, for effective learning to occur under conditions of high intratask interference, subjects typically must learn more things better about the material in order to perform successfully, and this additional or different learning also makes the learned material more resistant to subsequent forgetting.

Finally, despite the sizeable effects of intratask interference on first-list retention in Pellegrino's experiment, there were no such effects on transfer to learning of the second list. This indicates that direct retention of previously learned material shows greater facilitation from intratask interference during learning than does transfer when the material is used in some new or different learning task. This greater sensitivity of retention than transfer to facilitative effects of previous learning under high intratask interference is consistent with the results of several of our previous experiments in this area, although there are also a number of experiments which do show facilitated transfer due to intratask interference.

Failure to find facilitated transfer typically reflects the non-adaptability or irrelevance of the new or additional learning induced by intratask interference to the requirements of the transfer task. At least this interpretation has been successfully applied to each of our several experiments which failed to show any facilitation of transfer following learning under high intratask interference. This is only one of many serious methodological complications making for difficulty in researching this problem, which I'll be happy to discuss later if anyone so desires.

Hopefully this will be enough to convince you that substantial empirical support exists for our principle specifying high intratask interference during original learning as a major source of facilitation in subsequent transfer or retention. In addition, I know of at least 34 other experiments which I interpret as offering support for this principle, 12 in our laboratory, and 22 done elsewhere, usually by investigators failing to acknowledge that their results bear any relevance to our principle. These represent a wide variety of experimental variations in intratask interference, including formal, acoustic, or associative intralist similarity, length of list or number of items to be learned, presence or absence of required transformations or recoding of items during learning, serial position of items within the list, number of other items or responses intervening between successive presentations, complexity of the stimulus materials, and learning two different artificial vocabularies either together at the same time or separately at different times. Incidentally, this last demonstration, in a 1969 Journal of Educational Psychology article by Yeni-Komshian and Lambert, is the only one I know appearing in the educational rather than the experimental-psychological literature, and they make no reference to any other literature related to our principle in any way.

Even though the educational research literature seems to contain little if anything which even considers the possibility that increased intratask interference during learning may produce better subsequent retention or transfer of the learned material, applications of this principle in educational practice are far from unknown.

Some elementary school-teachers of my acquaintance have told me of instructional materials, especially in the area of reading instruction, which involve, for example, learning words in the direct context of other words of highly similar form or meaning. Such practices are also evident in the Stanford computer-assisted-instruction (CAI) program for teaching initial reading, at least one would infer this from some of the examples given in Atkinson and Fletcher's January, 1972 article in The Reading Teacher, although nothing is said here about any empirical or theoretical rationale for doing this. Since increased intratask interference can hardly be introduced without drastically increasing the occurrence of wrong responses or errors, especially at the early stages of learning, our principle clearly contradicts the minimization or elimination of errors that represents one of the basic tenets underlying Skinnerian type programmed-instruction techniques, the strong influence of which may well explain why nothing like our principle appears to have been made explicit by anyone working in education.

Recently I had called to my attention, by a graduate student who previously had been a flight instructor in the military, that flight training under conditions of the types of intratask interference associated with the actual flight situation was an important feature of the flight-instruction manuals prepared by the Federal Aviation Agency. More specifically, "integrated flight training" based both on outside visual references and attention to flight instruments at the same time (quote) "have been proved to produce more capable and safer pilots for the operation of today's airplanes," as compared with one type of training without involvement of the other. That this procedure runs counter to rather than being consistent with basic learning principles is very nicely demonstrated by the presence in the "Fundamentals of Teaching and Learning" section of this same manual of the following alleged "common misconceptions about learning". One misconception is that "making it easier for a student to learn is contrary to the fundamentals of sound teaching," another is that "failure is a part of life, so tests should be developed so that no one can get a perfect score."

Rather than being "misconceptions", these quotations seem more consistent with the aforementioned teaching of visual reference flying in the context of instrument flying that is advocated as the best flight-training procedure. It seems as though effective teachers and practitioners may be putting into practice our principle that learning under conditions of high intratask interference leads to improved subsequent retention or transfer, despite the counterarguments often advocated by learning and educational researchers and theorists.

Based on what I've said thus far, you may well be getting the impression that I consider learning under conditions of high intratask interference to be some kind of panacea providing the solution to all of education's problems, which certainly is not my intention at all. In fact, our research has really shown only that our principle applies quite generally provided that we are dealing with sources of intratask interference which are intrinsically a part of the learning task or situation, and provided that interference is not so strong as to prevent effective learning from taking place at all. Obviously there is no way that intratask interference could even produce, much less facilitate, subsequent retention if it is so strong that there is no original learning. Furthermore, although our research to date is not entirely clear on this point, it would appear that facilitation of subsequent retention or transfer requires either that the sources of intratask interference present during learning are similar to those that would typically bring about subsequent forgetting, or that these lead to the enhancement of learning processes which make the learned material more resistant to forgetting, or both of these.

Based on the above considerations, I would be inclined to expect that completely extraneous sources of interference irrelevant to the materials or task to be learned, like playing the radio while studying, should not produce any facilitation of subsequent retention or transfer, although I know of no actual research adequate to determine whether or not this is the case. All the research I know of has dealt only with sources of intratask interference intrinsically involved in the learning task.

