



Perfectionism and Relationship Status Influence Health Evaluations of Faces with Limbal Rings

Donald F. Sacco¹ · Mitch Brown¹ · Mary M. Medlin¹

© Springer Nature Switzerland AG 2019

Abstract

Research consistently demonstrates that limbal rings are a visual cue to health, given their peak vibrancy is observed in healthy individuals. Such perceptual acuity toward limbal rings is especially apparent among women evaluating male faces. The current research was designed as a replication and extension of previous findings demonstrating how women perceive limbal rings. Additionally, we sought to determine if this preference was moderated by relationship status and related to individual differences in perfectionistic tendencies, consistent with past research demonstrating moderation of good genes preferences by personality and relationship status. Women evaluated the perceived health of faces with and without limbal rings before responding to measures assessing perfectionistic tendencies. We replicated previous findings indicating that limbal rings are indeed a health cue, particularly in male faces. Furthermore, we extended previous findings by demonstrating that women higher in other-oriented perfectionism, a dimension of perfectionism associated with exceedingly high criteria for others' abilities, perceive faces with limbal rings as particularly healthy. Importantly, this perceptual acuity was only apparent among single women. We frame results in terms of how perfectionism facilitates recognition of good gene cues.

Keywords Limbal rings · Relationship status · Perfectionism · Face perception

Given associations between phenotypic cues of physical attractiveness and increased health, humans have evolved hypersensitivity in detecting variation in these cues and concomitant preferences for targets in possession of these good genes characteristics from which they can identify mates capable of producing healthy offspring (e.g., Rhodes 2006). Researchers have documented strong attunements and preferences for various facial and body characteristics connoting health, such as facial symmetry and healthy body compositions (Pisanski and Feinberg 2013; Rhodes et al. 2007). Based on different historical challenges pertaining to reproduction men and women faced, some of these attunements are sex-specific. For example, men prefer women's bodies that approximate a 0.7 waist-to-hip ratio, a cue to nubility and lower mortality rate in the context of giving birth (Lassek and Gaulin 2019; Singh 1993). Conversely, women prefer men possessing masculine facial features and muscular bodies particularly in short-term mating

contexts, as these heritable fitness cues would implicate them as producing healthy offspring (Frederick and Haselton 2007; Jones et al. 2018).

These basic perceptual attunements and preferences are further associated with certain mating-relevant personality characteristics and are moderated by individuals' own current relationship status. For example, individuals with more unrestricted sociosexual orientation, a personality trait associated with short-term mating interest and prioritization of good genes in mate selection, especially prefer facial symmetry in female faces (Sacco et al. 2009). Such perceptual acuity could facilitate men's identification of healthy mates and women's identification of potential intrasexual threats. Additionally, unrestricted sociosexuality is associated with a preference for extraverted male faces, a cue associated with short-term mating interest and heightened physical attractiveness, which would indicate sexual opportunity to women and intrasexual competition to men (Brown and Sacco 2017).

Nonetheless, such interest in identifying reproductive opportunities appears contingent upon an individual's current relationship status. For example, sociosexually unrestricted women prefer sex-typical characteristics (i.e., cues to fertility) in male and female faces but only women who report single rather than partnered relationship status (Sacco et al. 2012).

✉ Donald F. Sacco
Donald.Sacco@usm.edu

¹ School of Psychology, The University of Southern Mississippi, Owings-McQuagge Hall, Hattiesburg, MS 39406, USA

Consistent with the aforementioned findings, unpartnered men and women with an unrestricted sociosexual orientation demonstrate a heightened preference for facial symmetry in male and female faces; partnered individuals exhibited no such preference (Lustgraaf and Sacco 2015). Because partnered individuals' long-term mating goals are satisfied by their current relationship, they often show preferences for characteristics that would be advantageous for short-term mating goals (e.g., Little et al. 2002). Conversely, single individuals tend to show more systematic variability in the extent to which their preferences emphasize traits useful for both short- and long-term mating. As a consequence, mating personality variables may track variability in mate preferences better for unpartnered rather than partnered women.

