Dear Dr. Nöbel,  
  
Manuscript ID BRV-11-2021-0414 entitled "Conformity in mate choice, the overlooked social component of animal and human culture" which you submitted to  Biological Reviews, has been reviewed.  The comments of the reviewers are included at the bottom of this letter.  
  
As you can see, both referees are broadly enthusiastic about the work, and so am I. However, both feel that the submission could be substantially improved.  
  
Referee 1's major objection is to the application to human social evolution, which they consider speculative. While I do not want to \*insist\* on any particular revision here, I would ask you to seriously consider their comments, and at the very least include the counterevidence and caveats.  
  
Referee 2 has broader concerns about the clarity of the overall argument, and asks for a greater use of examples throughout. Regarding examples, I agree that they might clarify the argument at some points, but I would generally prefer a systematic treatment of the data to too many scattered examples. I would ask you to seriously consider the referee's suggestions about clarity of flow and repetition.  
  
In addition, both expert referees have several more minor suggestions that I would ask you to consider.  
  
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Once again, thank you for submitting your manuscript to Biological Reviews and I look forward very much to receiving your revision.  
  
Yours sincerely,  
  
Dr. John Welch  
Editor, Biological Reviews  
breditor@group.cam.ac.uk  
  
  
Reviewer(s)' Comments to Author:  
Referee: 1  
  
Comments to the Author  
Review of BRV-11-2021-0414  
  
This paper combines a useful and competent review of conformism in social learning with an interesting idea about the evolution of conformity in mate choice.  At the end, the authors argue that conformity in mate choice proceeded and potentiated the evolution of conformity in social learning during human evolution.  I think that the review is useful and mainly correct. The idea about Fisher and conformity is novel and interesting, but the application to the evolution human social evolution is very speculative and not really very plausible.  The role of female choice in primate evolution depends on the species but among apes there is not much evidence.  Australopiths were  highly dimorphic suggesting that female choice was not that significant.  Early Homo seems to have been less dimorphic, but male provisioning likely played a significant role as human babies became more altricial.  A conformist female would necessarily have to reduce choice on other dimensions.  I recommend that the authors revise accordingly.  I also offer a number of more detailed comments keyed to line number.  
  
168  The restaurant model depends critically on sequential learning.  Generally, positive frequency dependent learning does not lead to multiple equilibria.  For example, if the learning rule is linear with a positive intercept at 0 and a slope less than one, learning will lead to stable polymorphisms.  To be disruptive the rule needs to have something like the Boyd/Richerson structure, at least in population dynamic models (it could have an unstable equilibrium other than 0.5 as assumed by B/R).  
  
181 If the space of norms is continuous this need not be the case.  See Kuran 2008.  
262 Very important insight in this section, often ignored.  
  
297 The Perrault et results hold for any number of models.  
  
313 Also important  
  
336 Boyd and Richerson assumed that learners never erred about the fraction of the two types, but were only exposed to three models, not the entire group.  
  
341 In this story all of the smooth sigmoid shape comes from error.  In the B&R story it all comes from sampling.  A proper model would derive the sigmoid curve from a larger sample plus error.   
  
A big problem with this discussion is that the authors accept B&R’s unjustified assumption that individual and social learning are independent processes. This means that the degree of conformism cannot depend on the quality of non-social information.  In the Perreault et al mode a single parameter controls both the shape of the social learning function and the reliance on non-social information.   
  
376 Conformity in other animals!!!  Biologists should never refer to humans and animals as disjoint sets.  
  
405 Not sure what “within-group stable traditions” are. Do you mean stable behavioral within group polymorphisms? If so, conformism plus innovation/learning can maintain such.  
  
487 This paragraph is not very clear.  Fisher depends on a genetic correlation between the female preference and the male trait.  That will not be true initially, but will increase due to nonrandom mating.  If A’s are initially more common, so choosing (meaning conformist) female will choose A and this will lead to a genetic correlation between A and being choosy. It will also increase the frequency of A and due to the correlation the frequency of choosiness.   
  
497 Need to discuss the correlation here too.  
  
505 A cool idea  
  
535 Must have seems way too strong.  I would buy “might have.”  There are other factors involved.  Both males may differ in quality.  Males who make bigger direct investments will be chosen by females and a conformist tendency will compete with this.  Ditto for males who can signal good genes.  Female preferences may matter less than male preferences as seems to be the case in many primate species. It would be nice to have some evidence.  
  
575 What is assumed about linkage between the two loci.  
  
  
Referee: 2  
  
Comments to the Author  
This review defines and describes conformity in humans and non-human animals, reviews the evidence for conformity in animals, and then expands on the evolutionary implications of conformity in one specific context - mate choice copying.  
  
