

Behavioral and Brain Sciences

What human trust networks reveal about cognitive mechanisms of group cohesion in primates --Manuscript Draft--

Manuscript Number:	
Full Title:	What human trust networks reveal about cognitive mechanisms of group cohesion in primates
Short Title:	What human trust networks reveal about cognitive mechanisms of group cohesion in primates
Article Type:	Open Peer Commentary
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Abstract:	Drawing on our previous work on human trust networks, we provide further evidence of how group structure can foster group cohesion. But this work also raises doubts about two central tenets of the target paper: 1) the role assigned to cognitive abilities in group cohesion and stabilization; and 2) the emphasis on group size as the critical variable.

Target article:

Dunbar, RIM: Structural and cognitive mechanisms of group cohesion in primates

Word counts:

Abstract: 59

Main Text: 1031

References: 722

Entire text: 1812

Title:

What human trust networks reveal about cognitive mechanisms of group cohesion in primates

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Funding sources:**Cristina Acedo-Carmona:**

Funded by: MCIN/AEI/ 10.13039/501100011033 and by “ERDF A way of making Europe”

Grant number: PID2022-137379NB-I00

Antoni Gomila:

Funded by: MCIN/AEI/10.13039/50110001113033/FEDER

Grant number: PID2021-127214OB-I00

60-w Abstract: 59

Drawing on our previous work on human trust networks, we provide further evidence of how group structure can foster group cohesion. But this work also raises doubts about two central tenets of the target paper: 1) the role assigned to cognitive abilities in group cohesion and stabilization; and 2) the emphasis on group size as the critical variable.

1000-w main text: 1031

In previous work carried out in multi-ethnic regions of Northern Ghana and Mexican Yucatan (Acedo-Carmona & Gomila, 2019, 2015a, 2015b, 2014), we have provided evidence of how the structure of trust networks determines levels of cooperation and cohesion. Our central result was that several social structures can be found, but that levels of cooperation with non-personally-trusted partners -a measure of social cohesion- are higher when the structure of the social network is scale-free, so that some individuals that are trusted by a clique, trust themselves. This result converges with Dunbar's "friends-of-a-friend" effect. However, against Dunbar's argument, this structure is based on basic cognitive and emotional capacities that make possible the structure in the first place, calling into question Dunbar differentiation of mechanisms of group cohesion in terms of structural, behavioural and cognitive strategies. And second, our work suggest that structure does not determine a maximal group size, also against one of Dunbar's central contentions. We discuss these two points in turn. As a conclusion, we suggest that primate cognition cannot be explained as an evolutionary solution to a social coordination problem.

1) The role that cognitive abilities play in group cohesion and stabilization

Dunbar's argument is that mammals that live in stable social groups use two strategies to keep and reproduce the group, beside group structure itself: grooming, as a form of affiliative interaction, and a suite of higher order cognitive skills. This dichotomy overlooks the role of "mid-level" mechanisms, that combine emotional and cognitive components, such as trust itself, or empathy (Pérez-Manrique & Gomila, 2022, 2018), among other forms of social bonding and affiliation.

Importantly, and in contrast with cognitive abilities, these emotional dispositions involve a motivational component that is evolutionarily more effective to keep cooperative commitments and avoid free-riding than cognition itself (Jablonski, 2021; Frank, 1993). In other words, it is wrong to assume that higher cognition is the only way to make cooperation and social coordination possible in bigger groups. As a matter of fact, the paper is full of examples of species which achieve group stability and cohesion without going cognitive. Therefore, the contention that evolution of cognition in primates is driven by social pressures is not warranted.

For instance, as suggested by the paper itself, instances of group synchronization and entrainment, based on the "do as your neighbor" rule, may turn out to be a very effective solution to group coordination, a solution that does not require higher cognitive abilities. It is found in different species (Bates & Byrne, 2010), including primates, whose capacity for observation and learning by imitation is well-established (Whiten, 2000; Whiten & van de Waal, 2017), and that imitation induces affiliation (Dignath et al., 2021; Dignath et al., 2018).

Another example can be observed in species such as termites, bees, and ants, which secrete chemicals that serve to drive their coordinated actions and cohesion when required by the environment, without needing for cognitive complexity (Barbero et al., 2023; Mizumoto et al.,

2021; Pernal, 2021). In primates, this chemical mechanism, present with the secretion of endorphins, is related to the cognitive mechanism because it is linked to social contact (Dunbar, 2025). However, there are studies showing that primates' more complex cognitive abilities can be more difficult to coordinate collective action within a group than the chemical mechanism of ants (Dreyer et al., 2025).

Secondly, acknowledging these emotional-cum-basic cognitive abilities also entails that the differentiation of structural, behavioural and cognitive strategies of group coordination is misleading. Just as different kinds of social structures can be distinguished at the same time in humans, as our work on trust networks shows, the same point can be made for social mammals, where different structures can be distinguished depending on the kind of link chosen: status, patterns of residence, and affiliation but grooming, but also by empathy.

Likewise, large groups may exist with very weak cohesion. The structural mechanisms that enable the maintenance of relatively stable large groups, are compatible with such groups being comprised of smaller ones that coexist to a certain extent, due to the cognitive limitations of managing an excessively large number of relationships (Operario & Fiske, 1999), resulting in larger groups maintaining relatively weak internal cohesion (Alvarez-Rodriguez et al., 2021). This weakness of the large group may occur when individuals spend more time cultivating their closest relationships, perhaps to secure their ties against other cliques competing for resources, which causes greater distancing between coalitions (Chae, 2022; Morris-Drake, 2022). Similarly, in humans, our work shows that a large group may be composed of multiples cliques without much contact among them (Acedo-Carmona & Gomila, 2019, 2013a, 2013b).

Thirdly, the cognitive strategy may be suboptimal when the environment is unstable. For example, we found evidence that the cognitive mechanism of trust creates obstacles for individuals to adapt to rapidly changing environments in the short and medium term (Acedo-Carmona et al., 2018). Furthermore, trust is also easily susceptible to adversely affect relationships when it is negatively stimulated or when negative experiences are experienced (Davidson & Satta, 2021; Weiss et al., 2021).

2) Social structure and group size

In the target paper, Dunbar insists on his well-known argument for an intimate link between group coordination and group size, so that group size is thought to be dependent on the structural, behavioural, or cognitive, strategies evolved to achieve group coordination. The assumption is that the bigger the group the better, and that bigger groups require more cognitive abilities.

While it is true that social structure itself has a limited scope that depends on group size (La Macchia et al., 2016; Sato, 1988), it is also true that this limit can be overcome as long as such structures are extended through imitation (Bhoopchand et al., 2023). On the other hand, group size is sensitive to ecological conditions, not only to the strategy available for group coordination. Of course, some habitats may not impose any pressure on group size, but in our work in Northern Ghana we found that cooperation among different ethnic groups was promoted precisely for the scarcity of resources available. The moral is that group cohesion may turn out to be as high as required by the environment, not a consequence of the suite of cognitive abilities developed.

Competing interests: none

Reference list (APA Standard): 722 words

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