



## Invited Commentary

### Measures of mate choice: comment on Dougherty and Shuker

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The influence of experimental design on results is seldom compared systematically. Dougherty and Shuker (2014) address this topic with a careful meta-analysis examining how experimental design influences the outcome of mate choice experiments. Specifically, they compared the results of choice versus no-choice paradigms controlling for publication bias and phylogenetic history. The authors found that 2-choice designs tend to yield stronger estimates (effect sizes) of overall mating preferences, and this was especially true for female preferences.

The results of their analysis are important, but some aspects warrant further consideration. First, as the authors point out, the ecology of the individual species matters. In systems where species encounter mates sequentially and the costs of lost mating opportunities may be high, 2-choice tests may overestimate the strength of mate selection. We suggest that the converse may also be true; in lek breeding animals, individuals may seldom encounter a single courter. Thus, no-choice paradigms may underestimate the strength of selection in lek breeding species.

A second point addressed by the authors is the role of cognition, an area clearly in need of additional work. No-choice designs are often considered “recognition or minimum threshold” tests, whereas choice designs are often considered “discrimination” tests. Evidence suggests that recognition and discrimination of mating signals may derive from similar perceptual processes (Phelps et al. 2006; Mendelson and Shaw 2012), but single stimulus and multiple stimulus tasks likely require different cognitive processes. With acoustic signals for example, animals must form auditory “objects” and assign the objects to their source location. Forming an object requires that receivers combine multiple features of the signal into a coherent representation. How this critical task is accomplished in nonhuman animals is not well understood (Miller and Bee 2012, but see Farris and Ryan 2011). There are (at least) 2 processes at work here and which of these occurs is unclear. In the case of a no-choice paradigm, the receiver likely compares the signal it receives to some internal template (although this template may not even be fixed, e.g., Taylor and Ryan 2013). In a 2-choice test, the receiver may compare both signals to an internal template or it could bypass an internal template and compare the signals directly to each other. These represent fundamentally different processes and might bring into play various cognitive biases. Túngara frogs, for example, follow Weber’s Law of proportional difference when comparing 2

signals; it is not known if such a bias would exist in comparing 1 signal to an internal template (Akre et al. 2011). Adding a third signal could further complicate comparisons. Although asymmetrically dominated decoys have not been widely investigated in mate choice (but see Royle et al. 2008), in animal foraging and human economics, the presence of a third alternative can skew preferences in unpredictable ways (Bateson and Healy 2005).

Courtship signals also affect attention in receivers and influence the active time over which receivers selectively attend to the signals. For example, Akre and Ryan (2010) showed that call complexity can influence active time in túngara frog calls. If the intervals between signal presentations influence receiver responses as a function of active time, then different signal types (e.g., choice tests) may be competing for selective attention in the receiver. In other words, the receiver’s brain may be comparing differences in signal traits as well as summing differential neural activation times. The no-choice paradigm asks the receiver to respond when both signal properties and active time are held constant. Further, Uchida et al. (2006) suggest that many perceptual decision-making processes are completed in fewer than 300 ms and that decisions occurring over longer time spans may tap a uniquely different neural architecture. If so, then a particular experimental paradigm may not even test the same perceptual processes in all species (e.g., complex bird song vs. short, stereotyped insect calls).

We agree with Dougherty and Shuker (2014) that one test is not necessarily “better” than another. Instead, the employment of multiple approaches within a species can provide a richer understanding of perceptual processing and the evolution of mating signals.

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