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Coalitions matter for both men and women: Insights from three subsistence communities in southwest Ethiopia☆

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ABSTRACT

Coalitions are a widespread cooperative strategy across mammals, including humans. They may be transient, occurring in one-off interactions, or more commonly, as part of long-term relationships including friendship. In subsistence-based societies, research on coalitions has primarily focused on men, leaving women comparatively understudied. To address this gap, we examined coalitions across genders among three subsistence-based communities in southwest Ethiopia (Kwegu, Kara, Nyangatom). We distinguished contest coalitions, involving direct confrontation against others, and scramble coalitions, involving gaining access to resources before others. Using focus group interviews, we found robust support that both men and women use scramble and contest coalitions. We then conducted structured interviews ($n = 60$ men, 82 women) in a Kwegu community focusing on three domains of contest coalitions: group decision-making, interpersonal disagreements, and opposite-gender motivation. We find that both men and women were equally likely to report forming coalitions in those contexts. Exploring partner preferences, overall, women appear to exhibit greater selectivity than men in their choice of coalitionary partners. We found that while men prefer high-status partners and a larger number of coalitionary partners compared to women, women show strong preference for same gender partners as well as those from the same clan, age group and with whom they share kinship ties compared to men. In conclusion, differences in partner preferences may shape group dynamics, with women influencing social processes in ways that differ from men. As in many other mammalian species, including apes, female coalitions might be a fundamental feature of human social organization.

1. Introduction

Coalitions are a widespread cooperative strategy across mammals involving two or more individuals collaborating in competitive contexts against a third party (Harcourt & de Waal, 1992). In mammals, while coalitions for between-group conflict are usually male-biased, coalitions for within-group competitions occur in both sexes (Smith, Jaeggi, Holmes, & Silk, 2023) such as in banded mongooses (*Mungos mungo*) (Thompson et al., 2017), African wild dog (*Lycaon pictus*) (de Villiers, Richardson, & van Jaarsveld, 2003), white-lipped peccary (*Tayassu pecari*) (Leonardo et al., 2021) and in multiple species of primates including hanuman langurs (*Semnopithecus entellus*) (Hrdy, 1977), olive baboons (*Papio anubis*) (Smuts, 1985), and white-faced capuchins (*Cebus capucinus*) (Perry, Manson, & Perry, 2009).

In humans, coalitions can be transient, but they are also a common behavior in friendship, an evolutionarily important form of social bonding in humans (Hruschka, 2010; Shackelford & Buss, 1996; Silk, 2003). Friendships are long-lasting cooperative relationships maintained through repeated support that cannot be explained solely by direct tit-for-tat exchange (Hruschka, 2010; Hruschka & Henrich, 2006; Silk, 2003). One influential account, the alliance hypothesis, proposes that friendships are structured by alliance-like expectations of support in competitive situations (DeScioli & Kurzban, 2009). In this view, friendships resemble alliances: repeated coalitions among same individuals, with coalitionary support having a central role in maintaining the friendship.

Coalitionary behavior occurs across various contexts in humans, from within families to large-scale political cooperation. Similar to other

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mammals, coalitions for between-group conflict is also reported to be male-biased (Glowacki et al., 2016; Glowacki & von Rueden, 2015; Macfarlan, Walker, Flinn, & Chagnon, 2014), however, research on coalitions for within-group competition has largely focused on men, particularly in small-scale societies (Garfield & Glowacki, 2023; Otterbein, 1968; Redhead & von Rueden, 2021; Rodseth, 2012; Wrangham, 2021). Women's participation in coalitions has been understudied relative to men and neglected in reconstructions of the evolution of human sociality, leaving a gap in our understanding of coalitions across genders (Kramer, 2022).

However, women's ability to cooperate is as central as men's to the formation and maintenance of social relationships (Fox, Scelza, Silk, & Kramer, 2022). In subsistence-based societies, women often have extensive social networks, composed of kin and non-kin, notably for child care (Crittenden & Marlowe, 2008; Gibson & Mace, 2005; Ivey, 2000; Kramer & Veile, 2018; Meehan, Helfrecht, & Quinlan, 2014), resources acquisition through joint hunting (Bird, Scelza, Bird, & Smith, 2012; Noss & Hewlett, 2001), joint foraging (Hurtado, Hawkes, Hill, & Kaplan, 1985; Jang et al., 2024; Marlowe, 2010), and food sharing (Gettler, Redhead, Dzabatou, & Lew-Levy, 2023). Some research suggests that men and women's social networks differences are likely to be context dependent rather than gender-dependent, varying with social ecology and domains of cooperation (Hruschka, 2010; Mattison et al., 2021, 2022; Simpson & Power, 2022). In addition, as for men, alliance building—and by extension coalition building—has a central role in women's leadership and in securing reproductive and economic benefits across a diverse range of societies (Browser & Patton, 2010; Garfield, von Rueden, & Hagen, 2019).

