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# Personal trust extends cooperation beyond trustees: A Mexican study

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We studied 2 groups of workers from Oaxaca (Mexico) with different levels of income and education to investigate the role that the affective-based psychological mechanism of personal trust, as evolutionarily acquired, plays on group cooperation. We measured trust levels through some questionnaires and cooperative behaviour through an iterated prisoner's dilemma under different conditions and analysed trust networks of group members. While these groups did not differ in trust levels or cooperation among trustees, they did differ in terms of cooperation with other group members. Such differences are related to dissimilarities in the trust network topology—as a measure of group cohesion. These results suggest that some personal trust networks extend cooperation within a group beyond trustees in a way that complements the role of the reputation for indirect reciprocity.

***Keywords:*** Personal trust; Cooperation; Indirect reciprocity; Social network; Reputation.

An influential explanation of the evolution of cooperation in humans is the theory of indirect reciprocity (Nowak & Sigmund, 2005). According to this theory, members of a group have an incentive to cooperate in each situation not only because of the expectation of a future reciprocation by the benefited individual but also because it is an opportunity to gain reputation as a cooperative partner. In this way, by tracking each other's reputation over time, cooperation is extended to the whole group.

Reputation is certainly part of human psychology (Hamlin, Wynn, Bloom, & Mahajan, 2011). Humans show concern for what others think of them and their behaviour (Bateson, Nettleand, & Roberts, 2006; Johnson & Bering, 2006).

However, reputation might not be the only way through which cooperation by indirect reciprocity evolved (Fowler & Christakis, 2010). In particular, we wish to submit the view that personal trust might play a more basic and robust role in this regard. Personal trust works by building affective bonds among individuals who bias their behaviours and impose internal, emotional costs to defection (such as feeling guilty or ashamed) (Acedo-Carmona & Gomila, 2014, 2015a, 2015b). This affective dimension makes evolutionary sense as a "normative commitment of reciprocal origin" (Colquitt, LePine, Piccolo, Zapata, & Rich, 2012) that becomes a commitment device (Frank, 1988). Trust generates obligations that do not require cost–benefit calculations, as reputation does (Frank, 1988; Karlan & McConnell, 2012). In general, emotional mechanisms have been shown to be more powerful than rational ones in the motivation of social behaviour (DeSteno, Bartlett, Baumann, Williams, & Dickens, 2010). In fact, emotions promote strong ties (Turner, 2009) and motivate altruistic behaviours (Schino & Aureli, 2009) whose benefits are maintained over time (Pavey, Greitemeyer, & Sparks, 2011). Therefore, although having a good reputation may help in fostering cooperation, personal trust

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is clearly more effective (Acedo-Carmona & Gomila, 2013).

In addition, previous studies have shown that personal trust promotes cooperation beyond general trust attitudes within a group and that the topology of personal trust networks may also play a role in increasing the level of cooperation within a group, even among non-trustees (Acedo-Carmona & Gomila, 2013, 2014). Thus, while personal trust is a dual relationship, it may also affect the dynamics of cooperation (Acedo-Carmona & Gomila, 2014, 2015a, 2016). Accordingly, it deserves further study, particularly in terms of whether and why the network topology of trust relationships within a group plays a role in fostering higher levels of cooperation within the group beyond such trust circles. Just as the reputation-tracking mechanism introduces a way of choosing who to interact with, we wish to consider the hypothesis that certain structures of trust networks could particularly promote cooperative interaction more efficiently, ensuring higher levels of cooperation even among non-direct trustees. Specifically, we think that in lowly clustered, more cohesive trust networks, a dynamic analogous to that of indirect reciprocity emerges, allowing cooperation among individuals without direct trust relationships. In contrast, in highly clustered, lowly cohesive groups, cooperation will take place mostly among trustees.

To test these predictions, in the current study, we compared two work-based groups: a group of teachers who work at a school in Oaxaca de Juárez (Mexico) and a group of fishermen, members of an economic association located on the coast (Playa Vicente). While both groups share the same Oaxacan culture, they differ in their income and education levels. We first obtained scores for personal and general trust for each group to ensure comparison of groups with similar high levels of personal trust. This situation let us compare the effect of personal trust and its network topology on group cooperation. Accordingly, we obtained the personal trust network topologies for both groups to compare them. Lastly, we asked both group members to play an iterated prisoner's dilemma (IPD) under several conditions as a proxy for cooperation within each group. Each group member played the IPD either with a trustee from the group—the trust condition (TC)—and with another group member not mentioned as a trustee—the non-trust condition (NTC). In fact, the IPDs were played with the experimenter, who could follow one of two strategies, namely, a more favourable cooperative (COOP) strategy, whereby the experimenter's responses were always cooperative, and an imitative (IMIT) strategy, in which the experimenter's choices imitated that of the player, to test the robustness of the strategies in the game.

Thus, according to the expected role of personal trust and network topology in promoting cooperation, we hypothesized that we would find (1) high levels of cooperation towards trustees (TC) in both groups because of their high levels of personal trust, regardless of the differences in education and income, and the strategy followed by the experimenter; (2) the level of cooperation towards group members out of each one's circles of trust (NTC) would vary depending on group cohesion, measured in terms of its topological properties, with the greater the cohesion of the personal trust group network, the lesser the difference in cooperation between TC and NTC; and (3) a minor level of cooperation when playing against the imitative strategy in the NTC (given that in TC, both strategies will coincide).

## METHODS

### Participants and setting

This study was approved by the Ethics Committee of the University of the Balearic Islands. Written informed consent was obtained from each participant prior to participation.

The work groups from the Oaxaca region (Mexico) that participated in this study were a group of 33 elementary teachers (SCH) from a school located in Oaxaca de Juárez, and a group of 21 fishermen (FISH), members of an economic association located in Juchitán de Zaragoza (Playa Vicente). We looked for groups that shared the same type of bond among their members (in this case, work bonds) to maintain this variable as a constant and that had a long-lasting relationship among their members (to ensure a high level of personal trust towards their trustees within the group). In both groups, practically all their members agreed to participate. Thus, the sample size in each group is determined by the number of group members.

Some features of SCH and FISH participants are detailed in Table 1.

The economic differences between participants of SCH and FISH groups were significant (Pearson chi-square: $\chi^2$ (1, $N = 54$) = 14.240, $p < .004$). In addition, the differences between SCH and FISH in terms of the levels of education of group members were significant (Pearson chi-square: $\chi^2$ (1, $N = 54$) = 43.781, $p < .001$). Thus, we confirmed economic and educational differences between both groups.

### Materials and procedure

#### *Trust measures through questionnaires*

We used two questionnaires in order to separately measure the levels of personal and general trust—trust scores—previously used in Acedo-Carmona and Gomila (2014) from well-established items in the literature (Johnson-George & Swap, 1982; Yamagishi, 1998).

