
Male Cooperation is Culture-Specific: Evidence from Cross-Population Experiments

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ABSTRACT

The aim of our experimental study was to investigate population differences in sex-specific cooperative tendencies between modern Russians ($N = 192$) and Buryats ($N = 208$). Cooperative predispositions were tested independently within each population, under conditions of same-sex dyadic (Prisoner's Dilemma) and group (iterated Public

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Goods Game) interactions between subjects who were strangers to each other. The experiments involved face-to-face interactions, but any intentional communication was prohibited. The results revealed considerable differences in cooperativeness between Russian and Buryat men: Russian men were more predisposed to cooperate in dyads, while Buryat men were better at maintaining high levels of cooperation in group interactions. Russian and Buryat women did not differ in their predispositions to cooperate either in dyads or groups, being more prone to defect than to cooperate. The differences in group cooperativeness between Russian and Buryat men were further replicated in a control study using data from a previous independent experiment. It was also revealed that Buryat men demonstrated an enhanced level of cooperation only in ethnically homogeneous groups. Our results indicate that a higher degree of cooperation in groups is not a universally male feature, but rather may reflect general cultural variation in orientation towards individualism and collectivism. We view this study as a stepping stone towards a more comprehensive cross-cultural research of the revealed phenomenon.

Keywords: cooperation, sex differences, gender differences, parochialism, nomadic pastoralists, individualistic, collectivistic, cross-cultural.

INTRODUCTION

Cooperation and prosocial behavior have played the key roles in human evolution throughout the course of anthropogenesis. Nowadays, these behavioural traits still remain the most important integral component of human sociality. Humans have evolved a unique trait: a tendency to cooperate with unrelated individuals and even strangers. This has boosted human cooperation and its efficiency to an unprecedented level, distinguishing humans from all other organisms (Butovskaya and Rostovtseva 2021). Despite the general prosocial nature of humans, people differ in their propensities to cooperate. In addition to individual (Peysakhovich *et al.* 2014) and sex (Balliet *et al.* 2011) differences, there is considerable cultural variation in human cooperative tendencies (Henrich *et al.* 2004, 2005; Gächter *et al.* 2010; Ensminger and Henrich 2014; Kwantes and Kuo 2021). However, little work has been done so far to explore cultural differences in within-sex cooperation, especially with regard to cooperation in groups.

The aim of the present study was to investigate population differences in sex-specific predispositions to cooperate with strangers in same-sex dyads and groups. This study is an extension of our previous

experiment conducted among the Buryats of southeastern Siberia – nomadic pastoralists of Mongolian origin (Rostovtseva *et al.* 2020a). It was found that Buryat men were more cooperative than Buryat women in the context of dyadic and especially group cooperative interactions (in the Prisoner's Dilemma and the iterated Public Goods Game, respectively). In particular, Buryat men were more predisposed to unconditional cooperation in the context of interactions in all-male groups. The study was conducted in a setting of face-to-face cooperation, but without any intentional communication between participants. To our knowledge, it was the first study to investigate gender differences in group cooperation among representatives of a non-WEIRD society (WEIRD: Western, educated, industrialized, rich, and democratic; Henrich, Heine, and Norenzayan 2010). However, it remained unclear whether the increased level of cooperation in male groups, compared to female groups, is a universally human feature of any society, or a culturally-mediated tendency. In the former case, the revealed phenomenon could indicate general sex-differentiated adaptations, presumably caused by the common sexual division of labor in the course of human evolution (Murdock and Provost 1973; Bird 1999; Buss 2019). Alternatively, in the case of cultural specificity of male cooperative features, the results would rather point to differentiated cultural evolution (Molleman *et al.* 2013; Smaldino *et al.* 2019). In the present work, we aimed to test the cultural specificity/universality of our findings, and to replicate the study using an identical experimental setup in a society that differs from the Buryats in many aspects (environment, population origin, traditional type of economy, religion). The Russians were good candidates for the role of such a society (Alexandrov *et al.* 1997; Abayeva and Zhukovskaya 2004). The advantage of this study is a unified methodology, which allows direct cross-population comparison of the obtained results.