Despite evidence of the broad importance of coalitions, the existing literature has concentrated on a narrower set of contexts. Research on women's coalitions has predominantly focused on political contexts in large-scale, contemporary/industrial societies, where women's collective action is often examined in terms of governance, activism, and social movements (Kang & Tripp, 2018; Taylor, 2018; Yuval-Davis, 2002). Yet, research suggests women form coalitions to advance aims across many different contexts. For example, women may cooperate to resist aggression from men, including in the Mangrove Australian Aborigines (Arnhem Land, Northern Australia) (Burbank, 1994), the Wape (Pagua New Guinea horticulturalists) (Mitchell, 1992), the Marakwet women (Kenyan agriculturalists) (Schultz, 1962) and the!Kung (Draper, 1992) among others (see also: Kramer, 2022; Smuts, 1992). Several researchers have also proposed that women's competitive strategies often emphasize subtle, non-confrontational cooperative tactics, such as gossip and exclusion of others, to compete for status or mates (Benenson, 2014; Campbell, 2013; Hess, 2017; Reynolds, 2022; Rucas, Gurven, Winking, & Kaplan, 2012). Therefore, despite important research on women's cooperation in subsistence-based societies, systematic quantitative data that directly measure coalitions involving women is lacking.

To fill this gap, we investigated coalitionary behaviors among both men and women, using data collected among three subsistence-based societies in southwest Ethiopia (Kara, Nyangatom, and Kwegu). First, we examined coalition formation by adopting the concepts of scramble and contest coalitions defined below, thereby broadening the range of coalitions identified in both genders. We then focused on three coalitionary contexts: motivation of the opposite gender (i.e., men/women motivating women/men to go to work), group decision-making, and interpersonal disagreement.

2. Hypotheses and predictions

Coalitions emerge between at least two individuals who face a competitive context (Harcourt & de Waal, 1992). As defined by Harcourt & de Waal (1992, p.2): "Coalition is defined as cooperation in an aggressive or competitive context. […] Whether altruistic or opportunistic in nature, these acts share one characteristic: the interests of the cooperating parties are served at the expense of the interests of a third party. It is this well-coordinated 'us' against 'them' character that sets coalition formation apart from other cooperative interactions among conspecifics." They are often employed in the formation of dominance hierarchies, resource acquisition, and mate competition. Competition is often categorized into one of two forms: scramble competition for which the first individuals accessing resources acquire them, and contest competition for which individuals directly confront others to defend or obtain resources (Nicholson, 1954).

We include both scramble and contest coalitions in our study (Benenson & Abadzi, 2020; Berghänel, Schülke, & Ostner, 2010). Contest coalitions involve direct collaboration against a third party, occurring in interpersonal disputes, group decision-making processes, and between-group conflicts. Contest coalitions may involve non-contact aggressive coalitions (e.g., discussion, dance, song) or contact aggressive coalitions (e.g., fights). Scramble coalitions are those in which individuals collaborate to acquire resources before others can. In resource-limited environments, forming coalitions to acquire valuable information about food resources, other individuals (e.g, gossip, reputation) or other communities (e.g., resources obtained by others, others' plans to obtain resources) can yield benefits to coalitionary partners at the disadvantages of others. Overall, for both scramble and contest coalitions, the benefits gained through the coalition exceed what at least one individual could achieve alone.

Following our definition of scramble and contest coalitions, we derived three main hypotheses (see Table 1.).

In mammals, females typically invest heavily in parental care through internal fertilization and lactation, which make securing resources a primary focus (Clutton-Brock, 1991, 1998; Trivers, 1972; van Schaik & Paul, 1996). In contrast, males, less constrained by parenting effort, prioritize competition for access to mates (Clutton-Brock, 1991, 1998; Trivers, 1972; van Schaik & Paul, 1996). Similarly, humans exhibit distinct reproductive strategies. Men tend to pursue more mating effort while women focus more on parental effort (Low, 1990, 1992). Coalitionary strategies are then expected to vary due to sex differences in reproductive strategies. In addition, many human societies exhibit a gendered division of labor that often covaries with sex-linked differences in reproductive strategies and is reinforced through social norms and socio-ecological conditions (Hill & Kaplan, 1999; Low, 1990, 1992; Smith, von Rueden, van Vugt, Fichtel, & Kappeler, 2021; Venkataraman

Table 1
Predictions for gender differences in coalition formation among the three hypotheses. Women: coalition formation or stronger preference in coalitionary partners expected to appear in women compared to men. Men: coalition formation or stronger preference in coalitionary partners expected to appear in men compared to women. Neither or both: coalition formation or stronger preference in coalitionary partners expected to vary according to coalitionary context. Both: men and women both show coalition formation and strong preference in coalitionary partners. *NA* refers to no prediction for this hypothesis.

	Household-based hypothesis	Women-biased hypothesis	Gender-neutral hypothesis
Predictions for coalitions formation			
Contest coalitions observed	Men	Both	Both
Scramble coalitions observed	Both	Both	Both
More frequent coalitions	Men	Women	Both
Predictions for preferences in coalitionary partners			
Same gender	Men	Both	Neither or both
Relatives	Women	Both	Neither or both
Same clan	Women	Both	Neither or both
Same age group	Men	*NA*	Neither or both
High status	Men	*NA*	Neither or both
Higher number of partners	Men	*NA*	Neither or both

et al., 2024). Coalitions of men may primarily focus on dominance or reproductive advantages, while coalitions of women may primarily focus on mutual support and resource access (Bissonnette et al., 2015; Low, 1992).

We propose a *household-based hypothesis* which states that because of differential reproductive strategies across genders and divisions of labor, women's coalitions are primarily household-based, often formed among relatives when available, while coalitions of men include relatives and non-relatives. We therefore predict that women would be more limited in their range of potential partners compared to men who would have a wider choice of potential partners. While women would favor relatives and same-clan member as coalitionary partners when available, they would be constrained in their choices compared to men. The co-occurrence of these two preferences, clan and kin, would be consistent with the patrilineal organization of clans in our study groups (i.e., relatives are more likely to be part of the same clan as the participant). We also predict that men would more frequently engage in contest coalitions, whereas women would focus on scramble coalitions.