**TABLE 1**
Details of some features of SCH and FISH group participants: participants' percentages by gender, religion, economic situation and education level, as well as the mean and standard error (SE) for age.

| *Participants' features* | | | |
|---|---|---|---|
| | | SCH | FISH |
| *N* | | 33 | 21 |
| Gender | Male *N* (%) | 9 (27.3%) | 20 (95.2%) |
| | Female *N* (%) | 24 (72.7%) | 1 (4.8%) |
| Age | Mean ± *SE* | 36.24 ±1.754 | 48.62 ±2.669 |
| Religion (%) | Catholics | 45.5% | 61.8% |
| | Christians | 33.5% | 4.8% |
| | Evangelical Christians | 3% | 14.3% |
| | Pentecostal Christians | 3% | 9.5% |
| | Believers | 6% | 4.8% |
| | Non-believers | 6% | 4.8% |
| | Unknown | 3% | |
| Economic Situation (monthly expenses) (%) | Below 1840 Mex$ | 3% | 42.9% |
| | Between 1841 and 3680 Mex$ | 33.3% | 28.6% |
| | Between 3681 and 5524 Mex$ | 42.4% | 19% |
| | More than 5525 Mex$ | 21.3% | 9.5% |
| Education level (%) | Without academic studies | | 42.9% |
| | Primary school | | 38.1% |
| | Secondary school | 6% | 9.5% |
| | High school | 15.2% | 9.5% |
| | Vocational training | 63.6% | |
| | Higher education | 15.2% | |

While personal trust comes from previous experiences shared with trustees and general trust is the attitude towards any unknown person, these different notions are somehow related (Glanville & Patxon, 2007). This is why some items are similar in both questionnaires.

The General Trust Questionnaire (Cronbach's $\alpha = .39$) included five questions concerning attitudes towards other people in general: one about perceived fairness[1], one about relational trust (Yamagishi, 1998), and three questions about what trust is related to, namely, money, secret information, and care of loved ones (Johnson-George & Swap, 1982), with responses rated on a 5-point Likert scale (see Appendix A).

To obtain a measure of personal trust, we first asked our participants to name people they trusted within their group (SCH or FISH)—trustees—after which they completed our second questionnaire (Cronbach's $\alpha = .79$) about personal trust, referring to the three most trusted people from the previously chosen trustees. Six questions concerned the participants' expectations about their trustees with regard to lending and borrowing money, caring for loved ones, and sharing secrets—similar to some questions used in the General Trust Questionnaire, but this time related to the particular individuals they said they most trusted within the group—and two more questions to obtain a more accurate measure of the level of personal trust towards each particular trustee: getting help if moving or being defended by the trustees at their own expense or personal effort. All the responses were rated on a 5-point Likert scale (see Appendix B).

Both measures—general and personal trust scores—were expressed as a percentage, with 100% indicating maximal trust.

### *Iterated prisoner's dilemma*

Several days after filling in the questionnaires, each participant played two IPDs, of three trials each, under two experimental conditions. Under the TC, participants were told that they were playing with someone from their trust circles within the group (any person among the trustees mentioned previously). Under the NTC, participants thought they were playing with another group member, one not mentioned as one of their trustees within the group. Actually, they were paired with the researcher who passed herself off as an anonymous group member under both conditions. The PD allowed us to test whether the decision to cooperate, which is not usually the decision chosen by individuals under normal conditions, may be emotionally promoted by personal trust as playing in the TC compared to the NTC and even in the NTC when groups share cohesive personal trust networks. The IPD was also chosen as the simplest task that allowed us to test whether participants' cooperative decisions could be based on a strategic reciprocation or trust, as participants were told the game involved three rounds, and it is well-known that strategic players tend to defect on the third round (Ledyard, 1995). For this reason, the dependent variable was not only the total number of cooperative decisions but also the numbers of cooperative decisions in the first versus the third round of the game.

Half of the participants played first in the TC, the other half played first in the NTC. In each round, to obtain a number of points, participants were asked to decide whether to share some points with their partners—cooperate (C)—or to try to get all the points—defect (D)—before knowing the other player's decision. The game partner's decisions were communicated, in a simulated way, through SMS (telephone short message service). The number of points obtained depended on the decisions of both players, with the possibility of obtaining a maximum of six points or a minimum of zero points in each round, as specified in the pay-off table (Figure 1).

Participants received the same information—the researcher read the same instructions to all participants

[1]World Values Survey Association (2009) World Values Survey, 1981–2008. www.worldvaluessurvey.org/

| | C | D |
|---|---|---|
| C | 3 / 3 | 0 / 6 |
| D | 6 / 0 | 1 / 1 |

**Figure 1.** The prisoner's dilemma pay-off matrix: (C) = Cooperate and (D) = Defect.

(see Appendix C)—but the researcher followed two different strategies with each half of the group in his role as game partner: a strategy of always cooperating regardless of the participant's previous decisions (COOP) or a strategy of imitating the participant's previous decisions in every round (IMIT). The use of these two strategies allowed us to fix the level of effectiveness of personal trust and network topology on cooperative attitudes, even in less favourable contexts (IMIT).

Before playing, the researchers ensured that all participants understood the game well by asking them some questions about it (see Appendix D). If the answers were unsatisfactory, further explanation was provided. Some participants took longer to understand the game than others.

According to the number of points obtained after going through the three decisions under both conditions, participants obtained different rewards. The game's incentive consisted in accumulating points, as the higher the score, the greater the value of the prize to be obtained. The prizes consisted of tickets to eat in a cafeteria for the SCH group members, and fishing materials for the FISH group members, of similar value in both cases (four scales of accumulated points with prizes ranging from a minimum value of \$2.70 USD to a maximum value of \$10.80 USD). However, participants discovered the prizes at the end of the game, at the time they were distributed, to ensure they all played under the same conditions (regardless of the value they gave to the prize). At that time, participants were also informed that they truly did play with the researcher.

### *Trust network analyses*

We built the personal trust networks of both groups—SCH and FISH—with the confidential information that participants gave about all their trustees within their groups from the Personal Trust Questionnaire and using Gephi software (Bastian, Heymann, & Jacomy, 2009).

Several network measures were used to determine the level of network cohesion (measures provided by Gephi software):

- Clustering coefficient: it indicates how the nodes are embedded between their neighbouring nodes. The average gives a general indication of the clustering of the network.
- Modularity: this algorithm detects communities. A result of 0.4 or higher is considered generally significant.
- Graph density: it measures how close the network is to being complete. A complete graph has all possible edges and density equal to 1.
- Average path length: it measures the distance between all pairs of nodes. Connected nodes have a distance of 1.
- Diameter: it is the longest graph distance between any two nodes of the network—how far are the two furthest nodes. The meaning of this measure is very similar to the previous one.
- Average degree: it is a measure of how many edges are compared to the number of nodes.
- Authority: it measures how valuable is the information stored in that node, in this case in terms of trustfulness of the nodes that trust him.
- Hub: it measures the quality of the links of that node (the trustfulness level of its trustees).
- Page Rank: it classifies the "pages" of the nodes according to the frequency with which a user arrives at the node's "page," following links non-randomly.
- Eigenvector centrality: it measures the importance of a node in the network based on its connections.

## RESULTS

### Trust scores

Personal and general trust scores were calculated separately for SCH and FISH groups. We found no significant differences (see Appendix E)[2] between both groups—with the Mann–Whitney test—in general or with personal trust scores (Figure 2). Thus, we could compare groups with similar levels of personal and general trust, but while the levels of personal trust were high, the levels of general trust were medium.

