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# Creativity in Dolphins and Sea Lions

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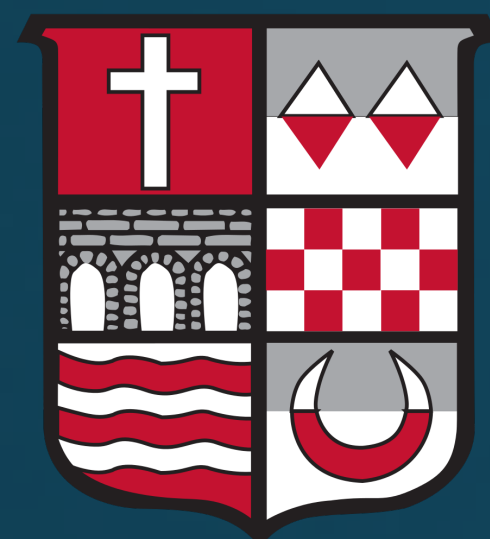
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Courtemanche, Allison; Chiaraluce, Brianna; and Weaver, Melissa, "Creativity in Dolphins and Sea Lions" (2017). *Academic Festival*. 58.

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# Creativity in Dolphins and Sea Lions

Allison Courtemanche, Brianna Chiaraluce and Melissa Weaver  
Mentors: Deirdre Yeater and Dawn Melzer



## Abstract

Torrance Tests of Creative Thinking (TTCT) are a leading methodology for collecting creativity data on an individual person. Creativity has become more widely accepted as a method of measuring cognitive abilities in humans as it has little to none of the bias commonly found in intelligence testing. A modified Torrance test was used to investigate innovative capabilities in bottlenose dolphins (*Tursiops truncatus*) (N=17) and sea lions (*Zalophus californianus*) (N=8) at Dolphin Encounters, The Bahamas. The subjects were trained using a “create” cue. The data were analyzed for fluency and flexibility of behavioral responses. Some dolphins produced more “creative” responses than others and differences emerged based on sex, age, and species. Understanding the nature of creativity across marine mammals in a controlled context may provide insight into the current definition of creativity, which in turn may enhance our understanding of the importance of play as an enrichment activity. The eventual goal of this research is to compare innovation in these marine mammals with other non-human animals and human children as related to development.

## Introduction

- Pryor et al. (1969) investigated rough-toothed dolphins and completely novel behaviors, never occurring by dolphins at that facility, were deemed “creative”.
- Kuczaj & Eskelinen (2014) included any behavior or combination of behaviors in a non-repeat contingency to be counted as “creativity”.
- Creative behaviors are novel for each individual or animal, as personality plays a role in every behavior (Kuczaj, 2017). In other words, bolder animals have a tendency to be more creative compared to those who are not as bold.
- The Torrance Tests of Creative Thinking (TTCT; Torrance, 1974). are the leading method of assessing creative abilities in an individual person. The TTCT evaluates four areas: Fluency, Flexibility, Originality, and Elaboration.



## Goal

To apply modified human creativity tests to investigate innovative capabilities in several species of marine mammals and eventually very young human children, with limited verbal abilities.

## Methods

- Data was collected at Dolphin Encounters in The Bahamas with bottlenose dolphins (*Tursiops truncatus*) (N=17) and sea lions (*Zalophus californianus*) (N=8).
- Subjects were trained using a “create” cue where each species would have to display a new behavior in order to receive reinforcement.
- These behaviors were recorded by a GoPro or Sony video camera and segments typically lasted for a few minutes, or until the new creative behaviors diminished.

## Results

- **Reliability** –
  - Intraclass Correlation Coefficient (ICC) reliability between independent coders for fluency was 0.974 for dolphins and 0.935 for sea lions
- **Frequency** –
  - Dolphins: 59 different behaviors coded
  - Sea lions: 42 different behaviors coded
- **Range** –
  - 1-16 behaviors given in each sequence (trial)
- **Fluency** – (See Table 1)
  - No sex differences found for dolphins. Female sea lions, on average, displayed more behaviors than males,  $t(6) = -5.861$ ,  $p = 0.001$ .
- **Flexibility** – four independent raters converged on the numbers of behavioral categories
  - Dolphins = 5 (Simple Show, Complex Show, Basic, Natural, Aerial)
  - Sea Lions = 4 (Show, Husbandry, Basic, Natural)

**Table 1:** Average number of behaviors on each trial

Species	Sex	Mean	SD	N
Dolphin	Male	11.23	2.44	7
	Female	12.51	1.72	10
Sea Lion	Male	11.62	1.06	3
	Female	15.16	0.68	5

## Discussion

- Preliminary findings may provide insight into the current definition of creativity, which in turn may enhance our understanding of the importance of play as an enrichment activity.
- Given that training sessions are considered forms of enrichment and cognitive stimulation for the animals, training the innovate behavior would stimulate the animals’ minds (i.e., have to remember what has been offered before to continue the sequence) while also potentially enriching the behavioral repertoire even more (e.g., the animal creates a novel combination of behaviors that the trainer wishes to capture).
- Additionally, the same methods were applied to preschool children (ages 3-5) in Bridgeport, CT, where they were given a “create” cue and asked demonstrate new behaviors. This data is currently be analyzed.
- Given the limited understanding of creative abilities in animals and young children this comparison using a modified version of the TTCT (Torrance, 1974) offers exciting possibilities that may have a wide applicability to a variety to animals under human care.



## Acknowledgments:

The authors thank Kathleen Dudzinski, Dolphin Communication Project, and Allison Kaufman for assistance collecting the data. We also thank the trainers and especially Annette Dempsey, Assistant Director Dolphin Encounters, for allowing us access to test the animals and for training the “innovate” behavior.

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