Smith et al. (2023) proposed that females compete over resources that are more easily shared, such as food and safety, whereas males more often compete over mating opportunities. Coalition benefits may then be more predictable for females. Under this framework, coalitions may yield more consistent returns for females, potentially favoring greater coalition formation among females than males. We then propose a *women-biased coalition hypothesis*. Women would also compete for more widely available resources offering more predictable gains from coalitions compared to men, eliciting more coalitions in women than men. Smith et al. (2023) also proposed that kinship is the primary foundation of cooperation in mammalian groups, and therefore the presence of kin might reinforce coalition formations. We predict then that men and women will engage in both contest and scramble coalitions. We also predict that individuals will preferentially form coalitions with same-gender partners, kin, and same clan partners.

At the same time, the results from Smith et al. (2023), analyzing 58 mammalian species including 39 primates, suggests that both sexes typically form within-group coalitions. These results align with recent human research suggesting that gender-based differences in cooperation may be overstated (Hruschka, Munira, & Jesmin, 2022). Mating and parenting effort are responsive to socio-ecological conditions (e.g., partnership dynamics and mating markets), producing overlap and context-dependent variation in strategies across genders (Scleza, Koster, & Shenk, 2024). Such distinctions are better viewed as tendencies rather than categorical differences, given evidence that coalitional behavior in both sexes can be strategically political and multifunctional (Hrdy, 1986).

We therefore propose a *gender-neutral coalition hypothesis*, which states that although men and women exhibit different reproductive strategies, they both engage in coalitionary behavior to a similar extent. We predict that men and women will engage in both contest and scramble coalitions. We also predict that individuals' preferences will vary according to the coalition's purpose and thus be strategized differently.

3. Methods

3.1. Data collection and communities

Data were collected between June 2024 and August 2025 using ODK-X–based software through in-person interviews conducted in the local language with live translation, each lasting approximately 20–30 min. Participants were compensated in local currency (100 Ethiopian birr). All study materials were reviewed and approved by the Boston University Review Board for Ethical Standards in Research. Informed consent was obtained at the community and individual levels. Data are available in supplementary information.

We collected data from three subsistence-based communities (Kara, Kwegu, Nyangatom) in southwest Ethiopia who are polygynous, patrilineal, patrilocal, and patriarchal, with male elders holding the highest status. Their societies are structured from family units, sub-clans, to clans, including age groups or generational set systems. All three groups rely on horticulture by cultivating maize and sorghum along the Omo River. Nyangatom and Kara are agro-pastoralists relying also on livestock, mainly goats and cattle, while the Kwegu, also called Koygu or Koegu, do not own livestock. All three groups speak distinct, mutually unintelligible languages and have substantial variation in their norms and customs (Buffavand, 2018; Girke, 2010, 2018; Glowacki, Wilson, & Wrangham, 2020; Hieda, 1990; and personal observation).

3.2. Focus group interviews

3.2.1. Conducting interviews

In each of the three communities, we conducted four focus group interviews with four participants each, organized by age and gender: elder women, younger women, elder men, and younger men.

Each focus group was asked about coalition formation across cooperative contexts that had been identified in advance based on existing ethnographies and the researchers' ethnographic expertise. Because the word “coalition” does not necessarily exist in the local language (or might be defined differently by locals), we first explain what a coalition is without focusing on the competitive outcomes: two or more persons cooperate together to do something, sharing the same goal. Then we asked, “Do you cooperate with others to (cooperative context)?” and followed up further with discussion to identify potential third-party adversaries and distribution of benefits.

While most contexts were relevant to both genders, a few were gender-specific (Table 2.). We then asked each group if they formed coalitions for any other goals not mentioned by the interview.

3.2.2. Analyzing conversations

We first classified affirmative answers into either cooperation or coalitions based on our definition of a coalition whereby the benefits gained through the coalition exceeds what at least one individual could achieve alone. To distinguish coalitions from other forms of cooperation and to classify coalitions as either scramble or contest, we applied a set of operational criteria. First, an interaction was coded as a coalition only when 1) at least one participant gained more benefit than what they could achieve alone and 2) those benefits imposed a cost on a third party. Second, coalitions were classified as contest coalitions when competition was direct, and a specific third-party adversary could be easily and clearly identified. In contrast, coalitions were classified as

Table 2
Identified coalitionary contexts for focus group interviews. Gender refers to which gender the question was asked. *This question was asked to Kara and Nyangatom, but not Kwegu as they do not own cattle.

Gender	Coalition formation for	Abbreviation
Men and women	farming (sorghum, maize)/growing food in the fields	Farming
Men and women	gathering food (plants, fruits)	Gathering
Men and women	arranging marriage for yourself, for friends, or for your children	Marriage arrangement
Men and women	gaining more information about the market, other villages, other tribes	Information gain
Men and women	obtaining materials (pots, blankets, solar panels, weapons, anything)	Material gain
Men*	caring and protecting cattle*	Cattle*
Women	caring for children	Children care
Women	fetching water	Fetching water
Men and women	settling a disagreement	Disagreement
Men	protecting the village	Village protection
Men and women	preparing ceremonies	Ceremony preparation

scramble coalitions when competition was indirect, such that no adversaries were easily or clearly identifiable and benefits were obtained primarily through speed or priority of access to a shared resource.