### Cooperation in the IPD

To measure the level of cooperation under both conditions (TC and NTC), four indicators were used: (a) the total percentage of cooperative choices (Tot), (b) the percentage of participants who cooperated in the three decisions (3Cop), (c) the percentage of cooperative decisions in the first round (1st) and (4) the percentage of cooperative decisions in the third round (3rd). The comparison of the first versus third round indicates whether cooperation was strategic reciprocation or trust based (Ledyard, 1995).

[2]In Appendix E are some tables with specific statistical details about the comparisons between SCH and FISH represented in the figures. Table numbers are the same as those of figures for easy identification.

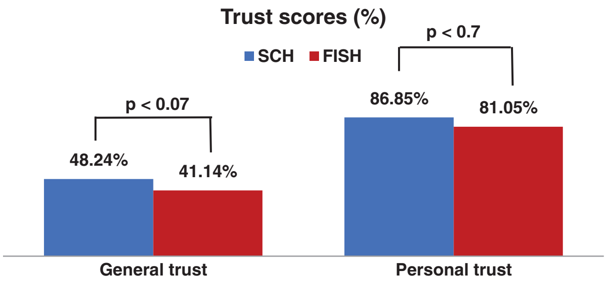


**Figure 2.** Comparison of general and personal trust scores between SCH and FISH groups (Mann–Whitney tests of significance).

Comparison between the SCH and FISH groups of these indicators under both conditions (TC and NTC) is presented in Figure 3.

Under the TC, we found high levels of cooperation in both groups, related to the high level of personal trust reported. We only found significant differences between groups—with Pearson Chi-square tests—in the proportion of total cooperative decisions (Tot.TC),[3] but we found no significant differences in the other indicators (3Cop.TC, 1st.TC and 3rd.TC). Specifically, there was no decrease in cooperation in the third round. Thus, these results support the relation between personal trust and cooperation.

On the other hand, under the NTC, there was no significant difference between the first and third round either. However, we found significant differences between both groups in all the indicators of cooperation used (Tot.NTC, 3Cop.NTC, 1st.NTC, 3rd.NTC). Such results mean that cooperation is not just self-interested and that the pattern of cooperation with group members outside one's trust circle is different for both groups, with significantly higher cooperation in SCH than in FISH participants (Figure 3).

Because we detected similarities between both groups in the levels of cooperation in TC but differences in NTC, we proceeded to analyse each group separately.

To begin with, one-tailed McNemar tests indicated that the SCH group showed no significant differences in levels of cooperation between TC and NTC for each indicator used (Figure 4). This finding indicates that the SCH group members cooperated in a similar way with group members, regardless of personal trust bonds.

In contrast, the FISH group showed significant differences between TC and NTC in most indicators of cooperation used: in the percentages of participants who cooperated in the three rounds and in the cooperation in the first and third rounds. We found no significant differences in the percentage of total cooperation (Figure 5). These results show more cooperation with trustees than with the other group members.

On the other hand, because the gender composition of the group members was different in both groups—more women in SCH and men in FISH—we analysed cooperation by gender—with contingency tests—in SCH (Figure 6) and in FISH (Figure 7). We found no significant differences in any of the groups, either in TC or NTC. However, we must remember that only one woman participated in the FISH group.

As for the strategies used in the game (COOP and IMIT), the only result of interest was a significant difference in the proportion of cooperative decisions in the third round of the NTC for the SCH group (Figure 8). No differences were found for the FISH group (Figure 9). Therefore, the use of different strategies did not influence participants' decisions very much: given the high level of cooperation in SCH and FISH in the TC, the IMIT strategy was indistinguishable from the COOP one, and in the case of FISH in the NTC, perhaps this result is because the desire not to cooperate is stronger than the COOP strategy effect.

## Trust network analysis

Given the significant differences found in cooperation between both groups in the NTC, we analysed whether they were related to differences in trust network topology, as hypothesized (2).

The network structure of both groups—SCH and FISH—appears in Figure 10. Participants and their trustees are represented as nodes, while directed edges represent the direction of trust relationships. The relative size of the node represents the times that a participant was mentioned as trusted by other group members—in-degree level (Id). The colours of nodes represent the different communities detected (modularity).

We found that the FISH group had fewer communities, shorter distance among nodes and more density of connections than the SCH group—indicated by modularity, average path length and diameter, and graph density, respectively. These results seem to indicate a higher level of cohesion in the FISH network than in the SCH network. However, the intensity of connections within neighbouring nodes was higher in the FISH group than in the SCH group—the average clustering coefficient—which indicated "small groups of trust" within the FISH network (Figure 11).

To examine whether the previous differences between both networks were significant, we proceeded to an individual analysis of nodes. For this goal, we looked at measures equivalent to the above ones (average clustering coefficient, modularity, graph density, average path length, diameter and average degree) but now at the individual level (individual clustering coefficient,

[3]The abbreviations comprising letters separated by a period refer first to the indicator used and, after the period, to the condition.

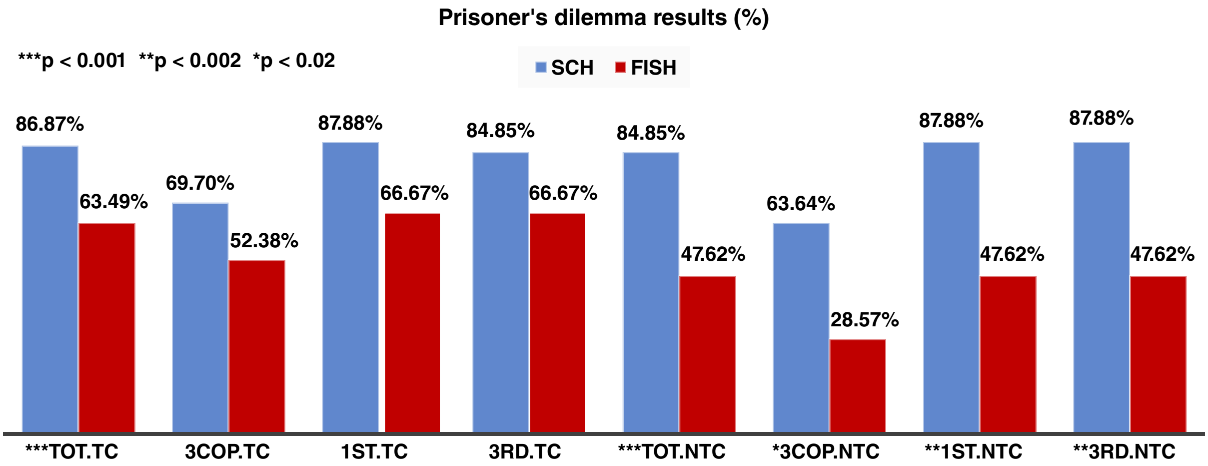


**Figure 3.** Cooperation results in the prisoner's dilemma by groups. Tot. refers to the total proportion of cooperative decisions; 3Cop. refers to the proportion of participants who cooperated in the three decisions; and 1stC and 3rdC refer to the proportions of cooperative decisions in the first and in the third rounds, respectively. The following TC and NTC refer to the trust and non-trust conditions, respectively. (*) (**) (***) Significant differences—Pearson chi-square tests. [Colour figure can be viewed at wileyonlinelibrary.com].

