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Triadic conflict "primitives" can be reduced to welfare trade-off ratios.

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10. Abstract
Pietraszewski proposes four triadic "primitives" for representing social groups. We argue that, despite surface differences, these triads can all be reduced to similar underlying welfare tradeoff ratios, which are a better candidate for social group primitives. Welfare tradeoff ratios also have limitations, however, and we suggest there are multiple computational strategies by which people recognize and reason about social groups.

11. Main text
Pietraszewski convincingly argues for the value of identifying computationally specific principles by which humans recognize and reason about social groups. He then proposes four types of triadic conflict scenarios as computational primitives for representing social groups. Here we argue that these are not primitives, but are a consequence of, and thus a cue to, a simpler underlying representation: dyadic welfare tradeoff ratios.

A welfare tradeoff ratio describes how one individual values another's welfare, and thus predicts when they will pay a cost to promote, or detract from, the other's rewards (Tooby & Cosmides, 2008; Delton & Robertson, 2016). In a dyad between person A and person B, if we define A's utility function as $u_{\mathrm{A}} = v_{\mathrm{A}} + \lambda_{\mathrm{AB}} \cdot v_{\mathrm{B}}$, where v_{A} is A's payoff and v_{B} is B's payoff, then λ_{AB} is A's welfare tradeoff ratio towards B. The greater λ_{AB}, the more A values B's payoff, and thus the more likely A is to act to B's benefit, even when those actions are costly or risky; when λ_{AB} is negative, A will be willing to pay a cost to harm B. (For simplicity, in this commentary we assume $\lambda_{\mathrm{AB}} = \lambda_{\mathrm{BA}}$.)

A attacking B provides direct evidence that λ_{AB} is negative. What happens next provides evidence about both the remaining pairwise welfare tradeoff ratios in a triad. First, if C attacks B or B attacks C, this indicates λ_{BC} is also negative. Under these circumstances, λ_{AC} will typically be positive. The pressure for this to be true is described by structural balance theory, which holds that equilibrium is achieved when social networks are structured such that the valence of each pairwise connection is consistent with the others. If A and C both benefit from harm to B, then their connection ought to have positive valence (Cartwright & Harary, 1956). (Consider what would happen if all three relations were negative: when C attacks B this would be consistent with λ_{BC} but inconsistent with λ_{AC}, as the attack would indirectly benefit A). In Pietraszewski's remaining conflict scenarios A attacks C or vice versa, and we learn that λ_{AC} is negative and can thus infer that λ_{BC} is positive.

In each of Pietraszewski's four conflict scenarios, the two individuals he specifies as belonging to a group coincide with the two that can be inferred to share a mutually high welfare tradeoff ratio according to the principles described above. A more parsimonious account, therefore, is to posit that mutually high welfare tradeoff ratios can provide a foundation for recognizing social groups. Like Pietraszewski's proposal, this approach can be specified computationally; for instance, balance theory can be instantiated in the form of signed graphs in which the sign of each edge is the product of the signs of adjacent edges.

In contrast to Pietraszewski's proposal, a representation of social groups based on welfare tradeoff ratios can generalize to situations without conflicts. For instance, A, B, and C could all have positive welfare tradeoff ratios (under balance theory a balanced triad can have 0 or 2 negative edges), resulting in mutually supportive behaviors and leading observers to consider all three a single social group. This proposal can thus better explain why prosocial and collective, interdependent behaviors can also serve as the basis for identifying groups and their members—for example, working together toward a shared goal (Sherif, 1966), or producing coordinated music or dance, which provides a credible signal of shared goals (Mehr et al., 2020; Savage et al., 2020).

Mutually high welfare tradeoff ratios are likely to be a strong cue to social group composition across many contexts, and often sufficient to define a social group on their own. They may also be developmentally privileged, serving as the core of infants' and young children's concepts of social affiliation (Noyes & Dunham, 2020; Powell, 2021). But despite having more range than Pietraszewski's conflict-based primitives, welfare tradeoff ratios still seem insufficient to capture the full range of social groups created and recognized by human adults.

Adult social groups vary widely in both size—from pairs to entire nations—and in permanence—from strangers who coordinate a one-time "flash mob", to religious groups that persist for millennia. Allowing welfare tradeoff ratio calculations to be context-specific helps capture some of this diversity, but not all. For example, the United States Congress could be considered a social group, yet its members can feel such mutual animosity that they are inspired to political, and sometimes even physical, attacks.

To ask for a single computational primitive, or even a set of primitives, that can capture the vast array of social structures may not be reasonable. Instead, we propose that there are likely to be multiple computational strategies by which adults recognize and reason about social groups, with many features sufficient for identifying a group, but none strictly necessary. This does not merely refer to the capacity to learn statistical associations between surface characteristics such as clothing or race, and underlying coalitions (Kurzban et al., 2001), or to discern latent groupings of welfare tradeoff ratios (Lau et al., 2018). The ways in which humans use norms and rules to create groups and institutions of many varied forms require conceptual resources with more structure. Intuitive causal theories of social relationships and conventions, as well as our ability to analogize new groups to past social structures we have experienced, allow us to reason about disparate groups in disparate ways depending on our theories of their origins and characteristics (e.g., essentialized social groups, Hirschfeld, 1996; Rhodes, 2013; and institutional social groups, Noyes & Dunham, 2020).

Nonetheless, we are sympathetic to Pietraszewski's assertion that there is something conceptually primitive about the underlying relations captured by his conflict scenarios, which we argue are best instantiated as dyadic welfare tradeoff ratios. Perhaps it could be said that sets of mutually high welfare tradeoff ratios provide the prototype for our concept of a social group: a collection of people willing to work toward individual or collective aims in the face of any nature of challenge.

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14. References

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