

The Effects of Auditory and Visual Enrichment on Abnormal Repetitive Behaviours and Enclosure Use: a case study with California sea lions (*Zalophus californianus*).

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Introduction

- Sea lions are not using full enclosure at ZSL Whipsnade Zoo
- Phocidae spend up to 50% of their time showing ARBs- more than felids and ursidae (Swaisgood and Shepherdson, 2005)
- Auditory and visual enrichment are the least implemented types of enrichment (Hoy, Murray, and Tribe, 2010)
- Combined enrichment has been shown to be more engaging than singular enrichment (Hanna et al., 2017)
- Aim: To determine the effects of auditory enrichment, visual enrichment, and combined (auditory + visual) enrichment on ARBs and enclosure use
- Hypothesis-
 1. Combined (most effective)
 2. Auditory
 3. Visual (least effective)

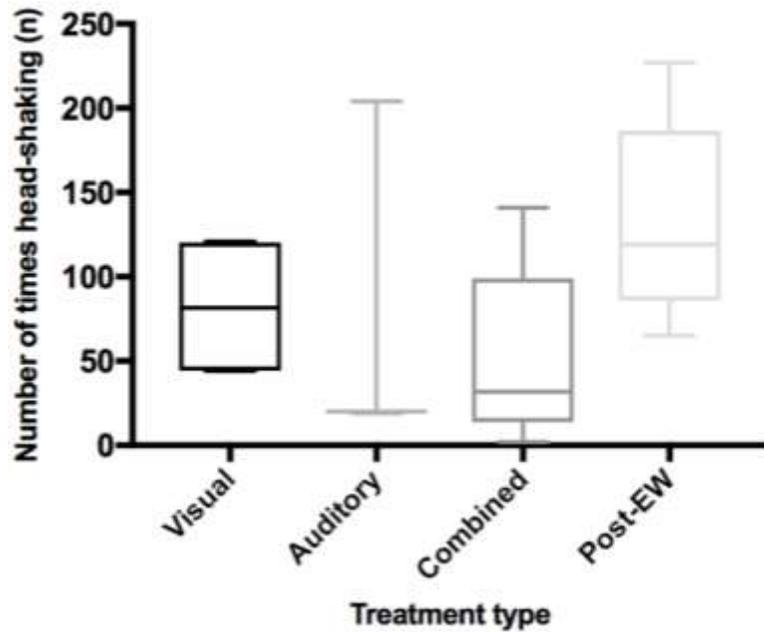
Methods

- Initial pilot study
- Recorded enclosure use and state behaviours with instantaneous scan sampling every 5 min for 90 min trial periods using CCTV
- Recorded event ARBs with conspicuous continuous sampling (head shaking, spin turning)
- 2 trials a day (morning and afternoon), 3x a week
- Washout weeks in-between
- Pre-enclosure changes and post-enclosure changes (baseline) also recorded from CCTV footage