Human cooperation can be studied in a variety of ways, but the most popular approach is based on experimental economic games, adopted from game theory and applied in both laboratory and field settings (Henrich *et al.* 2004; Camerer 2011). A Prisoner's Dilemma (PD) game is widely used in experiments focusing on cooperative tendencies in dyads (Rapoport *et al.* 1965; Sparks *et al.* 2016). In this game, two partners simultaneously decide whether to cooperate or defect, and the outcome of the game depends on the decisions of both partners. In an iterated Public Goods Game (iPGG), cooperation is realized in groups of partners interacting repeatedly in several successive rounds by investing their own funds in a common project (Le-

dyard 1994; Chaudhuri 2011). Both of these games are prototypes of a social dilemma, where individual interests conflict with social benefits. In both games, mutual cooperation yields higher payoffs for a pair or a group. However, defection may result in maximum individual gain by exploiting the cooperation of others.

Our experiments allowed estimating differences in cooperativeness of Buryat and Russian men and women under conditions of dyadic and group interactions. In addition, we analyzed the data previously collected in a similar independent experiment (Rostovtseva and Butovskaya 2018), in which Buryat and Russian men played an iPGG in ethnically homogeneous and heterogeneous groups. This control study was used to test the robustness of the population differences in the cooperative tendencies of Russians and Buryats men revealed in the main experiments.

METHODS

Study Populations

In the current study, population differences in cooperative behaviour between Russians and Buryats were investigated.

The Russians are an East Slavic ethnic group constituting the majority of population of Russia (estimated at over 111 million in Russia). In the past, the main traditional occupation was arable farming (Alexandrov *et al.* 1997). Today the Russians are modern industrial society. The main religious affiliation is Orthodox Christianity.

The Buryats are an ethnic group of Mongolian origin that originated in the Lake Baikal region of Eastern Siberia (estimated population in Russia is around 460,000 people). The majority of Buryats live in the Buryatia, Irkutsk and Trans-Baikal regions. Traditionally, Buryats were nomadic pastoralists divided into kinship clan groups with strongly patriarchal families, highly developed male warfare practices, and male collective hunting (Abayeva and Zhukovskaya 2004; Rostovtseva *et al.* 2020a). Nowadays, most Buryats have adopted an urban lifestyle; however, they still remain highly traditional in various cultural aspects (Darhanova 2009; Tregubova 2009; Dugarova 2010; Buyantueva 2016; Rostovtseva *et al.* 2020b). The main religious affiliations of Buryats are Buddhism and Shamanism.

Participants

The subjects of the main experimental studies were young Russian men and women from Tula (a city in western Russia) and young Buryat men and women from Ulan-Ude (a city in Buryatia, in the Lake

Baikal region of eastern Siberia). The control subjects were Russian and Buryat men residing in Moscow (the capital of Russia).

The Russian sample from Tula consisted of 192 subjects (96 males, 96 females) aged between 17 and 25 years (mean age 19 ± 1 years). There were no age differences between male and female participants. All participants were students of different disciplines living in Tula (the population of the city is about 480,000); some participants had come from smaller towns to study at the university. All subjects were native speakers of Russian; 94 per cent reported being purely Russian by ethnicity (both parents are Russians). There were several acquaintances in the sample, but none of them fell into the same experimental group. Thus, all subjects were included in the analysis of group interactions, but in the case of dyadic interactions, pairs of acquaintances were excluded from the analysis.

The Buryat sample from Ulan-Ude consisted of 208 subjects (104 men, 104 women). All participants were students of different disciplines living in Ulan-Ude (the city has a population of about 440,000, of which about 28 per cent are Buryats); many participants had come from rural areas to study in the capital. All subjects were bilingual, speaking mainly Russian, but also Buryat languages; 93 per cent reported themselves to be ethnically pure Buryat (both parents are Buryats). There were several acquaintances in the sample, and due to the logistics of the experiment, some of them fell into the same experimental groups. This was the reason for the complete exclusion of these subjects from the analyzed sample. After excluding acquaintances and two age outliers, the final sample consisted of 194 individuals (97 men, 97 women) aged between 17 and 25 years (mean age 20 ± 2 years). There were no age differences between male and female subjects.

