



# Appearance Enhancement: A Cue-Based Approach

David M. G. Lewis<sup>1,2</sup> · David M. Buss<sup>3</sup>

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Davis and Arnocky (2020) offer an impressive review that pulls together a large body of disparate studies and draws valuable attention to physical appearance enhancement behavior. Through numerous examples, they illustrate that an evolutionary framework is not incompatible with socio-cultural influences (Buss, 1995; Lewis, Al-Shawaf et al., 2017; Tooby & Cosmides, 1990; see also Al-Shawaf et al., 2019, 2020; Confer et al., 2010; Lewis & Lewis, 2017; Lewis, 2015; Lewis, Al-Shawaf, & Buss, 2020; Lewis, Al-Shawaf, et al., 2020; Lewis et al., 2018; Lukaszewski et al., 2020; Nesse, 2019; Tinbergen, 1963). This central aspiration of the Target Article—to integrate proximate and ultimate explanations for appearance enhancement behavior—will be invaluable for progress in this important domain of research.

We think that this integration will be best achieved through an approach that focuses on specific visual cues, in particular those ancestrally predictive of important fitness outcomes. Here, we present this cue-based approach, which we hope usefully supplements the Target Article through the wealth of new predictions that it generates about the psychology and behavior of appearance enhancement.

The foundations of this approach will be: (1) to explicitly recognize that appearance enhancement behavior is the manipulation of visual cues that conspecifics' attractiveness-assessment mechanisms attend to, and (2) to map the design features of these attractiveness-assessment mechanisms, including the specific cues to which they attend, and the distinct contexts in which they place value on those cues.

## Physical Appearance Enhancement Behavior: Manipulation of Visual Cues

Physical appearance enhancement behavior refers to the manipulation of specific visual cues to which humans' attractiveness-assessment mechanisms attend. The metaphor of a lock and key is apt: Attractiveness-assessment mechanisms are the locks that physical appearance enhancement behavior is attempting to open (see Buss, 1995; Tooby & Cosmides, 1992 for seminal uses of this metaphor). Just as the shape of a lock informs the shape of the tines and grooves of the key that will open it, understanding the information-processing architecture of attractiveness-assessment mechanisms can provide insight into physical appearance enhancement behavior.

An understanding of the causal origins of these attractiveness-assessment mechanisms will be central to this task analysis. Because natural selection is the only known process capable of producing complex organic mechanisms, we must understand the selection pressures that shaped these attractiveness-assessment mechanisms. Selection shaped these attractiveness-assessment mechanisms to attend to cues in a potential mate that were ancestrally predictive of the probabilistic fitness consequences of mating with that individual (Lewis et al., in press; Sugiyama, 2005, 2015; Symons, 1979, 1995). This is the first key design feature of attractiveness-assessment mechanisms, and it provides insight into the expected design of the mechanisms responsible for physical appearance enhancement behavior. Namely, we should expect many of the behaviors in this domain to be focused on manipulating cues that were predictive of reproductive fitness in ancestral environments. This evolutionary consideration usefully guides attention toward a specific set of visual cues and facilitates the generation of a priori predictions about specific visual features that we should expect appearance enhancement behavior to target.

Second, attractiveness-assessment mechanisms should differentially value specific cues across different contexts (Lewis et al., in press; Sugiyama, 2005, 2015; see also Al-Shawaf et al., 2019; DeBruine et al., 2010; DeKay & Buss, 1992; Gangestad & Buss, 1993; Lewis, Al-Shawaf, et al.,

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✉ David M. G. Lewis  
davidlewis@utexas.edu

- <sup>1</sup> Psychology, Murdoch University, Murdoch, WA, Australia
- <sup>2</sup> Centre for Healthy Ageing, Health Futures Institute, Murdoch University, Murdoch, WA, Australia
- <sup>3</sup> Department of Psychology, The University of Texas at Austin, Austin, TX, USA

2017; Lewis, Al-Shawaf, et al., 2020; Lewis et al., 2021). This is the second key design feature of attractiveness-assessment mechanisms, and it provides insight into another expected feature of physical appearance enhancement mechanisms. Specifically, we should expect these mechanisms to behaviorally enhance specific cues differentially across contexts as a function of contextual variation in the fitness value of those cues.

