

The highlight for March is by Dr. R.E. Lubow from the Department of Psychology at Tel Aviv University in Israel. My introduction to Dr. Lubow and his work was in 1973 when he published a seminal review on latent inhibition (Psychological Bulletin, 1973, 79, 398-407; interestingly, the paper became a Current Contents' Citation Classic in 1985). This review was important for my own research in that many of us had stumbled upon a similar effect in taste aversion learning during which exposure to the taste prior to conditioning appeared to weaken subsequent aversion learning (the so-called CS preexposure effect; learned safety). Dr. Lubow's work was much broader than what was being reported in aversion learning and had greater implications for general learning theory. This broader implication forms the basis of Dr. Lubow's interest in and work with latent inhibition and taste aversion learning. As he notes in his highlight, he became interested in aversion learning for the specific advantages offered in this design, advantages that allowed for specific assessments of the effects of various manipulations on latent inhibition that were quite difficult to do in other preparations (both human and animal). The advantages of the taste aversion design in the study of latent inhibition and the types of data generated from the aversion procedure are described in Dr. Lubow's highlight. Regarding specific findings, latent inhibition apparently weakens if a delay is imposed between the exposure and test phases, but, interestingly, only if the context in which the animals are maintained during this delay is similar to that in which exposure and testing occur. If animals spend the delay in a different environment from that in which exposure and testing occur, latent inhibition is potentiated. Dr. Lubow begins his highlight noting that his interest in the aversion design was a function less of its unique nature and more a function of what it could tell him about latent inhibition in general. Although not focusing on the unique nature of aversion learning, he, nonetheless, closes his summary with a caveat that the unique procedures associated with the taste aversion preparation (those that allow the advantages of the design in the study of latent inhibition) paradoxically make generalizations somewhat difficult (given that the questions that can be addressed with aversions are difficult in other preparations). It is an interesting paradox and one that hopefully will drive more analyses.

**Apparently Simple CTA Procedures Can Obscure Some Unusual Effects:
Retention Interval Context Determines If Latent Inhibition Increases or
Decreases as a Function of Time**

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Unlike many of the other contributions to this series of reminiscences, my research with conditioned taste aversion (CTA) has not been guided by the desire to understand this unique example of learning. Instead, I have used CTA as a tool to explore a different phenomenon, a ubiquitous effect that cuts across paradigms, namely latent inhibition (LI). As most of you know, LI is an empirical phenomenon that is defined as relatively poor performance on a learning task in which the currently relevant stimulus had a history of being unattended or ignored, as compared to the same stimulus when it is novel. In short, LI is said to occur when there is evidence for poor learning performance with an old, irrelevant CS compared to a novel one. LI effects are particularly prominent in CTA (Lubow, 1989; Lubow, in press).

Although there have been a number of explanations of LI, contemporary theories reside within two major classes – acquisition/associative deficit (A-theories) and retrieval/competition (R-theories). A-theories assume that irrelevant stimulus preexposures impair the ability of that stimulus to enter into new associations. In contrast, R-theories claim that stimulus preexposure does not affect associability. Instead, the stimulus preexposed (PE) and non-preexposed (NPE) groups enter the acquisition phase with the same capacity to acquire new associations. According to R-theory, almost exclusively tested in three stage paradigms (preexposure, acquisition and test), when a phase-three test is employed, a CS-0 (CS-no consequence) association that was formed by the PE group during the preexposure phase competes with the CS-US association formed in the acquisition phase. Accordingly, the LI effect is exhibited because in the test stage the NPE group has only the second association to be retrieved, whereas the PE group retrieves the associations formed during the preexposure phase *and* the acquisition phase, ones which can compete for expression.

Although A-theories of LI were in the ascendancy during the 1970s and 1980s, it has become increasingly clear that some aspects of R-theories must also be accommodated in order to explain the full range of LI results, particularly those

from context and retention interval studies (for a review of the older theories, see Lubow, 1989; for more recent developments, see Lubow & Weiner, in press).