Results-Abnormal Repetitive Behaviours

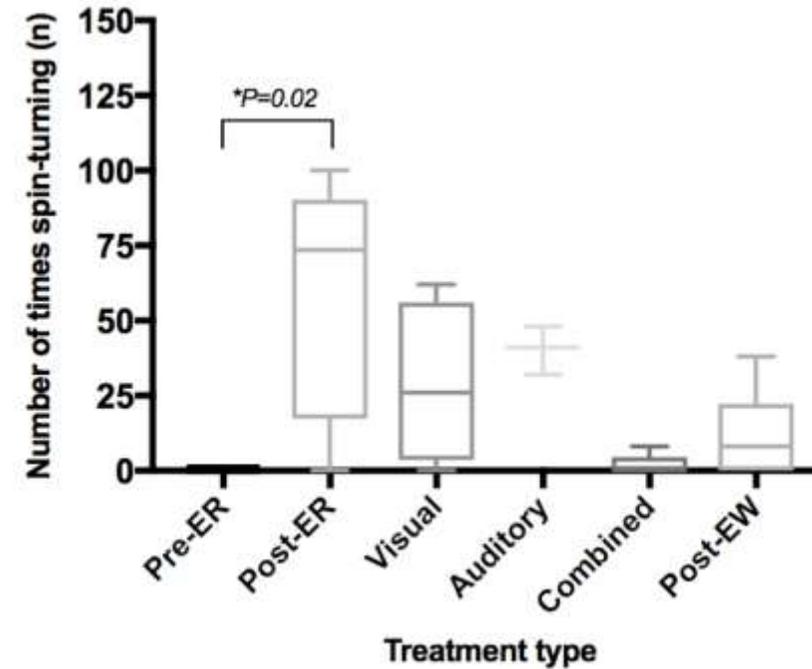
Head-shaking



No statistically significant differences

1. Auditory 2. Combined 3. Visual

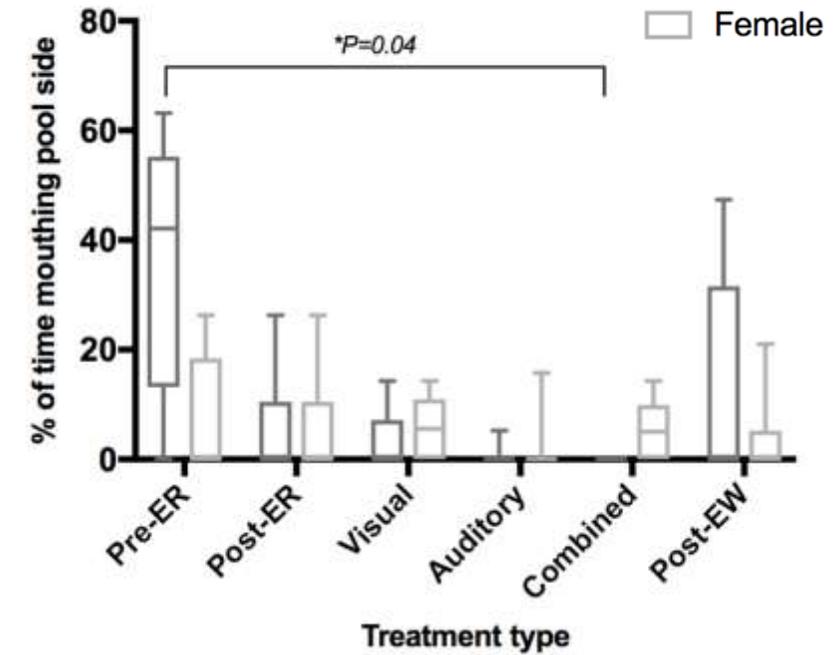
Spin-turning



Significant interaction ($H=15.63$, $P=0.008$)

1. Combined 2. Visual 3. Auditory

Mouthing pool-side

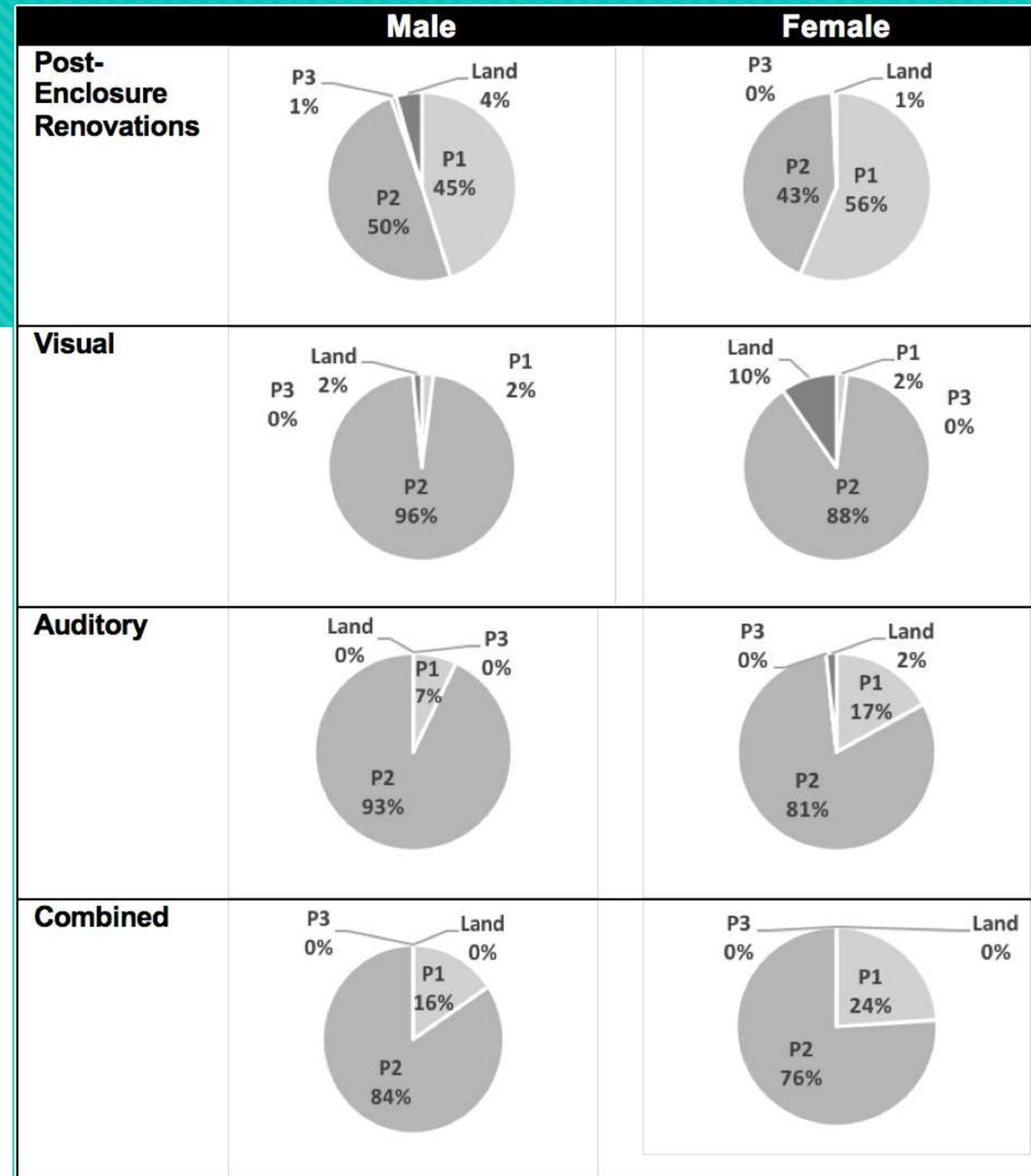


Trend found ($H=10.26$, $P=0.06$)

Male: 1. Combined 2. Auditory 3. Visual
 Female: 1. Auditory 2. Combined 3. Visual

Results- Enclosure changes

- **Male:** Highly significant interactions found for enclosure use overall ($F_{15,96}=8.72$, $P<0.0001$)
- **Female:** Highly significant interactions between the data overall ($F_{15,94}=6.93$, $P<0.0001$)
- Pool 1 and 2 use changed significantly, but not Pool 3 or Land



Conclusions

- Revealed that combined and auditory enrichment seem to be most effective overall at reducing ARBs
- Visual enrichment seemed to be most effective at increasing enclosure use
- Suggests importance of individual enrichment evaluation on separate ARBs and to consider sensory abilities
- Cheap and practical solutions to improve welfare for captive sea lions
- Cannot generalise findings to population due to small sample size and limited trials