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

Maud Mouginot[1,*]

Zachary H. Garfield[2,*,†]

Luke Glowacki[1,*,†]

[1]Department of Anthropology, Boston University, MA, USA

[2]Africa Institute for Research in Economics and Social Science, University of Mohammed VI Polytechnic, Morocco

*Corresponding authors: mmougino@bu.edu, zachary.garfield@um6p.ma, laglow@bu.edu

†These authors share senior authorship.

Abstract

Coalitions are a widespread cooperative strategy across mammals, including humans, in which they form an important component that sustain friendships. In subsistence-based societies, research on coalitions has primarily focused on men, leaving women comparatively understudied. To address this gap, we examined coalitions within and between 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. Using GLMMs, we showed 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. Using MBLRs and LMMs, 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, women's use of coalitions extends to contexts typically associated with men and might affect social dynamics differently. As for multiple other mammal species, including our closest living relatives, female coalitions might be a fundamental feature of human social organization.

Keywords: men, women, scramble, contest, coalition, subsistence-based society

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). Coalitions can occur among different social relationships, including friends, and form an important component of the cooperative strategies that sustain friendships (Hruschka, 2010; Hruschka & Henrich, 2006; Silk, 2003). Although across mammals, coalitions for between-group conflict are usually male-biased, within-group coalitions can occur in both sexes (Smith et al., 2023) such as in banded mongooses (*Mungos mungo*) (Thompson et al., 2017), African wild dog (*Lycaon pictus*) (Villiers et al., 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*) (B. B. Smuts, 1985), and white-faced capuchins (*Cebus capucinus*) (Perry et al., 2009). In humans, coalitions for between-group conflicts are also reported to be male-biased, but research on within-group coalitions have largely focused on men, particularly in small-scale societies (Glowacki et al., 2016; Otterbein, 1968; Rodseth, 2012; Wrangham, 2021). Women's participation in coalitions has been understudied relative to men, leaving a gap in our understanding of the evolution and functions of coalitions across genders (Kramer, 2022).

Coalitionary behavior among human groups occurs across various contexts, from within a single family to large-scale political cooperation. Research on coalitions in small-scale societies has primarily focused on coalitions of men both for intergroup aggression (Glowacki & von Rueden, 2015; Macfarlan et al., 2014; Wrangham & Glowacki, 2012) and within-group conflicts (Garfield & Glowacki, 2023; Otterbein, 1968; Redhead & von Rueden, 2021; Rodseth, 2012). The importance of within-group coalitions for dominance and defence would favor coalitions of men, which would be less important in women (David-Barrett et al., 2015; Kramer, 2022; Wrangham & Benenson, 2017). Despite notable research on women's cooperation and coalitions in subsistence-based societies, they have been neglected in reconstructions of the evolution of human sociality (Glowacki, 2024; Kramer, 2022; Pisor & Surbeck, 2019).

Women's ability to cooperate is as crucial as men's for building and maintaining social relationships (Fox, Scelza, et al., 2022). In subsistence-based societies, women 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 et al., 2014), resources acquisition through hunting (Bird et al., 2012; Bird & Bird, 2008; Noss & Hewlett, 2001), foraging (Hurtado et al., 1985; Jang et al., 2024; Marlowe, 2010), and food sharing (Gettler et al., 2023). Research shows no gender differences in the extent of women's social networks compared to men (Dyble et al., 2015, 2021; Mattison et al., 2021, 2022; Simpson & Power, 2022) and no evidence of gender differences in the development of prosociality and fairness in children (House et al., 2022). In addition, alliance building—and by extension coalition building—has been shown to play a central role in women's leadership, as well as in securing reproductive and economic benefits (Browser & Patton, 2010; Garfield et al., 2019).

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 a number of aims. 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 cooperatively engage in subtle, non-confrontational tactics, such as gossip and exclusion of others, to compete for status or mates (Campbell, 2013; Hess, 2017; Reynolds, 2022; Rucas et al., 2012; Benenson et al., 2014). Yet, systematic quantitative data on coalitions of women is lacking.

To feel 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, thereby broadening the range of coalitions identified in both genders. We then focused on three coalitionary contexts - motivation of opposite gender, group decision-making, and interpersonal disagreement.

In animal behavior, coalitions are widely understood as a form of cooperative behavior. They 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 employed for dominance, resource, and mate competition (Harcourt & de Waal, 1992). 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). Similarly to previous research, we included both scramble and contest in our study of coalition (Berghänel et al., 2010). First, *contest coalitions* for which individuals collaborate directly against a third party such as for interpersonal disagreements, group decision-making, or between-group fights. Those contest coalitions would involve non-contact aggressive coalitions (e.g., discussion, gossip, dance, song) or contact aggressive coalitions (e.g., fights). Second, *scramble coalitions* for which individuals collaborate to acquire resources before others can. In resource-limited environments, forming coalitions to acquire valuable information about rare food resources or other communities for example, can yield benefits to coalitionary partners at the disadvantages of others.

Coalitionary strategies are expected to vary due to sex differences in reproductive strategies. In mammals, females typically invest heavily in parental care through internal fertilization and lactation, which make securing resources their 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. Even though men can provide extensive – thought variable – paternal care (Flinn, 1992; Griffin & Griffin, 1992; Harkness & Super, 1992; Hewlett, 1992; Jankowiak, 1992; Morelli & Tronick, 1992), they pursue mating effort while women focus on parental effort (Low, 1990, 1992). In addition, humans have a division of labor which distinguishes the role of men and women within their

society (Hill & Kaplan, 1999; Low, 1990, 1992). Therefore, coalitions of men should primarily focus on dominance or reproductive advantages, while coalitions of women should primarily focus on mutual support and resource access (Bissonnette et al., 2015; Low, 1992). This should also affect preferences in coalitionary partners between both genders.

Based on this and following Low (1992) we formed a *household-based hypothesis* which states that because of differential reproductive strategies across genders and divisions of labor, women's coalitions are more stable and primarily household-based, often formed among relatives, while coalitions of men are less stable including relatives and non-relatives and are more fluid. Men would then engage in more frequent coalitions.

We also propose a *women-biased hypothesis*. In mammals, because females compete for more widely available resources (e.g., food) than males (van Hooff & van Schaik, 1992), the benefits from coalitions are more equally shared among females than males (Bissonnette, 2015). Thus, the benefits of a coalition would be more predictable for females compared to males which might elicit more coalition formation in females than males. Similarly, 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.

Reviewing within-group coalitionary behavior in 58 mammalian species, including 39 primates, Smith and colleagues (2023) found that both sexes typically form within-group coalitions. Multiple studies on human social networks report no gender differences (Dyble et al., 2015, 2021; Mattison et al., 2021, 2022; Simpson & Power, 2022), suggesting that gender-based differences in cooperation may be overstated (Hruschka et al., 2022). Therefore, we formed 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.

2. Methods

Data were collected via interviews that lasted 20–30 minutes and 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. The study protocol and goals were introduced to, and approved by, local communities. Prior informed consent was obtained at the community and individual levels. Data are available in supplementary material. We tested our three main hypotheses, each with specific predictions (Table 2.1.).

Hypothesis	**Household-based**	**Women-biased**	**Gender-neutral**
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	Both	Both	Neither or both
Relatives	Women	Both (if relatives present)	Neither or both
Same clan	Women	Both (if relatives present)	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

Table 2.1. Predictions for gender difference in coalition formation among the three hypotheses. Women refers to women with a higher preference compared to men. Men refers to men with a higher preference compared to women. Both and Neither refers to similarity observed between genders. Both refers to both genders with a high preference, with no difference between genders. Neither refers to no preference observed for any gender. *NA* refers to no prediction for this hypothesis. *Data used to test those predictions come from focus group interviews among three communities. The rest of the predictions were tested with data from individual structured interviews in one community.

2.1. Communities

Data were collected between June 2024 and August 2025, using an ODK-X based software. The three subsistence-based communities studied in southwest Ethiopia share similarities by all being 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. They also rely on horticulture by cultivating maize and sorghum along the Omo River. However, they have distinct, not mutually understandable languages and exhibit substantial variation in their norms and customs. Nyangatom and Kara are agro-pastoralists relying also on livestock, mainly goats and cattle. Politically and militarily highly influential in the Omo Valley, Nyangatom counts around 25,000 members while Kara numbers around 1500 members (UNFPA, 2007) (Girke, 2010, 2018; Glowacki et al., 2020). Unlike neighboring agro-pastoralists, the Kwegu, counting around 2000 members (UNFPA, 2007), do not own livestock (Buffavand, 2018; Hieda, 1990; and personal observation).

2.2. Focus group interviews

2.2.1. Conducting interviews

We conducted four focus groups, each with four participants, in each of the three communities, which included: one for elder women, one for young women, one for elder men, and one for young men. Local community members, who assisted with our integration, facilitated participant selection.