The data, which we used as controls, were collected during an independent experimental study in Moscow in 2016 (Rostovtseva and Butovskaya 2018). The total sample consisted of 102 male participants (51 Russians, 51 Buryats) aged between 18 and 30 years (mean age 25 ± 3 years, both for Russians and Buryats). The Russian men in this sample were residents of Moscow and the Moscow region, and most of them were born in this area. The Buryat men came from Buryatia and had lived in Moscow for between one and eight years. The participants' professional activities varied from students of different disciplines to men working in different economic sectors. Initially, the study was designed to test parochial effects in male cooperative behaviour. Therefore, it involved group interactions between Russian and Buryat men in both ethnically homogeneous and heterogeneous

experimental groups. The size of the groups also varied from three to five members. In order to ensure the comparability of the data, we did not analyze the decisions of those participants, who constituted the ethnic minorities of the groups, since being in a minority is a very specific position that may entail certain psychological effects. Thereby, all analyzed decisions were made either in ethnically homogeneous environments – as in the main studies – or in fairly heterogeneous groups (where half of one group were Russians, and half were Buryats). This restriction reduced the sample size from 102 to 76 individuals (37 Russian and 39 Buryat men).

Experimental Games

Individual differences in the propensity for cooperation in dyads and groups were investigated using experimental economic games. The design of the experiments conducted among Russians (in Tula; 2021) and Buryats (in Ulan-Ude; 2017) was completely identical.

Each subject participated in group and dyadic economic games: in one iterated Public Goods Game (iPGG); and in four one-shot Prisoner's Dilemma games (PD). In these experimental games, participants could earn tokens, which had a certain monetary equivalent (the exact exchange rate was not known to the participants until the end of the experimental interactions). At the end of the experiments, each participant's payoffs were converted into real money. The average realized payoff was around USD 20 but was highly dependent on individual performance.

The iPGG was played in groups of four subjects of the same sex, who were strangers to each other. The game consisted of three repeated rounds. First, each participant was given a fixed budget of 20 tokens, and each had to decide how much (from 0 to 20) to invest into a common pool. These decisions were made privately, so that none of the group-partners would know the amounts invested by others. Not invested funds were kept by one participant. After all members of a group had made their investments, the common pool was doubled and divided equally between four group members. After that, a new round started, and participants were given a new set of 20 tokens for making their investments. This game represents a social dilemma, where individual interests are in conflict with the benefits of the group: if everyone invests the maximum, the multiplier will provide the maximum return at the group level, but from an individual perspective there is always the temptation to take advantage of others' investments and maximize individual payoff by free-riding.

The PD game was played in pairs of participants of the same sex, who were also unfamiliar with each other. In each PD game, one participant sat in front of a partner and had to decide whether to cooperate or defect. Both partners had to make their decisions simultaneously, without negotiation. After the decisions were made, the payoffs for the one-shot PD interaction were calculated as follows. If both partners cooperated, each of them received five tokens; if both partners defected, each of them received two tokens; if one of them cooperated and one defected, the one who defected received eight tokens, and the one who cooperated received one token. After the payoffs were realized, the PD game was played again with a new partner. Over the course of the experiment, each participant played four one-shot PD games with four different partners. This game is the prototype of a social dilemma in a dyadic context: mutual cooperation is more beneficial for a pair (both partners) than mutual defection. However, from an individual perspective, defection is safer (by defecting, one can get either eight or two tokens, whereas by cooperating, one can get either five or one).

During all games, participants were in visual contact with their partners, but they were not allowed to communicate verbally or to use any intentional gestures, signs or facial signals. The experimenter was present in the room during all experimental interactions to ensure strict adherence to this condition. The rules of the games were explained to the participants in Russian language. More detailed descriptions of the experimental procedures are provided in our previous publication on the study conducted in Buryatia (Rostovtseva *et al.* 2020a).