One as-yet-unstudied personality dimension that may relate to adaptive face preferences, particularly for unpartnered individuals, is self-reported perfectionism. Indeed, many of the "good genes" characteristics previously described are often described as physical attractiveness ideals. For perfectionistic individuals who are especially interested in identifying mates representing this physical ideal (Hoffmann et al. 2015), it would be adaptive to exhibit considerable sensitivity toward physical features connoting good genes. In an extension of these findings, the current study sought to determine if similar patterns of personality and relationship status predict sensitivity to a relatively understudied facial cue, namely limbal rings contained in the eye, an especially attractive physical feature (Peshek et al. 2011). Given that past work exploring how personality and relationship status interact to influence good genes mate preferences have focus heavily on sociosexual orientation, we considered it prudent to explore an additional facet of mating personality, namely perfectionism, to explore the breadth of this mating personality-relationship status link to good genes mate preferences.

Limbal Rings as a Good Genes Cue

Limbal rings are dark annuli that encircle the eye's iris where the sclera and iris converge. Their presence augments the brightness of sclera relative to the iris, thereby presenting a light-dark contrast that makes the sclera appear whiter (Shyu and Wyatt 2009). Its connotation to underlying physical health is due to the fact that their visibility deteriorates with age and the fact that declining health is itself associated with their deterioration, as is evident in various degenerative diseases (Peshek et al. 2011; Cavallotti and Cerulli 2008). Indeed, individuals rate faces whose eyes contain limbal rings as more attractive than faces whose eye lack this phenotypic cue (Peshek et al. 2011).

Several recent findings provide supplemental evidence that limbal rings are a good genes cue, particularly for women's evaluation of male targets with and without limbal rings.

Faces with limbal rings are perceived as healthier than those without, an effect that was demonstrated to be stronger among women, particularly when evaluating male faces. Additionally, activating short-term mating goals in women heightens preferences for faces whose eyes contain limbal rings. Furthermore, women rated male faces with limbal rings as more desirable short-term mates (Brown and Sacco 2018). More recently, using a line-bisection task that assesses activation of the behavioral approach and avoidance systems, mating-primed women displayed left visual field biases when presented with facial targets lacking limbal rings, indicating activation of avoidant motivational states, suggesting this preference has a basis in bad genes aversion (Brown et al. *in press*; Zebrowitz and Rhodes 2004). This bad genes aversion is further reflected in the fact that advertisements featuring faces without limbal rings elicit stronger perceptions of that brand as untrustworthy and less pure (Ilicic et al. 2016). These findings indicate an aesthetic value to limbal rings, which could subsequently inform perceptions of prospective mates' attractiveness.

Individual Differences in Perfectionism and Mate Selection

The aesthetic qualities of limbal rings position their presence to represent a physical ideal for women's mate selection. This perceptual acuity would be especially crucial toward individuals high in perfectionism. Perfectionism refers to a dispositional desire to impose exceedingly high standards onto their environment, including themselves and others (Hewitt and Flett 1991). Within these intra- and interpersonal domains of perfectionism is a potential evolutionary basis that could serve to improve one's physical appearance in intrasexual competition. Perfectionistic tendencies could be a product of the motivation to make oneself appear more desirable than potential rivals by making oneself appear more attractive or capable of satisfying prospective mates' reproductive goals, which could potentially result in eating and body image disorders in extreme cases (Abed et al. 2012; Li et al. 2014).

Consequently, in response to making oneself appear especially desirable, individuals would necessitate for themselves higher criteria for a prospective mate to meet, thereby creating the basis of other-oriented perfectionism, defined as exceedingly high standards for another person. Although other-oriented perfectionism can concern various relationships, its consideration in a mating domain would necessarily lead to consideration of mates' physical attractiveness. Indeed, individuals exhibiting high levels of other-oriented perfectionism engage in assortative mating by selecting perfectionistic mates who appear more physically attractive (Davis et al. 2018; Hoffmann et al. 2015). This physical attractiveness in prospective mates would position such individuals to satisfy

mating goals relevant to short-term mating domains (Li and Kenrick 2006).