We asked each focus group if they form coalitions in cooperative contexts pre-identified based on available ethnographies and personal observations from previous field trips. While most contexts were relevant to both genders, a few were specifically associated with one gender (Table 2.2.). We then asked each group if they formed coalitions for any other goals not mentioned by us during the interview.

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

Table 2.2. 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.

2.2.2. Analyzing conversations

We first classify the affirmative answers into cooperation or coalitions based on our definition of a coalition: two or more individuals joining forces to pursue *a common goal,* whereby the benefits gained through coalition exceeds what at least one individual could achieve alone. We then break down coalitions into contest and scramble coalitions.

2.3. Structured interviews

We conducted structured interviews, one per participant, in the Kwegu community (142 interviews total including 82 women and 60 men). We first asked participants which gender formed coalitions more frequently ("do men cooperate together more often or do women cooperate together more often to do things?"). We then focused on three 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?")

2.4. 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, considering gender, clan affiliation, kinship ties, age group affiliation, and status.

Since most participants struggled to provide their age, we estimated a range and calculated a mean which we included as a control for statistical analyses. For the 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 same gender, 2) of same clan membership, 3) of same age group, 4) with kinship ties, and 5) with high-status. We defined high-status partners broadly as individuals who are more influential, more respected, and wealthy. We also asked participants the number of partners they would prefer by selecting cards with fictional illustrations of men and women presented to them.

2.5. Statistical analyses

For all statistical analyses, we used Rstudio version 2023.06.1.

2.5.1. Participation to 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 applied a generalized linear mixed model (GLMM) with a binomial distribution (Bates et al., 2015) with 1/0 answer as the dependent variable and gender as the independent variable. Because we observed that younger participants, especially women, tended to say no to questions, we included the mean age as an independent variable. We then created a set of three models, including 1) only the intercept, 2) gender, and 3) 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.

2.5.2. Preferences

We used a Bayesian 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.

Among the individuals participating in coalitions, we then 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) 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., same gender, same clan, same 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 this variable 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. For this, we assessed out-of-sample predictive performance using leave-one-out cross-validation with Pareto-smoothed importance sampling (Vehtari et al., 2017), the function add_criterion and loo. Because several observations had unstable importance weights (Pareto-k>0.7k), 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 ($\hat{\beta}$) and by calculating the median, the probability of direction (PD), and the 95% highest density posterior interval (HDPI).

We also examined the preferred number of partners. First, we looked at the overall preferred number of partners. 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). We used count of the preferred number of partners as the dependent variable and sex as the independent variable. Because age might affect this number, we included the mean age as an independent variable. We then created a set of three models, including 1) only the intercept, 2) gender, and 3) 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.

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). As previously, as participant's age might have an effect on the number of preferred partners given we created three models including 1) only the intercept, 2) gender, and 3) gender and mean age, and used a similar approach using an information theoretic model selection approach described earlier (Anderson & Burnham, 2002; Mazerolle, 2017) to determine which model best fit our data. Candidate models with alternative fixed-effects structures were fitted using maximum likelihood (ML, i.e. REML = FALSE) to allow valid information-theoretic comparison.

3. Results

3.1. Focus group interviews

3.1.1. Pre-identified cooperation contexts

Both men and women reported relying on both scramble and contest coalitions across all three communities. While some focus groups answered positively to cooperating with others for fetching water, childcare, or marriage arrangement, they do not appear to form coalitions as we defined it: two or more individuals joining forces to pursue *a common goal,* whereby the benefits gained through coalition exceeds what at least one individual could achieve alone. However, some focus groups answered positively to cooperating with others for farming, gathering, ceremony preparation, interpersonal disagreement, information gain, material gain, cattle care and protection, and village protection, and appear to form coalitions to face competition against others or accelerate resource gain (Table 3.1., see also supplementary material).

Interestingly, while discussing interpersonal disagreement, one young Nyangatom women noted:

> "Sometimes when they are fighting, the women just gather and saying to the man, "Why you are beating?" Because the women less strengths, so they gather to help, like, "Why you are beating a woman?" But in times of resolving the issue, the women just gather to the woman, and the men gather to the man." "Only after we see the reason for the fight go. If the man was the one who initiated the fights, we go to the man say that, "Why you are beating her?" When you go to those people who are fighting, the relative sometimes go and force even to beat that man, but the other women are going to resolve the issue." (translated answer by local field assistant).

This response is particularly relevant regarding coalitions of women against aggressive men but also regarding conflict resolution.

Both men and women also identified additional coalitionary contexts (Table 3.1.). Men reported cooperating to hunt, and described coordinated group dancing efforts:

> "We have beautiful women somewhere, let's go and dance. Let's go ahead dance together." (Young Nyangatom Men, translated by field assistant).

They reported cooperating to raid for cattle and 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 Men, translated by field assistant).

They also reported motivating other men:

“When you gather, also, you will slaughter a lot of animals, and you will motivate them [young men] until their eyes get red. They [elder men] will motivate them [young men] until they feel and get… Their eyes being red. [...] So, when you are motivating them like that, when the enemy comes, all of them will die protecting the animals.” (Elder Nyangatom men, translated by field assistant).

Both genders reported collaborating on community decisions regarding farming, childcare, and cattle protection. Both also reported that women motivate men to go to work:

“So, the elders and mothers, they used to encourage them and send them before even the farming. Even when there is a lazy person, they used to beat him. Yes. “I just cut your hands, you’re lazy.”” (Young Nyangatom men, translated by field assistant).

Our Nyangatom 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 don’t do anything, they would curse you”.

Discussing between-group conflicts, he pursued:

“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 weak, the woman say, “Why you can do that, do that.” The woman says like that, the pushing, “You do this.”” (Young Kwegu men, translated by field assistant).

> "They motivate us for hunting, for fighting, by singing. […] Even for field work. Even when hunger happen. They motivate us" (Elder Kara men, translated by field assistant).

Finally, women reported cooperating to help poor women who require assistance and reported answering women's call from other villages:

> "There is no other gathering than going if someone is calling" (Elder Nyangatom women, translated by field assistant).

Therefore, both men and women appear to rely on scramble and contest coalitions across the three communities. 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, and interpersonal disagreement.

Context	Coalition type	Reports
Pre-identified coalitionary contexts		
Farming	Scramble	Help each other sometimes. This can be coalitions if several people work together in the goal of helping someone.
Gathering	Scramble	Travel together but gathering is individual except for Nyangatom who reported cooperating together to gather with women gathering while men lead and protect the women.
Ceremony	Contest	Cooperate together to prepare ceremonies, which could be a show-off strategy 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 some material items.
Cattle*[1]	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[1]	Contest	Cooperate to protect the village against enemies.
Other coalitionary contexts		
Hunting	Scramble	Cooperate to go hunting in the bush.
Fetching wood	Scramble	Cooperate to go gathering wood in the bush.
Dancing	Contest	Cooperate to dance during ceremonies/celebrations.
Raids	Contest	Cooperate to go stealing cattle from others.
Men 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 might depend on the call.
Help women	Scramble	Cooperate to help poorer women who need help.

Table 3.1. 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. *indicates that the context was not given to Kwegu participants as they do not own cattle. [1] are pre-identified coalitionary contexts only asked to men.

3.2. Structured interview

Structured interviews focused on within-group contest coalitions 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 number of partners preferred.

3.2.1. Coalitions among men and women

We asked participants if either women or men cooperate together more frequently ("do men cooperate together more often or do women cooperate together more often to do things?"). Most participants answered that women cooperate more often (73.9%, 60 women, 45 men) (see also Table S1. in supplementary material).

3.2.2. Participation in coalitions

To examine variation in participation across three coalitionary contexts (motivation of opposite gender, group decision-making, and interpersonal disagreement), we used information theoretic model selection approaches and compared three GLMM models with binomial error structure with each coalitionary context as the dependent variable and 1) only the intercept (null), 2) mean age, or 3) gender and mean age as the dependent variables.

For participation in coalitions to motivate opposite gender, we found that the null model had the lowest AICc (ΔAICc = 0, weight = 0.38), indicating that sex and age did not substantially improve model fit. Model-averaged parameter estimates further suggest no strong effects of gender (β = 0.45, 95% CI [−0.24, 1.14]) and age (β = 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 material).

For participation in coalitions to make community decisions, we found that the model including sex and age had the lowest AICc (ΔAICc = 0, weight = 0.63). While model-averaged parameter estimates further suggest no strong effects of gender (β = 0.18, 95% CI [−0.51, 0.87]), age may

have a positive effect on participant answers (β = 0.03, 95% CI [0, 0.05]). We find no evidence that gender predicts the tendency to participate in coalitions for group decision-making (see Table S2. for model details in supplementary material).

