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The Future of Enrichment for Lab Animals

Over the last 30+ years, enrichment has become a staple in animal care for a wide range of captive environments. But there has been relatively little study of its effectiveness. More importantly, the modern science of animal behavior has, in many cases, left enrichment behind with repeated use of simple methods and lack of a deeper understanding of problem behavior. We suggest that there are new revolutions in animal behavior, including in technology (for data logging and enrichment itself), behavioral genetics, learning theory, and temperament and personality, all of which can contribute to better animal welfare. But first, before we look forward, we need to know where we have been.

Laboratories, zoos and aquaria, domestic animal shelters, farms and the like have all contributed a great deal to our understanding of the benefit of enrichment to the psychological well-being of captive animals. Outside of laboratories and farms, many studies suffer from extremely low sample sizes and a lack of experimental control of many important aspects of the environment. When these shortcomings become so rampant in the literature, it is necessary to take a step back and analyze the whole of the data—the perfect situation for a meta-analysis.

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Three such meta-analyses have been published on the effects of environmental enrichment on captive animal behavior as a metric for welfare. In each of the prior meta-analyses, experimental design limited the focus to specific environments, behavior, and/or taxa. Shyne (2006) went so far as to attempt to explore the effectiveness of specific environmental enrichment on stereotypy, but found no significant results. Our meta-analysis went beyond the scope of the previous studies by including all captive environments and all commonly recorded behaviors. We expanded the number of studies by only requiring a change from a baseline measure. Since many of the published enrichment articles available do not report crucial data needed for calculating effect sizes, had we used the same statistical methodology as the prior studies, we would have been limited to roughly the same zoo and aquarium research and thus the same results.

By expanding the scope of our meta-analysis, we were able to tap into important trends that have not yet been addressed. Namely, we found trends indicating that specific enrichment types can be used to target specific behaviors based on the subject's taxa. We found that, without controlling for taxa, foraging-based enrichment worked better at increasing explorative behaviors than did enclosure manipulation

based enrichment. Further, we found that enrichment as a whole worked better at increasing exploration in carnivores than it did in ungulates. Along these same lines, results indicated that enrichment was more successful at influencing inactivity in carnivores than in primates; the same was found for the effect of enrichment on "other behaviors", or those which were either not able to be categorized due to low sample representation or were designated as "other" by the original authors.

When we contrasted specific enrichment types between and within taxa, we again found multiple notable results. We discovered that among carnivores, ungulates, and primates, foraging-based enrichment worked least of all for reducing stereotypy in primates. We found that foraging enrichment, specifically, worked better at increasing exploration in carnivores than in ungulates and that foraging enrichment worked better for increasing enclosure use in carnivores than in primates. All is not lost for primates, however. We found that "Other Enrichment" types (those which were not food,

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enclosure, sensorial, social, or toys) worked best for reducing stereotypy in primates than did foraging-based enrichment types. Within carnivores, our results suggest that foraging-based enrichment worked better than enclosure manipulations at influencing exploration. Lastly, we found that within our sample, the enrichment types that seemed to have the biggest influence on a specific taxon were not the ones being used most commonly within that taxon. Carnivores were provided the most "Other Enrichment" and both ungulates and primates were given more foraging-based enrichments than carnivores.

Our results suggest that an ethologically-supported approach to enrichment may make the use of enrichment to influence captive animal behavior more efficient. We believe that future developments in enrichment will come from creative application of technology, quicker and easier data collection to document outcomes, better understanding of behavioral genetics and evolutionary relationships and history, sophisticated application of new findings in learning theory, and the incorporation of new methods for quantifying and understanding differing animal temperaments.