3.3. Structured interviews

We conducted one structured interview per participant in the Kwegu community (142 interviews total including 82 women and 60 men). We first asked participants which gender cooperates more frequently to achieve common goals through coalition formation. We then focused on three contexts of contest coalitions identified during focus group interviews:

- Interpersonal disagreement ("If you are in a disagreement, do people come to support you?")
- Group decision-making ("Do you cooperate with others to make decisions that affect the community?")
- Opposite-gender motivation given ("Do you work with others to motivate men/women to work?) and received (Do men/women cooperate together to motivate you to go to work?")

3.4. Variables for structured interview

If participants answered yes to one of the questions related to participation in coalitions, we followed with more detailed questions about their preferred coalitionary partners, including gender, clan affiliation, kinship ties, age group affiliation, and status.

As age is not routinely tracked in this community and many participants could not report exact ages, we estimated age ranges and used the resulting mean values as a control in the statistical analyses. For participants in the Kwegu community, the mean age for men was 38.3 years old (median = 37.5, range = 17–82.5) and for women 34.5 years old (median = 32.2, range = 17–72.5).

For each coalitionary context, we asked participants if they preferred coalitionary partners: 1) of similar gender, 2) of similar clan membership, 3) of similar age group, 4) with kinship ties, and 5) with high-status. We defined high-status partners as individuals who were more influential, more respected, and wealthier than others in their community. We also asked participants the number of partners they would prefer by selecting cards with fictional illustrations of men and women presented to them (see Fig. S1.).

3.5. Statistical analyses

To test our hypotheses, we used a multivariate framework when modeling the five correlated binary outcomes of coalition partner preferences, whereas simpler frequentist GLMMs/LMMs were applied for single-outcome analyses where multivariate modeling was not required. We based inference on 95% confidence intervals, considering effects supported when intervals excluded the null value. For all statistical analyses, we used Rstudio version 2023.06.1.

3.5.1. Participation in coalitions

We examined men and women's reported participation in coalitions (e.g., opposite-gender motivation, group decision-making, and interpersonal disagreement), coding affirmative answers as 1 and negative answers as 0. We fitted a binomial generalized linear mixed model (GLMM; Bates, Mächler, Bolker, & Walker, 2015) in which the binary response (1/0) served as the response variable. Gender was included as an independent variable as well as mean age to account for age-related variation in response patterns. We then fitted a set of three models: (1) an intercept-only model, (2) a model including gender, and (3) a model including gender and mean age, and used an information-theoretic model selection approach (Anderson & Burnham, 2002) to determine which model best fit the data. We used the AICcmodavg package (Mazerolle, 2017) to rank the three models according to the QAICc score (lowest being the best) and used results from those models to calculate model-averaged estimates of parameters (Anderson & Burnham, 2002; Mazerolle, 2017) to obtain estimates of the effect of each of independent variables on participant answers.

3.5.2. Preferences

Among the individuals reporting participating in coalitions, we then tested if men or women preferred coalitionary partners 1) of similar gender, 2) of similar clan membership, 3) of similar age group, 4) with kinship ties, and 5) with high-status, also using binary coding of 1 for affirmative answers and 0 for negative answers. We used multivariate Bayesian logistic regression models using the brms package (Bürkner, 2017). The outcome consisted of five binary response variables for preferences in coalitionary partners (i.e., similar gender, similar clan, similar age group, kinship ties, or high status) using the "mvbind" function. Because individuals' age might affect their preferences, we also included mean age as a fixed effect. Since we were interested in preferences in coalitions overall, we included the three coalitionary context (e.g., opposite-gender motivation, group decision-making, and interpersonal disagreement) as a random effect alongside individual respondent IDs to account for repeated measures and clustering.

First, we compared three models including 1) the intercept only (null), 2) gender, and 3) gender and mean age. To do so, we assessed out-of-sample predictive performance using leave-one-out cross-validation with Pareto-smoothed importance sampling (Vehtari, Gelman, & Gabry, 2017), the function add_criterion and loo. Because several observations had unstable importance weights (Pareto- $k > 0.7$ k), and our sample had a weak number of repetitions, we used the option reloo which triggers exact refits for problematic cases to ensure reliable estimates. Models were then compared using the expected log predictive density (ELPD), where higher values indicate better predictive accuracy with "loo_compare" (Bürkner, 2017; Vehtari et al., 2017). We then reported results of the best fit model by reporting the posterior distribution ($\widehat{\beta}$) and by calculating the median, the probability of direction (PD), and the 95% highest density posterior interval (HDPI).

3.5.3. Number of partners preferred

For the next analyses, to account for age-related variation in response patterns we included mean age as an independent variable. We created three candidate models, including (1) an intercept-only model, (2) a model including gender, and (3) a model including gender and mean age, and used an information theoretic model selection approach (Anderson & Burnham, 2002) to determine which model best fit our data. We used the AICcmodavg package (Mazerolle, 2017) to rank the three models according to the QAICc score (lowest being the best) and used results from those models to calculate model-averaged estimates of parameters (Anderson & Burnham, 2002; Mazerolle, 2017) to obtain estimates of the effect of each of independent variables on participant answers.