Normally, LI experiments make a point of using the same context in the preexposure and acquisition/test stages. However, if the contexts are different from each other, then LI is disrupted (for review see Lubow, 1989, pp. 74-82; Lubow, 2009). These results are critical for R-theories because in the preexposure phase the subject has no knowledge of the forthcoming acquisition-test conditions, context or otherwise. Therefore, during the preexposure stage, the context-same and the context-different groups must process the PE stimulus and context information in an *identical* manner, and any difference in performance between the two groups in the test must be attributed to a process that surfaces *after* preexposure, such as retrieval-competition.

A retrieval account of LI also gains support from experiments that have manipulated the time between the stage-2 acquisition and stage-3 test stages. If one varies the time between acquisition and test, and LI is found after a short delay but not after long delay (typically 21 days), this is evidence that with the short-delay the CS-US association was acquired but not manifest, and that something occurred during the longer retention interval that allowed the association that was *normally* encoded in the acquisition phase to be retrieved.

When Gonzalo De la Casa and I reviewed this literature, we became aware of three consistent features: 1) most studies reported that LI decreased as a function of the retention interval; 2) almost all of these experiments used the CTA paradigm; 3) with few exceptions, the preexposure, acquisition, retention interval and test stages all were conducted in the *same* context, namely the home cage. Later, we provided a detailed account of these findings (for a list of LI-CTA studies that have manipulated retention interval duration, and a description of the contexts of the various stages, see Lubow & De la Casa, 2005, Table 1).

In retrospect, we should not have been surprised by the conjunction of these three features. The popularity of the CTA protocol comes, at least in part, from the fact that it does not require a special apparatus. Thus, a complete procedure can easily be conducted in the home cage. And, if retention interval duration is an experimental variable, then what can be simpler than just leaving the animal in the home cage for the specified period of time? Such simplicity cannot be readily attained with standard conditioned avoidance or conditioned suppression learning procedures. However, the sirens of simplicity evidently have led to a disregard of the possible consequences of the atypical CTA conditions.

Indeed, in the few early experiments that failed to find a recovery of the conditioned response (i.e., less LI) after a long delay between the acquisition and test stages, the interval was spent in a context that was *different* from that of preexposure, acquisition and test (e.g., Kraemer & Spear, 1992, Exp. 1). Given that context and retention interval effects play critical roles in supporting R-

theories of LI, and puzzled by the possibility that the context of the retention interval might affect LI, De la Casa and I embarked on a program of research designed to clarify the role of these variables. In brief, we found that LI actually became stronger with an increase in the temporal interval between the stage-2 acquisition and the stage-3 test, but *only* when that interval was spent in a context that was different from that of the other stages (De la Casa & Lubow, 2000, 2002, 2005; Lubow & De la Casa, 2002, 2005). In other words, it appears that super-LI is generated with AA[B]A context conditions (the first, second and fourth letters represents the contexts of the preexposure, conditioning and test stages; the third letter, in brackets, the context in which the interval is spent). As opposed to this, the attenuated LI that is found after a long retention interval requires a BB[B]B condition, in which the interval is spent in the same context as that of the other stages (e.g., Aguado, Symonds & Hall, 1994).

That the context of a long duration retention interval can either attenuate or potentiate LI, depending on whether it is the same or different from the contexts of the other stages is a startling and perplexing discovery that may have had significant implications for theories of learning and memory, and their applications. However, there is a significant problem. On the one hand, the animal-CTA preparation provides a unique opportunity to study the effects of long retention intervals under context conditions that cannot be duplicated in experiments with human participants, where subjects cannot be kept in the same context for extended periods of time. For human subjects, one can duplicate the different-context condition but not the same-context condition. On the other hand, for animals, with the exception of the CTA protocol, practical equipment problems would make it difficult to use the same-context condition. It would seem, then, that only the animal-CTA preparation allows for the instantiation of *both* the same- and different-context conditions. As a consequence, CTA is a unique source for generating otherwise unavailable data. And there's the rub. To have an impact on theories of learning and memory, it is necessary to replicate the results from the rat-CTA studies with other research procedures, and with human subjects.

Unfortunately, beyond the evidence from the rat-LI-CTA experiments, there is little to support the generality of the time-induced retention interval context effects. The need for additional research is obvious, as are the obstacles which confront it, namely to overcome the inability to impose the long retention interval/same context condition on human subjects, and the practical difficulty in doing so with other organisms, except with the CTA paradigm.

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