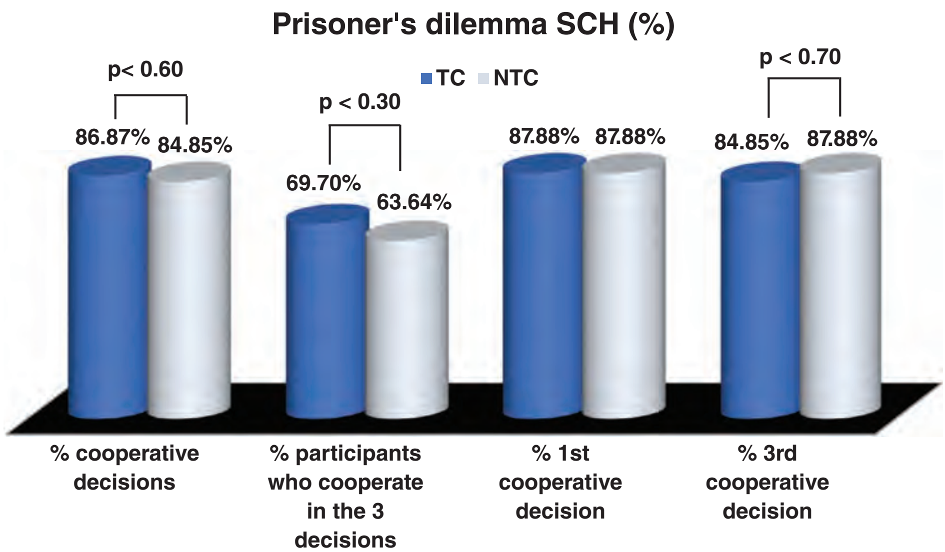


**Figure 4.** Levels of cooperation of the SCH group in IPD. One-tailed McNemar tests to measure significant differences. [Colour figure can be viewed at wileyonlinelibrary.com].

individual modularity, connected components, closeness centrality, eccentricity and degree, respectively). Thus, "connected components" refers to the density of connections of a node across the whole network, "closeness centrality" refers to the average distance from an initial node to all other nodes in the network, "eccentricity" refers to the distance from a node to the furthest one from it in the network, and "degree" refers to the node's number of undirected edges. A Mann–Whitney test found significant differences between SCH and FISH network structures in several such measures, namely, clustering coefficient, graph density, closeness centrality and eccentricity, but no significant differences were found in modularity or degree (Figure 11).

Some of the measures, such as authority, hub, page rank and eigenvector centrality are individual measures, which are graphically represented with means. Higher means indicate that more nodes in the network obtain a high value for these measures. This result means that more nodes are relevant in the network at the trust level. Significant differences between SCH and FISH—with Mann–Whitney tests—were found in each of these measures (Figure 12).

After finding these latter differences, a deeper analysis of the relationships among these relevant nodes in each network became particularly relevant. We represent them in more detail in Figures 13 and 14. In the case of SCH, the most trusted node in the network (number 1), with 23

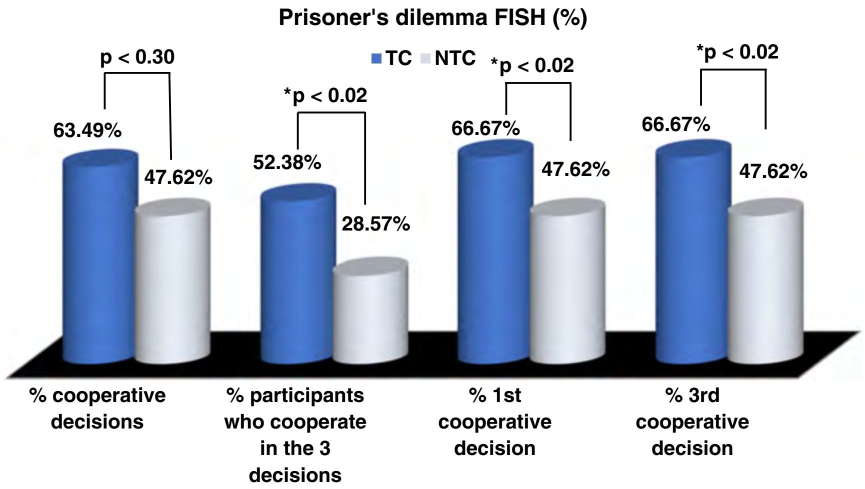


**Figure 5.** Levels of cooperation of the FISH group in the IPD. (*) Significant differences—One-tailed McNemar tests. [Colour figure can be viewed at wileyonlinelibrary.com].

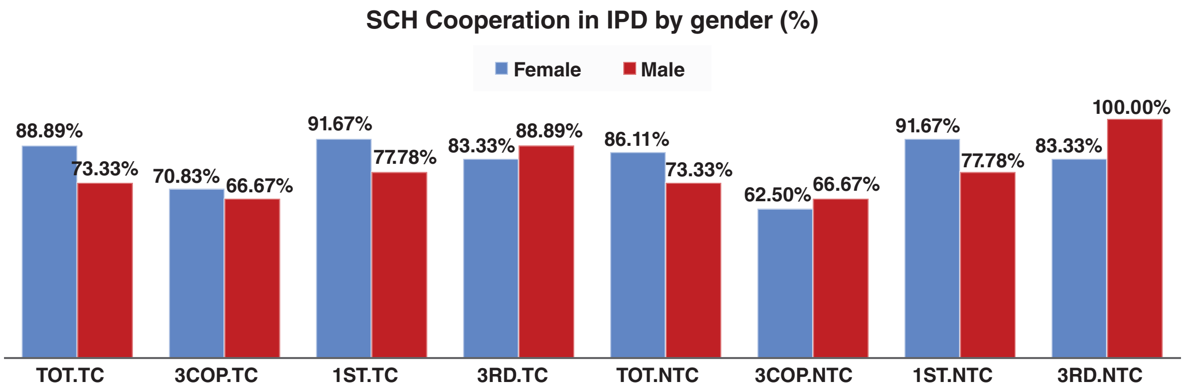


**Figure 6.** Cooperation results in the SCH prisoner's dilemma by gender. Abbreviations are explained in Figure 3. [Colour figure can be viewed at wileyonlinelibrary.com].

trusters (Id1 = 23), was a trustee of the other more trusted nodes (Id2 = 11, Id3 = 18, Id4 = 10, Id5 = 10, Id6 = 12, Id7 = 8, Id8 = 11, Id9 = 7) (Figure 13).

Nevertheless, in the case of FISH, we found no node with a similar centrality. The trust links of the four nodes with the highest Ids (Node 1, above left, with Id1 = 9; Node 2, above right, with Id2 = 11; Node 3, below left, with Id3 = 12; and Node 4, below right, with Id4 = 9) appear in Figure 14, but none of them was simultaneously trusted by all the other three nodes. While Node 1 trusted the other three nodes but was not a trustee for any of them and Nodes 2 and 3 trusted each other but were only a trustee for Node 1, Node 4 did not trust any of the other ones but was a trustee for Node 1.

