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Correlates, Cues, and Signals: A Decision Flowchart for Researchers and Students

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ABSTRACT

Discussions of animal communication and human social perception are replete with different terms referring to observable features, many of which are frequently (and incorrectly) conflated. To introduce some order, previous writers have drawn a distinction between *cues* and *signals*. Here, I introduce a further distinction—between cues and *correlates*—and I provide a decision flowchart to help researchers and students think clearly about correlates, cues, and signals. A more rigorous use of these terms will not only facilitate scientific communication, but also aid understanding of the underlying concepts among undergraduate and graduate students engaged in evolutionary studies.

KEYWORDS

correlates; cues; signals; social perception

For animals, much of social perception is about utilizing the observable to infer the unobservable. For researchers, much of the *study* of social perception is about identifying the observable features that perceivers attend to, and attempting to pinpoint the unobservable information that may be inferred from those features. Researchers of human social perception have investigated such features as morphological symmetry, facial resemblance, facial expressions, height, masculinity, femininity, body size, waist-to-hip ratio, facial width-to-height ratio, voice pitch, body odor, and morphological disfigurements, which purportedly allow perceivers to infer such information as health, fertility, personality, and threat (for reviews, see Neuberg, Kenrick, & Schaller, 2010; Puts, Jones, & DeBruine, 2012; Swami & Furnham, 2008). In the literature, these features have been variously referred to as attributes, characteristics, ornaments, signals, cues, correlates, indices, and indicators.

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Researchers of nonhuman animals appear to have reached a consensus regarding the distinction between *cues* and *signals* (Maynard Smith & Harper, 2003; Scott-Phillips, 2008). Unfortunately, this distinction continues to be frequently ignored or obscured in the human literature, and it is not uncommon to see passages in which the terms *cue* and *signal* are used to refer to the very same feature. Furthermore, because recent empirical studies have unearthed a wide array of evolutionarily relevant features, I argue that it has become necessary to delineate a further distinction—that between *cues* and *correlates*. Below, I provide a decision flowchart to help researchers distinguish the features under investigation, with a focus on features purportedly associated with some underlying "quality." For students, becoming familiar with these distinctions is not simply a matter of improving terminological accuracy; utilizing this flowchart will facilitate clearer conceptualization with regard to functions of features and reasons for their perception (if any).

As illustrated in Figure 1, if a feature does not covary with any underlying quality (e.g., health, fertility, dominance), it has no inferential significance (e.g., navel diameter). If a feature is found to covary with some underlying quality, it meets the criterion for a *correlate* (e.g., second-to-fourth-digit ratio). If a correlate is found to be utilized by perceivers in forming judgments, it meets the criterion for a *cue* (e.g., height, size of lesion from pathogenic infection). If a cue is found to be emitted by evolutionary design, it meets the criterion for a *signal* (e.g., behavioral dominance, certain features associated with physical attractiveness).

The decision flowchart suggests that it is most logical to first establish a newly discovered feature as a correlate. If there are theoretical reasons suggesting that it may be a cue or a signal, additional evidence could then be marshaled for the claim that a correlate is a cue, and a cue a signal. A recent example is facial width-to-height ratio in men. Initial evidence revealed positive correlations between this ratio and aggressive behavior (Carré & McCormick, 2008), establishing it as a correlate. Further research indicated that perceivers utilize this ratio to make judgments regarding aggressiveness and trustworthiness (Carré, McCormick, & Mondloch, 2009; Stirrat & Perrett, 2010), establishing it as a cue. It remains to be seen whether this ratio is an evolved signal (for a discussion of how researchers empirically identify signals, see Maynard Smith & Harper, 2003).

In sum, correlates, cues, and signals are conceptually distinguishable and should not be conflated. They also call for different theoretical angles. In general, signals are associated with selection pressure on targets to convey information, cues are associated with selection pressure on perceivers to glean information, and mere correlates are incidental features that may help researchers advance theory but play no role in social perception (and should never be called cues or signals). Students may be especially likely to be led astray by correlates, as they appear to have some biological "reality" and encourage the assumption that they have communicative relevance. Other specific terms (such as ornament) can be seen to fall into one of the three categories (signal). Vague terms (such as indicator) should be avoided if more precise alternatives are available.

Previously, I wrote about common misunderstandings of inclusive fitness theory that are repeated in undergraduate textbooks (Park, 2007), which caught the attention of eminent evolutionary psychologists (Buss, 2009; Kurzban, 2010). One would hope that the textbook writers will take notice and that these misunderstandings will eventually get stamped out, to the benefit of students. Similarly, conflating correlates, cues, and signals is a misunderstanding that impedes education, especially if it appears in texts intended for students. I invite textbook writers to make these distinctions explicit, using the decision flowchart; and I urge instructors of evolutionary psychology and social psychology to do the same. We can help students to avoid unnecessary confusion and to make more efficient scientific progress.

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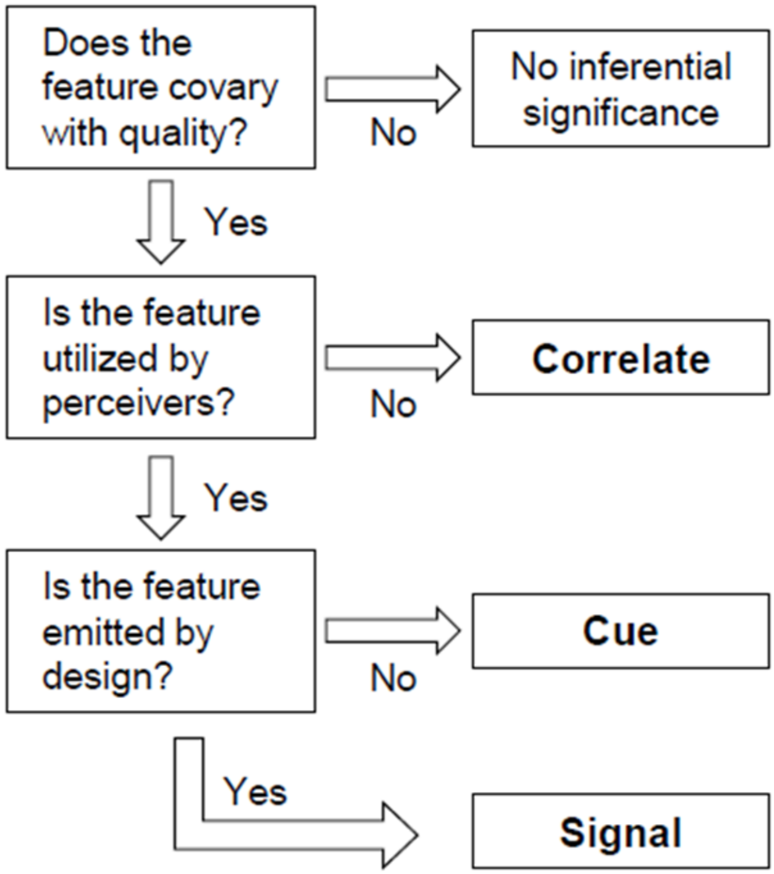

Figure 1. Decision flowchart distinguishing different kinds of features.