



Attention by Beluga Whales to Human Mimicry Movements

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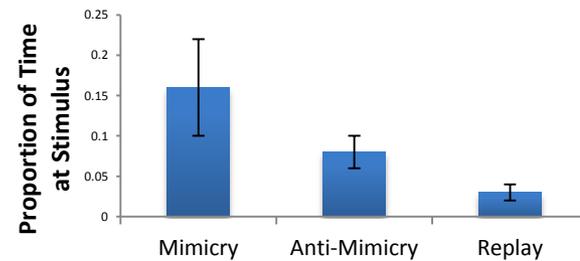
INTRODUCTION

Both human and nonhuman primates recognize when they are being imitated^{2, 6, 7}, affiliate more with imitators^{3, 8}, and are more prosocial towards conspecifics that perform similar actions^{11, 12}. These findings bring special focus to the role that mimicry (or at least coordinated movements) play in the social structure of primate species.

The present study extends this line of research to cetaceans. The social behavior of whales and dolphins are often highly synchronized¹, and at least one species uses coordinated swimming to promote social cohesion⁵. Moreover, Reiss et al⁹ have shown that dolphins demonstrate prolonged looking at their own mirror reflections. It is time, therefore, to ask experimentally whether a sensitivity to, and preference for, mirroring movements exist in cetaceans in a way that is comparable to that seen in primates.

RESULTS

The findings are depicted in the figure below. The amount of time the whales spent facing the human actor was approximately four times greater for the Mimicry condition than it was when the actor repeated those same movements in the Replay condition ($F(2, 16)=3.04, p=.076$). The Anti-Mimicry condition yielded times that were intermediate between the other two conditions.



METHODS

The subjects were 9 beluga whales (*Delphinapterus leucas*), housed at Marineland of Canada. Over successive 5 minute epochs, conducted on separate days, a human was positioned 1.5 meters in front of an underwater viewing window. Once the focal whale remained directly in front of the human for 5 seconds, the human proceeded to act according to one of the following three conditions:

- **Mimicry:** The human mirror-matched her own movements as closely as possible to those of the focal whale.
- **Anti-Mimicry:** The human performed equal but opposite movements to those of the whale.
- **Replay:** The human re-performed the movements from the preceding mimicry session.

The number of seconds the whale spent directly in front of the human during each condition was recorded from video. A repeated measures ANOVA was used to assess differences across conditions.



DISCUSSION

Although only preliminary, the findings suggest that at least one species of cetacean does have a preference for mimicry in a way that is comparable to that which is seen in primates. The prolonged time that the whales chose to spend near, and apparently looking at, the mimicking human indicates that behavioral matching was perceived positively by the whales. This is compatible with the notion that behavioral synchrony is affiliative in cetaceans.

That the whales' attention to the anti-mimicry condition also exceeded the replay condition suggests that the effect in this species is less dependent on precise kinesthetic visual-matching⁴ than on more general coordination. This contrasts with at least one study in nonhuman primates in which a similar attention in an anti-mimicry condition was not found². Perhaps because the morphology of primates more closely matches that of humans they are more sensitive to a greater precision in matching movements.

In any event, this is the first time that heightened attention to mimicry has been demonstrated in a non-primate species, and it suggests that a physiological mechanism comparable to the mirror neurons of primates probably also exists in this taxa.

REFERENCES

1. Brown, M., Burhans, D. & Noonan, M. (2011) Temporal Synchrony in the Bubbling Behavior of Captive Beluga Whales (*Delphinapterus leucas*). Animal Behavior Society, Indianapolis.
2. Haun, D.B.M. and Call, J. (2008). Imitation recognition in great apes. *Current Biology*, 18, R1-R2.
3. Lakin, J.L. and Chartrand, T.L. (2003). Using nonconscious behavioral mimicry to create affiliation and rapport. *Psychological Science*, 14, 334-339.
4. Mitchell, R.W. (2002). Kinesthetic-visual matching, imitation, and self-recognition. In: *The Cognitive Animal*, Bekoff, M., Allen, C., and Burghardt G.M. (eds.). Cambridge, MA: MIT Press.
5. Noonan, M. & Giordano, C. (2006) Echelon swimming as a means of post-agonistic reconciliation in killer whales (*Orcinus orca*). *Animal Behavior Society*, Snowbird, UT.
6. Nielsen, M., Collier-Baker, E., Davis, J.M. & Suddendorf, T. (2005). Imitation recognition in a captive chimpanzee (*Pan troglodytes*). *Animal Cognition*, 8, 31-36.
7. Paukner, A., Anderson, J.R., Borelli, E., Visalberghi, E. & Ferrari, P.F. (2005). Macaques (*Macaca nemestrina*) recognize when they are being imitated. *Biology Letters*, 1, 219-222.
8. Paukner, A., Suomi, S.J., Visalberghi, E. & Ferrari, P.F. (2009). Capuchin monkeys display affiliation towards humans who imitate them. *Science*, 325, 880-883.
9. Reiss, D. & Marino, L. (2001). Mirror self-recognition in the bottlenose dolphin: A case of cognitive convergence. *Proceedings of the National Academy of Sciences USA*, 98, 5937-5942.
10. Rizzolatti, G., Fadiga, L., Gallese, V. & Fogassi, L. (1996). Premotor cortex and the recognition of motor actions. *Cognitive Brain Research*, 3, 131-141.

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