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Animal Shorts

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An independent academic psychologist, based in England, who has written extensively on different areas of psychology with an emphasis on the critical stance towards traditional ideas.

A complete listing of his writings at http://psychologywritings.synthasite.com/. See also material at https://archive.org/details/orsett-psych.

CONTENTS

1. LERI AND STEIN (2024)

BACKGROUND: Predators produce cues of their presence for prey (eg: olfactory; visual), which prey use to determine the level of danger in the environment. This information can be communicated by parents to offspring.

RESEARCH ISSUE: Whether parents respond differently to single or multiple cues of predators, and the impact on offspring. The presence of predator cues will influence the exploratory behaviour of the prey, for example.

STUDY ANIMAL: Trinidadian guppies (Poecilia reticulata).

METHOD: Laboratory experiment.

DESIGN: Independent groups design (also known as unrelated or between-participants design).

INDEPENDENT VARIABLE: Type of predator cue.

DEPENDENT VARIABLE: The exploratory behaviour of the guppies in a novel environment.

PROCEDURE: Virgin male and female guppies were placed in tanks in one of four conditions for fourteen days:

i) Control – freshwater with no odours and no visual cues of predator (pike cichlid).

ii) Olfactory – circulating water containing odours of predators in an adjacent tank (which was not visible).

iii) Visual – no olfactory cues, but a tank nearby containing predators that was visible to the guppies.

iv) Combined olfactory and visual cues.

On day 15, the fish were placed in a birthing tank with clean water, where the offspring were kept. The offspring were exposed to predator cues, but the parents had been. The dependent variable was measured by placing individual fish in a new environment and measuring the time to emerge from a refuge into the open arena, and the overall activity within the arena. Eighty-nine adults and 197 offspring were tested.

FINDINGS: The adults and offspring did not vary in exploratory behaviour based on the predator cue condition, but there were some sex differences in behaviour. Adults females in the visual condition were more active than females in the other conditions, while, among the offspring, females were slower to emerge from the refuge than the males. Also, "male offspring of parents exposed to visual cues or combined cues showed increased levels of activity compared to male offspring of parents in control and olfactory treatments... This pattern was not observed in female offspring" (Leri and Stein 2024 p245).

EXPLANATION OF FINDINGS: The sex differences in behaviour may be explained by the appearance and behavioural differences between the sexes. Namely that females have little colouration and shoal together for safety and maternal care, while males are brightly coloured and provide no parental care. Adult females being more active in the visual condition could be them searching for a shoal in the presence of visual information about predators.

The male offspring being more active in the visual presence of predators could be explained by the fact that selective pressure is upon males to mate. An environment perceived as high risk could result in "bold" behaviour to mate as time may be limited. Put very crudely, mate quick before you die soon.

CONCLUSION: Visual predator cues influenced the behaviour of adult and offspring guppies, but there were sex differences in the behaviour.

EVALUATION (positive): a) Four separate conditions of the experiment meant that there was no interference between the different conditions (including "order effects).

b) The video recording of the exploratory behaviour in the new environment with a clear scoring system. The time to emerge from the refuge was set at ten minutes (and then non-emergers were gently forced to emerge). Ten minutes of activity in the open arena was scored for both emergers and non-emergers.

EVALUATION (negative): a) An artificial experiment, though a laboratory colony was created to replicate the natural environment.

b) Uncontrolled or unmeasured variables (eg: the degree to which individuals were aware of the predator cues; individual differences in boldness or shyness; differential mortality between the experimental conditions).

Reference

Leri, F & Stein, L.R (2024) Does parental experience with visual and olfactory predator cues have consequences for offspring in guppies? Animal Behaviour 214, 241-255

2. MUTUAL MATE CHOICE AND A SCORPION

"Mutual mate choice" is where both partners signal their quality to each other, as in courtship behaviour. This is compared to selective mate choice where females, say, decide among males competing to show their quality.

Oviedo-Diego et al (2024) studied mutual mate choice in a species of scorpion (Urophonius achalensis) in Argentina (figure 2.1). There is a "mating dance" (or courtship behaviour) to enable sperm transfer. "At the beginning of courtship, the male holds the female with his pedipalps, starting the 'mating dance', which involves a series of co-ordinated movements between the sexes for successful sperm transfer... Throughout courtship, some female-specific behaviours have been identified as indicative of female resistance (lack of co-operation during locomotion: hold themselves to the ground, displace their bodies to the side and perform movements contrary to the position of the male)... Interestingly, despite scorpions being generally considered aggressive organisms..., this does not necessarily apply to sexual contexts. Instead, male scorpions tend to exhibit stimulatory or appeasement behaviour during mating... After locating a suitable place, the male attaches his spermatophore to the substrate and guides the female to complete sperm transfer, after which the pair separates" (Oviedo-Diego et al 2024 p2).