In fact, other-oriented perfectionism is associated with behavioral repertoires indicative of successful short-term mate acquisition. Other-oriented perfectionistic individuals utilize aggressive humor and are high in Dark Triad personality traits (narcissism, Machiavellianism, psychopathy), which themselves are associated with short-term mating success (Aitken et al. 2013; Stoeber 2014, 2015). Such behavioral repertoires would further allow these perfectionistic individuals to decouple following a short-term pairbond, thereby affording them the opportunity to identify and acquire additional attractive mates (Jonason and Buss 2012). In the context of the current research, it may be the case that those higher in other-oriented perfectionism may be especially sensitive to facial features that would communicate good genes, leading them to more favorably evaluate targets with limbal rings, and to be especially negative toward those without limbal rings. Another aspect of perfectionism that could similarly predict perceptual acuity toward limbal rings is perfectionism specific to physical appearance (Yang and Stoeber 2012). For those with considerable concern over physical attractiveness, the identification of attractive mates could be critical to a sense of anxiety over being able to secure an ideal mate. Indeed, those higher in anxiety, itself a symptom of perfectionism, often prioritize highly attractive mates (Levinson et al. 2013; Brumbaugh et al. 2014). Taken together, these findings suggest multiple facets of perfectionism could predict acuity toward good gene cues in the service of mate acquisition, though perhaps specifically for unpartnered women as demonstrated in previous research exploring other good genes cues.

Current Study

The current study sought to identify how perfectionistic individuals perceive limbal rings. Given both the potential short-term mating interest among these individuals and previous research demonstrating such perceptual acuity is most apparent to single individuals, we found it prudent to consider relationship status as a moderator. We thus tested two primary hypotheses that would provide the opportunity to replicate and extend previous work on good genes cue perception, relationship status, and mating-relevant personality variables. Consistent with previous findings (Brown and Sacco 2018), we predicted that women would rate faces with limbal rings as healthier than those without, particularly male targets. Furthermore, we predicted that individual differences in perfectionism and relationship status would additionally moderate these effects. That is, given previous research indicating that perfectionistic individuals engage in the behavioral repertoires indicative of short-term mating interest (Stoeber 2015), as well as prefer highly attractive mates (Hoffmann et al.

2015), higher perfectionism would predict greater perceptions of male targets with limbal rings as healthy as well as stronger perceptions of male targets without limbal rings as unhealthy, but only for single women (Lustgraaf and Sacco 2015; Sacco et al. 2012).

Method

Participants

We recruited 238 women from a public university in the Southeastern United States in exchange for course credit ($M_{\text{Age}} = 20.61$ years, $SD = 3.72$; 47.5% White; 129 single, 109 paired). We sought to collect as many participants as possible throughout the last month of a semester to ensure an appropriately powered study. A sensitivity analysis indicated this number of participants was sufficient in detecting small-medium effects (Cohen's $f = 0.18$, $\beta = 0.80$). Importantly, this sample was much larger than previous studies considering evaluations of limbal rings (Brown and Sacco 2018; Peshek et al. 2011).

Materials and Procedure

Face Stimuli Target faces included 10 unique male and 10 female faces, previously altered to either have or not have limbal rings (see Peshek et al. 2011, for stimulus construction details; Fig. 1). Participants viewed both versions of each target face in a randomized order, with no possibility of seeing the same target identity in consecutive trials. Participants rated the extent to which they perceived each face as healthy using a 7-point Likert-type scale (1 = Very Unhealthy; 7 = Very Healthy; Brown and Sacco 2018).

Perfectionism Given this study's focus on physical appearance cues, we assessed two kinds of perfectionism as individual



Fig. 1 Example faces with (left) and without limbal rings

difference measures: other-oriented and physical appearance perfectionism. Other-oriented perfectionism (OOP; Hewitt and Flett 1991) was assessed using a 5-item scale and participants used a 7-point Likert-type response for each item (1 = Strongly Disagree; 7 = Strongly Agree), with higher scores indicating greater OOP. One sample item was included, “I have high expectations for the people.” The scale demonstrated adequate reliability ($\alpha = 0.61$); individual-item analyses indicated removal of no items would have improved reliability significantly; thus, all items were retained in the computation of average other-oriented perfectionism.

Physical appearance perfectionism (PAP; Yang and Stoeber 2012) was assessed using a modified version of the Worry About Imperfection 7-item subscale to assess participants’ desire for physical appearance perfection in others, which provided consideration of a complementary facet of perfectionism. Participants responded using 5-point Likert-type responses (1 = Strongly Disagree; 5 = Strongly Agree), with higher scores indicating greater PAP. A sample item includes, “I am not satisfied with others’ appearance.” The scale demonstrated acceptable reliability ($\alpha = 0.86$).

