Reply to Fosgaard and Wengström: Confusion should not be used to explain cooperative behavior in public goods game experiments

Guangrong Wang[a,b] (ID), Jianbiao Li[b,c,1] (ID), Wenhua Wang[b,c,1] (ID), Xiaofei Niu[b] (ID), and Yue Wang[b] (ID)

Table 1. Distribution of motives in the human and computer treatments

Treatment Type		Human				Computer			
		Free rider (N = 53)	Conditional cooperator (N = 49)	Humped cooperator (N = 13)	Other (N = 2)	Free rider (N = 80)	Conditional cooperator (N = 27)	Humped cooperator (N = 10)	Other (N = 0)
*Motives for answering "yes"	Altruism	0	9	2	1	–	–	–	–
	Social norm	5	22	9	1	10	18	6	
	Self-image	0	10	0	0	0	6	1	–
	Social image	0	1	0	0	0	1	1	–
	Other	0	5	1	0	3	2	2	–
Motives for answering "no"	Self-interest	24	0	1	0	47	0	0	–
	Social norm	20	2	0	0	17	0	0	–
	Other	4	0	0	0	3	0	0	–

*Response to question whether participants' contributions depended on others' contributions. Question asked: "In the decision you just made, did your contribution depend on the contributions of other members of your group?"

Wang et al. (1) introduce a novel design to distinguish confusion (i.e., misunderstanding the game) from the factors influencing cooperation decisions and suggest that social preferences, rather than confusion, play a crucial role in determining cooperation in public goods games (hereinafter "PGG"). Fosgaard and Wengström (2) question this conclusion. However, their comments result from a misunderstanding of the experimental design of Wang et al. (1).

Fosgaard and Wengström's (2) first criticism relates to the use of 10 control questions, and they suggest that we lack a baseline treatment similar to previous studies with fewer control questions and less feedback. This criticism is based on a misunderstanding of our design. In fact, our goal is to test whether confusion about game structure explains cooperative behavior in PGG. Since these 10 questions have been widely used in previous studies (3, 4), we also use these questions to test whether they are sufficient to ensure that subjects understand the experiment. However, the use of 10 control questions with feedback is not our primary purpose, so we do not compare other studies with fewer control questions and less feedback.

Fosgaard and Wengström (2) then argue that our finding of contributions in the games with computer contradicts our claim that confusion cannot explain cooperation. In fact, our evidence from Experiment 1 shows that there are many factors that influence contributions in the computer condition, such as social norms and image concerns (Table 1).

Furthermore, we provide a literature review on confusion and cooperation in PGG in Supporting Information of our paper (1). The paper by Fosgaard et al. (5) focuses primarily on the framing effect on participants' cooperation behavior.

As for Fosgaard et al.'s (5) finding of substantial confusion, the possible reason may be as follows: first, they ask participants to answer the payoff-maximizing action from the third-party perspective, as their prompt is "Imagine a person who only cares about their own earnings." Second, they do not explicitly state: "Of course, your actual contribution may be different," as we do. Third, their experiment was conducted online without any explanation of the experimental instructions and without any detailed explanation if someone failed to answer the control question correctly, which may further contribute to the high proportion of confused participants.

In summary, confusion cannot explain cooperative behavior in public goods games. What we should do is minimize confusion to prevent it from obscuring the effect of social preferences.

[1]To whom correspondence may be addressed. Email: biaojl@sdu.edu.cn or whua_wang@126.com.

Published August 16, 2024.

1.	G. Wang, J. Li, W. Wang, X. Niu, Y. Wang, Confusion cannot explain cooperative behavior in public goods games. *Proc. Natl. Acad. Sci. U.S.A.* **121**, e2310109121 (2024).
2.	T. R. Fosgaard, E. Wengström, Insufficient evidence to conclude that confusion cannot explain cooperative behavior. *Proc. Natl. Acad. Sci. U.S.A.* **121**, e2412216121 (2024).
3.	U. Fischbacher, S. Gächter, Social preferences, beliefs, and the dynamics of free riding in public goods experiments. *Am. Econ. Rev.* **100**, 541–556 (2010).
4.	U. Fischbacher, S. Gächter, E. Fehr, Are people conditionally cooperative? Evidence from a public goods experiment. *Econ. Lett.* **71**, 397–404 (2001).
5.	T. R. Fosgaard, L. G. Hansen, E. Wengström, Framing and misperception in public good experiments. *Scand. J. Econ.* **119**, 435–456 (2017).