In the control study, the propensity of male subjects for group cooperation was also estimated using an iPGG, but the design of the game was slightly different (Rostovtseva and Butovskaya 2018). The main distinctive features of the iPGG of this experiment were as follows. The groups varied in size and composition. There were groups of three, four, and five male subjects, which could consist entirely or partly of Russian and/or Buryat men, so that there were ethnically homogeneous and heterogeneous male groups. Participants were not endowed with a new fixed budget at the beginning of each new round of the game. The individual funds for each new round were cumulative, that is, payoffs from the previous rounds were transferred to the next round as part of the individual funds that could be used to make new investments (from 0 to the individual maximum). Finally, participants did not receive real monetary payoffs for their decisions in the game. De-

spite these differences in the iPGG design, the results of the ethnically homogeneous groups could still be used for comparison with the results of the main experiments. Moreover, the independent nature of the control study with a slightly different design provides a good test of the robustness of the findings.

Statistical Analysis

In order to assess differences in cooperativeness in the PD game, we analyzed the frequencies of decisions to cooperate and to defect. The statistical significance of the differences between the target distribution of decisions and the random distribution was estimated using a chi-square test for goodness-of-fit. Differences in the distribution of decisions between the sexes or ethnic groups were assessed using a chi-square test for independence.

Differences in cooperativeness in the iPGG were assessed on the basis of the amounts of investments in each experimental round of the game. Since individual investments were not normally distributed, we used non-parametric statistics. The Mann-Whitney U test was used to estimate differences between two groups and the Kruskal-Wallis H test was used when there were more than two groups. The significance level (p) was set at 0.05; $p < 0.1$ was treated as a statistical trend.

The analysis was performed in SPSS v.26 (IBM Corp., 2019).

RESULTS

Population and Sex Differences in Dyadic Cooperation

In this section, we compare the cooperative behaviour of Russian and Buryat men and women under the conditions of dyadic experimental interactions in the main experiments (the PD games). First, we examined the general cooperativeness of Russians and Buryats by considering the overall frequencies of 'cooperate' and 'defect' decisions in all interactions in the PD games ($N = 1,461$ interactions). According to a chi-squared test of independence, Buryats and Russians did not differ significantly in their choice of 'cooperate' or 'defect' options ($\chi^2 = 0.419$, $df = 1$, $p = 0.517$).

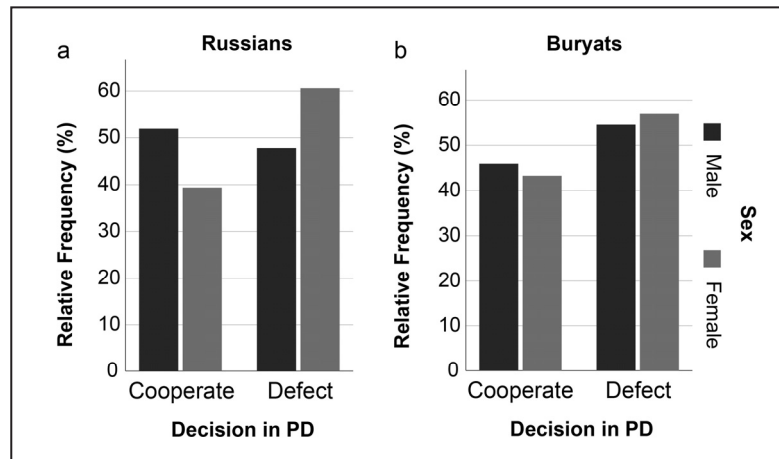


Fig. 1. The distribution of male and female decisions in the Prisoner's Dilemma games for Russians (a) and Buryats (b)

Note: PD – Prisoner's Dilemma game; relative frequencies per each sex are presented.

Figure 1 shows the relative frequencies of cooperative decisions for Russian and Buryat men and women. Women defected significantly more often than they cooperated, both among Russians (a chi-squared test for goodness-of-fit against an equal distribution of decisions: $X^2 = 14.925$, $df = 1$, $p < 0.001$) and Buryats ($X^2 = 6.969$, $df = 1$, $p = 0.008$). According to a chi-square test of independence, there were no significant differences in the general levels of cooperation between Russian and Buryat women ($X^2 = 1.221$, $df = 1$, $p = 0.269$).