We first examined the preferred number of partners. We looked at the overall preferred number of partners and modeled the count of preferred partners as the response variable. We applied a generalized linear mixed model (GLMM) with a truncated Poisson error structure, using "glmmTMB" function from the glmmTMB package (Brooks et al., 2017).

Then, we studied the difference between preferred numbers of same gender versus opposite gender partners. For each participant, we calculated a normalized difference score (same gender - opposite gender)/(same gender + opposite gender), which ranges from −1 (exclusive preference for opposite-gender partners) to +1 (exclusive preference for same-gender partners), with 0 indicating no bias. We modeled these normalized scores using linear mixed-effects models (LMMs) including coalitionary context and individual IDs as random effects (Bates et al., 2015). Candidate models described earlier with alternative fixed-effects structures were fitted using maximum

likelihood (ML, i.e. REML = FALSE) to allow valid information-theoretic comparison.

4. Results

4.1. Focus group interviews

Both men and women reported relying on both scramble and contest coalitions across all three communities. They form coalitions for gathering, ceremony preparation, interpersonal disagreement, information gain, material gain, cattle care and protection, and village protection. They also reported other coalitionary contexts that we did not identify before starting the study such as hunting, dancing, motivating others to go to work, and group-decision making (Table 3., Fig. 1., see also supplementary information). While some coalitionary contexts are identified as gender-specific such as hunting, some are used by both genders including for group decision-making, motivation of opposite-gender (i.e., women/men motivating men/women to go to work), and interpersonal disagreement. Below, we reported a series of participant comments that we found relevant for understanding the coalitionary contexts.

Interpersonal disagreements.

While discussing interpersonal disagreement, one young Nyangatom women noted:

Table 3
Identification of coalition types during focus group interviews. Coalition types identified during focus group interviews based on pre-identified contexts and other contexts given by participants. *Scramble* indicates scramble coalition, and *Contest* indicates contest coalition. See Supplementary information for more details.

Context	Coalition type	Reports
Gathering	Scramble	Women travel together but gathering is an individual activity except for Nyangatom who reported cooperating with other women to gather while men protected the women.
Ceremony preparation	Contest	Cooperate to prepare ceremonies, which are sometimes a show-off behavior to other members of the community, and/or to other communities.
Information gain	Scramble	Cooperate to gain information which can provide a strategic advantage, particularly when used to anticipate or respond to others.
Material gain	Scramble	Cooperate to raise money to buy material items.
Cattle (excluded Kwegu, asked only to men)	Scramble & contest	Cooperate to gain access to grazing areas for cattle. Cooperate to protect their cattle.
Disagreement	Contest	Participate in coalitions to settle disagreements.
Village protection (asked only to men)	Contest	Cooperate to protect the village against enemies.
Hunting	Scramble	Cooperate to go hunting.
Dancing	Contest	Cooperate to dance during ceremonies/celebrations.
Raids	Contest	Cooperate to steal cattle from other groups.
Men's demands	Contest	Cooperate to demand food from men from other areas.
Group decision-making	Contest	Cooperate to make decisions about farming, childcare, cattle protection for example.
Motivation of men by men	Contest	Cooperate to motivate men to go to work.
Motivation of men by women	Contest	Cooperate to motivate men to go to work.
Women call	Scramble & contest	Cooperate to answer the call of women from other communities. Coalition type depends on the context of the call.

"Sometimes when [a man and a woman] are fighting, the women just gather and say to the man, 'Why are you beating [her]?' Because the women have less strength, they gather to help, [asking], 'Why are you beating a woman?'. But when we [men and women] want to resolve the issue, the women just gather to the woman, and the men gather to the man." "Only after we understood the reason for the fight, [do we] go. If the man was the one who initiated the fight, we go to the man and say, 'Why are you beating her?' When we go to the people who are fighting, sometimes the relatives [the family members] go to beat the man, and the other women are going to resolve the issue."

Dancing.

Men reported described coordinated group dancing efforts:

"We have beautiful women somewhere, let's go and dance. Let's go ahead and dance together." (Young Nyangatom man).

Men's demands.

The men also reported cooperating to demand food from men of other villages.

"Let's go to this specific man, and he can give us a cow or a goat to slaughter." (Elder Nyangatom man).

Motivation of men by men.

The men also reported motivating other men:

"When you gather, you will slaughter a lot of animals, and you will motivate them [the young men] until their eyes get red. They [the elder men] will motivate them [the young men] until they feel and get their eyes red. [...] So, when you are motivating them, [the young men] like that, when the enemy comes, all of them will die protecting the animals." (Elder Nyangatom man).

Motivation of men by women.

Both genders reported that women motivate men to go to work:

"So, the elders and mothers, they used to encourage them [the men] and send them, before even [we start] farming. Even when there is a lazy person, they [the women and elders] used to beat him. Yes. 'I just cut your hands, you're lazy.'" (Young Nyangatom man).

A Nyangatom assistant field added to the focus group discussion:

"Sometimes women have the power. They come to you, they sing, very offensive songs to you, they want you to do something for them, like slaughtering a goat. If a man doesn't do anything, they would curse you".

Discussing between-group conflicts, the field assistant suggested:

"Women motivate the men 'you are sleeping here, and your friend is taking your cattle.' Women are powerful and then men go and there is a war. If women don't do that, men would not go."