Consenting participants completed this study online by assessing the health of targets with and without limbal rings. This was followed by OOP and PAP, which were presented in random order. Participants then completed a demographics questionnaire and were debriefed.

Results

Preliminary Analysis

To establish replicability with previous research (Brown and Sacco 2018), we first conducted a 2 (Target Sex: Male vs. Female) \times 2 (Limbal Rings: Present vs. Absent) repeated-measures ANOVA. This analysis revealed a main effect of Target Sex, such that female targets ($M = 4.60$, $SD = 0.92$) were rated as healthier than male targets ($M = 4.50$, $SD = 1.00$), $F(1, 237) = 5.11$, $p = 0.025$, $\eta_p^2 = 0.021$. A main effect of Limbal Rings emerged, such that targets with limbal rings ($M = 4.59$, $SD = 0.92$) were rated as healthier than targets without limbal rings ($M = 4.52$, $SD = 0.91$), $F(1, 237) = 22.01$, $p < 0.001$, $\eta_p^2 = 0.085$. Effects were qualified by a Target Sex \times Limbal Rings interaction, $F(1, 237) = 5.40$, $p = 0.021$, $\eta_p^2 = 0.022$ (see Fig. 2). Consistent with previous research, simple effects tests indicated that women perceived male face without limbal rings as less healthy ($M = 4.45$, $SD = 1.02$) than male faces with limbal rings ($M = 4.56$, $SD = 1.00$), $F(1, 237) = 23.01$, $p < 0.001$, $\eta_p^2 = 0.088$. No difference emerged in female targets with ($M = 4.62$, $SD = 0.94$) and without limbal rings ($M = 4.58$, $SD = 0.94$), $F(1, 237) = 2.45$, $p = 0.119$, $\eta_p^2 = 0.010$. Viewed another way, although no difference emerged in ratings of male and female targets with

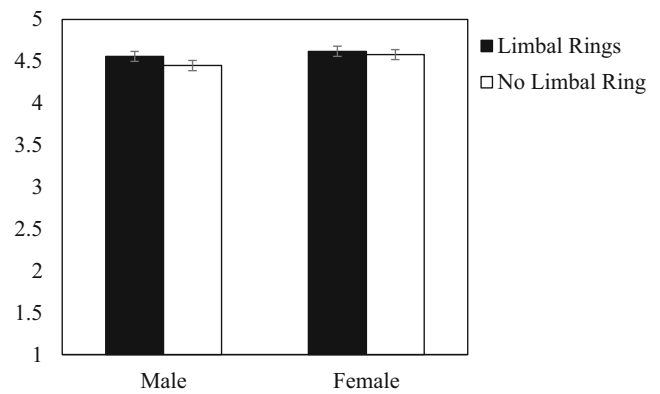


Fig. 2 Ratings of male and female targets’ perceived health as a function of limbal ring presence

limbal rings, $F(1, 237) = 1.80$, $p = 0.181$, $\eta_p^2 = 0.008$, male faces without limbal rings were perceived as less healthy than female faces without limbal rings, $F(1, 237) = 7.87$, $p = 0.005$, $\eta_p^2 = 0.032$.

Moderation by Relationship Status and Association with Perfectionism

Building on the previous model to test for potential moderation, we then included relationship status and other-oriented perfectionism, specifically by conducting custom repeated-measures ANCOVAs that allowed for tests of main effects and interactions with respect to continuous (i.e., perfectionism) and categorical variables (i.e., participant sex, target sex, target limbal ring status), separately for OOP and PAP. This model revealed no main effect of Limbal Rings nor Limbal Rings \times Target Sex interaction, $F_s < 0.02$, $p_s > 0.970$. However, this model produced a significant Relationship Status \times OOP \times Limbal Rings interaction, $F(1, 234) = 3.89$, $p = 0.050$, $\eta_p^2 = 0.016$. No other interactions emerged for Relationship Status and OOP, $F_s < 3.28$, $p_s > 0.070$.