The researchers collected 130 individuals in 2019, and each was rated for body condition before pairs were experimentally placed together for a sexual encounter. Various behaviours were scored (table 2.1). Of sixty sexual encounters, males courted the females in 55% of the trials, while in half of the total trials (53%) were receptive, but resisted in one-third (32%) of the cases. Overall, one-third (37%) of females successfully completed mating.

The female body condition did not alter male interest, but sexual status did (ie: virgin females more than previously mated ones). Male body condition influenced the females' decision to mate. Certain behaviours during the mating dance were influenced by the body condition of the participant (eg: high-condition males performed sexual stings for longer).

The data supported mutual mate choice in this species of scorpion. Male body condition was important for females while female sexual status was key for males. These characteristics were revealed during the courtship interaction. High-condition males produced spermatophores

BEHAVIOUR	DESCRIPTION
Male - juddering	"Shaking of the body at the beginning of courtship (before and after grasping the female)" - frequency
Male – rubbing with telson	"Friction with telson gland (spreading chemical secretion) on the ventral area of the female's body, including the operculum * and legs" – duration (absolute and relative) and frequency
Male – sexual sting	"Sting the pleural membrane of the female mesosoma" – duration (absolute and relative)
Female – resistance during courtship	"Lack of co-operation during locomotion in mating dance, resistance to moving forward in the mate direction" – duration (absolute) and frequency
Female – spermatophore consumption	"Consumption of spermatophore remains after sperm transfer" – duration
Both – mating dance	"Joint locomotion with joint detention intervals, from 'pedipalp grasping' to the beginning of spermatophore deposition" – duration
Both – conjoint pause	"Total cessation of movement by both sexes while grasped by their pedipalps" - duration

(* Genital opening)

(Source: Oviedo-Diego et al 2024 table 1)

Table 2.1 – Definitions and measures of courtship behaviour.

with more spermatozoa, so "male body condition may be an honest indicator of quality that could also provide information on the sperm competitive ability of these males, allowing females to select the best-quality males" (Oviedo-Diego et al 2024 p9).

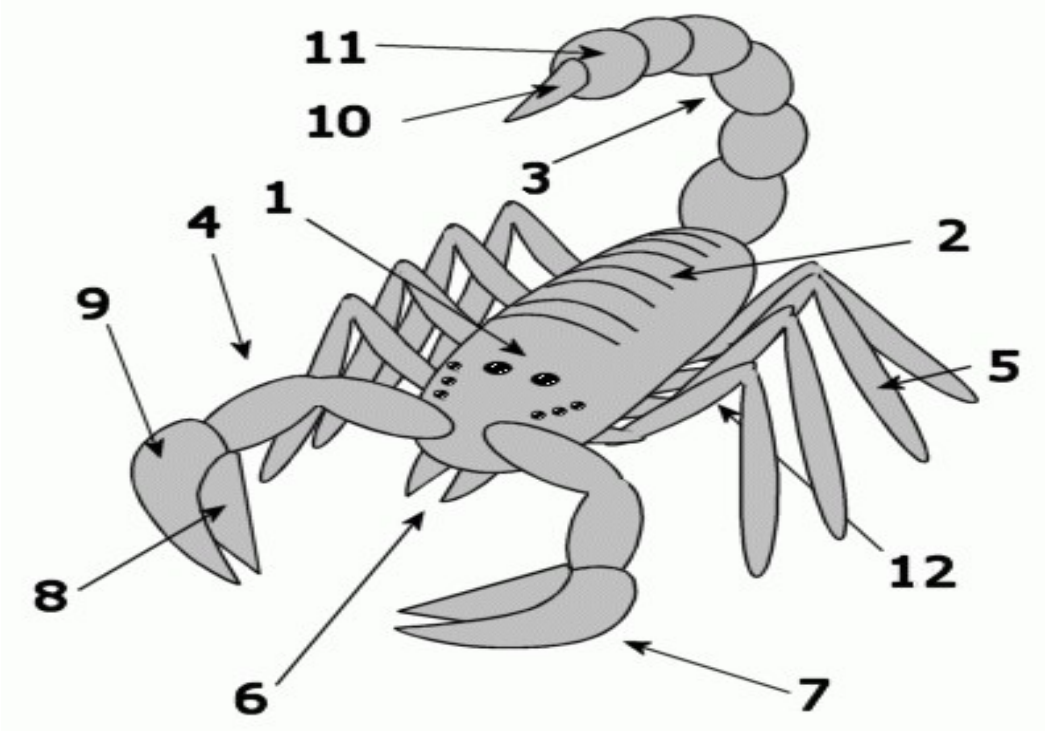
The male preference for virgin females is probably influenced by the fact that a genital plug is placed by the first mating male, though females can remate as the plug is not fully effective. The researchers explained: "A high cost of producing chitinous spermatophores with accessory substances in the ejaculate..., coupled with a high risk of finding mated females (which are more likely to cannibalise males...), leads to selective males assessing female mating status" (Oviedo-Diego et al 2024 p9) (table 2.2).