## DISCUSSION AND CONCLUSION

This study served to analyse the role of the affective-based psychological mechanism of personal trust in group cooperation. For this objective, we compared cooperative attitudes in two work groups (SCH and FISH), using an IPD under two conditions (TC and NTC). The groups had similar levels of trust, which were measured by personal and general trust questionnaires, but differences in their group members' educational and economic situations. We also considered whether the personal trust network topologies of the members of each group also have an effect of cooperation within the group.

As for group members' situations, this study did provide evidence that supports the similar effect of personal trust on cooperation towards trustees (TC) in both groups, despite their different economic and educational situations. Thus, the economic differences of group members did not prevent high levels of cooperation towards trustees, even in the case of the FISH group, whose members had lower incomes, so that the incentive to obtain a more valuable prize would be higher, and therefore, the incentive to defect (less favourable situation for cooperation) would also be higher. As expected, significant differences in levels of education between SCH and FISH did

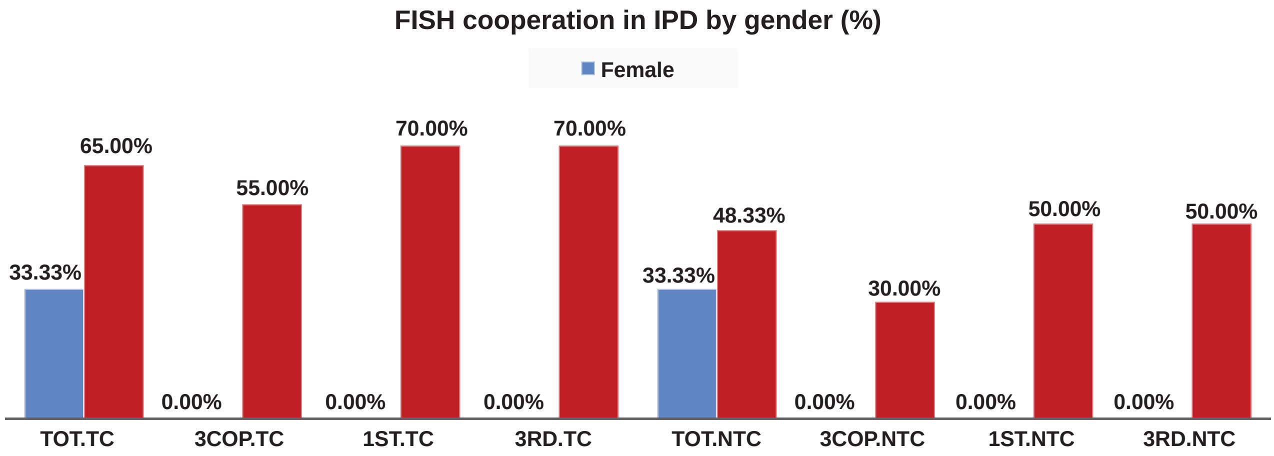


**Figure 7.** Cooperation results in the FISH prisoner's dilemma by gender. Abbreviations are explained in Figure 3. [Colour figure can be viewed at wileyonlinelibrary.com].

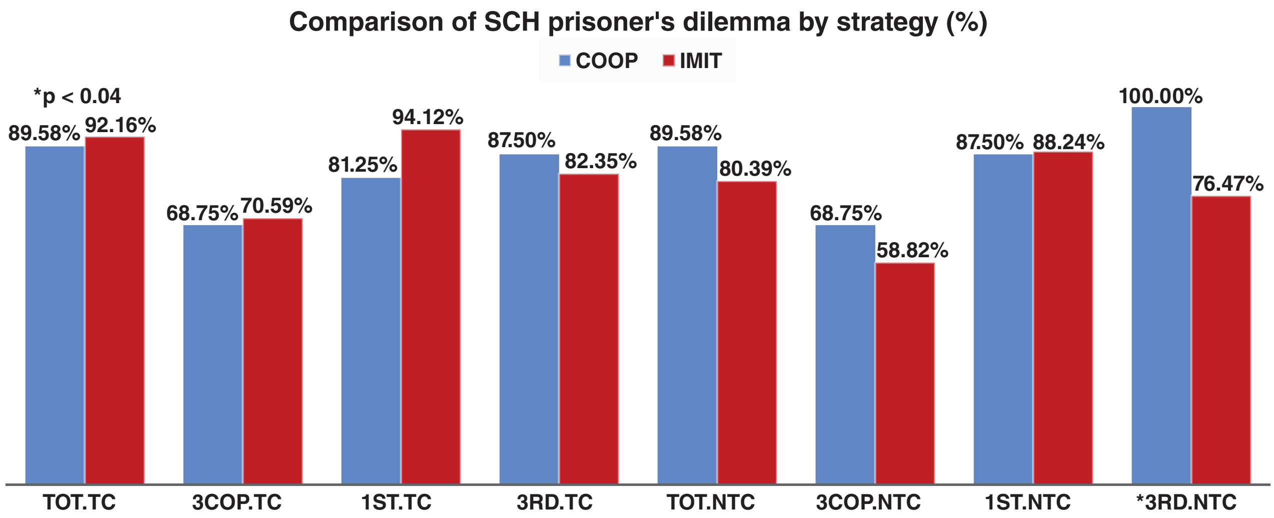


**Figure 8.** Results of cooperation in the prisoner's dilemma by type of strategy (COOP or IMIT) in the SCH group. (*) (**) Significant differences—Pearson chi-square tests. [Colour figure can be viewed at wileyonlinelibrary.com].

not give rise to significant differences in the high levels of cooperation towards trustees (Hypothesis 1).

Similarly, the different strategies followed by the experimenter did not influence either the levels of cooperation towards trustees, supporting personal trust as a strong (adaptive) mechanism to promote cooperation (Acedo-Carmona & Gomila, 2014). Accordingly, high levels of cooperation were expected and found when playing with trustees, even in the less favourable strategy (IMIT) (Hypothesis 1).

Concerning Hypothesis 2, on the role of personal trust to extend cooperation beyond direct trustees (NTC), only the SCH group showed this effect. We identified some features of its trust network topology, as indicative of group cohesion, that seem to favour the extension of cooperation beyond trustees. In particular, the SCH group is characterised by a trust network structured around a main node, corresponding to a highly trustworthy individual, trusted by the other most trusted nodes within the network. The FISH trust network, on the contrary, is a set of cliques, lacking trust connections among them. While the former illustrates a cohesive group, the latter is an example of a topology that prevents cooperation from each one's trust circle. In other words, our study provides evidence in support of the idea that the level of cooperation within a group depends not only on general and personal trust levels but also on how personal trust relationships are structured.