We conducted separate repeated-measures ANCOVAs for single and partnered participants by collapsing across Target Sex, with other-oriented perfectionism as a custom covariate to test for interactive effects. For single participants, effects were qualified by a significant OOP \times Limbal Rings interaction, $F(1, 127) = 4.73$, $p = 0.032$, $\eta_p^2 = 0.036$. We individually correlated OOP with health ratings of faces with and without limbal rings. Consistent with hypotheses a positive association between OOP and perceptions of faces with limbal rings as healthy emerged, $r(127) = 0.172$, $p = 0.051$. However, inconsistent with hypotheses, no relation emerged for faces without limbal rings, $r(127) = 0.118$, $p = 0.182$. For participants in a relationship, no interaction emerged, prompting us to consider it no further, $F(1, 107) = 0.45$, $p = 0.505$, $\eta_p^2 = 0.005$.

For the model including PAP, the only effect to emerge was a main effect of self-perfectionism, such that women reporting

greater PAP rated all targets as less healthy, $F(1, 234) = 6.92$, $p = 0.009$, $\eta_p^2 = 0.029$, $r = -0.169$.

Discussion

Consistent with a growing body of research, we found that women utilize limbal rings as a cue to infer another's health (Brown and Sacco 2018). Additionally, this perceptual acuity toward limbal rings was most apparent for male faces, as male faces without limbal rings were perceived as especially unhealthy. These findings suggest that the absence of limbal rings in male faces is a stronger bad genes cue than the presence of limbal rings is a good genes cue, which is further consistent with previous research (Brown et al. *in press*). Though the mean difference in health ratings for male targets with and without limbal rings was small, it was nonetheless statistically significant with its effect size ($\eta_p^2 = 0.088$) yielding a similar magnitude to that found in previous research ($\eta_p^2 = 0.109$), suggesting this pattern of results is robust.

We also found that, consistent with past research, the association between personality and good genes face perception was moderated by relationship status, such that personality was related to health evaluations of target faces, but only for unpartnered women (Sacco et al. 2012; Lustgraaf and Sacco 2015). However, the association between personality and face evaluations received mixed support for hypotheses. Specifically, higher OOP predicted single women's perceptions of faces with limbal rings as especially healthy. Inconsistent with predictions, however, single women reporting higher OOP did not perceive faces without limbal rings as especially unhealthy. At least in the context of relationship status and mating-related personality, single women higher in OOP tend to be more attentive to good genes cues (i.e., targets with limbal rings) than bad genes cues (targets without limbal rings), which could be in the service of identifying mates possessing the traits they would desire in another person. It is possible that the robust general aversion of all women toward faces lacking limbal rings, but especially male targets, reduces the ability of relationship status and personality to exacerbate an already strong aversion to faces lacking limbal rings.

We further found a level of specificity in the role of perfectionism in predicting perceptual acuity toward limbal rings. Specifically, effects were only apparent for OOP. This could reflect the nature of OOP in terms of the demands it places on others (Hewitt and Flett 1991), which would position individuals high in OOP to exhibit higher criteria in mate selection (Hoffmann et al. 2015). These results seem further sensible, given the fact that women are especially selective toward attractive mates in short-term mating domains (Kenrick, Groth, Trost, & Sadalla, 1993). Conversely, PAP did not interact with relationship status to predict perceptual acuity toward limbal

rings. This could similarly reflect the nature of perfectionism indexed through this measure. This measure was initially developed to consider worries over imperfections (Yang and Stoeber 2012), which could be less relevant to defining mate selection criteria. However, given that PAP oftentimes predicts symptoms of appearance-based psychopathologies (e.g., eating disorders; Stoeber and Yang 2015), individuals who are highly concerned over physical perfection may infer that they themselves do not meet the mating criterion of others or could be anxious about finding someone perfect, thereby impeding mating goals. Future research would benefit from considering how PAP predicts inferences of highly attractive prospective mates' interests and how that influences engagement with attractive others (Lee et al. 2008).