Russian men cooperated more often than Russian women (52.5 % of male decisions to cooperate vs. 39.2 % of female decisions to cooperate), and these gender differences were statistically significant (a chi-squared test of independence: $X^2 = 12.080$, $df = 1$, $p < 0.001$). Russian men also tended to be more cooperative in dyads than Buryat men ($X^2 = 3.266$, $df = 1$, $p = 0.071$). There were no significant gender differences in dyadic cooperation among Buryats.

Summarizing the above, we can conclude that: (a) Russian and Buryat women did not differ in their cooperative tendencies in the same-sex dyadic interactions, both being more prone to defect than to cooperate; (b) Russian men demonstrated the highest level of cooperation in same-sex dyads.

Population and Sex Differences in Group Cooperation

In this section, we compare the cooperative tendencies of Russian and Buryat men and women under the condition of experimental group interactions (in the iPGG) in the main experiments. As we describe above, sex differences in group cooperation among Buryats have already been investigated in detail in our previous study: it was revealed that Buryat men were predisposed to unconditional cooperation in group interactions, whereas Buryat women commonly applied free-rider strategies under the same experimental conditions (Rostovtseva *et al.* 2020a). Rather than comparing the Russians' and Buryats' cooperative predispositions from a strategic point of view, here we consider cooperative behaviour in the game from a different perspective – by analyzing investments in a public good in each round of iPGG.

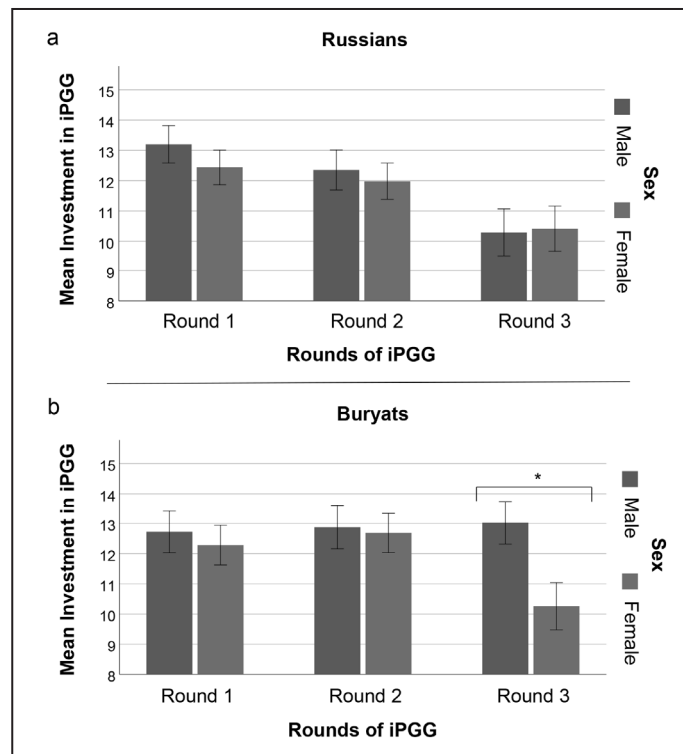


Fig. 2. The male and female investments in the iterated Public Goods Game for Russians (a) and Buryats (b)

Note: iPGG – iterated Public Goods Game; whiskers represent standard errors of the mean; * statistically significant gender differences.

Figure 2a shows these mean values of investments in a common pool in each of the three rounds of the iPGG for Russian men and women. Cooperativeness among Russians generally declined in the course of the iPGG (Kruskall-Wallis test: $H = 12.089$, $p = 0.002$), that is, investments were the lowest in the last round of the game. There were no significant sex differences in the investments in all three rounds of the game. We conclude that there were no significant sex differences in cooperativeness under the condition of the face-to-face group interactions among Russians.

In turn, Figure 2b shows the mean values of the investments into a common pool in each of the three rounds of the iPGG for Buryat men and women. As was revealed in our previous study, Buryat men were distinguished from Buryat women by applying a strategy of unconditional cooperation in group interactions (Rostovtseva *et al.* 2020a). Here, this pattern is well illustrated by the distribution of Buryat men's average investments over three rounds of the game: male investments were equally high in all three rounds, which reflects the tendency towards *unconditional* cooperation. In contrast, Buryat women were unable to sustain cooperation in group interactions. The latter follows from the striking difference in the investments between Buryat men and women in the final round of the iPGG, where men invested significantly more on average than women (Mann-Whitney U test: $U = 3787.5$, $p = 0.009$).