Finally, for participation in coalitions for interpersonal disagreement, we found that the model including sex and age had the lowest AICc (ΔAICc = 0, weight = 0.47). Model-averaged parameter estimates suggested estimates suggest no strong effects of gender (β = 1.65, 95% CI [−0.52, 3.82]), but a possible small negative effect of age (β = −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 material).

3.2.3. 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. We used multivariate Bayesian logistic regression models with those five binary variables for preferences as the response variable. 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 material).

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 ($\hat{\beta}$ = -2.1, 95% HDPI: [-3.80, -0.66], PD = 1.00), and with kinship ties ($\hat{\beta}$ = -1.2, HDPI: [-2.20, -0.32], PD = 1.00). Conversely, men were more likely to prefer high-status partners ($\hat{\beta}$ = 3.5, HDPI: [1.00, 7.5], PD = 1.00). Effects for same age group ($\hat{\beta}$ = -1.4, HDPI: [-3.10, 0.22], PD = 0.97) and same gender ($\hat{\beta}$ = -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 (Figure 3.1 & 3.2., see also Table S4 and 5. and Figure S1. in supplementary material).

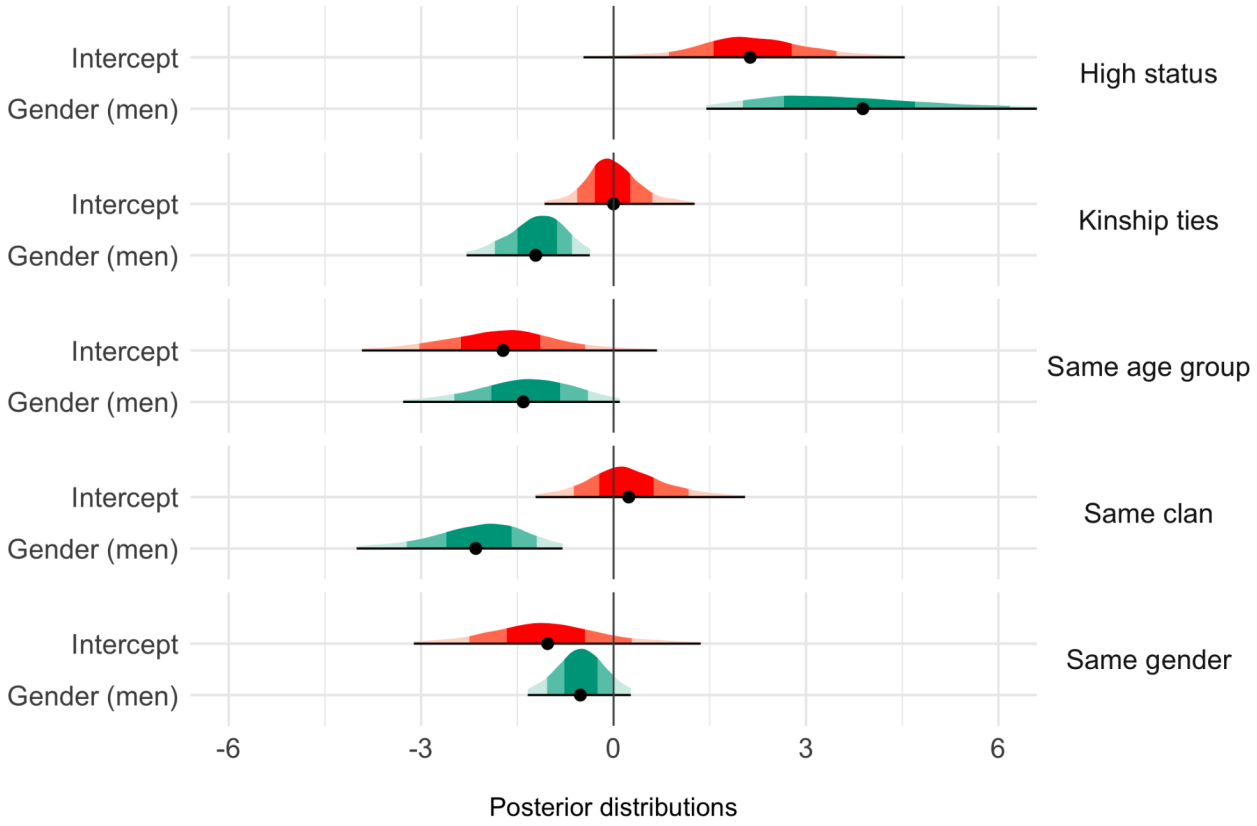

Figure. 3.1. Posterior distributions from Bayesian models estimating the effect of gender across five preferences for coalition partners. Gender (men) refers to gender, men being the reference category. High status refers to participants preference for high-status partners; kinship ties refers to participant 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. (COLORED NEEDED)

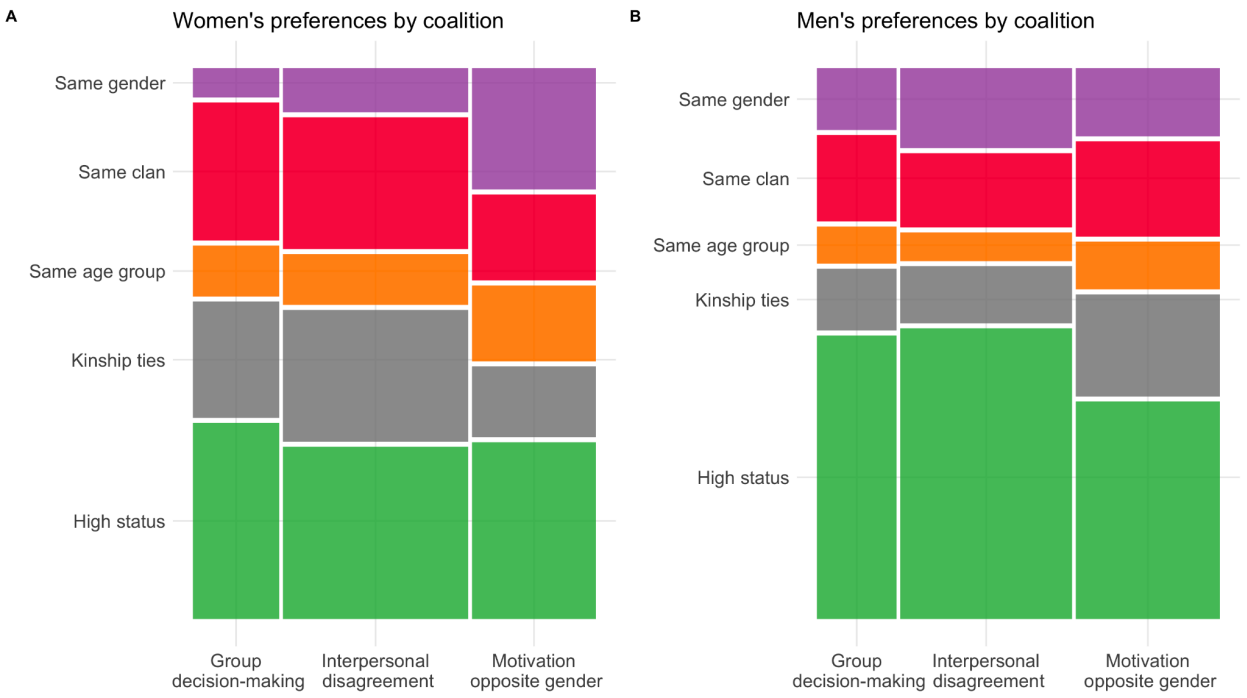

Figure 3.2. Preferences for coalitionary partners by gender and coalitionary contexts. Mosaic plots show the distribution of preferences for coalitionary partners among women (A) and men (B) across the three coalitionary contexts: group decision-making, interpersonal disagreement, and motivation of opposite gender. Each colored bar represents the proportion of participants within each coalitionary context who prefer partners with high status (green), with kinship ties (gray), from the same age group (orange), from the same clan (red), and with the same gender (purple). For another representation of those data, see Figure S1. In supplementary material. (COLORED NEEDED)

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 Figure S2. in supplementary material). 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 possibly a small 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 material).

To examine the difference between preferred numbers of same gender versus opposite gender partners, we calculated a normalized difference score. Although this score varied across coalitionary contexts, it overall indicated that women show a stronger preference for same-gender partners compared to men (Men: mean = 0.30, SD = 0.60; Women: mean = 0.62, SD = 0.51) (see also Table S8. and Figure S3. for details). Using an information theoretic model selection approach, we compared three 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 (β = -0.30, 95% CI [-0.16, -0.44]) and no consistent effect of age (β = 0.00, 95% CI [0.00, -0.01]) (see Table S9. for model details in supplementary material).