Similar reports came from Kwegu and Kara men:

"Maybe in family place, if someone is weak, the woman says, 'Why do you do that.' The woman says, to push [him], 'You do this.'" (Young Kwegu man).

"They [the women] motivate us [the men] for hunting, for fighting, by singing. [...] Even for field work. Even when hunger happens. They motivate us" (Elder Kara man).

Women call.

Finally, women reported answering women's call from other villages:

"There is no other gathering [there is no better meeting] than going if someone [a woman] is calling" (Elder Nyangatom women).

4.2. Structured interviews

Structured interviews focused on contest coalitions for within-group competition in the domains of interpersonal disagreements, group decision-making, and opposite-gender motivations, as these were the within-group coalition types observed across all three communities.

To test our predictions, we first explored which gender forms coalitions more frequently. Following this, we studied participation of both genders in those three contest coalitions and examined characteristics of preferred coalitionary partners (same gender, same clan, same age-group, kinship ties, high status), as well as the number of partners preferred coalition partners.

Fig. 1. Pictures showing a women's coalition in Kwegu during an age-group ceremony. Women from a specific age group find a man from the same cohort who failed to participate in ceremony preparations. They escort him to a designated hut where age-mates are assembled and whip him before entry.

4.2.1. Participation in coalitions

We first asked participants which gender cooperates more frequently to achieve common goals through coalition formation. Most participants answered that women cooperate more often (73.9%, 60 women, 45 men) (see also Table S1. in supplementary information).

For participation in coalitions to motivate the opposite gender, we found that the null model had the lowest AICc (ΔAICc = 0, weight = 0.38), indicating that gender and age did not substantially improve model fit. Model-averaged parameter estimates further suggest no strong effects of gender ($\beta = 0.45$, 95% CI [−0.24, 1.14]) and age ($\beta = 0.02$, 95% CI [−0.01, 0.04]). Therefore, both men and women form coalitions to motivate opposite-gender to go to work (see Table S2. for model details in supplementary information).

For participation in coalitions to make community decisions, we found that the model including gender and age had the lowest AICc (ΔAICc = 0, weight = 0.63). However, model-averaged parameter estimates further suggest no strong effects of gender ($\beta = 0.18$, 95% CI [−0.51, 0.87]), or age on participant answers ($\beta = 0.03$, 95% CI [0, 0.05]). We find no evidence that gender predicts the tendency to report participation in coalitions for group decision-making (see Table S2. for model details in supplementary information).

Finally, for participation in coalitions for interpersonal disagreement, we found that the model including gender and age had the lowest AICc (ΔAICc = 0, weight = 0.47). Model-averaged parameter estimates suggested estimates suggest no strong effects of gender ($\beta = 1.65$, 95% CI [−0.52, 3.82]) or age ($\beta = -0.04$, 95% CI [−0.09, 0]). We find no evidence that gender predicts the tendency to participate in coalitions for interpersonal disagreement (see Table S2. for model details in supplementary information).

4.2.2. Preferences

Among the individuals participating in coalitions, we tested if men or women preferred coalitionary partners 1) of same gender, 2) of same clan, 3) of same age group, 4) with kinship ties, and 5) of high-status. Among the three models compared (null model, gender, age and gender), the model including gender as the independent variable was the best fit model (ELDP difference = 0.00; standard error difference = 0.00) (see also Table S3. in supplementary information).

The posterior distributions of the best fit model revealed distinct gender-based patterns. Men were less likely than women to prefer coalitionary partners of the same clan ($\widehat{\beta}$men = −2.1, 95% HDPI: [−3.80, −0.66], PD = 1.00), and with kinship ties ($\widehat{\beta}$men = −1.2, HDPI: [−2.20, −0.32], PD = 1.00). Conversely, while both men and women reported to prefer high-status partners (Table S4), men were more likely to prefer them compared to women ($\widehat{\beta}$men = 3.5, HDPI: [1.00, 7.5], PD = 1.00). Effects for same age group ($\widehat{\beta}$men = −1.4, HDPI: [−3.10, 0.22], PD = 0.97) and same gender ($\widehat{\beta}$men = −0.51, HDPI: [−1.30, 0.28], PD = 0.91) were also negative for men, though the 95% HDPIs included zero, indicating greater uncertainty. Overall, even though variation in preferences exists between coalitionary contexts, gender differences were more likely to be in favor of women than men. Important to note, estimates were consistently non-zero across coalition and individual IDs, suggesting variance across individuals and across coalitionary contexts (Fig. 2., see also Table S4 and S5. and Fig. S2 and S3. in supplementary information).

4.2.3. Number of partners preferred

We asked participants the number of coalitionary partners they would prefer for each coalitionary context. While this number varies among coalitions, overall, men preferred more coalitionary partners than women (Men: mean = 12.15, median = 7.5, SD ± 12.83; Women: mean = 7.30, median = 5.67, SD ± 6.28) (see also Table S6. and Fig. S4. in supplementary information). Using an information theoretic model selection approach, we compared three GLMM models (null model, gender, age and gender) with truncated Poisson error structure using count of the preferred number of partners as the dependent variable. We found that the gender and mean age model had the lowest AICc (ΔAICc = 0.00, weight = 0.78). Model-averaged parameter estimates further suggest an effect of gender (β = 0.37, 95% CI [0.10, 0.64]) and no effect of age (β = 0.01, 95% CI [0.00, 0.02]). Therefore, men prefer a higher number of coalitionary partners compared to women (see Table S7. for model details in supplementary information).