Summarizing the results, we conclude that Russians and Buryats differ in their predispositions to group cooperation. In particular, Buryat men are better at sustaining a high levels of group cooperation in the long term, whereas Russians (both men and women), and Buryat women demonstrate a relatively low ability to cooperate in same-sex groups without verbal communication.

Control Study

To replicate the revealed population differences in male group cooperation, we analyzed the data, which was collected earlier (in 2016) in an independent study using a similar experimental approach, and involving Russian and Buryat male subjects residing in Moscow. The aim of that study was to test parochial effects in male cooperative behaviour (Rostovtseva and Butovskaya 2018), so the study included group interactions between Russian and Buryat men in both ethnically homogeneous and heterogeneous environments. In the current study, to test whether population differences in cooperativeness between Russians and Buryats are consistent and reliable, we used the previous

experimental data, and conducted an additional analysis of differences in group cooperation between Russian and Buryat men from the 2016 experiment.

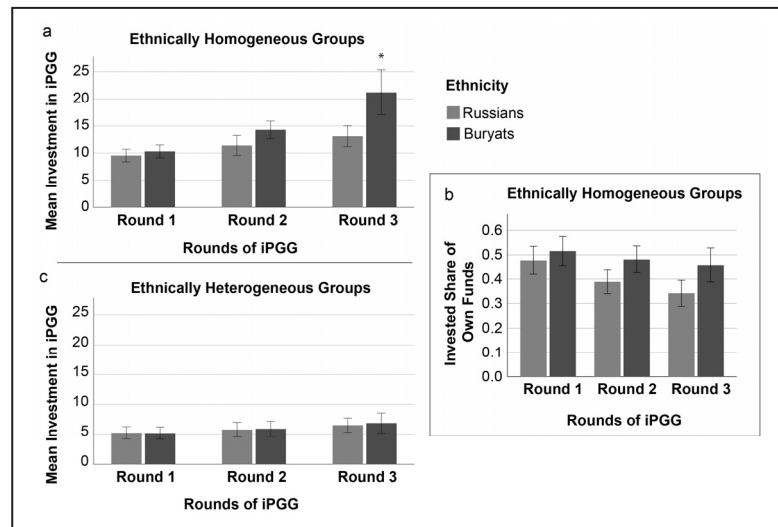


Fig. 3. Investments of Russian and Buryat men in ethnically homogeneous (a, b) and heterogeneous (c) experimental groups

Note: iPGG – iterated Public Goods Game; (a) raw investments in the ethnically homogeneous experimental groups, * significant difference; (b) share of own funds invested in each round of the iPGG in the ethnically homogeneous experimental groups; (c) raw investments in the ethnically heterogeneous experimental groups.

Figure 3 shows the average investments of the Russian and Buryat men in the three rounds of the iPGG in ethnically homogeneous and heterogeneous groups. The results revealed that in ethnically homogeneous groups, Buryat men were more cooperative than Russian men (Figure 3a). This was manifested in the fact that Buryats generally invested more in the common pool than Russians (Mann-Whitney U test: $U = 2012.0$, $p = 0.05$), and in particular they increased their investments in the last round of the iPGG (Mann-Whitney U-test for Buryat investments in the third round versus investments in all other rounds for all participants: $U = 1775.0$, $p = 0.041$). This effect only occurred in ethnically homogeneous experimental groups, whereas in heterogeneous groups (where half of the group were Russians, and half were Buryats) there were no differences in investment between Russian and Buryat men. In general, investments in ethnically heterogeneous

