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A Comparative Test of Creative Thinking in Dolphins (*Tursiops truncatus*) and Preschool Children

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Abstract

Few studies have investigated the development of creativity as a measure of intelligence/cognitive ability in non-human species and children. A non-verbal method to test creative thinking in bottlenose dolphins and preschoolers was developed and implemented. A comparative investigation of innovation in these species indicates that this creativity measure my demonstrate similarities related to cognitive abilities in the future.

Introduction

- Recently there has been interest in substituting creativity (innovative) assessments to investigate IQ due to decreased language demands and possible biases usually associated with traditional IQ tests.
- There are three approaches represented in the literature with respect to asking dolphins to be innovative on request:
 - 1) Examining novelty in behavior(s) that had not been previously observed or reinforced (Pryor, et al. 1969; Pryor, 1975)
 - 2)Reinforcing behaviors previously learned while not repeating an immediately preceding behavior (Mercado et al., 1998)
 - 3)Reinforcing varying strings of behaviors (i.e., chained behaviors) within each test trial (Kuczaj & Eskelinen, 2014; Lawrence et al., 2016).
- Little research exists applying these approaches to human children although they might provide insight into the intelligence levels of young non-verbal children or those with disabilities.
- 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. Fluency refers to the number of novel behaviors an individual creates when prompted and is the focus of the current project.

- Goal: To apply modified human creativity test to investigate innovative capabilities of fluency in a species of marine mammals and young human children, with limited verbal abilities.

Method

Participants:

- The subjects in this study were eight bottlenose dolphins (*Tursiops truncatus*) and 17 preschoolers (aged 3-5 years).
- The data were collected from the Roatan Institute for Marine Sciences (Roatan, Honduras) and a local preschool.

Procedure:

- This study utilizes a similar creativity task to test the cognitive abilities of both the dolphins and preschoolers.
- The human and animal participants were trained using an “innovate” prompt in which they would have to demonstrate a non-repeated novel behavior in order to be reinforced.
- The session would last until the behaviors were no longer novel or repeated two times. All sessions were recorded and coded for behaviors.
- For preschoolers, the PTONI intelligence test was administered to investigate the possible relationship between non verbal IQ and the modified creativity measure (Ehrler & McGhee, 2008).

Table 1 The mean novel behaviors for each individual dolphin across four research sessions.

Dolphin	Behavior Frequency Score
Richie	10.25
French	13.25
Champ	16.25
Polly	6.25
Maury	10
Ronnie	17.25
Bill	15.25
Han	17.75

Table 2. Average number of behaviors in each trial.

Species	Mean
Dolphin	13.28
Human	9.17

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Results

- Table 1 shows the mean number of novel behaviors produced in response to the innovate cue by each dolphin over 4 research sessions.
- Table 2 compares the species on the mean frequency of novel responses /behaviors performed in a session.
- A Pearson correlation was run to determine the relationship between preschoolers creative behaviors and standardized scores on the PTONI. Although the results were not statistically significant, they demonstrated a trend for intelligence scores and this new non-verbal creativity measure ($r = .272$, $n = 17$, $p = .05$).

Discussion

- In the future we plan to explore different standardized intelligence tests used with children such as the Bayley III.
- Although 8 dolphins is a relatively large sample size for animal cognition research, 17 children is a low sample size for human subjects, therefore more data collection is necessary.
- In the future, using a group of children that are within a smaller age range would better control for maturation effects. Additionally, using older children may be beneficial to ensure an understanding of the behavioral task.
- We plan to further analyze the creativity behavior dolphin data for flexibility and originality, using behavioral categories such as “low energy” (vocalization) versus “high energy” (aerial) behaviors.
- 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 in both animals and children.
- Given the limited understanding of creative abilities in animals and young children this comparison using a modified version of the offers exciting possibilities that may have a wide applicability to a variety to animals under human care or possibly children with developmental delays.

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