The courtship behaviour could be described as a "sexual dialogue" that "involves behavioural

adjustability according to multiple indicators, with the realisation of male stimulating behaviours and appeasement and female resistance in response" (Oviedo-Diego et al 2024 p10).

	BODY CONDITION	SEXUAL STATUS
MALE	Most important for females	Not important
FEMALE	Not important	Most important for males

Table 2.2 – Mate choice found by Oviedo-Diego et al (2024).



(1 = cephalothorax or prosoma; 2 = abdomen or mesosoma; 3 = tail or metasoma; 4 = claws or pedipalps; 5 = legs; 6 = mouth parts or chelicerae; 7 = pincers or chelae; 8 = moveable claw or manus; 9 = fixed claw or tarsus; 10 = sting or telson; 11 = anus; 12 = openings for book lungs)

(Source: Pasixxxx; public domain)

Figure 2.1 – Basic scorpion anatomy.

Reference

Oviedo-Diego, M et al (2024) Communication via female resistance: Sexual behavioural modulation and mutual mate choice determinants in a scorpion Animal Behaviour (https://www.sciencedirect.com/science/article/abs/pii/S0003347223003044?via%3Dihub)

3. NO COSTS OF LEARNING FOR BUMBLE BEES

Learning and memory have many benefits for survival, but the necessary cognitive architecture is associated with physiological costs (constitutive or induced). "Constitutive costs describe evolutionary costs associated with maintaining neural infrastructure and are paid by an individual irrespective of whether this infrastructure is put to use... [while] the active processes of learning and memory formation also consume energy, resulting in proximate trade-offs with other traits that are also energetically expensive (induced costs...)" (Watrobska et al 2024 p173).

Watrobska et al (2024) studied experimentally induced costs in bumble bees (Bombus terrestris audax). "Bumble bees are annual eusocial insects in which a colony is founded by a single queen in the spring... When mated queens emerge from diapause, they are effectively solitary individuals until their colony is founded and must therefore perform all tasks that will later be taken on by workers, in addition to nest searching, nest building and reproduction... This includes foraging to feed the brood, which places demands on learning and memory... and has been linked to foraging success... Accordingly, bumble bee queens have been shown not only to successfully complete associative learning tasks quickly, but also to perform them better than workers..., suggesting they invest relatively heavily in learning and memory processes" (Watrobska et al 2024 p174). Does the cost of learning ability impact on brood production?

Sixty-eight queens were taught to associative certain colours of artificial flowers with sucrose (reward) across a six-day period (and compared to controls with no learning). The amount of reward was varied to produce a high- and a low-quality diet. The number of eggs produced was an outcome measure of colony success.

Learning had no impact on colony success, whereas diet significantly impacted egg laying. It appeared that learning and memory had no energetic costs in terms of less eggs laid, which was contrary to expectations and predicted by previous studies.

The researchers admitted that their study "precluded stressors other than nutrition, such that queens did not incur the costs of flight, thermoregulation or infection that they would in the wild... Uniquely, our queens were laboratory bred, and therefore aseasonal, free from parasites, with no previous exposure to the external environment and a standardised diapause time. While this

allowed us to standardise for potential confounds (eg: parasites may negatively affect learning...; previous experiences affect learning...), in the wild stressors may act synergistically..., meaning a potential trade-off may not be large enough to detect in such a controlled set-up" (Watrobska et al 2024 pp177-178). Also "ecological costs", like memory mistakes or unfavourable foraging decisions, were not measured (Watrobska et al 2024).

When researchers find null results (ie: statistically non-significant) or unexpected findings, it can be seen as a "failure", but there are positives to come from such studies, including:

i) Knowledge progresses from both confirmation and disconfirmation of predictions and expectations.

ii) Researchers are forced to consider carefully their predictions and the study design in order to explain the null findings. This can lead in new directions and/or to further studies.

iii) Making known null findings is important, particularly for meta-analyses that take an overview on a particular topic. There is a temptation to not publish "unsuccessful" research, and so only statistically significant results are published, which can give the impression of strong agreement between studies. This is called the "file drawer problem". For example, ten studies are published on a topic that showed similar statistically significant results, but ten studies on the same topic are unpublished which had null findings. The published research gives one impression whereas the total research research gives another.