For example, cues that a potential mate is sexually proceptive may predict positive fitness outcomes in short-term mating contexts, but may also be linked to countervailing fitness costs in mating contexts in which sexual monogamy is paramount. Based on these differences in the fitness value of cues to sexual proceptivity across mating contexts, we should expect selection to have shaped attractiveness-assessment mechanisms to differentially value proceptivity cues across these contexts. They do: Evidence suggests that cues to proceptivity increase men's perceptions of women's attractiveness in short-term, but not long-term, contexts (see Goetz et al., 2012; Oliver & Sedikides, 1992). In turn, we should expect to observe behavioral enhancement of cues to proceptivity in short-term, but not necessarily long-term, contexts. This is a clear, testable hypothesis about physical appearance enhancement behavior: We should expect greater enhancement of visual cues to proceptivity in short-term than in long-term contexts (for evidence consistent with this hypothesis, see Goetz et al., 2014; Lewis et al., 2021; Schmitt & Buss, 1996). Moreover, the term "enhance" could inadvertently limit researchers to thinking about only those behaviors that increase the level of a cue. Our suggested emphasis on cue manipulation—which can include increasing or decreasing the level of a cue—facilitates the generation of another testable hypothesis: In long-term mating contexts, people manipulate their physical appearance to actively conceal cues to promiscuity.

These evolutionary insights—that (1) a specific set of visual cues were ancestrally predictive of fitness and (2) the fitness value of those cues varied systematically as a function of specific contextual variables—are invaluable for understanding and generating new hypotheses about physical appearance enhancement behavior. These two key evolutionary ideas should serve as the foundation for generating and testing new hypotheses about physical appearance enhancement behavior, including variation in such behavior across sociocultural environments and other contexts.

## A Cue-Based Approach to Appearance Enhancement

The Target Article organizes physical appearance enhancement behavior around different behavioral categories (e.g., cosmetics, exercise-based modification of one's physique,

hairstyling). We think that a more productive approach, especially with respect to generating new a priori predictions, would be to build a model of physical appearance enhancement behavior based on specific visual cues. Here, we refer to just a few examples from the Target Article that illustrate how a cue-based model can (1) more readily tap into evolutionary insights that a "behavioral category" taxonomy may miss and (2) guide research toward a more explanatory and predictive framework for appearance enhancement.

The Target Article writes, "Cosmetics can be used to [enhance appearance by] manipulating facial features that humans [...] evolved to find attractive." This framing is reasonable, but has two shortcomings. First, stating that humans evolved to find a feature attractive—without qualification about contextual effects—could be interpreted to mean that this preference is fixed and uninfluenced by proximate factors such as sociocultural and other inputs during development. In contrast, stating that humans have attractiveness-assessment mechanisms that attend to a feature is more accurate and accommodates the context-dependent design of those mechanisms. This context dependence can include perceiving a feature as attractive in some contexts, but not in others. Second, the use of cosmetics may appear to form a coherent category of behavior, but organizing appearance enhancement behaviors in this manner loses out on key within-category differences between distinct behaviors designed to manipulate different cues.

A cue-based approach, on the other hand, can (1) identify distinct cues manipulated by different behaviors within a single behavioral category, (2) unify behaviors that fall under different behavioral categories but which manipulate the same cue, and (3) guide researchers toward new hypotheses about these behaviors. Take, for example, the cue of the limbal ring, which is a dark ring formed at the border of the iris and sclera in the human eye. The limbal ring is a hypothesized cue to youth; with age, the presence of Vogt palisades in the corneal limbus decreases and the size of the limbal basal epithelial cells increases, resulting in a lightening of the limbal ring (see Zheng & Xu, 2008). In line with the hypotheses that the limbal ring is a hypothesized fitness-relevant cue and that selection shaped attractiveness-assessment mechanisms to attend to this cue, available evidence suggests that individuals with more prominent limbal rings are perceived as more attractive (see Brown & Sacco, 2018; Peshek et al., 2011). Based on this, researchers can generate predictions about multiple behaviors that could be used to manipulate perceptions of this visual cue. One such behavior could be the application of eyeliner, which can be used to create a dark border at the edge of the sclera that mimics the visual effect of the limbal ring. Another behavior would be the use of contact lenses that themselves contain limbal rings (e.g., Acuvue Define contact lenses). Moreover, a consideration of the specific fitness-relevant information

that the limbal ring predicts can be used to generate a priori predictions about individual differences in the deployment of these behaviors. If prominent limbal rings are a cue to youth, and men's attractiveness-assessment mechanisms place greater value on cues to youth than women's attractiveness-assessment mechanisms do (see Buss, 1989; Kenrick & Keefe, 1992; Symons, 1979; Williams, 1975), then we should expect to observe sex differences in the deployment of these limbal ring-enhancement behaviors: Women, more than men, should engage in behaviors to manipulate this visual cue. This hypothesis is novel, although, for eyeliner usage, it may be complicated by already-known sex differences in the use of makeup. However, the prediction that women, relative to men, disproportionately wear limbal ring contact lenses is specific, novel, and testable.