Just during the past few months, however, Stephen Brunette has completed an undergraduate independent study project in my laboratory which suggests that retention may also be enhanced by the inclusion during learning of interference completely extraneous to the learning task. Brunette's experiment required free-recall learning of a list of 15 common words presented visually, under varying extraneous auditory interference conditions ranging from simply playing music on a tape recorder while the word list was being studied, to the aural presentation also of 10 letters at a 3-second rate during each 30-second study trial, with the subjects being required both to repeat aloud these letters as they were presented, and also to pronounce the 10-letter word formed by the presented letters immediately after their presentation and before attempted recall of the words. Unfortunately, Brunette's 15-minute retention interval proved too short to produce sufficient forgetting in any group to show any retention differences as a function of extraneous interference, as all groups showed at least 90% correct recall during the delayed retention test. However, when evaluated in terms of recall differences from the last free-recall learning trial to the 15-minute delayed retention test, the highest-interference group, where subjects were both required to say the extraneous letters and pronounce the word formed thereby during the study period, actually showed a slight half-of-one-percent gain, while the other three lower-interference groups all showed at least a 4% loss. These differences, however, were significant at only the 10% level, so it can only be suggested that extraneous sources of interference during learning may also produce some facilitation of subsequent retention of the learned material.

In the hope that it may stimulate some discussion of the major issues concerning our principle which I have tried to develop here, I should like to conclude with some explicit challenges and controversial statements regarding the points I have been trying to make, as far as future educational research and practice is concerned.

As should be obvious by now, I think the empirical evidence, emerging primarily from psychological experiments on the effects of intratask interference during original learning on subsequent retention or transfer, leaves no alternative but to take seriously the facilitative nature of these effects. What is clearly called for now is research conducted in educational and applied-learning settings, rather than the psychological laboratory, to determine whether our principle can in fact be generalized to nonlaboratory situations. Educational research of this type would appear to be of sufficient potential significance to merit high and immediate priority, since it would be concerned with what may be serious shortcomings both in underlying principles, and current practices and procedures, which govern present-day educational learning.

I challenge anybody to compile as convincing evidence to support those basic and largely unquestioned educational principles which sharply conflict with our principle, such as immediate reward for correct responses being the key to effective education, punishment for wrong responses being largely ineffective in producing learning or education, or students needing to be carefully led through a sequence of simple and error-free small steps in order to learn effectively, because experiences of failure allegedly prevent effective learning. Such principles may have some validity insofar as ease or speed of original learning is concerned, but our work must at least raise considerable question as to the long-term benefits derived from original learning under such simplified, rewarded, and error-free conditions. Hopefully it is not necessary to remind anybody that education that is forgotten immediately after the learning experience, or cannot be applied outside of the actual learning situation, is often little if any better than no education at all.

Finally, my reason for being here today, and devoting considerable time and effort to formulating my position so as to be appropriate for communicating effectively with educational researchers and practitioners, is because our previous writings on this issue, appearing primarily in the experimental psychological literature, appear to have had no impact whatever on the field of education or educational research. . .

Equally ineffective have been my several efforts to communicate these ideas informally to specific individuals in the field of education. This is why I have taken the initiative to develop this particular mode of presentation of what I have to say, and to step outside the ivory tower of the basic learning research laboratory to try to convince educators to apply our basic research findings to situations where such applications seem to be particularly called for. Hopefully the impact of my formal presentation, which I shall now conclude, will be such as to dispel my present feeling that the basic problem with the application of basic research findings to educational practice is not the disinterest of basic researchers in developing such practical applications, but rather the disinterest or unwillingness of educational researchers and practitioners, with respect to taking seriously basic research findings which challenge their cherished beliefs, assumptions, and preferences, as our principle clearly does.

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INTERFERENCE DURING LEARNING AS A SOURCE OF FACILITATION IN SUBSEQUENT RETENTION AND TRANSFER

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Johnson (1964) Low and High-Interference Conditions and Results (see Battig, 1966)

Pretraining Conditions

Low Interference	Stimulus	High Interference
MARINE	A_1	MARINE
"	A_2	FEMININE
"	A_3	AMPERE
FEMININE	B_1	ARMY
"	B_2	MASCULINE
"	B_3	VOLT
AMPERE	C_1	NAVY
"	C_2	NEUTER
"	C_3	OHM

Results

Interference	Pretraining (% Correct)	Recognition (% Correct)
LOW	92.9	31.9
↓	76.8	34.1
↓	67.1	36.3
↓	59.9	36.9
HIGH	54.4	42.2

Pellegrino (1972) Design and MMFR Results (Mean % Forgetting)

Experimental Transfer Paradigm

1st-list Similarity	A-B, A-D: 2nd-list Sim. High	A-B, A-D: 2nd-list Sim. Low	A-B, C-D: 2nd-list Sim. High	A-B, C-D: 2nd-list Sim. Low	Experimental Total	Control
High	21.6	12.5	4.8	5.6	11.1	3.5
Low	36.8	27.1	15.3	8.3	21.9	3.5

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