Reference

Watrobska, C.M et al (2024) Potential costs of learning have no detectable impact on reproductive success for bumble bees Animal Behaviour 214, 173-185

4. NOISE IMPACTS ANTI-PREDATOR BEHAVIOUR

Anthropogenic marine noise includes military and construction activities, and boat noise (the most common source). "Boat noise can negatively affect the behaviour, reproduction, orientation and survival of coral reef fishes... Some of the most disruptive boat noise effects are regarding risk assessment and anti-predator behaviour in fishes... Noise-induced stress can reduce the likelihood of prey detecting an approaching predator, resulting in failing to react with the appropriately rapid startle and escape response, and thus increasing the chance of mortality" (Price et al 2023 p1).

Price et al (2023) showed this impact in an experiment with three coral reef fish species – the orange-spotted grouper (Epinephelus coioides), the common clownfish (Amphiprion ocellaris), and the black damselfish (Neoglyphidodon melas). The captive-bred fishes were placed for seven days in tanks with little noise (10 dB), or chronic noise (70 dB) (equivalent to boat noise in tourist areas). The next part of the experiment was fifteen minutes of exposure to no sound, acute ocean sound or acute boat noise, followed by the appearance of a suspended predator model. The response to the predator model was the outcome or dependent variable (table 4.1), and the level of noise exposure was the independent variable.

MEASURE	DEFINITION
Response latency	Time between onset of predator model and response (seconds)
Response distance	Total distance travelled in first two flips of tail to escape (cm)
Response speed	Distance covered divided by duration of response (cm/seconds)
Response duration	Total response time (seconds)

Table 4.1 – Outcome measures taken by Price et al (2023).

The three species behaved slightly differently, but overall the acute noise had an impact on anti-predator behaviour. "For the grouper E. coioides, their response latency decreased in the presence of acute noise, while their response duration increased in the presence of both chronic and acute noise. Among the anemonefish A. ocellaris, all variables remained unaffected by chronic

noise, whereas acute noise increased the response distance and response speed. In the case of the black damselfish N. melas, chronic noise decreased the response speed, while acute noise decreased the response latency and response duration" (Price et al 2023 p1).

This research was undertaken because in Taiwan attempts have been made to restock coral reefs, but this takes place in areas with high fishing and recreational boat activity. The researchers explained: "Despite 30 years of the highly controversial stock enhancement programmes, the noise pollution in the culturing process and predator-induced mortality following noise exposure at release sites has been largely overlooked in Taiwan, consequently, to date there are no studies on the subjects" (Price et al 2023 p2).

Reference

Price, N.W et al (2023) Acute noise is harmful on the anti-predator behaviour of commercially important juvenile coral reef fishes Behavioural Processes 210, 104908

5. THE GRAVEYARD HYPOTHESIS

Queen conch (Aliger gigas) are "large, relatively long-lived gastropod molluscs that reach terminal shell length and can begin to demonstrate shell lip-flaring associated with sexual maturity at 3.5–6 years of age... They may survive up to 40 years… although the average lifespan is likely 25–30 years" (Elvidge et al 2023 p1). They are particularly found in The Bahamas.

"In common practice, Bahamian fishers typically remove the animal from its shell by breaking (also called 'knocking' or 'cracking') the shell at the attachment point of the adductor muscle. The fleshy meat is detached from the unpalatable tissue, and then both shell and offal are discarded into the water near the shoreline or where fishers moor their boats, in piles or middens" (Elvidge et al 2023 p2). It is believed by these fishers that queen conch move away from or avoid these discarded conch shell areas (described as the "graveyard hypothesis"). Elvidge et al (2023) experimentally investigated this idea.

Queen conch collected from 50-200 m offshore of Eleuthera, The Bahamas, were used in two experiments. The first experiment tested chemical alarm cues, and the second visual cues. A 2 x 2m quadrant was marked on the sea floor and the movement of the conch in sixty minutes was recorded.

Experiment 1 compared the response to seawater containing the smell of carcasses of freshly harvested conch or plain seawater, while Experiment 2 had three conditions – old knocked conch shell, a rock, or nothing placed nearby.

Experiment 1 studied 276 conch, and they were significantly more likely to move in trials with alarm cues than controls, and large individuals moved more often than smaller ones. Four hundred and eighty-six conch were tested in Experiment 2, and there was no difference in movement based on the condition. The findings suggested that "chemical cues consistent with damage-released alarm cues may play a greater role in eliciting avoidance behaviour than the visual cues typically associated with queen conch graveyards" (Elvidge et al 2023 p1).

This research used a field experiment method. This involves the rigour of the experimental method, but takes place in the natural environment of the animal (in this case, 40-100 m offshore). However, there is less control

over confounders and extraneous variables than in the laboratory experiment (eg: the presence of predators during the sixty minutes of the experiment).