To examine the difference between preferred numbers of same gender versus opposite gender partners, we calculated a normalized difference score. Despite variation across coalitionary contexts, the overall score indicated a stronger preference among women than men for same-gender partners (Men: mean = 0.30, SD = 0.60; Women: mean = 0.62, SD = 0.51) (see also Table S8. and Fig. S5. for details). Using an information theoretic model selection approach, we compared three

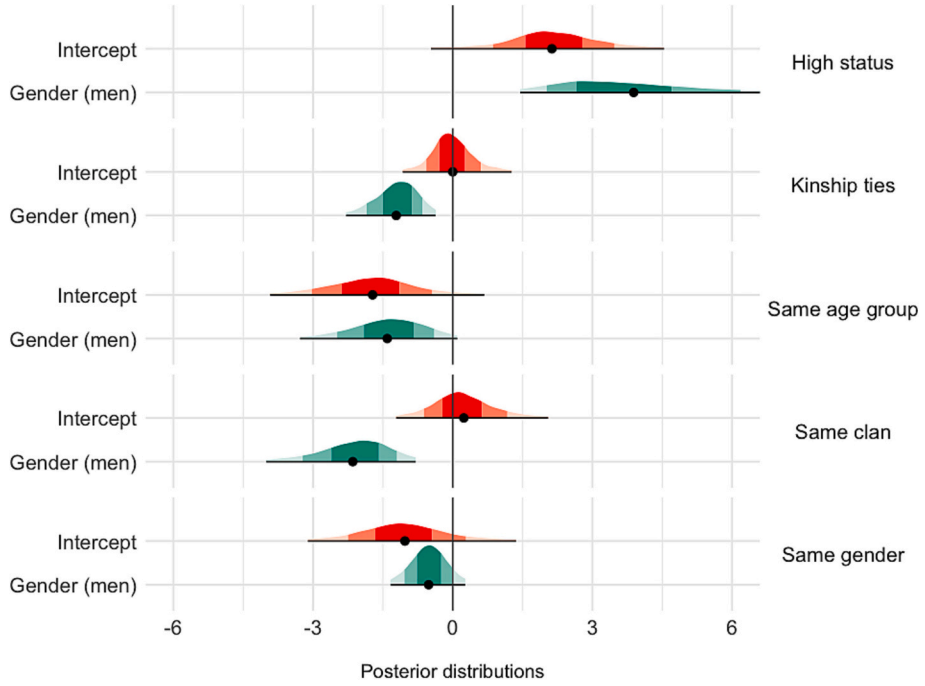

Fig. 2. Posterior distributions from Bayesian models estimating the effect of gender across five preferences for coalition partners. Gender (men) refers to gender, men being the reference category. High status refers to participants preference for high-status partners; kinship ties refer to participant preference for partners with kinship ties; same age group refers to participants preference for same age group partners; and same gender refers to participants preference for same gender partners. Colored distributions show the posterior distributions of the intercept and gender coefficient for each model. The width of the distribution indicates the density of credible intervals for parameter values, with wider areas representing more likely estimates. Black dots indicate posterior means, and horizontal bars represent 95% credible intervals.

LMM models (null model, gender, age and gender) using the normalized difference score as the dependent variable. We found that the gender and mean age model had the lowest AICc (ΔAICc = 0.00, weight = 0.50), even though the gender model follows closely (ΔAICc = 0.030, weight = 0.50). Model-averaged parameter estimates further suggest that women prefer same gender partners compared to men ($\beta = -0.30$, 95% CI [−0.16, −0.44]) and no consistent effect of age ($\beta = 0.00$, 95% CI [0.00, −0.01]) (see Table S9. for model details in supplementary information).

5. Discussion

Coalitions encompass both *contest* and *scramble* competition: contest coalitions involve direct collaboration against a third party (e.g., interpersonal disputes, group decision-making, or between-group conflicts), whereas scramble coalitions involve collaboration to secure resources ahead of others (e.g., information, material resources, or hunting opportunities). We identified multiple coalitionary contexts among the three focal communities (Nyangatom, Kara, and Kwegu) for which both men and women rely on scramble and contest coalitions. While some coalitionary contexts were identified as gender-specific (e.g., hunting), most were shared by both genders (e.g., group decision-making, motivation of others, and interpersonal disagreement). Differentiating both types of coalitions is important as they involve different costs and benefits: scramble coalitions can offer gains to all participants and competitors, even though faster participants might benefit more than their competitors, and contest coalitions typically result in a winners-take-all outcome (Parker, 2000). The household-based hypothesis predicted that women should rely on scramble coalitions while men rely on contest coalitions (Table 1.). Nevertheless, our results do not seem to show such a trend. Future research may look at such a gender-specific use of each type of coalition as well as their development in different societal and ecological contexts.

Our data show that women's intra-gender coalitions extend beyond the household level to at least the community level. Although some coalitionary contexts are gender-specific, men and women also form coalitions in overlapping contexts, including both contest and scramble types. These results do not support the household-based hypothesis which states that because of differential, gender-specific reproductive strategies and gender divisions of labor, women's intra-gender coalitions are primarily household-based, often formed among relatives, while coalitions of men including both relatives and non-relatives. Instead, our results provide support to both the female-biased and gender-neutral hypotheses. The female-biased hypothesis proposes that women compete over resources that are easier to share (e.g., food and safety) compared to men (e.g., mating opportunities), making the benefits from coalitions more predictable than for men and eliciting more coalition formation among women than men, whereas the gender-neutral hypothesis proposes that men and women engage in coalitionary behavior to a similar extent.