Whereas past research demonstrated that women were especially sensitive to male target faces with and without limbal rings (an effect we replicated in our model not including relationship status and personality), target sex did not interact with relationship status and personality in evaluations of targets with and without limbal rings. One possible explanation for this finding may be that single women may be sensitive not only to good genes cues with respect to potential mating partners (i.e., men) but also to good genes cues in those who might represent greater intrasexual competition due to the presence of good genes cues (i.e., women with limbal rings). Though the signal value of limbal rings may be more robust in evaluating male targets (e.g., Brown and Sacco 2018; Brown, Medlin, & Sacco, *in press*), it is likely that limbal rings contained in female faces nonetheless signal good genes that would be attractive to potential mates, thereby increasing sensitivity to their presence or absence among women who may be most influenced by intrasexual competition, specifically single women. There is increasing evidence for same-sex good genes cue sensitivity (e.g., positive evaluation) that would be consistent with the possibility that attending to intrasexual competitors manifests similarly with opposite sex good genes affordance perception (e.g., Brown and Sacco 2017; Lustgraaf and Sacco 2015; Sacco et al. 2009).

Limitations and Future Directions

A primary limitation of the current study was the nature of the dependent measure, which was simply perceived healthiness of target faces. Though interesting in its own right, it does not necessarily represent what participants' evaluation of a target would be (e.g., such as through a preference task) nor how an individual may choose to behave toward a target. As such, the current study is limited to inferences regarding perceivers' sensitivity to how limbal rings may be communicative of relative physical health. However, how such sensitivity translates to target evaluations and perceiver behavior necessarily needs to be addressed in future studies. Future research could consider discrete indices of behavioral attraction, including

extended gaze time toward prospective mates or heightened physical proximity toward confederates with limbal rings (Kampe et al. 2001; Montoya et al. 2018; Shin et al. 2019), as well as interest in going on future dates following a speed dating session (Medlin, Brown and Sacco 2018).

Furthermore, given the relation of perfectionism to other evolutionarily salient personality dimensions, such as the Dark Triad (Stoeber 2014), future research would benefit from simultaneously measuring these personality traits to determine their role in perceptions of targets with and without limbal rings. Given previous findings indicating that narcissism predicts preferences for narcissistic facial structures (Lyons & Blanchard, 2016), it is possible that Dark Triad personality dimensions also predict sensitivity to targets with and without limbal rings. Future research would benefit from determining whether the Dark Triad heightens perceptual acuity toward limbal rings similarly to OOP. Alternatively, mediation studies could determine if Dark Triad personality traits predict evaluation of targets with and without limbal rings by way of other-oriented perfectionism as a mediator, which would allow for stronger causal inferences. Importantly, given the robust relationship between relationship status and sociosexual orientation found in previous research (e.g., Sacco et al. 2012; Lustgraaf and Sacco 2015), it would be valuable for future research to include this variable to determine how it potentially interacts with other facets of mating personality, such as perfectionism.

To determine the full extent of how other-oriented perfectionism could predict awareness toward cues to heritable fitness, future studies could also consider various other good gene cues that shape perfectionistic individuals' mate preferences. Given the especially strong preference for facial symmetry in mate selection (e.g., Lustgraaf and Sacco 2015; Sacco et al. 2009), highly perfectionistic individuals may be especially likely to upregulate their preferences for facial symmetry. There could be further consideration of bodily features connoting good genes, with future studies tasking perfectionistic women to indicate their interest in bodies with different degrees of muscularity (Frederick and Haselton 2007) and men's preference for women's optimum waist-to-hip ratio (Lassek and Gaulin *in press*).

Conclusion

Previous research demonstrates that the presence of limbal rings, particularly in male faces, is a good genes cue preferred by women, particularly when motivated by short-term mating goals. Conversely, women demonstrate particularly strong negative evaluations and avoidance of targets without limbal rings. The current study replicated this general pattern of results for perceptions of health ratings of targets with and without limbal rings. Additionally, the current study extended

previous work by demonstrating that health evaluations of targets with and without limbal rings are qualified by individual differences in other-oriented perfectionism and relationship status, such that for single women, higher other-oriented perfectionism is associated with stronger perceptions of faces with limbal rings as healthier.