Overall, this is an interesting read, and I enjoyed read it. However I also found it a confusing read, with ideas jumping around within paragraphs, and sometimes little apparent connection between subsections for paragraphs. I think it could be greatly improved by reordering parts of the manuscript to improve the flow. I have detailed this for individual paragraphs below in my line-by-line comments, but in particular, I think section III needs some rethought - I would suggest moving the normative subsection entirely out (as these ideas go nowhere afterwards, and it could be sufficiently dealt with by a small expansion of the part that already talks about it in SII.  
  
Second, I would say that the manuscript would benefit more from importing more of the empirical examples from the table into the text - the manuscript is often quite abstract, and empirical examples would help to ground the text and give the reader “hooks” to hang on to. In particular, I think the subsection on behavioural ecology (in SIV) needs to be extensively revised to focus more on real world examples and the diversity of behavioural contexts and taxa that conformity is observed in. At present, it spends more time rehashing concepts and definitions that are already perfectly well covered in the earlier sections.  
  
Third, I think it is a missed opportunity that individual variation in conformity is not better explored. In my view, this topic is worthy of its own subsection in SIII. However, failing that, I give a few suggestions where it could be expanded on in the line-by-line comments below.  
  
Line-by-Line Comments:  
  
L82-89: This introductory paragraph feels a bit confused, as it starts with “cultural processes” and “cultural evolution”, and then goes onto to define social learning, and not return to them. I suggest it should start with social learning, and end by explaining how social learning is a building block of cultural traditions (defining these terms).  
  
L93: “frequency-dependent bias in learning” …  
  
L97: need a sentence here stating that conformity can be advantage for the individual, or this part all feels a bit group selectionist  
  
L100: Not always - see Somveille et al. 2018. In fact, you seem to have missed this reference entirely, and it is also relevant for later discussion on meta-populations and conformity.  
  
L104: I think it has always been a topic when considering human evolution - you could make the transition to considering conformity across all animal species clearer here.  
  
L116-122: This paragraph doesn’t belong here, as you return to it later. I suggest starting at the beginning (i.e. L123), and then definition from this paragraph to L140, when you get to it again.  
  
L129: “varying other factors” is unclear wording, do you mean also replicated across variable conditions?  
  
L145-155: You need to be much clearer in separating normative conformity that is driven from the individual (“advantages to fitting in”), and that from the group (“peer pressure”, “punishment”). There are potentially very different drivers and could lead to different outcomes, and they are a bit mixed up in the text.  
  
L145 - L189: In general, you can move the text from S111 (1) to this part, as a lot of the later part on normative conformity is repetition anyway, and the main thrust of your argument is the informational conformity.  
  
L177: you mention individual variation here in passing, could you better develop this here?  
  
L191: Again, you never define cultural evolution.  
  
L214-216: This isn’t what Aplin et al. 2017 finds, rather they find the opposite - that conformity is beneficial in promoting populations to shift to more optimal behaviours. I’m not sure if it is published yet, but there is some recent work by Wataru Nakahashi showing a similar benefit of conformity in humans.  
  
L219-232: In general, this part of the text could use some empirical examples to give us some context, as well as a mention of different behavioural contexts these models  could apply to.   
  
L225-232: Very unclear paragraph. Is cooperation the suboptimal trait here? Revise. I would also suggest moving the previous paragraph to after this one, as this paragraph directly flows on from L218.  
  
L376 - See major comment above bout including examples. At present it spends more time debating definitions than talking about the contexts that we have evidence for conformity in. In particular, L387-410 is a confusing paragraph that goes back and forth between concepts - it could revised down to be much clearer.  
  
L419: worth mentioning that conformity is a term often used in the collective behaviour literature, although not defined in the same way.  
   
L427: This section about mate choice copying is out of place. It should be one max of sentence here, and then inserted at the beginning of (2) to avoid repetition. It also feels very artificial, you are talking not including mate choice copying - well you also didn’t include studies on all other forms of social learning either - this is about studies on conformity, not social learning. It only makes sense when you develop this specific area later.  
  
L523: Make link of “hinting at conformity” more explicitly here, perhaps with real world example.  
  
L557-561: Yeah…I’m sorry, I don’t buy this - this statement is just too broad. What about the drive for complexity and novelty? Couldn’t it be equally argued that courtship displays are the basis of exquisite arts, and that there is often a drive for novelty (against conformity), leading to ever new and complex forms? I think you really should tone down this language, or just remove these lines entirely.  
  
Table 1: I suggest ordering it by context, rather than taxa. Would make more sense as a reader, as the point is to be comparative.