Among the Kwegu, both men and women reported that women form coalitions more frequently than men (73.9%; $n = 60$ women, 45 men), which provide more support to the women-biased hypothesis. Both genders rely on contest coalitions for group decision-making, opposite-gender motivation, and interpersonal disagreement. Using an information theoretic model selection approach to examine the variations in reports of participation, we found no evidence that gender predicts the tendency of participation across the three coalitionary contexts. Those results provide more support to both women-biased and gender-neutral hypotheses (Table 1.).

Preferences for coalitionary partners vary across coalitionary contexts. We noted that estimates for the random effect accounting for the different coalitionary contexts were consistently non-zero across coalition, suggesting variance across coalitionary contexts (Table S4 and S5. and Fig. S2 and S3. in supplementary information) and providing some support to the neutral-gender hypothesis.

Nevertheless, we were still able to identify some patterns. Using multivariate Bayesian logistic regression models, we found that overall,

even though both men and women reported preferring high-status partners, men showed a stronger preference those coalitionary partners ($\widehat{\beta}$men = 3.5, HDPI: [1.00, 7.5], PD = 1.00). Both genders have relatives in the community, but women showed stronger preferences for same clan coalitionary partners ($\widehat{\beta}$men = −2.1, 95% HDPI: [−3.80, −0.66], PD = 1.00) and relatives ($\widehat{\beta}$men = −1.2, HDPI: [−2.20, −0.32], PD = 1.00) compared to men. The co-occurrence of these two preferences is consistent with the patrilineal organization of clans (i.e., relatives are more likely to be part of the same clan as the participant). Those results provide more support to the household-based hypothesis. Women also appear to show some preferences for same age group ($\widehat{\beta}$men = −1.4, HDPI: [−3.10, 0.22], PD = 0.97) and same gender partners ($\widehat{\beta}$men = −0.51, HDPI: [−1.30, 0.28], PD = 0.91) compared to men, even though the 95% HDPIs included zero, indicating greater uncertainty.

Using an information theoretic model selection approach to examine the variations in reported number of coalitionary partners, we found that men prefer a higher number of coalitionary partners compared to women (β = 0.37, 95% CI [0.10, 0.64]). These results align with von Rueden and colleagues (2018), who found that Tsimane men reported more cooperation partners than women, particularly non-kin partners. They argue that women's smaller cooperation networks partly reflect the opportunity costs of within household labor (von Rueden et al., 2018). Those results thus, provide more support to the household-based hypothesis.

In addition, we found that women prefer same gender partners compared to men (β = −0.30, 95% CI [−0.16, −0.44]), which aligns with our previous results. These results provide more support to the women-biased or gender-neutral hypotheses.

Taken together, our study finds support for each of the three hypotheses, but none of the three was fully supported by our data. Our results show that women exhibit greater selectivity than men in their choice of coalitionary partners and do not appear to be more limited than men in the range of potential partners choices.

Although this study is limited to three communities in southwest Ethiopia, the findings underscore that women's support systems are underrecognized in subsistence-based societies (Fox, Scelza, et al., 2022; Kramer, 2022). Both genders rely on scramble and contest coalitions, but they appear to employ different strategies, particularly in partner choice, with women showing greater selectivity in coalition partner selection than men. Dynamics of coalition formation are complex (Pietraszewski, 2016). Prior to forming a coalition, individuals must assess the cost and benefits of their own and other's roles, while also considering the short-term and long-term consequences within communities characterized by repeated interactions (Pietraszewski, 2012, 2016). Therefore, differences in partner preferences may shape group dynamics, with women potentially influencing social processes within their communities in ways that differ from men, including through participation in group decision-making, interpersonal disputes, and opposite-gender interactions. Their influence might go even beyond within-community affairs, by for example, motivating men to fight or get food in times of food scarcity. These results support a growing body of literature indicating that women's cooperative behavior encompasses scales and domains typically associated with men (Garfield & Hagen, 2020; Kramer, 2022).

Patterns of coalitionary behavior observed in women aligns with what is observed more broadly in female mammals. Among mammals, coalitions for within-group competition can occur in both sexes including in non-human primates regardless of the dispersion pattern (Smith et al., 2023). Among our two closest relatives, bonobos and chimpanzees, even though females disperse when reaching maturity (Emery Thompson, 2013; Furuichi, 1989; Goodall, 1986; Hanamura, 2015) and thus lack relatives as cooperative partners, they still form coalitions. Female chimpanzee coalitions are rare but can occur in response to male aggression (Fox et al., 2022; Newton-Fisher, 2006). Female bonobos form those coalitions even more frequently to prevent male aggression and ensure dominance (Surbeck et al., 2025; Tokuyama & Furuichi, 2016). Therefore, as for multiple other mammal species, including our closest living relatives, female coalitions might be a fundamental feature of human social organization.

CRediT authorship contribution statement

Maud Mouginot: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Zachary H. Garfield:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Methodology, Conceptualization. **Luke Glowacki:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Methodology, Funding acquisition, Conceptualization.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the author(s) used Chat GPT to improve readability and language. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

Declaration of competing interest

The authors declare no conflict of interest.

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Appendix A. Supplementary data

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