Our study also suggests that the clustering coefficient in trust networks is a negative indicator of group cohesion. While the topology of the FISH network showed a shorter distance between nodes, fewer communities, and a higher density of edges, which seems to indicate group cohesion, trust relationships were more intensely interconnected around neighbouring nodes identifying "smaller groups

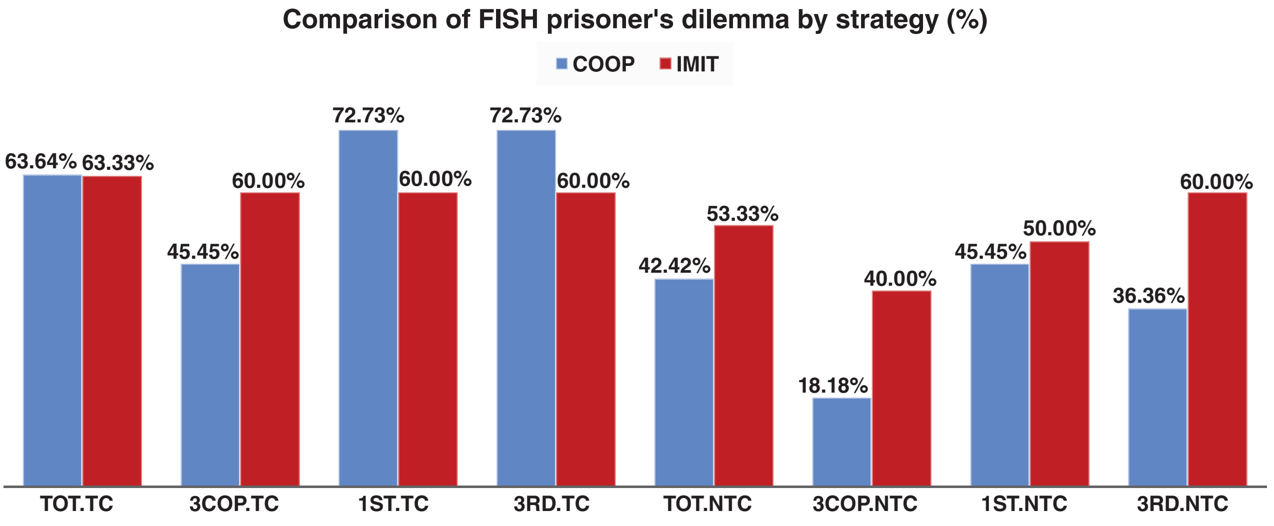


**Figure 9.** Results of cooperation in the prisoner's dilemma by type of strategy in the FISH group. Significant differences measured by Pearson chi-square tests. [Colour figure can be viewed at wileyonlinelibrary.com].

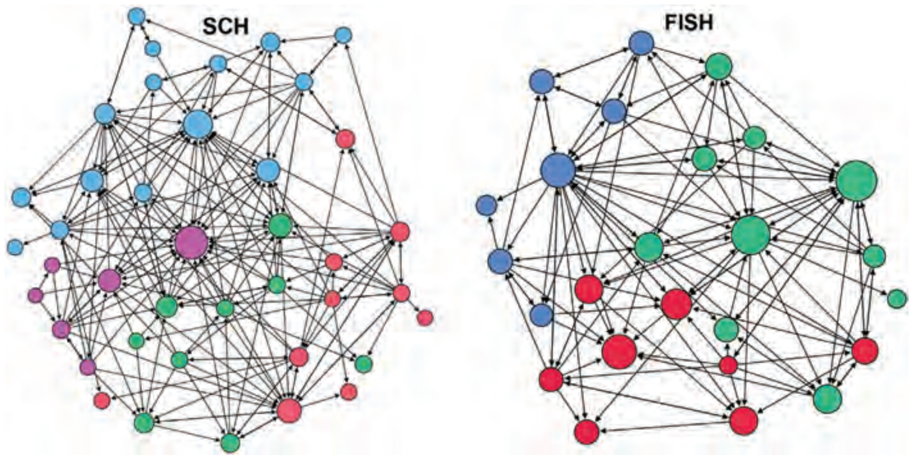


**Figure 10.** The SCH and the FISH trust networks. The nodal size represents the in-degree level and the colours of nodes represent communities—modularity. [Colour figure can be viewed at wileyonlinelibrary.com].

of trust" within the group—measured by a higher clustering coefficient—which is inversely related to group cohesion. Thus, the SCH and FISH trust network topologies represent, respectively, some examples of sources of *trust-generating*—cooperative—and *trust-inhibiting*—competitive—(Lusher, Kremer, & Robins, 2014), or symmetric and asymmetric trusts (Schoorman, Mayer, & Davis, 2007), but only in relation to NTC.

We should also point out that in the SCH network, cooperation flows beyond the direct trust bonds, in line with the theory of indirect reciprocity, whereas the mechanism is quite different from reputation. While the indirect reciprocity theory contends that cooperation occurs out of self-interest, personal trust seems to provide a mechanism which is prosocial from the outset, a sort of emotional commitment (Frank, 1988; Fulmer & Gelfand, 2012).

Lastly, concerning Hypothesis 3, which postulated differences in cooperation only in NTC according to the strategies used, the COOP strategy predicted more cooperation because non-cooperative decisions would be answered with cooperative ones, and the IMIT strategy predicted less cooperation because the larger number of non-cooperative decisions expected in the NTC would be imitated. However, these strategies had no effect on cooperation in this case: in SCH, we only found a small effect of the IMIT strategy in the third-round decision, where usually more possibilities of defection appear because of its being the last decision, but not enough to produce significant differences between TC and NTC—the SCH results might be explained by the high level of cooperation found under both conditions, so that the IMIT strategy had no relevant influence; in FISH, however, none of the strategies resulted in significant differences

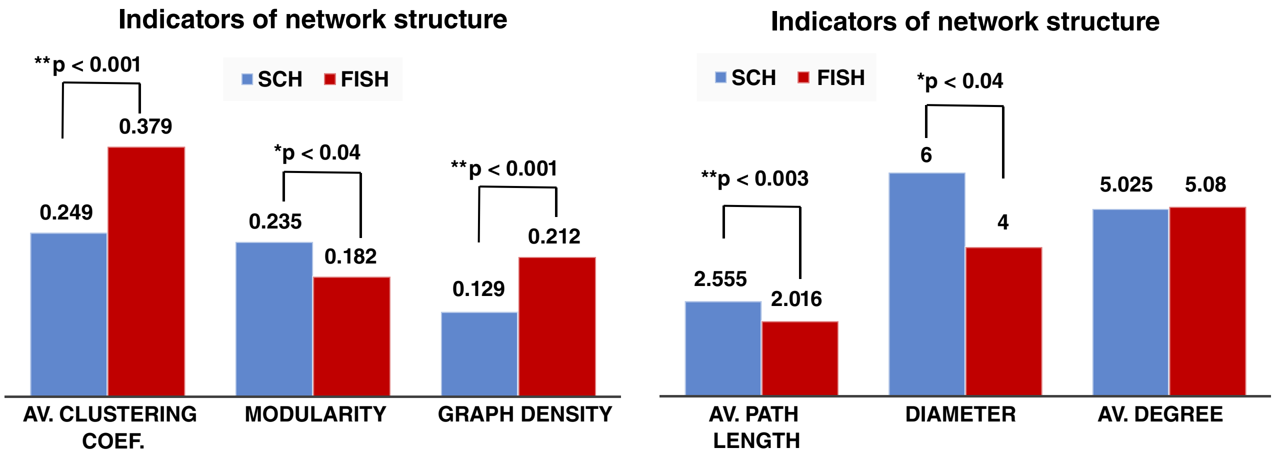


**Figure 11.** Comparison of measures of SCH and FISH network structures. (**) Significant differences regarding their equivalent individual measures (clustering, modularity, connected components, closeness, eccentricity, and degree respectively)—Mann–Whitney tests. [Colour figure can be viewed at wileyonlinelibrary.com].