4. Discussion

In this study, coalition included both scramble and contest competition: *contest coalitions* for which individuals use contest competition and thus collaborate directly against a third party such as for interpersonal disagreements, group decision-making, or between-group fights, and *scramble coalitions* for which individuals use scramble competition and thus collaborate to acquire resources before others can such as information gain, material gain, or hunting. We identified multiple coalitionary contexts or aims among the three communities we studied (Nyangatom, Kara, and Kwegu) for which both men and women rely on scramble and contest coalitions. While some coalitionary contexts are identified as gender-specific (e.g., hunting), most are 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 some 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). While we could expect women to rely on less costly coalitions such as scramble coalitions compared to men, 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 coalitions of women extend beyond the household level to at least, the community level. While men and women form coalitions for gender-specific contexts, they also use coalitions for similar contexts, including both contest and scramble coalitions. Those results do not support the *household-based hypothesis* which states that because of differential reproductive strategies across genders and our division of labor, women coalitions of women are more stable and primarily household-based, often formed among relatives, while men coalitions of men are less stable including relatives and non-relatives and more fluid. Instead, our results support *the female-biased hypothesis* which states that because women compete for more widely available resources, the benefits from coalitions are more predictable for them than men which

might elicit more coalition formation in women than men, and the *gender-neutral hypothesis* which proposes that men and women engage in coalitionary behavior to a similar extent.

Continuing with results from the Kwegu community, both men and women reported that women form coalitions more frequently than men, and both genders rely on contest coalitions for group decision-making, opposite-gender motivation, and interpersonal disagreement. We found no evidence that gender predicts the tendency to participate in these three coalitional aims. Preferences for coalitionary partners vary across coalitionary contexts, however, we found that men show a stronger preference for high-status coalitionary partners. Even though relatives are present for both genders, women show stronger preferences for same clan coalitionary partners and relatives. The co-occurrence of these two preferences is consistent with the patrilineal organization of clans. Women might also show stronger preferences for same age group and same gender partners even though the 95% HDPIs included zero, indicating greater uncertainty. Nevertheless, results of the preferred number of men and women coalitionary partners also support that women prefer same gender partners compared to men. Overall, women appear to exhibit greater selectivity than men in their choice of coalitionary partners. Finally, even though the preferred number of coalitionary partners varies across coalition contexts, we found that men prefer more coalitionary partners than women. Therefore, those results provide support to specific predictions, but none of the hypotheses received full overall support.

Our results are limited to three communities in southwest Ethiopia but they emphasize that women's support system has been underestimated in subsistence-based societies (Fox, Scelza, et al., 2022; Kramer, 2022). Although both genders rely on scramble and contest coalitions, they appear to employ different strategies, particularly in their choice of coalition partners, with women appearing to strategize more in this selection compared to men. Dynamics of coalition formation are complex (Pietraszewski, 2016). Before forming a coalition, individuals must assert 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 preferences might influence group

dynamics and women affect social dynamics within their community, possibly differently than men, by participating in group-decision making, interpersonal disagreement, or opposite-gender motivation. Their influence might go even beyond the within-community affairs, by for example, motivating men to go fight or get food in times of food scarcity. Those results support the growing literature dictating that women cooperative behavior encompasses scales and domains usually observed in men (Kramer, 2022).

Patterns of coalitionary behavior observed in women aligns with what is observed more broadly in female mammals. Among mammals, within-group coalitions 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, Muller, 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.

Acknowledgements

We are grateful for the generosity of the Nyangatom, Kara, and Kwegu communities and the assistance provided by Baye Lokoroma, Lale Kuro, Bigo Torka, Kappa Ejem, Dessalegn Tekele, Gude Ari, and Teytey Lowoyo. A special thanks to Valérie Béraud, Haileysus Melkamu, and Tilahun Abebe for help with logistics. This research was supported by an award from the National Science Foundation (Award Number 009500313907).

Declaration of interest

The authors declare no conflict of interest.

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.

References

Anderson, D. R., & Burnham, K. P. (2002). Avoiding pitfalls when using Information-Theoretic Methods. *The Journal of Wildlife Management*, *66*(3), 912–918. https://doi.org/10.2307/3803155

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting Linear Mixed-Effects Models using lme4. *Journal of Statistical Software*, *67*(1), 1–48. https://doi.org/10.18637/jss.v067.i01

Benenson, J. F. (2014). *Warriors and Worriers: The Survival of the Sexes*. Oxford University Press.

Berghänel, A., Schülke, O., & Ostner, J. (2010). Coalition formation among Barbary macaque males: The influence of scramble competition. *Animal Behaviour*, *80*(4), 675–682. https://doi.org/10.1016/j.anbehav.2010.07.002

Bird, R. B., & Bird, D. W. (2008). Why women hunt: Risk and contemporary foraging in a Western Desert Aboriginal community. *Current Anthropology*, *49*(4), 655–693. https://doi.org/10.1086/587700

Bird, R. B., Scelza, B., Bird, D. W., & Smith, E. A. (2012). The hierarchy of virtue: Mutualism, altruism and signaling in Martu women's cooperative hunting. *Evolution and Human Behavior*, *33*(1), 64–78. https://doi.org/10.1016/j.evolhumbehav.2011.05.007

Bissonnette, A., Perry, S., Barrett, L., Mitani, J. C., Flinn, M., Gavrilets, S., & Waal, F. B. M. de. (2015). Coalitions in theory and reality: A review of pertinent variables and processes. *Behaviour*, *152*(1), 1–56. https://doi.org/10.1163/1568539X-00003241

Brooks, M. E., Kristensen, K., van Benthem, K. J., Magnusson, A., Berg, C. W., Nielsen, A., Skaug, H. J., Machler, M., & Bolker, B. M. (2017). glmmTMB balances speed and flexibility among packages for zero-inflated generalized linear mixed modeling. *The R Journal*, *9*(2), 378–400. https://doi.org/10.3929/ethz-b-000240890

Browser, B., & Patton, J. (2010). Women's leadership: Political alliance, economic resources, and reproductive success in the Ecuadorian Amazon. In K.J. Vaughn, J.W. Eerkens, & J. Kantner (Eds.), *The evolution of leadership: Transitions in decision making from small-scale to middle-range societies* (pp. 51–71). SAR Press.

Buffavand, L. (2018). 21 Kwegu: Hunters of the river. In T. Clack & M. Brittain (Eds.), *The River: Peoples and Histories of the Omo-Turkana Area* (pp. 140–148). Archaeopress Publishing Ltd.

Burbank, V. K. (1994). *Fighting women: Anger and aggression in Aboriginal Australia*. University of California Press.

Bürkner, P.-C. (2017). brms: An R package for Bayesian multilevel models using stan. *Journal of Statistical Software*, *80*, 1–28. https://doi.org/10.18637/jss.v080.i01

Campbell, A. (2013). *A Mind Of Her Own: The evolutionary psychology of women*. OUP Oxford.

Clutton-Brock, T. H. (1991). *The Evolution of Parental Care*. Princeton University Press.

Clutton-Brock, T. H. (1998). Reproductive skew, concessions and limited control. *Trends in Ecology & Evolution*, *13*(7), 288–292. https://doi.org/10.1016/S0169-5347(98)01402-5

Crittenden, A. N., & Marlowe, F. W. (2008). Allomaternal care among the Hadza of Tanzania. *Human Nature*, *19*(3), 249. https://doi.org/10.1007/s12110-008-9043-3

David-Barrett, T., Rotkirch, A., Carney, J., Izquierdo, I. B., Krems, J. A., Townley, D., McDaniell, E., Byrne-Smith, A., & Dunbar, R. I. M. (2015). Women favour dyadic relationships, but men prefer clubs: Cross-cultural evidence from social networking. *PLOS ONE*, *10*(3), e0118329. https://doi.org/10.1371/journal.pone.0118329

Draper, P. (1992). Room to maneuver: !Kung women cope with men. In D.A. Counts, J. K. Brown, & J. C. Campbell (Eds.), *Sanctions And Sanctuary Cultural Perspectives On The Beating Of Wives* (pp. 43–61). Routledge.

Dyble, M., Migliano, A. B., Page, A. E., & Smith, D. (2021). Relatedness within and between Agta residential groups. *Evolutionary Human Sciences*, *3*, e49. https://doi.org/10.1017/ehs.2021.46

Dyble, M., Salali, G. D., Chaudhary, N., Page, A., Smith, D., Thompson, J., Vinicius, L., Mace, R., & Migliano, A. B. (2015). Sex equality can explain the unique social structure of hunter-gatherer bands. *Science*, *348*(6236), 796–798. https://doi.org/10.1126/science.aaa5139

Emery Thompson, M. (2013). Reproductive ecology of female chimpanzees. *American Journal of Primatology*, *75*(3), 222–237. https://doi.org/10.1002/ajp.22084

Flinn, M. V. (1992). Paternal care in a Caribbean village. In Barry S. Hewlett (Ed.), *Father-Child Relations: Cultural and Biosocial Contexts* (pp. 57–84). Aldine De Gruyter.