Reference

Elvidge, C.K et al (2023) A field test of the "graveyard hypothesis" reveals avoidance of chemical but not visual cues in Bahamian queen conch (Aliger gigas) Behavioural Processes 210, 104914

6. CHIMPANZEE PERSONALITY

Animal personality is an area of interest that has developed in the last thirty years, particularly in studying the differences between individual captive animals. The non-human primates are most studied, in one of two ways - by applying human personality dimensions and characteristics (trait rating), or by behaviour coding. The latter tends to be based on direct observation, while the former is ratings by humans familiar with the animals (Padrell et al 2023).

Both approaches have strengths and weaknesses. "For instance, although behavioural coding is assumed to be more objective, human studies have shown that it can also provide unreliable estimates..., as single measures of specific behaviours tend to have low cross-situational consistency. By contrast, ratings provide a more global perspective, as they encompass the experience of the raters across time and situations... Another popular criticism regarding the use of questionnaires, especially those based on human models, is the risk of anthropomorphism, which would imply that raters are falsely attributing human features to animals" (Padrell et al 2023 p2).

Concentrating on the human personality dimensions with non-human primates (known as a "top-down" approach, while behaviour observation is a "bottom-up" approach), the human Five-Factor Model (FFM) (eg: McCrae and Costa 1999) has been used, and adapted in the "Hominoid Personality Questionnaire" (HPQ) (King and Figueredo 1997). Weiss et al (2009) revised the HPQ with 54 items and 146 chimpanzees. Both studies "obtained five personality traits homologous to the human traits in the FFM: Neuroticism, Extraversion, Agreeableness, Conscientiousness, and Openness (to Experience), plus the trait Dominance" (Padrell et al 2023 p2).

Another human personality model is Eysenck's (eg: 1967) "Psychoticism-Extraversion-Neuroticism" (PEN) model. Ubeda and Llorente (2015) developed a twelve-item questionnaire for use by keepers of captive chimpanzees. "For each factor (ie: Extraversion, Neuroticism and Psychoticism), the authors selected four primary scales, ensuring that they were appropriate to characterise chimpanzee personality. After performing factorial analyses, the authors identified three dimensions: Extraversion, Neuropsychoticism and Dominance. The items that loaded onto Extraversion were very similar to those reported for humans in that same dimension, facilitating

the interpretation of this trait. The trait Neuropsychoticism was identified as a combination of Neuroticism and Psychoticism, because it included items that in humans load on these two traits. Moreover, the authors identified a third factor, labelled Dominance..." (Padrell et al 2023 p2). The sample size was small, however (n = 14).

Padrell et al (2023) combined the data from this sample in Spain with that of twenty-three chimpanzees living in a research in Germany (total sample = 37) (table 6.1). The Germany sample was rated by eight keepers (compared to 33 raters in Spain). Not all raters scored every individual. Characteristics were rated on a seven-point scale (table 6.2).

SPAIN	GERMANY
Fundacio Mona at Girona (rescue and rehabilitation centre for former pets and chimpanzees used in the entertainment industry). N = 14 (5 females) Kept in two groups in separate outdoor areas and with four indoor areas. 10 chimpanzees rated by 28 humans in 2012 (Ubeda and Llorente 2015); 4 chimpanzees by 15 raters in 2018 (Padrell et al 2020). Raters had known chimpanzees for at least 4-6 months.	Wolfgang Kohler Primate Research Centre at Leipzig Zoo. N = 23 (16 females) Kept in a large and a small group in two separate outdoor and indoor areas. 8 keepers (six of them rated all chimpanzees) in 2019. They had worked between four to eighteen years with chimpanzees.

Table 6.1 - Two samples of chimpanzees in Padrell et al (2023).

Using a variety of statistical methods, the researchers produced three underlying personality factors similar to the previous research - Extraversion (eg: "active", "social", "spontanenous" characteristics), Neuropsychoticism (eg: "aggressive", "impulsive", "anxious" characteristics), and Dominance. Where the same individual chimpanzee was rated by more than one human, there was a high degree of agreement.

Padrell et al (2023) saw a high degree of similarity in characteristics between the chimpanzee and human versions, though Dominance "may not be directly comparable to any of the human traits described by the PEN model, as it contains items that in humans load on different traits (ie: Neuroticism and Extraversion). The

absence of a Dominance factor in humans may be a consequence of our species having evolved in small-scale egalitarian societies..., in contrast to the dominance hierarchies that characterise chimpanzees and other non-human primates, and that are mostly based on agonistic interactions" (p7).

The underlying personality dimensions found in the data do depend on the factor analysis and other statistical methods used. While the twelve-item measure may have missed certain characteristics. Also "the only study that compared behavioural observations with personality ratings [Padrtell et al 2020] obtained with Eysenck's adapted model in chimpanzees reported limited discriminant validity" (Padrell et al 2023 p7).

Extraversion:

- Active
- Social
- Spontaneous
- Sad
- Creative

Neuropsychoticism:

- Aggressive
- Impulsive
- Anxious
- Cruel
- Bad-tempered

Dominance:

- Fearful
- Dominant

(Source: Padrell et al 2023 table 6)

Table 6.2 - Twelve personality characteristics rated in Padrell et al (2023).