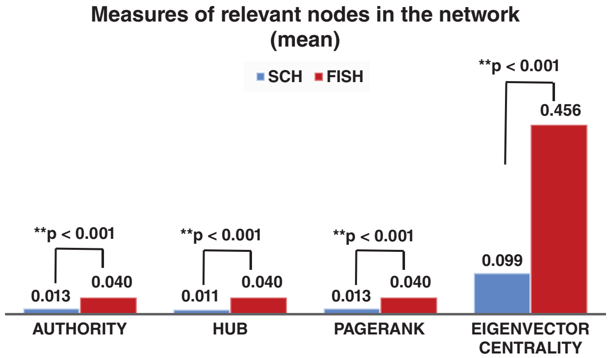


**Figure 12.** Comparison between the SCH and FISH groups on their relevant nodes within the trust network (authority, hub, page rank and eigenvector centrality). The graph shows the means of individual scores. (*) (**) Significant differences—Man-Whitney tests. [Colour figure can be viewed at wileyonlinelibrary.com].

in levels of cooperation. These results suggest that the IMIT strategy might influence the cohesive trust networks to a greater extent than the COOP strategy influences the less-cohesive trust networks, but this point requires further investigation.

In general, the results of this study provide additional explanations for the role played by personal trust in fostering cooperation within groups, from individual level to group level (Fulmer & Gelfand, 2012), thanks to a methodology that allows combining trustees and anonymity simultaneously in the games. The participants' anonymous decisions suggest an alternative to reputation and social exchange relationships to promote indirect cooperation. In addition, the analysis of the group trust network structure contributes to operationalising the notion of social cohesion and provides a measure for it. Altogether, the results suggest that our disposition to develop trusting relationships may have been a critical

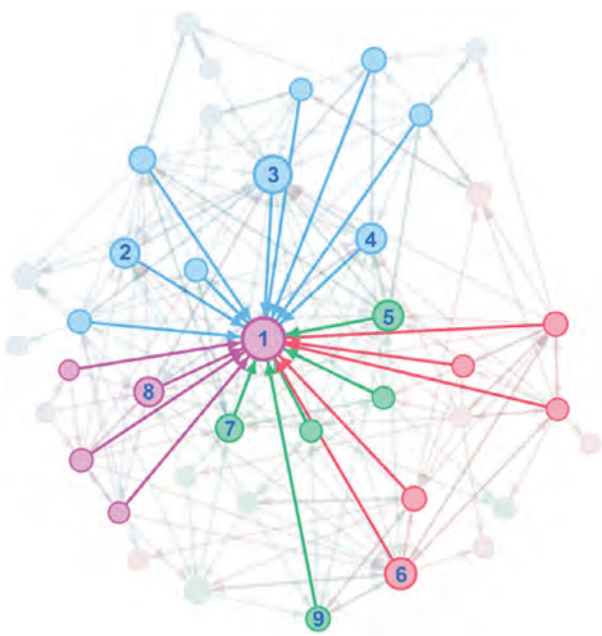


**Figure 13.** Highlighted representation of trust relationships of Node 1 within the network. [Colour figure can be viewed at wileyonlinelibrary.com].

adaptation for the evolution of cooperation when some degree of social cohesion was reached, in particular when someone becomes a trustee for most of the other group members. From an anthropological point of view, this structure is similar to the kind of social structure that could be found in so-called Big Man societies, where a highly influential individual within a group does his or her best to keep it together (Brown, 1990). In addition, the study opens the door to considering the flow of affective-based trust in groups beyond direct relationships.

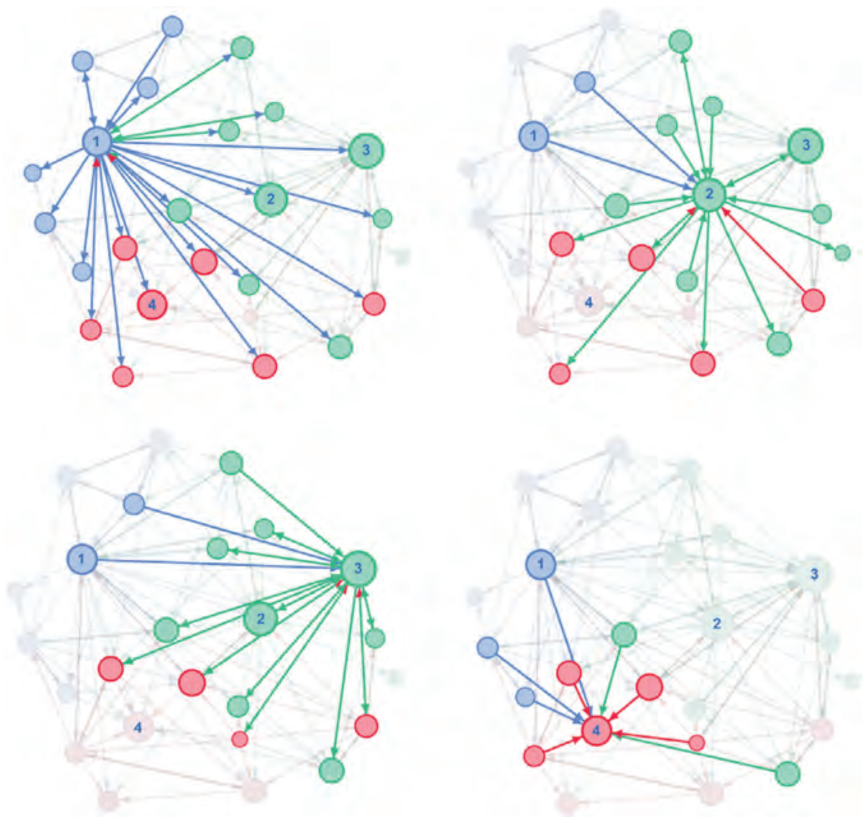


**Figure 14.** Highlighted representations of trust relationships of Nodes 1 (above left), 2 (above right), 3 (below left) and 4 (below right) within the network. [Colour figure can be viewed at wileyonlinelibrary.com].

Certainly the role of trust does not exclude reputation from being a mechanism that extends cooperation beyond mutualistic individuals. As a matter of fact, being trustworthy is something that can be known to others and influence decisions, so that an individual may reach a central position within a group as the outcome of a trust-building process, which can be grounded both in direct and witnessed social exchanges (Henrich, Chudek, & Boyd, 2015). However, while complementary, the psychological mechanisms involved in both processes are clearly different: prosocial trust is different from self-interested reputation. In the game, participants knew that everybody's choices would be kept secret, so that reputation-tracking was out of the question. In addition, the basic conditions that evolutionary models on the emergence of indirect cooperation need to assume are also different: for instance, indirect reciprocity models assume that individuals interact at least once with each other (Nowak & Sigmund, 2005), whereas personal trust is the outcome of repeated interactions. How trust and reputation mesh is an issue that clearly deserves further investigation.