Fox, S. A., Muller, M. N., González, N. T., Enigk, D. K., Machanda, Z. P., Otali, E., Wrangham, R., & Thompson, M. E. (2022). Weak, but not strong, ties support coalition formation among wild female chimpanzees. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *378*(1868), 20210427. https://doi.org/10.1098/rstb.2021.0427

Fox, S. A., Scelza, B., Silk, J., & Kramer, K. L. (2022). New perspectives on the evolution of women's cooperation. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *378*(1868), 20210424. https://doi.org/10.1098/rstb.2021.0424

Furuichi, T. (1989). Social interactions and the life history of female *Pan paniscus* in Wamba, Zaire. *International Journal of Primatology*, *10*(3), 173–197. https://doi.org/10.1007/BF02735199

Garfield, Z. H., & Glowacki, L. (2023). Interpersonal conflicts and third-party mediation in a pastoralist society. *Evolution and Human Behavior*, *44*(6), 613–623. https://doi.org/10.1016/j.evolhumbehav.2023.10.003

Garfield, Z. H., von Rueden, C., & Hagen, E. H. (2019). The evolutionary anthropology of political leadership. *The Leadership Quarterly*, *30*(1), 59–80. https://doi.org/10.1016/j.leaqua.2018.09.001

Gettler, L. T., Redhead, D., Dzabatou, A., & Lew-Levy, S. (2023). BaYaka forager food sharing networks in the Congo Basin: The roles of gender homophily and kin sharing. *American Journal of Biological Anthropology*, *181*(1), 59–69. https://doi.org/10.1002/ajpa.24688

Gibson, M. A., & Mace, R. (2005). Helpful grandmothers in rural Ethiopia: A study of the effect of kin on child survival and growth. *Evolution and Human Behavior*, *26*(6), 469–482. https://doi.org/10.1016/j.evolhumbehav.2005.03.004

Girke, F. (2010). Bondfriendship and cultural neighborhood in South Omo. In E. C. Gabbert & S. Thubauville (Eds.), *To live with others: Essays on cultural neighborhood in southern Ethiopia* (pp. 68–98). Köln.

Girke, F. (2018). *The Wheel of Autonomy: Rhetoric and Ethnicity in the Omo Valley*. Berghahn Books.

Glowacki, L. (2024). The evolution of peace. *Behavioral and Brain Sciences*, *47*, e1. https://doi.org/10.1017/S0140525X22002862

Glowacki, L., Isakov, A., Wrangham, R. W., McDermott, R., Fowler, J. H., & Christakis, N. A. (2016). Formation of raiding parties for intergroup violence is mediated by social network structure. *Proceedings of the National Academy of Sciences*, *113*(43), 12114–12119. https://doi.org/10.1073/pnas.1610961113

Glowacki, L., & von Rueden, C. (2015). Leadership solves collective action problems in small-scale societies. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *370*(1683), 20150010. https://doi.org/10.1098/rstb.2015.0010

Glowacki, L., Wilson, M. L., & Wrangham, R. W. (2020). The evolutionary anthropology of war. *Journal of Economic Behavior & Organization*, *178*, 963–982. https://doi.org/10.1016/j.jebo.2017.09.014

Goodall, J. (1986). *The chimpanzees of Gombe: Patterns of behavior*. Belknap Press of Harvard University Press.

Griffin, P. B., & Griffin, M. B. (1992). Fathers and childcare among Cagayan Agta. In B. S. Hewlett (Ed.), *Father-Child Relations: Cultural and Biosocial Contexts* (pp. 297–320). Aldine De Gruyter.

Hanamura, S. (2015). Fission-fusion grouping. In K. Hosaka, K. Zamma, M. Nakamura, & N. Itoh (Eds.), *Mahale chimpanzees: 50 years of research* (pp. 106–118). Cambridge University Press.

Harcourt, A. H., & de Waal, F. B. M. (1992). Coalitions and alliances: A history of ethological research. In A.H. Harcourt & F. de Waal (Eds.), *Coalitions and Alliances in Humans and Other Animals* (pp. 1–19). Oxford University Press.

Harkness, S., & Super, C. M. (1992). The cultural foundations of father's roles: Evidence from Kenya and the United States. In B. S. Hewlett (Ed.), *Father-Child Relations: Cultural and Biosocial Contexts* (pp. 191–212). Aldine De Gruyter.

Hess, N. H. (2017). Informal warfare: Coalitional gossiping as a strategy for within-group aggression. In M. L. Fisher (Ed.), *The Oxford Handbook of Women and Competition* (pp. 223–247). Oxford University Press.

Hewlett, B. S. (1992). Husband-wife reciprocity and the father-infant relationship among Aka pygmies. In B. S. Hewlett (Ed.), *Father-Child Relations: Cultural and Biosocial Contexts* (pp. 153–176). Aldine De Gruyter.

Hieda, O. (1990). Koegu, a preliminary report. スワヒリ＆アフリカ研究, 97–108. https://doi.org/10.18910/71065

Hill, K., & Kaplan, H. (1999). Life History Traits in humans: Theory and empirical studies. *Annual Review of Anthropology*, *28*(Volume 28, 1999), 397–430. https://doi.org/10.1146/annurev.anthro.28.1.397

House, B., Silk, J. B., & McAuliffe, K. (2022). No strong evidence for universal gender differences in the development of cooperative behaviour across societies. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *378*(1868), 20210439. https://doi.org/10.1098/rstb.2021.0439

Hrdy, S. B. (1977). *The Langurs of Abu*. Harvard University Press. https://www.hup.harvard.edu/catalog.php?isbn=9780674510586

Hruschka, D. J. (2010). *Friendship: Development, Ecology, and Evolution of a Relationship*. University of California Press.

Hruschka, D. J., & Henrich, J. (2006). Friendship, cliquishness, and the emergence of cooperation. *Journal of Theoretical Biology*, *239*(1), 1–15. https://doi.org/10.1016/j.jtbi.2005.07.006

Hruschka, D. J., Munira, S., & Jesmin, K. (2022). Starting from scratch in a patrilocal society: How women build networks after marriage in rural Bangladesh. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *378*(1868), 20210432. https://doi.org/10.1098/rstb.2021.0432

Hurtado, A. M., Hawkes, K., Hill, K., & Kaplan, H. (1985). Female subsistence strategies among Ache hunter-gatherers of Eastern Paraguay. *Human Ecology*, *13*(1), 1–28. https://doi.org/10.1007/BF01531086

Ivey, P. K. (2000). Cooperative reproduction in Ituri Forest hunter-gatherers: Who cares for Efe infants? *Current Anthropology*, *41*(5), 856–866. https://doi.org/10.1086/317414

Jang, H., Ross, C. T., Boyette, A. H., Janmaat, K. R. L., Kandza, V., & Redhead, D. (2024). Women's subsistence networks scaffold cultural transmission among BaYaka foragers in the Congo Basin. *Science Advances*, *10*(2), eadj2543. https://doi.org/10.1126/sciadv.adj2543

Jankowiak, W. (1992). Father-child relations in urban China. In B. S. Hewlett (Ed.), *Father-Child Relations: Cultural and Biosocial Contexts* (pp. 345–363). Aldine De Gruyter.

Kang, A. J., & Tripp, A. M. (2018). Coalitions matter: Citizenship, women, and quota adoption in Africa. *Perspectives on Politics*, *16*(1), 73–91. https://doi.org/10.1017/S1537592717002225

Kramer, K. L. (2022). Female cooperation: Evolutionary, cross-cultural and ethnographic evidence. *Philosophical Transactions of the Royal Society B*. https://doi.org/10.1098/rstb.2021.0425

Kramer, K. L., & Veile, A. (2018). Infant allocare in traditional societies. *Physiology & Behavior*, *193*, 117–126. https://doi.org/10.1016/j.physbeh.2018.02.054

Leonardo, D. E., Nogueira-Filho, S. L. G., de Góes Maciel, F., Biondo, C., Mendl, M., & Nogueira, S. S. da C. (2021). Third-party conflict interventions are kin biased in captive white-lipped peccaries (*Mammalia*, *Tayassuidae*). *Behavioural Processes*, *193*, 104524. https://doi.org/10.1016/j.beproc.2021.104524

Low, B. S. (1990). Sex, power, and resources: Ecological and social correlates of sex differences. *International Journal of Contemporary Sociology*, *27*, 45–71.

Low, B. S. (1992). Sex, coalitions, and politics in preindustrial societies. *Politics and the Life Sciences*, *11*(1), 63–80. https://doi.org/10.1017/S0730938400017214

Macfarlan, S. J., Walker, R. S., Flinn, M. V., & Chagnon, N. A. (2014). Lethal coalitionary aggression and long-term alliance formation among Yanomamö men. *Proceedings of the National Academy of Sciences*, *111*(47), 16662–16669. https://doi.org/10.1073/pnas.1418639111

Marlowe, F. (2010). *The Hadza: Hunter-gatherers of Tanzania*. University of California Press.