References

Eysenck, H.J (1967) The Biological Basis of Personality Springfield, Ill: Thomas

King, J.E & Figueredo, A.J (1997) The five-factor model plus dominance in chimpanzee personality Journal of Research in Personality 31, 2, 257-271

McCrae, R.R & Costa, P.T (1999) A Five-Factor theory of personality. In Pervin, L.A & Johns, O.P (eds) Handbook of Personality: Theory and Research (2nd ed) New York: Guilford Press

Padrell, M et al (2020) Personality, cognition and behaviour in chimpanzees: A new approach based on Eysenck's model PeerJ 8, e9707

Padrell, M et al (2023) Assessing Eysenck's PEN model to describe personality in chimpanzees Behavioural Processes 210, 104909

Ubeda, Y & Llorente, M (2015) Personality in sanctuary-based chimpanzees: A comparative approach of psychobiological and penta-factorial human models Evolutionary Psychology 13, 1, 182-196

Weiss, A et al (2009) Assessing chimpanzee personality and subjective well-being in Japan American Journal of Primatology 71, 4, 283-292

7. ANXIETY-LIKE BEHAVIOUR IN THE ZEBRAFISH

Anxiety is an adaptive behaviour to help individuals increase protective behaviour in the face of threats, but too much anxiety is maladaptive. Animal models of human anxiety disorders have been developed, including rodents and zebrafish. Technically, it is anxiety-like behaviour.

In the case of zebrafish (Danio rerio), populations have been bred to be distinct - eg: "short fin" (SF) and "leopard" (LEO). "While the former has dark horizontal stripes on the side of the body, the latter is recognised by the presence of scattered dark spots along the body, due to the reduction of melanophores, resulting in altered pigmentation pattern... In parallel to these findings, the SF population has higher brain serotonin levels, probably due to their lower monoamine oxidase activity... These findings corroborate the existing differences in anxiety-like profile, since LEO has pronounced diving behaviour (ie: swimming at the bottom of the tank) and scototaxis (ie: preference for darkness), suggestive of heightened anxiety" (Resmin et al 2023 p2).

Resmin et al (2023) studied twenty adult SF and twenty LEO zebrafish and anxiety-like behaviours. Each individual was scored on the anxiety-like behavioural index (table 7.1), based on their behaviour in two tests - the "novel tank test" (NTT) and the "light-dark test" (LDT). In the NTT an individual is placed in a novel tank with two vertical compartments and their movement is measured for six minutes (eg: total distance travelled; latency to move to higher compartment). The LDT involves a tank divided into two horizontal compartments (a dark area and a lit area). Movement to the lit area, and time spent in the lit area are recorded during a six-minute period.

Subsequently, the fish underwent the "open field trial" (OFT), where an individual is placed in the centre of a tank, and they can explore the open area or seek refuge in a "safe area" (homebase) at the side. Movement is measured over a thirty-minute period.

The LEO individuals showed a higher anxiety-like behavioural index score. This was manifest as swimming at the bottom of the tank and less locomotion generally in the NTT, less time in the lit area in the LDT, and a preference for the homebase (ie: less exploration) in the OFT.

- Formula:

$$\frac{TB + LT + TD}{TT + TL}$$

TB = time spent in the bottom compartment in NTT (seconds out of 360)
LT = latency to enter the top compartment in NTT (seconds).
TD = time spent in dark in LDT (seconds out of 360)
TT = number of transitions to top compartment in NTT
TL = number of transitions to lit area in LDT

- Hypothetical example (loosely based on data from figure 2 Resmin et al 2023):

SF zebrafish (low anxiety): $\frac{200 + 25 + 150}{30 + 30} = 6.25$

LEO (high anxiety): $\frac{250 + 60 + 200}{20 + 25} = 11.33$

Table 7.1 - Anxiety-like behavioural index.

Invertebrate models of anxiety have been developed around avoidance learning, or more specifically, "conditioned place avoidance" (CPA). Jordan et al (2023) studied free-living flatworms (Planarians), specifically, Schmidtea mediterranea. They have a limited repertoire of defensive behaviours to potentially harmful events, which includes avoiding bright areas (known as negative phototaxis).

The avoidance behaviour when associated with a particular place can be seen as similar to place avoidance in humans with post-traumatic stress disorder (PTSD). The CPA paradigm involves the use of classical conditioning to associate a particular place with a mild electric shock, say. It is also possible to associate the electric shock with a particular surface (eg: rough vs smooth).

