Time to recognize zebrafish ‘affective’ behavior

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Abstract

Widely used in biomedical research, zebrafish (Danio rerio) are steadily gaining popularity as a
model organism for studying neurobehavioral phenomena. Here, we focus on to the growing spec-
trum of zebrafish behavioral phenotypes and the ‘bigger’ biological problems these models help
to address. Emphasizing the developing potential of zebrafish as a model organism in biological
psychiatry, we discuss several questions related to this field: Do zebrafish have ‘emotional’-like
behaviors? What are their neural circuits, biomarkers, and ontogenetic origins? And, finally, how
can we use this knowledge to build translational bridges to understand human emotions, motivation
and personality? Representing a joint effort of several established neurobehavioral laboratories, this
article outlines the mounting evidence to support emotionality in zebrafish and other fishes. This conclusion is important to justify the validity of zebrafish ‘affective’ paradigms and their utility for basic/translational research of normal and pathological behaviors.

**Keywords**

zebrafish, biological psychiatry, fish models, behavioral syndromes, physiological correlates, emotionality.

1. **Introduction**

Expanding the range of animal tests and model species is an important strategy in neurobehavioral research (Kalueff et al., 2007; Kalueff & Schmidt, 2011). Zebrafish (*Danio rerio*) have long been used in biomedicine, including genetics, developmental biology and toxicology. In addition, this species is currently emerging as a useful model organism for studying neurobehavioral phenomena, including normal and pathological conditions, such as cognitive, affective and substance abuse disorders (Jesuthasan, 2002; Best & Alderton, 2008; Norton et al., 2008; Stewart et al., 2010a, b). Dedicated to various zebrafish behavioral paradigms, this special issue of *Behaviour* reflects the growing recognition of the potential of this organism in the field of translational biological psychiatry.

What can be learned from zebrafish in the domain of ‘affective’ (influenced by, or resulting from, the emotions) behaviors? To address this question, a survey was sent to various zebrafish behavioral laboratories worldwide on behalf of the International Zebrafish Neuroscience Research Consortium (ZNRC). The main focus of this discussion was whether zebrafish have simple instinctive escape reactions, or have more complex responses representing some kind of ‘emotionality’. The answer to this question is important for our ability to justify the validity of this field and establish future strategic directions of its research. This editorial article offers consolidated views of several active zebrafish laboratories, providing necessary clarification and updates in this field, and encouraging further discussion of what we know and what we have still to learn.

2. **Why use zebrafish for neurobehavioral research?**

This question is frequently asked by neuroscientists who use more traditional (e.g., primate or rodent) models, and want to know why to use fish instead. Institutional review boards also ask this question, aiming to understand the