The specificity and explanatory capacity of a cue-based approach would strengthen Davis and Arnocky's (2020) Target Article, which, at times, is limited on these dimensions. For example, Davis and Arnocky state that "Kohl, a black powder, was used [...] as a cosmetic to draw attention to the eyes." This behavior-focused approach does not provide the reader with any greater specification of cues other than "the eyes." The eyes do not constitute a single cue but rather include manifold important cues. This includes, among an even larger set of fitness-relevant cues, the limbal ring; the coloration of the sclera, which provides information about diverse fitness-relevant outcomes—from pathogenic infection to physical trauma to impaired liver function (see Cronau et al., 2010; Roche & Kobos, 2004); the tightness of the eyelid skin (e.g., dermatochalasis, or "baggy eyes"), a cue linked with age and future reproductive potential; and ptosis, or eyelid drooping, which can indicate neuromuscular impairment (see Damasceno et al., 2015 for a description of these and other fitness-relevant cues in the eyes). The Target Article also leaves the reader to work out why "drawing attention" to the eyes should have the obvious consequence of increasing attractiveness. Precisely why increased attention should necessarily increase attractiveness is left a mystery.

In short, the greater specificity of a cue-based approach translates to both (1) a greater capacity to explain known physical appearance enhancement behaviors and (2) stronger predictive power: It positions researchers to generate precise and specific new predictions about appearance enhancement behaviors. These can include novel predictions about individual differences in appearance enhancement behaviors and contextual effects on them that have yet to be discovered.

## Future Directions

A cue-based approach can be used to generate a wealth of a priori hypotheses that tie together proximate and ultimate explanations and, ultimately, lead to new discoveries about

physical appearance enhancement behavior. For example, the Target Article identifies that individuals use physical exercise as means to sculpt their physique. However, this hypothesis would be strengthened by leveraging evidence that the specific physical features attended to by men's attractiveness-assessment mechanisms differ from those attended to by women's attractiveness-assessment mechanisms. Knowledge of differences in the specific physical cues that men and women attend to can be used to generate new predictions about sex-differentiated patterns of exercise-based appearance enhancement. For example, if upper body musculature was a recurrent predictor of male intrasexual mating competition, and women's—but not men's—attractiveness-assessment mechanisms evolved to frequently place positive value on cues to upper body strength (see Sell et al., 2017), then we should expect to observe greater exercise-based enhancement of upper body musculature among men than among women (see Mealey, 1997). We recognize that demonstrating that men, more than women, do exercises to develop their chest, shoulder, and arm muscles might not be entirely novel (but see Caton et al., 2021; Caton & Lewis, 2021 for original hypotheses about the development of the neck muscles). However, it would be novel to show that women develop certain muscle groups more than men do. For example, if men's attractiveness-assessment mechanisms attend to the specific cue of women's lumbar curvature (see Lewis et al., 2015, 2021; Lewis, Russell, et al., 2017), then we might expect women to disproportionately engage in exercises to enhance their lumbar curvature, such as back extensions or hyperextensions. This prediction—generated from a cue-based approach—is novel, specific, and testable. Importantly, it could lead to the discovery of a previously unknown sex difference that would add valuable nuance to an understanding of weight training-based appearance enhancement, a domain historically regarded as pertaining mostly to men (see Quatman et al., 2009).

## Conclusion

We applaud the Target Article for attempting to steer research on physical appearance enhancement in a much-needed direction. A central misconception about an evolutionary framework is that sociocultural and evolutionary explanations are in competition with one another. As the Target Article validly asserts, they are not. A sociocultural perspective addresses proximate causes of behavior. In contrast, an evolutionary framework leverages the ultimate level of analysis to generate predictions about proximate influences on behavior: Understanding the distal evolutionary origins of a behavior is indispensable for generating new predictions about proximate influences on that behavior in contemporary sociocultural contexts (Lewis, Al-Shawaf, et al., 2017; see

also Buss, 2020). We hope that the Target Article helps dispel misconceptions that, though unwarranted, have a long history of ensnaring non-evolutionary researchers and preventing them from taking advantage of the powerful insights and predictive power that an evolutionary framework has to offer.

We also hope that the approach that we have proposed—to organize appearance enhancement behavior around specific cues—yields new discoveries about the psychology and behavior of appearance enhancement. More broadly, we hope this approach contributes, however modestly, to the increased sophistication of research on physical appearance enhancement behavior. Like Davis and Arnocky (2020), we think this can be best accomplished through an evolutionary framework that integrates both proximate (e.g., sociocultural) and ultimate explanations.

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