Compliance with Ethical Standards

Conflict of Interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

References

- Abed, R., Mehta, S., Figueredo, A. J., Aldridge, S., Balsion, H., Meyer, C., & Palmer, R. (2012). Eating disorders and intrasexual competition: testing an evolutionary hypothesis among young women. *The Scientific World Journal*, 290813.
- Aitken, S. J., Lyons, M., & Jonason, P. K. (2013). Dads or cads? Women's strategic decisions in the mating game. *Personality and Individual Differences*, 55, 118–122.
- Brown, M., Sacco, D. F., & Medlin, M. (*in press*). Women's short-term mating goals elicit avoidance of faces whose eyes lack limbal rings. *Evolutionary Behavioral Sciences*.
- Brown, M., & Sacco, D. F. (2017). Unrestricted sociosexuality predicts preferences for extraverted male faces. *Personality and Individual Differences*, 108, 123–127.
- Brown, M., & Sacco, D. F. (2018). Put a (limbal) ring on it: women perceive men's limbal rings as a health cue in short-term mating domains. *Personality and Social Psychology Bulletin*, 44, 80–91.
- Brown, M., Sacco, D. F., & Medlin, M. (*in press*). Women's short-term mating goals elicit avoidance of faces whose eyes lack limbal rings. *Evolutionary Behavioral Sciences*.
- Brumbaugh, C. C., Baren, A., & Agishtein, P. (2014). Attraction to attachment insecurity: flattery, appearance, and status's role in mate preferences. *Personal Relationships*, 21, 288–308.
- Cavallotti, C., & Cerulli, L. (2008). Age-related changes of the human eye. Springer Science & Business Media.
- Davis, W. E., Abney, S., Perekslis, S., Eshun, S. L., & Dunn, R. (2018). Multidimensional perfectionism and perceptions of potential relationship partners. *Personality and Individual Differences*, 127, 31–38.
- Frederick, D. A., & Haselton, M. G. (2007). Why is muscularity sexy? Tests of the fitness indicator hypothesis. *Personality and Social Psychology Bulletin*, 33(8), 1167–1183.
- Hewitt, P. L., & Flett, G. L. (1991). Perfectionism in the self and social contexts: conceptualization, assessment, and association with psychopathology. *Journal of Personality and Social Psychology*, 60, 456–470.
- Hoffmann, A., Stoeber, J., & Musch, J. (2015). Multidimensional perfectionism and assortative mating: a perfect date? *Personality and Individual Differences*, 86, 94–100.
- Ilicic, J., Baxter, S. M., & Kulczynski, A. (2016). White eyes are the window to the pure soul: metaphorical association and overgeneralization effects for spokespeople with limbal rings. *International Journal of Research in Marketing*, 33, 840–855.
- Jonason, P. K., & Buss, D. M. (2012). Avoiding entangling commitments: tactics for implementing a short-term mating strategy. *Personality and Individual Differences*, 52, 606–610.
- Jones, B. C., Hahn, A. C., Fisher, C. I., Wang, H., Kandrik, M., Han, C., ... & O'Shea, K. J. (2018). No compelling evidence that preferences