Mattison, S. M., MacLaren, N. G., Liu, R., Reynolds, A. Z., Baca, G. D., Mattison, P. M., Zhang, M., Sum, C.-Y., Shenk, M. K., Blumenfield, T., von Rueden, C., & Wander, K. (2021). Gender differences in social networks based on prevailing kinship norms in the Mosuo of China. *Social Sciences*, *10*(7), Article 7. https://doi.org/10.3390/socsci10070253

Mattison, S. M., MacLaren, N. G., Sum, C.-Y., Shenk, M. K., Blumenfield, T., & Wander, K. (2022). Does gender structure social networks across domains of cooperation? An exploration of gendered networks among matrilineal and patrilineal Mosuo. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *378*(1868), 20210436. https://doi.org/10.1098/rstb.2021.0436

Mazerolle, M. J. (2017). Package "AICmodavg." *R Package*, *281*.

Meehan, C. L., Helfrecht, C., & Quinlan, R. J. (2014). Cooperative breeding and Aka children's nutritional status: Is flexibility key? *American Journal of Physical Anthropology*, *153*(4), 513–525. https://doi.org/10.1002/ajpa.22415

Mitchell, W. E. (1992). Why Wape men don't beat their wives: Constraints toward domestic tranquility in a New Guinea society. In D. A. Counts, J. K. Brown, & J. C. Campbell (Eds.), *Sanctions And Sanctuary* (pp. 89-98). Routledge. https://doi.org/10.4324/9780429305306-7

Morelli, G. A., & Tronick, E. Z. (1992). Male care among Efe-foragers and Lese farmers. In B. S. Hewlett (Ed.), *Father-Child Relations: Cultural and Biosocial Contexts* (pp. 231–262). Aldine De Gruyter.

Newton-Fisher, N. E. (2006). Female coalitions against male aggression in wild chimpanzees of the Budongo Forest. *International Journal of Primatology*, *27*(6), 1589–1599. https://doi.org/10.1007/s10764-006-9087-3

Nicholson, A. J. (1954). An outline of the dynamics of animal populations. *Australian Journal of Zoology*, *2*(1), 9–65. https://doi.org/10.1071/ZO9540009

Noss, A. J., & Hewlett, B. S. (2001). The contexts of female hunting in Central Africa. *American Anthropologist*, *103*(4), 1024–1040. https://doi.org/10.1525/aa.2001.103.4.1024

Otterbein, K. F. (1968). Internal war: A cross-cultural study. *American Anthropologist*, *70*(2), 277–289. https://doi.org/10.1525/aa.1968.70.2.02a00040

Parker, G. A. (2000). Scramble in behaviour and ecology. *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences*. https://doi.org/10.1098/rstb.2000.0726

Perry, S., Manson, J. H., & Perry, S. (2009). *Manipulative monkeys*. Harvard University Press.

Pietraszewski, D. (2012). The elementary dynamics of intergroup conflict and revenge. *Behavioral and Brain Sciences*, *36*(1), 32–33. https://doi.org/doi:10.1017/S0140525X1200057X

Pietraszewski, D. (2016). How the mind sees coalitional and group conflict: The evolutionary invariances of *n*-person conflict dynamics. *Evolution and Human Behavior*, *37*(6), 470–480. https://doi.org/10.1016/j.evolhumbehav.2016.04.006

Pisor, A. C., & Surbeck, M. (2019). The evolution of intergroup tolerance in nonhuman primates and humans. *Evolutionary Anthropology*, *28*(4), 210–223. https://doi.org/10.1002/evan.21793

741 Redhead, D., & von Rueden, C. R. (2021). Coalitions and conflict: A longitudinal analysis of
742 men's politics. *Evolutionary Human Sciences*, *3*, e31. https://doi.org/10.1017/ehs.2021.26

743 Reynolds, T. A. (2022). Our grandmothers' legacy: Challenges faced by female ancestors leave
744 traces in modern women's same-sex relationships. *Archives of Sexual Behavior*, *51*(7), 3225–
745 3256. https://doi.org/10.1007/s10508-020-01768-x

746 Rodseth, L. (2012). From Bachelor Threat to fraternal security: Male associations and modular
747 organization in human societies. *International Journal of Primatology*, *33*(5), 1194–1214.
748 https://doi.org/10.1007/s10764-012-9593-4

749 Rucas, S. L., Gurven, M., Winking, J., & Kaplan, H. (2012). Social aggression and resource
750 conflict across the female life-course in the Bolivian Amazon. *Aggressive Behavior*, *38*(3), 194–
751 207. https://doi.org/10.1002/ab.21420

752 Silk, J. (2003). Cooperation without counting: The puzzle of friendship. In P. Hammerstein
753 (Ed.), *Genetic and Cultural Evolution of Cooperation* (pp. 37–54). MIT Press.

754 Simpson, C. R., & Power, E. A. (2022). Dynamics of cooperative networks associated with
755 gender among South Indian Tamils. *Philosophical Transactions of the Royal Society B:*
756 *Biological Sciences*, *378*(1868), 20210437. https://doi.org/10.1098/rstb.2021.0437

757 Smith, J. E., Jaeggi, A. V., Holmes, R. K., & Silk, J. B. (2023). Sex differences in cooperative
758 coalitions: A mammalian perspective. *Philosophical Transactions of the Royal Society B:*
759 *Biological Sciences*, *378*(1868), 20210426. https://doi.org/10.1098/rstb.2021.0426

760 Smuts, B. (1992). Male aggression against women. *Human Nature*, *3*(1), 1–44.
761 https://doi.org/10.1007/BF02692265

762 Smuts, B. B. (1985). *Sex and Friendship in Baboons*. Routledge.
763 https://doi.org/10.4324/9781315129204

764 Surbeck, M., Cheng, L., Kreyer, M., Gort, G., Mundry, R., Hohmann, G., & Fruth, B. (2025).
765 Drivers of female power in bonobos. *Communications Biology*, *8*(1), 550.
766 https://doi.org/10.1038/s42003-025-07900-8

767 Taylor, L. (2018). Coalition from the inside out: Women of color feminism and politico-ethical
768 coalition politics. *New Political Science*, *40*(1), 119–136.
769 https://doi.org/10.1080/07393148.2017.1416447

770 Thompson, F. J., Cant, M. A., Marshall, H. H., Vitikainen, E. I. K., Sanderson, J. L., Nichols, H.
771 J., Gilchrist, J. S., Bell, M. B. V., Young, A. J., Hodge, S. J., & Johnstone, R. A. (2017).
772 Explaining negative kin discrimination in a cooperative mammal society. *Proceedings of the*
773 *National Academy of Sciences*, *114*(20), 5207–5212. https://doi.org/10.1073/pnas.1612235114

774 Tokuyama, N., & Furuichi, T. (2016). Do friends help each other? Patterns of female coalition
775 formation in wild bonobos at Wamba. *Animal Behaviour*, *119*, 27–35.
776 https://doi.org/10.1016/j.anbehav.2016.06.021

777 Trivers, R. L. (1972). Parental investment and sexual selection. In B. Campbell (Ed.), *Sexual*
778 *Selection and the Descent of Man* (pp. 53–95). Aldine.

779 UNFPA. (2007). *Summary and Statistical Report of the 2007 Population and Housing Census*
780 *Results*.

781 van Hooff, J., & van Schaik, C. P. (1992). Cooperation in competition: The ecology of primate
782 bonds. In A.H. Harcourt & F. de Waal (Eds.), *Coalitions and Alliances in Humans and Other*
783 *Animals* (pp. 357–390). Oxford University Press.

784 van Schaik, C. P., & Paul, A. (1996). Male care in primates: Does it ever reflect paternity?
785 *Evolutionary Anthropology: Issues, News, and Reviews*, *5*(5), 152–156.
786 https://doi.org/10.1002/(SICI)1520-6505(1996)5:5%253C152::AID-EVAN3%253E3.0.CO;2-H

787 Vehtari, A., Gelman, A., & Gabry, J. (2017). Practical Bayesian model evaluation using leave-
788 one-out cross-validation and WAIC. *Statistics and Computing*, *27*(5), 1413–1432.
789 https://doi.org/10.1007/s11222-016-9696-4

790 Villiers, M. S. de, Richardson, P. R. K., & Jaarsveld, A. S. van. (2003). Patterns of coalition
791 formation and spatial association in a social carnivore, the African wild dog (*Lycaon pictus*).
792 *Journal of Zoology*, *260*(4), 377–389. https://doi.org/10.1017/S0952836903003832

793 Wrangham, R. W. (2021). Targeted conspiratorial killing, human self-domestication and the
794 evolution of groupishness. *Evolutionary Human Sciences*, *3*, e26.
795 https://doi.org/10.1017/ehs.2021.20

796 Wrangham, R. W., & Benenson, J. (2017). 14. Cooperative and competitive relationships within
797 sexes. In *Chimpanzees and Human Evolution* (pp. 509–547). The belknap of Harvard university
798 press. https://doi.org/10.4159/9780674982642-008

799 Wrangham, R. W., & Glowacki, L. (2012). Intergroup aggression in chimpanzees and war in
800 nomadic hunter-gatherers. *Human Nature*, *23*(1), 5–29. https://doi.org/10.1007/s12110-012-
801 9132-1

802 Yuval-Davis, N. (2002). Beyond differences: Women, empowerment and coalition politics. In N.
803 Charles & H. Hintjens (Eds.), *Gender, Ethnicity and Political Ideologies* (pp. 168-189).
804 Routledge.