groups were significantly lower compared to ethnically homogeneous groups (Figure 3c) (Mann-Whitney U-test: $U = 9234.0$, $p < 0.001$). The iPGG version of this experiment slightly differed from the one used in the later experiments conducted in Buryatia and Tula (see Methods). The distinctive feature of the iPGG played in Moscow was cumulative individual funds, meaning that a payoff from each round of the iPGG was added to a participant's funds and transferred to the next round as part of their individual capital, which could be used to make new investments. Thereby, participants on average had more funds at their disposal at the start of each new round than at the beginning of previous rounds. This design peculiarity is reflected in the overall increase in the raw investments during the iPGG (Figure 3a). Typically, at least in anonymous iterated cooperation games, investments decrease with a number of repetitions of a game (Andreozzi *et al.* 2021). To control for our specific design feature, we also looked at the distribution of the shares of own funds invested by the participants in each round of the iPGG, instead of the raw investments. Figure 3b shows that the behaviour of the subjects was generally in line with the literature: in each subsequent round, the participants invested smaller shares of their individual funds. However, for the Buryats this decline was milder, and their invested shares did not differ significantly between the three rounds of the iPGG (Kruskal-Wallis test: $H = 1.131$, $p = 0.568$).

The results of the control study (an independent experiment with a slightly different experimental setup) confirm that Russian and Buryat men differ in their cooperative tendencies in ethnically homogeneous groups, with Buryat men being more predisposed to unconditional cooperation in groups than Russian men. The results of the control study suggest that the revealed population differences are robust.

DISCUSSION

Our previous study revealed that among Buryats of southeastern Siberia – Mongolian nomadic pastoralists with strong patriarchal traditions – young men, but not women, were predisposed to unconditional cooperation in same-sex groups (Rostovtseva *et al.* 2020a). In the present study, we aimed to retest this finding among Russians – a modern industrial population that differs from Buryats in terms of ethnic origin, culture, and economic background. The aim of our current study was to investigate population differences/universalities in sex-specific predispositions to cooperate in dyadic and group contexts: in the Prisoner's Dilemma and in the iterated Public Goods Game.

Our results revealed that under the condition of face-to-face interactions with strangers, Russian and Buryat women did not differ in their predisposition to cooperate, either in dyads or in groups. When interacting in same-sex dyads (in the PD game), both Russian and Buryat women were more prone to defect than to cooperate. In group interactions (in the iPGG), women demonstrated a relatively low ability to sustain cooperation over the course of the game, which was manifested in the decline in investment levels with a number of repetitions of the interactions.

Considerable population differences were revealed in male cooperative behaviour. Russian men were more predisposed to cooperate in pairs than Russian women, and Buryat men. However, when cooperating in groups, Russian men were less cooperative than Buryat men – their investments generally decreased over the course of the game, whereas many Buryat men maintained high levels of cooperation in all three rounds, which determined their *unconditional* cooperativeness in groups (see also Rostovtseva *et al.* 2020a). The behaviour of Russian participants in group interactions (the general trend of decreasing investments in each subsequent round) is fully consistent with the results of numerous studies conducted by other authors in WEIRD societies, where investments always decrease with a number of repetitions in iterated cooperation games including iPGG (Andreozzi *et al.* 2020). Therefore, it may be that the differences between Russian and Buryat men reflect the cultural differences in individualistic and collectivistic values.

Importantly, the analysis of the data from an independent experimental study with a similar but slightly different design reproduced the revealed population differences in male group cooperation. This ‘replication’ analysis confirmed that in ethnically homogeneous groups, Buryat men are more cooperative than Russian men, but this result did not apply to ethnically heterogeneous groups, where levels of cooperation were very low in both populations studied. The replication of the results by an independent study provides reassurance that the revealed population differences are robust, regardless of independent factors such as group size, location, and financial motivations, which differed between the settings of the control and the main experiments.

