

Habituation of mating preferences: A response to Chiandetti and Turatto

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Our recent investigation of guppy female mating preference for novel sexual signals in males revealed that this preference fulfils the criteria for both short-and long-term habituation [1].

Based on these results, we postulated that habituation, and a resulting preference for novel sexual traits, plays an underappreciated role in the evolution of mating behaviour and the maintenance of genetic variation. In their comment, Chiandetti & Turatto [2] review areas of the psychology literature related to the results of our study. Because our study links two related fields—evolutionary biology and psychology—we believe this exchange is beneficial for clarifying the parallels and distinctions between our results and those of previous studies of habituation for the benefit of researchers from these different disciplines.

Chiandetti & Turatto remark that habituation of mating interest has been well studied and point to the literature suggesting that the ‘Coolidge effect’—loss of interest in prior sexual partners—can be accounted for by habituation (e.g. [3,4]). This is correct, but it is important to clarify a fundamental difference between our results and this literature. Chiandetti & Turato describe Daniel et al. [1] as reporting ‘habituation to the same male partner’ [2, p. 2]; however, this is not correct. Rather than examining habituation to the same partner, as in studies of the Coolidge effect, our study evaluated a different phenomenon: change of interest in a phenotype shared by

multiple males. The goal of our study was to test whether habituation can account for the mating preference for rare/novel phenotypes that have been well documented in the literature (e.g. [5,6]), but for which no proximate or evolutionary explanations have been forthcoming. This distinction between preference for novel phenotypes and other preferences for novelty is important because these different preferences have distinct evolutionary consequences. For example, preference for novel phenotypes can generate negative frequency-dependent selection on sexual signals and thus maintain genetic variation within populations [5]. Our results, combined with the literature highlighted by Chiandetti & Turatto, suggests that habituation can result in sexual preferences for novelty at multiple levels of biological organization. This raises an intriguing question: what determines whether habituation leads to preference for novel phenotypes and/or individuals? Possible explanations include differences in individual distinctiveness of phenotypes or differences in receiver psychology (e.g. whether sexual signals are cognitively represented as independent phenotypes or integrated into representations of individuals). Addressing this question would be a fruitful avenue of future study.

Chiandetti & Turatto state that another area of the literature relevant to understanding our results pertains to habituation of reinforcer effectiveness (HRE). Studies on HRE have documented that reinforcers (e.g. rewards used in operant conditioning such as food or water) progressively wane in effectiveness, which is partly attributable to habituation to the reinforcer [7]. This literature provides examples of habituation affecting responsiveness to biologically meaningful stimuli, even when consumption of the reinforcer is prevented [8], as was observed in our study. However, we disagree with Chiandetti & Turatto's suggestion that our results are probably an example of HRE. Exposure to males was not used as a reinforcer in our study, and studies

outside of the HRE literature (in which stimuli were also not used as reinforcers) have also demonstrated that habituation to biologically meaningful stimuli can occur without consumption (e.g. [9–12]). Therefore, it is not appropriate to describe our results as an example of HRE. Our results, combined with other literature, suggest that waning interest in a biologically relevant, but non-consumed, stimulus is a common feature of habituation, and not specific to HRE.

Chiandetti & Turatto remark that it is incorrect for us to conclude that ‘habituation causes a preference for novel sexual signals’ [1, p. 1] because habituation is the reduced preference for the common sexual signal. This statement appears to stem from semantic confusion about two aspects of the wording we used to argue that habituation helps explain preference for novel phenotypes, which we endeavour to clarify. First, while Chiandetti & Turatto are correct that habituation is the reduced interest in the common phenotype, habituation is not equivalent to a preference for novel phenotypes. Rather, a mating preference for novel phenotypes refers to relatively more interest in rare phenotypes than common phenotypes. Preference for novelty can, but does not necessarily, result from a decline in interest in common phenotypes. Consider a scenario in which a common and a rare phenotype are sufficiently similar for exposure to either phenotype to cause a decline in interest in both phenotypes (though stimulus specificity might still be observed with respect to other, more dissimilar stimuli). In this case, habituation occurs without a preference for the rare phenotype. Alternatively, consider a scenario in which the common phenotype is more attractive for reasons unrelated to the phenotype’s frequency (e.g. the common phenotype has larger colour spots, which females find more attractive). Habituation to the common phenotype will only result in a preference for the rare type if the reduction in interest in the common phenotype exceeds the advantage it had prior to habituation. As these

examples illustrate, whether habituation to sexual signals results in a preference for rare/novel phenotypes is an empirical question—one addressed by Daniel et al. [1].

Second, while Chiandetti & Turatto correctly define habituation as a change in behaviour, this change in behaviour can itself be a mechanism explaining other phenomena (e.g. preference for novel phenotypes). Numerous studies explicitly refer to habituation as a mechanism causing various clinical [13], behavioural [14], ecological [15] or evolutionary [16] phenomena. Note that like Daniel et al. [1], these studies use the term mechanism in a broad sense, meaning the process by which something comes about, but not necessarily the specific molecular or neural machinery underpinning a behaviour. This broader usage of the term mechanism is common within evolutionary ecology (e.g. [17,18]) and also occurs frequently within the psychology literature (e.g. [13,19]). We therefore suggest that Chiandetti & Turatto’s critique of our wording stems not from a misuse of terms, but rather the multiplicity of meanings attached to those terms.

Demonstrating that habituation causes preference for novel phenotypes does help to explain this preference. Habituation and its neural underpinnings are ancestral and subject to selection in non-mating contexts [20]. Thus, our findings lend plausibility to the sensory bias hypothesis as a potential explanation for the evolutionary origins of mating preference for novel phenotypes. Additionally, models have been proposed that offer insights into the neural and molecular substrates responsible for habituation, some of which we cited in our study [20–22], and others which Chiandetti & Turatto highlight [23–25]. Thus, by linking habituation and preference for

novel phenotypes, our findings have implications for understanding how and why this mating preference exists.

To conclude, the literature reviewed by Chiandetti & Turatto has some parallels with, and distinctions from, our study. We do not believe that this literature alters the interpretation of the results in Daniel et al. [1], but hope that this exchange has clarified some of the terminology used therein and helped readers to place our study in the context of broader habituation research.

Data accessibility. The data supporting the original study are available from the Dryad Digital Repository: <https://doi.org/10.5061/dryad.fp030jg> [26].

Competing interests. We declare we have no competing interests.

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