Received: 26 August 2022 | Accepted: 22 November 2022

DOI: 10.1111/bjop.12617

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COMMENTARY

Mapping physical characteristics in face images to social judgements

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Funding information

EPSRC, Grant/Award Number: EP/T023783/1

Abstract

Sutherland and Young (*Br. J. Psychol.*, *113*, 2022, 1056) provide a comprehensive and timely overview of recent developments in research on social judgements of faces, emphasizing the utility of data-driven approaches. Here, we expand on this theme, focusing on how data-driven approaches can provide new insights into the physical characteristics in face images that best predict social judgements.

KEYWORDS

data-driven, faces, quantitative approaches, social perception

The specific physical characteristics that drive individual social judgements of faces remain somewhat unclear. Data from studies that have directly compared methods for investigating this issue suggest that this knowledge gap is largely a consequence of fundamental problems with the method that most studies on this topic have employed. Studies investigating the physical characteristics that perceivers use to form social judgements of faces have typically used a theory-driven experimental approach in which individual characteristics (e.g. sex-typical shape information) are either exaggerated or reduced in face images using computer graphics techniques, with participants then asked to indicate which version of the image depicts the person they perceive to be more likely to possess a certain trait (Perrett et al., 1998).

The type of theory-driven experimental approach described above can be problematic, however, since (1) existing theories of links between perceived traits and physical characteristics are arguably weak and underspecified, (2) the testing procedure arguably has low ecological validity, and (3) this method only reveals characteristics that predict social judgements when face images vary on a single dimension (Jones & Jaeger, 2019; Lee et al., 2021). Indeed, several recent studies have demonstrated that physical characteristics that have shown clear and robust effects on social judgements of faces in studies using this method are relatively poor predictors of social judgements when the physical characteristics and ratings are taken from natural (i.e. unmanipulated) face images that vary simultaneously on multiple dimensions (Holzleitner et al., 2019; Jaeger & Jones, 2022; Lee et al., 2021; Said & Todorov, 2011).

As Sutherland and Young (2022) commented, data-driven approaches have emerged as a viable alternative to this theory-driven experimental approach. Indeed, they have two clear advantages over

Invited comment on Sutherland & Young (2022). Understanding trait impressions from faces. British Journal of Psychology. https://doi.org/10.1111/bjop.12583

theory-driven experimental methods. First, they do not require researchers to make a priori predictions about which specific physical characteristics relate to which individual social judgements (i.e., they are not constrained by existing theories, findings or researcher assumptions and expectations, Holzleitner et al., 2019; Jack et al., 2018). Second, they are well suited to analyses of natural face images that vary simultaneously on multiple dimensions (Holzleitner et al., 2019). Furthermore, these data-driven methods can more easily identify non-linear relationships between physical characteristics in face images and social judgements than the theory-driven experimental approaches can.

A particularly useful data-driven approach to investigating the relationships between physical characteristics in faces and social judgements[1] first uses Principal Component Analysis to identify the main shape and colour dimensions of variance (i.e. principal components) in a sample of face images that have been rated for a trait (Holzleitner et al., 2019; Said & Todorov, 2011). Analyses of the relationships between the ratings and the shape and colour principal components can then reveal the components that best predict the ratings and these components can be visualized (Holzleitner et al., 2019).

This type of data-driven method can provide important new insights into the physical characteristics in face images that best predict social judgements. For example, two studies have shown that this type of data-driven model substantially outperforms theory-driven models for attractiveness judgements (Holzleitner et al., 2019; Said & Todorov, 2011). However, there are two challenges that researchers face when using this type of data-driven approach for mapping physical characteristics in faces to social judgements.

The first challenge is how to identify which components, if any, are reliably related to the social judgement of interest. As Sutherland and Young (2022) note, data-driven methods can be well suited to this problem, but overfitting (i.e. drawing inferences from idiosyncratic noise in a given data set) can be a substantial problem, raising the question of how best to minimize risk of overfitting when building data-driven models. To date, two different types of approaches have been used to address this issue in the literature on social judgements of faces. The mostly commonly used approach is bootstrapped regressions, in which only those components that predict the outcome variable consistently across iterations are retained (Holzleitner et al., 2019; Said & Todorov, 2011). An alternative but less widely used approach is to employ regularized regressions (Jaeger & Jones, 2022), which shrink uninformative predictors to small values, retaining informative ones. These are most naturally approached from a Bayesian perspective (Jones & Kramer, 2021), within which prior distributions put very low probability on large estimates, which can be overcome only with strong data. Although both approaches reduce overfitting, using both in tandem may be a pragmatic solution to the problem of overfitting. We also suggest here that, in many cases, it may be possible for researchers to make greater use of out-of-set testing and further increase the generalizability of findings.

The second challenge is how best to evaluate models. The proportion of variance explained is widely used for this purpose in research on social judgements of faces, as well as in other research areas. However, it is not well suited for assessing the predictive accuracy of data-driven models, since it is highly sensitive to the number of predictors included in the model. Rather than focusing on explained variance, the root-mean-squared error (RMSE) directly assesses the accuracy of predictions made by data-driven approaches and is directly comparable across models (Holzleitner et al., 2019; Jaeger & Jones, 2022). Thus, we recommend using RMSE, rather than the proportion of variance explained, when evaluating data-driven models.

As Sutherland and Young (2022) describe in their target article, researchers have recently made substantial strides in increasing our understanding of the processes that underpin social judgements of faces. We hope that greater use of data-driven models of the mapping between physical characteristics of faces and social judgements will help to further develop this understanding and, ultimately, contribute to the development of fuller, more useful theories of social judgements of faces.

[1]A different, but related, type of data-driven approach for investigating this issue is the reverse correlation method employed by Jack and colleagues (Zhan et al., 2021). However, while this method is certainly powerful, it requires very large number of trials per participant (i.e. has a high participant burden), meaning it is not necessarily well suited to the type of large-scale testing that is emerging in the area.

AUTHOR CONTRIBUTION

All authors wrote and approved the submission.

ACKNOWLEDGEMENT

This work was partly supported by EPSRC grant EP/T023783/1, awarded to BCJ. For the purpose of Open Access, the author has applied a Creative Commons Attribution (CC BY) to any Author Accepted Manuscript (AAM) version arising from this submission.

CONFLICTS OF INTEREST

The author declares that there is no conflict of interest.

DATA AVAILABILITY STATEMENT

This isn't an empirical paper so contribution statement is brief and there are no data or materials to make available.

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How to cite this article: Jones, B. C., Jones, A. L., & Shiramizu, V. (2023). Mapping physical characteristics in face images to social judgements. *British Journal of Psychology*, *114*, 498–500. https://doi.org/10.1111/bjop.12617