Supplementary Material

RESULTS

Focus group interview details for pre-identified contexts

- Farming: Kara, and Kwegu participants reported traveling to the farm together but working on their own farm. Nevertheless, they also reported cooperating together to help others if they need. Nyangatom reported no cooperation.
- Gathering: All three communities reported to cooperate for gathering. In Nyangatom, women cooperate to gather while men, especially young men, cooperate to lead and protect women, but not the two other communities.
- Preparing ceremony: In all three communities, participants reported cooperating together to prepare ceremonies. Cooperation is highly structured by sex and clans, including age set for Nyangatom.
- Childcare: Only Kwegu women reported helping each other to care for children. Nevertheless, their report indicates one individual helping the other in reciprocal exchanges.
- Marriage arrangement: Participants reported cooperation to be mostly family restricted.
- Fetching water: Women reported to go fetch water together and Kwegu women reported fetching water for elders.
- Disagreement: In all three communities, focus groups reported participating in coalitions to settle disagreements. Interestingly, one comment translated by our field assistant and given by Nyangatom young women, was particularly relevant regarding women coalitions against men's aggression: “She say that, sometimes when they are fighting, the women just gather and saying to the man, “Why you are beating?” Because the women less strengths, so they gather to help, like, “Why you are beating a woman?” But in times of resolving the issue, the women just gather to the woman, and the men gather to the man.” “Only after we see the reason for the fight go. If the man was the one who initiated the fights, we go to the man say that, “Why you are beating her?” When you go to those people who are fighting, the relative sometimes go and force even to beat that man, but the other women are going to resolve the issue.” (translated answer by local field assistant).
- Gaining information: In all three communities, focus groups reported cooperating to gather information. In Nyangatom, women reported gathering to share information on different topics such as farming, while men also reported gathering to talk about cattle and farming. After those talks, they may share information between genders. In Kwegu, information is gathered collectively, though elder men noted that men discuss information first before sharing it with women. In Kara, young women reported that women only gain information among themselves while elder women reported that they do not cooperate to gain information.
- Material gain: In all three communities, men and women cooperate to raise money to buy some material items. Older women gave us the example of collecting money to buy a grinder. Young women added that this buy was organized by the kebele and women gave to buy the grinder.

- Cattle: In Nyangatom, men reported cooperating to care for the cattle and protect them. The elders send the young to scout for good grazing places when dry seasons, even in enemy territory. In Kara, men reported cooperating to care for cattle with both men and women. Allowing cattle to gain access to grazing area, especially under competitive conditions, constitutes scramble coalitions.

Structured interviews figures and tables

1. Cooperation

Response	Total (n=142)	From women (n=82)	From men (n=60)
Women cooperate more often	105 (73.9%)	60	45
Men cooperate more often	31 (21.8%)	18	13
Did not know / Confused	6 (4.2%)	4	2

Table S1. Summary response to gender coalition formation

2. Preferences

Model	Intercept	Gender	Mean age	K	Delta AICc	Model weight
Motivate others participation						
Null	0.34			1	0.00	0.38
Gender	0.15	0.47		2	0.21	0.34
Gender & age	-0.39	0.42	0.016	3	0.59	0.28
Model averaged parameter estimate	0.070	0.45	0.020			
97.50%	0.90	1.14	0.040			
2.50%	-0.77	-0.24	-0.010			
Group decision-making participation						
Null	-0.28			1	1.88	0.25
Gender	-0.39	0.26		2	3.35	0.12
Gender & mean age	-1.36	0.17	0.028	3	0.00	0.63
Model averaged parameter estimate	-0.98	0.18	0.030			
97.50%	0.28	0.87	0.050			
2.50%	-2.24	-0.51	0.00			
Interpersonal disagreement participation						
Null	2.96			1	1.47	0.22
Gender	2.54	1.54		2	0.84	0.31
Gender & age	4.11	1.72	-0.040	3	0.00	0.47
Model averaged parameter estimate	3.37	1.65	-0.040			
97.50%	5.47	3.82	0.00			
2.50%	1.27	-0.52	-0.090			

Table S2. Results from model selection approach for participation to coalitions. For each coalition type, we compared three GLMM models with binomial error structure with participation to each coalition types as the dependent variable and 1) null (only the intercept), 2) mean age, or 3) gender and mean age as the independent variables. Parameters included the intercept, mean age, and sex. Model average estimates with the lower (5%) and upper (95%) confidence intervals.

Model	Expected log predictive density (ELDP) difference	Standard Error (se) difference
Null model	-11.92	7.98
Gender	0.00	0.00
Gender & mean age	-3.50	2.35

Table S3. Results from model comparison for preferences. We compared four Bayesian logistic regression models with the 5 preferences (i.e., same gender, same clan, same age group, kinship ties, and high-status) as the dependent variable and 1) null (only the intercept), 2) gender, or 3) gender and mean age, as the dependent variables. We included id and coalition type as random effects.

Outcome type	Predictor/grouping factor	Posterior median	Probability of direction	HPDI	
				2.50%	97.50%
Fixed effect (predictors)					
Same gender	Intercept	-1.07	0.86	-3.12	1.34
Same gender	Gender (Male)	-0.51	0.91	-1.31	0.28
Same clan	Intercept	0.18	0.62	-1.29	1.96
Same clan	Gender (Male)	-2.05	1.00	-3.78	-0.66
Same age group	Intercept	-1.72	0.94	-3.87	0.72
Same age group	Gender (Male)	-1.36	0.97	-3.10	0.22
Kinship ties	Intercept	-0.04	0.54	-1.06	1.28
Kinship ties	Gender (Male)	-1.17	1.00	-2.2	-0.32
High status	Intercept	2.12	0.96	-0.27	4.70
High status	Gender (Male)	3.51	1.00	1.00	7.45
Random effects (standard deviations)					
Same gender	Coalition	1.65	1.00	0.43	4.08
Same gender	ID	0.45	1.00	0.00	1.38
Same clan	Coalition	0.74	1.00	0.00	2.65
Same clan	ID	2.36	1.00	1.02	3.79
Same age group	Coalition	1.24	1.00	0.04	3.82
Same age group	ID	2.54	1.00	1.06	4.32
Kinship ties	Coalition	0.43	1.00	0.00	2.05
Kinship ties	ID	1.14	1.00	0.15	2.17
High status	Coalition	0.87	1.00	0.00	3.49
High status	ID	2.27	1.00	0.01	5.11

Table S4. Results of the posterior distribution for the best bayesian logistic regression model. The 5 preferences are the outcome, and gender is the predictor. We added id and coalition type as random effects. We included the 95% Highest Posterior Density Interval (HDPI).

			Count answers				
Coalition	preference	gender	Affirmative	Negative	Undecided	Total	Percentage
motivation opposite gender	Same gender	Men	10	29	0	39	25.6
		Women	24	20	0	44	54.5
	Same clan	Men	14	17	7	38	36.8
		Women	17	24	3	44	38.6
	Same age group	Men	7	21	10	38	18.4
		Women	15	24	5	44	34.1
	Relatives	Men	15	15	8	38	39.5
		Women	14	25	5	44	31.8
	High status	Men	32	1	5	38	79.5
		Women	35	7	2	44	84.2
Group decision-making	Same gender	Men	5	23	0	28	17.9
		Women	4	29	0	33	12.1
	Same clan	Men	7	17	4	28	25.0
		Women	19	10	4	33	57.6
	Same age group	Men	3	20	5	28	10.7
		Women	7	19	7	33	21.2
	Relatives	Men	5	15	7	27	18.5
		Women	16	10	7	33	48.5
	High status	Men	23	1	4	28	81.8
		Women	27	3	3	33	82.1
Interpersonal disagreement	Same gender	Men	14	45	0	59	23.7
		Women	13	63	0	76	17.1
	Same clan	Men	13	40	5	58	22.4
		Women	39	33	4	76	51.3
	Same age group	Men	5	41	13	59	8.5
		Women	15	50	11	76	19.7
	Relatives	Men	10	39	10	59	16.9
		Women	39	31	5	76	51.3
	High status	Men	51	5	2	58	87.9
		Women	51	24	1	76	67.1

Table S5. Summary of the answers for preferences for coalitionary partners. Answers could be affirmative, negative, or indecisive.