- for facial masculinity track changes in women's hormonal status. *Psychological Science*, 29, 996–1005.
- Kampe, K. K., Frith, C. D., Dolan, R. J., & Frith, U. (2001). Reward value of attractiveness and gaze. *Nature*, 413, 589.
- Kenrick, D. T., Groth, G. E., Trost, M. R., & Sadalla, E. K. (1993). Integrating evolutionary and social exchange perspectives on relationships: Effects of gender, self-appraisal, and involvement level on mate selection criteria. *Journal of Personality and Social Psychology*, 64(6), 951–969.
- Lassek, W. D., & Gaulin, S. J. (2019). Evidence supporting nubility and reproductive value as the key to human female physical attractiveness. *Evolution and Human Behavior*.
- Lee, L., Loewenstein, G., Ariely, D., Hong, J., & Young, J. (2008). If I'm not hot, are you hot or not? Physical-attractiveness evaluations and dating preferences as a function of one's own attractiveness. *Psychological Science*, 19, 669–677.
- Levinson, C. A., Rodebaugh, T. L., White, E. K., Menatti, A. R., Weeks, J. W., Iacovino, J. M., & Warren, C. S. (2013). Social appearance anxiety, perfectionism, and fear of negative evaluation. Distinct or shared risk factors for social anxiety and eating disorders? *Appetite*, 67, 125–133.
- Li, N. P., & Kenrick, D. T. (2006). Sex similarities and differences in preferences for short-term mates: what, whether, and why. *Journal of Personality and Social Psychology*, 90, 468–489.
- Li, N. P., Smith, A. R., Yong, J. C., & Brown, T. A. (2014). Intrasexual competition and other theories of eating restriction. In V. A. Weekes-Shackelford & T. K. Shackelford (Eds.), *Evolutionary perspectives on human sexual psychology and behavior* (pp. 323–346). New York: Springer.
- Little, A. C., Jones, B. C., Penton-Voak, I. S., Burt, D. M., & Perrett, D. I. (2002). Partnership status and temporal context of relationship influence human female preferences for sexual dimorphism in male face shape. *Proceeding of the Royal Society of London, B*, 269, 1095–1100.
- Lustgraaf, C., & Sacco, D. F. (2015). Sociosexuality and relationship status interact to predict facial symmetry preferences. *Human Ethology Bulletin*, 30, 3–9.
- Lyons, M., & Blanchard, A. (2016). "I could see, in the depth of his eyes, my own beauty reflected": Women's assortative preference for narcissistic, but not for Machiavellian or psychopathic male faces. *Personality and Individual Differences*, 97, 40–44.
- Medlin, M. M., Brown, M., & Sacco, D. F. (2018). That's what she said! Perceived mate value of clean and dirty humor displays. *Personality and Individual Differences*, 135, 192–200.
- Montoya, R. M., Kershaw, C., & Prosser, J. L. (2018). A meta-analytic investigation of the relation between interpersonal attraction and enacted behavior. *Psychological Bulletin*, 144, 673–709.
- Peshek, D., Semmaknejad, N., Hoffman, D., & Foley, P. (2011). Preliminary evidence that the limbal ring influences facial attractiveness. *Evolutionary Psychology*, 9, 137–146.
- Pisanski, K., & Feinberg, D. R. (2013). Cross-cultural variation in mate preferences for averageness, symmetry, body size, and masculinity. *Cross-Cultural Research*, 47(2), 162–197.
- Rhodes, G. (2006). The evolutionary psychology of facial beauty. *Annual Review of Psychology*, 57, 199–226.
- Rhodes, G., Yoshikawa, S., Palermo, R., Simmons, L. W., Peters, M., Lee, K., Halberstadt, J., & Crawford, J. R. (2007). Perceived health contributes to the attractiveness of facial symmetry, averageness, and sexual dimorphism. *Perception*, 36, 1244–1252.
- Sacco, D. F., Hugenberg, K., & Sefcek, J. A. (2009). Sociosexuality and face perception: unrestricted sexual orientation facilitates sensitivity to female facial cues. *Personality and Individual Differences*, 47, 777–782.
- Sacco, D. F., Jones, B. C., DeBruine, L. M., & Hugenberg, K. (2012). The roles of sociosexual orientation and relationship status in women's face preferences. *Personality and Individual Differences*, 53, 1044–1047.
- Shin, J. E., Suh, E. M., Li, N. P., Eo, K., Chong, S. C., & Tsai, M. H. (2019). Darling, get closer to me: spatial proximity amplifies interpersonal liking. *Personality and Social Psychology Bulletin*, 45, 300–309.
- Shyu, B. P., & Wyatt, H. J. (2009). Appearance of the human eye: optical contributions to the "limbal ring". *Optometry and Vision Science*, 86, E1069–E1077.
- Singh, D. (1993). Adaptive significance of female physical attractiveness: role of waist-to-hip ratio. *Journal of Personality and Social Psychology*, 65, 293–307.
- Stoerber, J. (2014). How other-oriented perfectionism differs from self-oriented and socially prescribed perfectionism. *Journal of Psychopathology and Behavioral Assessment*, 36, 329–338.
- Stoerber, J. (2015). How other-oriented perfectionism differs from self-oriented and socially prescribed perfectionism: further findings. *Journal of Psychopathology and Behavioral Assessment*, 37, 611–623.
- Stoerber, J., & Yang, H. (2015). Physical appearance perfectionism explains variance in eating disorder symptoms above general perfectionism. *Personality and Individual Differences*, 86, 303–307.
- Yang, H., & Stoerber, J. (2012). The physical appearance perfectionism scale: development and preliminary validation. *Journal of Psychopathology and Behavioral Assessment*, 34, 69–83.
- Zebrowitz, L. A., & Rhodes, G. (2004). Sensitivity to "bad genes" and the anomalous face overgeneralization effect: cue validity, cue utilization, and accuracy in judging intelligence and health. *Journal of Nonverbal Behavior*, 28, 167–185.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.