Here is an example of one of Jordan et al's (2023) experiments with thirty-two flatworms. Individuals were placed in a petri-dish divided into two halves - half with a smooth surface and half with a rough one. Every time the flatworm moved to the rough surface, say, they received a mild electric shock (during 4-7 training sessions). Then they were placed on a rough surface in another dish and their movement was observed. An "avoidance score" was used, where zero means no movement,

a positive score is a movement away, and a negative score is movement towards the aversive area. A positive avoidance score was shown by flatworms placed in the area which had become associated with the electric shock.

References

Jordan, L et al (2023) Conditioned place avoidance in the planaria Schmidtea mediterranea: A pre-clinical invertebrate model of anxiety-related disorders Behavioural Processes 210, 104894

Resmin, M.A et al (2023) Assessing the exploratory profile of two zebrafish populations: Influence of anxiety-like phenotypes and independent trials on homebase-related parameters and exploration Behavioural Processes 210, 104912

8. CALLS BY HYBRIDS

Some mammals of different, but close-related, species can breed (table 8.1). The acoustic properties of the calls of the hybrid offspring tend to be intermediate between the parental species (Piastolov et al 2023).

SPECIES A	SPECIES B
Red deer (Cervus elaphus)	Sika deer (Cervus nippon)
Little ground squirrel (Spermophilus pygmaeus)	Speckled ground squirrel (Spermophilus suslicus)
Russet ground squirrel (Spermophilus major)	Yellow ground squirrel (Spermophilus fulvus)
Tien Shan vole (Myodes centralis)	Bank vole (Myodes glareolus)
Mantled howler monkey (Alouatta palliata)	Black howler monkey (Alouatta pigra)

(Source: Piastolov et al 2023)

Table 8.1 - Examples of hybrid mammals used in studies of calls.

Piastolov et al (2023) studied the ultra-sonic vocalisations (USVs) of pups of two species of dwarf hamsters - Campbell's (Phodopus campbelli) and winter white (Phodopus sungorus). Female hybrids are fertile, but males are sterile. The USVs of 4-8 day-old captive hamsters from three groups were recorded - pure Campbell's [1], pure winter white, and hybrid (from male winter white and female Campbell's).

All pups produced two categories of USVs: Low-Frequency (around 41 kHz) and High-Frequency (around 60 kHz). There were differences, however, between the pure and hybrid pups: "In hybrids, Low-Frequency calls were shorter and lower-frequency than in either parental species, whereas High-Frequency calls were longer and lower-frequency in hybrids than in pure P.sungorus but similar with another parental species" (Piastolov et al 2023 p1).

The animals studied belonged to a laboratory population in Moscow started in 1985 from animals captured in North-East Mongolia. Pups were removed from their parents and tested individually for four minutes in an isolated room. Four thousand calls were recorded from

[1] There were pups from two separate populations of Campbell's dwarf hamsters used in the study.

eighty pups.

The study showed that "hybrids had calls unlike either of the parents. This was unexpected because vocalisations of rodents are genetically determined" (Piastolov et al 2023 p6).

Reference

Piastolov, S.V et al (2023) Comparison of ultra-sonic isolation calls of pure-breeding and interspecies hybrid Phodopus dwarf hamster pups Behavioural Processes 210, 104917

9. NEOPHOBIA AND HOUSE SPARROWS

Neophobia is "an aversive response to novelty" (Kimball and Lattin 2023 p1). It is most commonly measured as a reluctance/unwillingness to approach a novel object, consume a novel food, or explore a new environment/space (Kimball and Lattin 2023). This behaviour is particularly important for animals that live in human environments, like cities and towns, where they will meet many new things. The house sparrows (Passer domesticus) is an example of such an animal (Kimball and Lattin 2023).

There is a debate as to whether neophobia is a single trait covering objects, foods, and environments, or that it is possible to be one but not the others. Kimball and Lattin (2023) studied the correlation between object and spatial neophobia in twenty-three wild house sparrows caught in the USA. The sparrows were kept individually in cages with separate compartments, of which they lived in one of them. Spatial neophobia was measured by the willingness to explore the other compartment when it was opened, measured as latency to enter, duration of visit, and number of visits during one hour. Object neophobia involved placing a new (strange) object (eg: "cocktail umbrella") close to the food dish, and the time to approach and length of feeding were measured during one hour.

There was not a correlation between the two neophobic behaviours. The researchers stated: "Results indicate that neither time spent in a novel environment nor time to first enter a novel environment were correlated with an individual's average response to novel object trials. Therefore, these two tests may be assessing two discrete behaviours that involve separate decision-making processes and functional circuits in the brain" (Kimball and Lattin 2023 p1).

One potential confounder was that the novel object test included a food reward whereas the new environment test did not include food.

Previous research with house sparrows had found a positive correlation between object and food neophobia (eg: Bokony et al 2012).