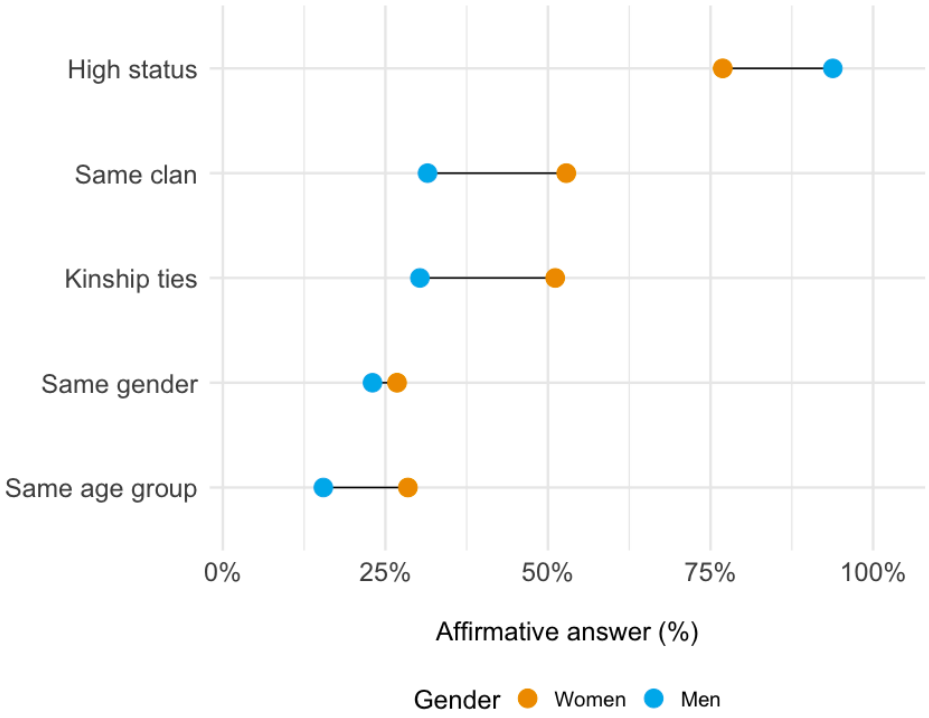

Figure S1. Gender differences for preferences in coalitionary partners.

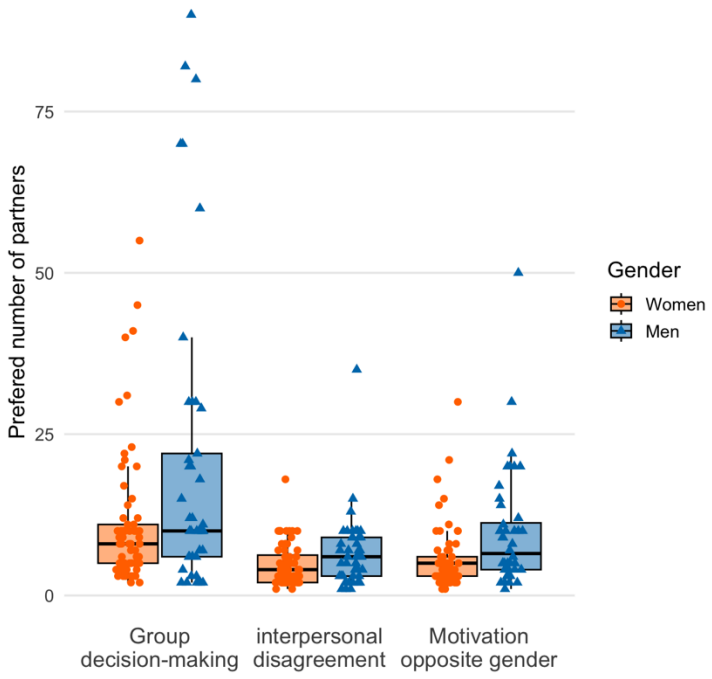

Figure S2. Preferred number of coalitionary partners across gender and coalition types. Orange represents men's answers, blue represents women's answers.

Coalition type	Gender	Mean	Median	Standard Deviation (SD)
Group decision-making	Men	20.31	10	23.86
	Women	11.22	8	10.72
Interpersonal disagreement	Men	6.44	6	5.55
	Women	4.89	4	3.16
Motivation opposite gender	Men	9.68	6.5	9.09
	Women	5.78	5	4.95
All coalition types	Men	12.15	7.5	12.83
	Women	7.30	5.67	6.28

Table S6. Summary of the results for the preferred number of coalitionary partners.

Model	Intercept	Gender	Age	K	Delta AICc	Model weight
Null	1.87			3.00	9.39	0.01
Gender	1.71	0.41		4.00	2.57	0.21
Gender & mean age	1.39	0.36	0.0095	5.00	0.00	0.78
Model averaged parameter estimates	1.46	0.37	0.01			
97.50%	2.10	0.64	0.02			
2.50%	0.83	0.10	0.00			

Table S7. Results from model selection approach for preferred number of coalitionary partners. For each coalition type, we compared three GLMM models with truncated Poisson error structure with count preferred number of partners as the dependent variable and 1) null (only the intercept), 2) mean age, or 3) gender and mean age as the independent variables. Parameters included the intercept, mean age, and sex. Model average estimates with the lower (5%) and upper (95%) confidence intervals.

Gender	Coalition type	Mean	Standard Deviation (SD)
Motivation opposite gender	Men	0.29	0.64
	Women	0.76	0.48
Group decision-making	Men	0.41	0.58
	Women	0.47	0.54
Interpersonal disagreement	Men	0.20	0.57
	Women	0.62	0.52
All coalition types	Men	0.30	0.60
	Women	0.62	0.51

Table S8. Summary of the results for the normalized difference score. Looking at the difference between preferred numbers of same gender versus opposite gender partners.

Model	Intercept	Gender	Age	K	Delta AICc	Model weight
Null	0.48			4	15.74	0.00
Gender	0.61	-0.31		5	0.030	0.50
Gender & mean age	0.72	-0.29		6	0.00	0.50
Model averaged parameter estimates	0.67	-0.30	0.00			
97.50%	0.85	-0.16	0.00			
2.50%	0.49	-0.44	-0.01			

Table S9. Results from model selection approach for normalized difference score. For each coalition type, we compared three LMM models with count the normalized difference score as the dependent variable and 1) null (only the intercept), 2) mean age, or 3) gender and mean age as the independent variables. Parameters included the intercept, mean age, and sex. Model average estimates with the lower (5%) and upper (95%) confidence intervals.

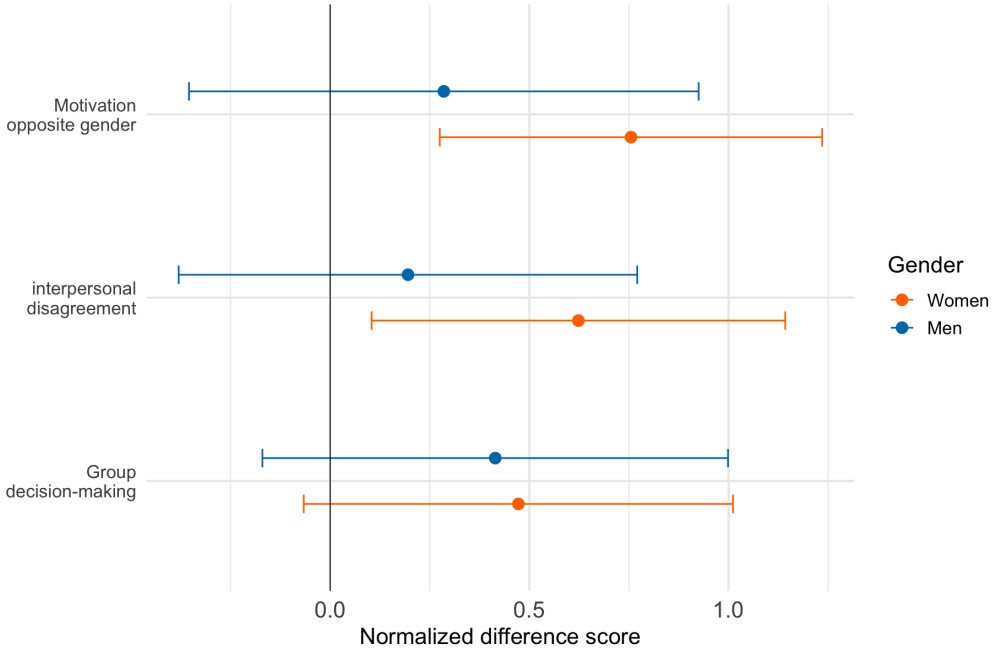

Figure S3. Normalized difference score according to coalition types. Orange represents scores for men, blue represents scores for women. Points represent the mean, and bars represents the standard deviation.