A number of previous studies had investigated gender differences in cooperation in all-male and all-female groups among representatives of WEIRD societies (USA, Canada, Japan) using a Public Goods Game (Yamagishi 1986; Fleishman 1988; Brown-Kruse and Hummels 1993; Sell *et al.* 1993; Nowell and Tinkler 1994; Batson *et al.* 1995; Sell 1997; Cadsby and Maynes 1998; Kurzban 2001). Although the

evidence from these studies is generally inconsistent, only one of them reported that men were more cooperative than women in same-sex group interactions (Brown-Kruse and Hummels 1993). To our knowledge, there is only one experimental study, apart from our own, that investigated cooperation in all-male groups among representatives of a non-WEIRD society (Orma – traditional patriarchal pastoralists of Kenya) (Ensminger 2004). Comparing the obtained results, the author of that study concluded that the level of cooperation in Orma men was much higher than in US men, but this data was based on a small sample size (24 Orma individuals) and was limited to males only. Consideration of all the available empirical evidence does not provide a clear understanding of the patterns of sex differences in cooperation tendencies across different populations. On the one hand, the literature data may indicate a general cross-cultural inconsistency of sex differences in cooperativeness, especially in groups, but on the other hand, it may be a matter of experimental methodology, which may blur an existing cross-cultural pattern. Comparison of the results obtained by different authors inevitably encounters many factors that potentially affect the outcome of each experiment, such as the anonymous/face-to-face experimental design, the number of repetitions of interactions, the information provided to the participants, the specific experimental conditions (such as thresholds of investment needed to receive any pay-offs, or punishment options), and, finally, the approach to data analysis. All of these factors make it extremely difficult to find a single pair of studies with comparable results.

Here we present the evidence for population differences in sex-specific cooperation in dyadic and group contexts obtained in an identical methodological setting. We can conclude that the higher level of cooperation in Buryat all-male groups, compared to Buryat all-female groups, is a culture-mediated phenomenon. It reflects specific features of contemporary Buryat society. However, the interpretation of the findings is still difficult. A higher propensity of Buryat men to cooperate in groups may be rooted in specific features of the Buryat culture, such as nomadic pastoralism, strong patriarchal traditions, patri-locality, and highly developed male collective activities practiced until recent past (collective hunting in large all-male groups of 300–1,000 men; highly developed male warfare practices) (for more details see Rostovtseva *et al.* 2020a). Another explanation could be that the Buryats are a small-scale society embedded as an ethnic minority within a larger Russian state. Both in Moscow and even in Ulan-Ude the Russians make up the majority of the population. This can lead to the formation of more close ties among the Buryats, as well as a perma-

ment opposition of their own group to the surrounding ethnic majority. This in turn may cause a persistent parochial effect among the Buryats, which is known to enhance cooperation, especially among men (see meta-analysis: Balliet *et al.* 2014). This line of reasoning is also supported by the fact that Buryat men behaved differently in the ethnically heterogeneous groups. On the other hand, this scenario does not explain the higher propensity of Russian men to cooperate in dyads. The differences in cooperativeness between Russian and Buryat men were particularly manifested in the fact that Russians were more predisposed to cooperate in pairs, whereas Buryats – in groups. In the first place, this suggests an analogy with the famous concept of individualist and collectivist cultures (Gardner 1966; Hofstede 1980; Triandis 2001; Grossmann, Santos 2016). Although Russians are usually referred to as a collectivist society in this concept, the degree of collectivism can vary considerably, and in a modern state Russians from urban areas apparently become more individualistic. It is well established that urbanization and globalization inevitably promote the emergence of individualistic values, even in Asian countries, where collectivism is generally more developed (Greenfield 2016; Chen and Ren 2016; Santos *et al.* 2017; Reese *et al.* 2019). The major factors underlying this process are the decline in family size (the diminishing role of kinship networks in social life), as well as the increase in the frequency of interactions with unrelated individuals, which permeates almost all aspects of urban life, including the process of socialization itself. Individualistic social values are not a unique product of globalization: for instance, the culture of modern traditional hunter-gatherers, the Hadza, would also be classified as an individualistic culture (Gardner 1966; Butovskaya *et al.* 2018). In this respect, social values can be viewed as a reflection of the socio-cultural environment, which in turn is a product of a multidirectional evolutionary process. In this scenario, our results, together with the results of other authors (Shah 2009; Nafstad *et al.* 2013; Santos *et al.* 2017), would suggest that cultural background may substantially modulate the impact of globalization on different societies, resulting in the observed population differences in prosocial behaviour.

However, taken together, our findings raise more questions than they answer. We view this study as a stepping stone towards a more comprehensive cross-cultural investigation of the phenomenon revealed in more targeted populations.

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