References

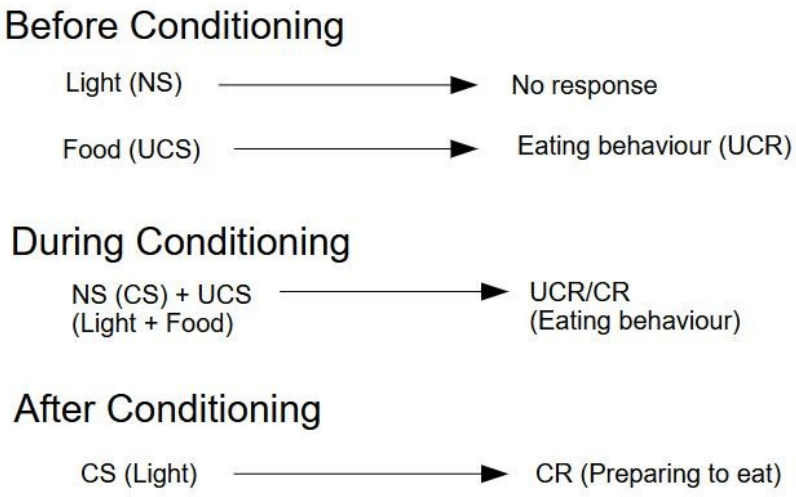
Bokony, V et al (2012) Personality traits and behavioural syndromes in differently urbanised populations of house sparrows

(Passer domesticus) PLoS ONE 7, e36139 (Freely available at https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0036639)

Kimball, M.G & Lattin, C.R (2023) Exploration of a novel environment is not correlated with object neophobia in wild-caught house sparrows (Passer domesticus) Behavioural Processes 210, 104913

10. CONDITIONED REINFORCEMENT

"Conditioned reinforcement" is the combination of both classical and operant conditioning. Class conditioning is learning based on the association of two things as in a light is turned on before food is provided to a rat. The rat learns that the light coming on is associated with food arriving (figure 10.1). Operant conditioning is learning based on reward and punishment of past experiences. For example, a rat learns that pressing a lever will be rewarded by food (figure 10.2).



(NS = neutral stimulus (no response before learning); UCS = unconditioned stimulus (already existing trigger of response); UCR = unconditioned response (already existing response); CS = conditioned stimulus (to be taught); CR = conditioned response (learned through association))

Figure 10.1 - Principles of classical conditioning.

Conditioned reinforcement is a combination as in the example of when a light comes on, the rat must press the lever in order to receive a food reward. Not pressing the lever when the light is on, or pressing the lever when the light is not on result in no food reward (figure 10.3).

During the learning process, getting the rat to pay attention to the lever which needs to be pressed is known as "sign-tracking" (ie: "they approach, lick, nibble, and/or bite the lever..."; Mahmoudi et al 2023 p1), and it is associated with more effective learning than "goal-tracking" (paying attention to the source of the food).

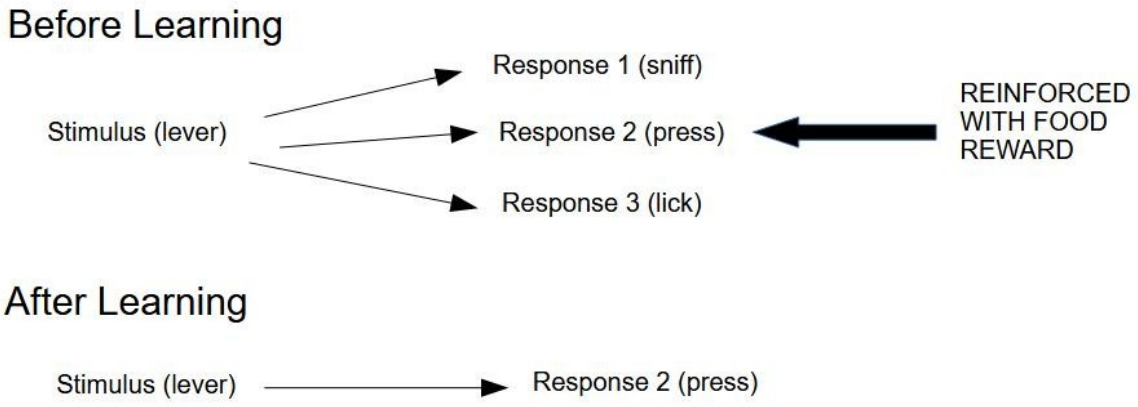


Figure 10.2 - Principles of operant conditioning.

There are also individual differences between rats in these behaviours (Mahmoudi et al 2023).

Light on + press lever	= food
Light on + no lever press	= no food
Light off + press lever	= no food

Figure 10.3 - Conditioned reinforcement.

Reference

Mahmoudi, S et al (2023) Effects of inter-trial interval on sign-tracking and conditioned reinforcer efficacy in female rats Behavioural Processes 210, 104911