## Limitations and future research

We would like to note that this is a field study, not a laboratory study. It follows that the generalisation of the main conclusion on the influence of personal trust networks on levels of cooperation needs further support. Groups differ in size, for example; however, previous studies suggest that group size is not a relevant factor in determining the level of group cooperation and cohesion (Acedo-Carmona & Gomila, 2013, 2014). Likewise, there were gender and age differences among the members of SCH and FISH. While we registered gender and so could discard that it played any role, we did not do so for age, because previous studies did not suggest that this variable is relevant to cooperative decisions (Acedo-Carmona & Gomila, 2013, 2014; Croson & Buchan, 1999). In any case, we believe that these results invite research on other groups for further support.

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## APPENDIX A

## GENERAL TRUST QUESTIONNAIRE

Please, cross out one of the 5 levels according to your answer to the following questions:

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Take advantage | | | | Be fair |
| 1 | Do you think that most people would try to take advantage of you if they had the opportunity or would they try to be fair? | 1<br>a | 2<br>b | 3<br>c | 4<br>d | 5<br>e |
| | | Absolutely agree | | | | Absolutely disagree |
| 2 | In general, when you need it, you are more likely to be helped by a person with whom you have had a long relationship. | 1<br>a | 2<br>b | 3<br>c | 4<br>d | 5<br>e |
| | | Surely not | | | | Surely yes |
| 3 | Would you lend something of yours to a stranger? | 1<br>a | 2<br>b | 3<br>c | 4<br>d | 5<br>e |
| | | Surely not | | | | Surely yes |
| 4 | Would you leave a loved one in the care of a stranger? | 1<br>a | 2<br>b | 3<br>c | 4<br>d | 5<br>e |
| | | Surely not | | | | Surely yes |
| 5 | Would you share personal information with strangers? | 1<br>a | 2<br>b | 3<br>c | 4<br>d | 5<br>e |

### General trust questionnaire's reliability measures

Reliability Statistics

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|---|---|---|
| .396 | .438 | 5 |

Inter-Item Correlation Matrix

| | 1. Take advantage/Fair | 2. Time of relationship | 3. Lend | 4. Let the care of loved ones | 5. Give personal information |
|---|---|---|---|---|---|
| 1. Take advantage/Fair | 1.000 | .082 | -.071 | .225 | -.052 |
| 2. Time of relationship | .082 | 1.000 | .196 | .100 | .109 |
| 3. Lend | -.071 | .196 | 1.000 | .244 | .172 |
| 4. Let the care of loved ones | .225 | .100 | .244 | 1.000 | .345 |
| 5. Give personal information | -.052 | .109 | .172 | .345 | 1.000 |

Item-Total Statistics

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Square Multiple Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|---|
| 1. Take advantage/Fair | 7.815 | 10.795 | .058 | .092 | .443 |
| 2. Time of relationship | 8.259 | 7.516 | .213 | .054 | .349 |
| 3. Lend | 9.426 | 9.079 | .226 | .112 | .323 |
| 4. Let the care of loved ones | 10.111 | 9.874 | .380 | .220 | .261 |
| 5. Give personal information | 9.870 | 9.889 | .214 | .148 | .336 |

## APPENDIX B

## PERSONAL TRUST QUESTIONNAIRE

About each of the 3 most trusted people (XX) within the group previously mentioned, please answer the following questions:

Please, cross one of the 5 levels according to your answer to the following questions:
1= Surely not
5= Surely yes

| | Surely not | | | | Surely yes |
|---|---|---|---|---|---|
| 1. Do you think that XX would lend you a large sum of money if he or she had it? | 1 | 2 | 3 | 4 | 5 |
| | a | b | c | d | e |
| 2. Do you think that XX would return you the loan of a large sum of money to you? | 1 | 2 | 3 | 4 | 5 |
| | a | b | c | d | e |
| 3. Would you leave something very valuable for you in the care of XX? | 1 | 2 | 3 | 4 | 5 |
| | a | b | c | d | e |
| 4. If you had a secret that, if being known, would be very detrimental to you, would you feel safe sharing it with XX? | 1 | 2 | 3 | 4 | 5 |
| | a | b | c | d | e |
| 5. Do you think that XX would you help in a move? | 1 | 2 | 3 | 4 | 5 |
| | a | b | c | d | e |
| 6. If XX had to defend you at the expense of harming him/herself, do you think he/she would do it? | 1 | 2 | 3 | 4 | 5 |
| | a | b | c | d | e |

Personal trust questionnaire's reliability measures

Reliability Statistics

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|---|---|---|
| .795 | .788 | 6 |

Inter-Item Correlation Matrix

| | 1. Lend | 2. Return the loan | 3. Let the care of something valuable | 4. Secrets | 5. Help in a move | 6. Altruistic defense |
|---|---|---|---|---|---|---|
| 1. Lend | 1.000 | .252 | .640 | .539 | 0,356 | .384 |
| 2. Return the loan | .252 | 1.000 | .138 | .153 | .246 | .030 |
| 3. Let the care of something valuable | .640 | .138 | 1.000 | .602 | .471 | .481 |
| 4. Secrets | .539 | .153 | .602 | 1.000 | .516 | .562 |
| 5. Help in a move | .356 | .246 | .471 | .516 | 1.000 | .361 |
| 6. Altruistic defense | .384 | .0296 | .481 | .562 | .361 | 1.000 |

Item-Total Statistics

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Square Multiple Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|---|
| 1. Lend | 21.284 | 20.088 | .632 | .470 | .743 |
| 2. Return the loan | 20.948 | 25.867 | .201 | .110 | .827 |
| 3. Let the care of something valuable | 21.129 | 19.061 | .692 | .540 | .727 |
| 4. Secrets | 21.368 | 17.780 | .705 | .528 | .721 |
| 5. Help in a move | 20.871 | 22.866 | .551 | .335 | .767 |
| 6. Altruistic defense | 21.561 | 20.131 | .528 | .357 | .770 |

Personal trust questionnaire's reliability measures (without item 2)

Reliability Statistics

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|---|---|---|
| .826 | .827 | 5 |

Inter-Item Correlation Matrix

| | 1. Lend | 3. Let the care of something valuable | 4. Secrets | 5. Help in a move | 6. Altruistic defense |
|---|---|---|---|---|---|
| 1. Lend | 1.000 | .634 | .534 | .358 | .378 |
| 3. Let the care of something valuable | .634 | 1.000 | .603 | .468 | .482 |
| 4. Secrets | .534 | .603 | 1.000 | .512 | .564 |
| 5. Help in a move | .358 | .468 | .512 | 1.000 | .357 |
| 6. Altruistic defense | .378 | .482 | .564 | .357 | 1.000 |

Item-Total Statistics

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Square Multiple Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|---|
| 1. Lend | 16.814 | 17.533 | .608 | .438 | .795 |
| 3. Let the care of something valuable | 16.647 | 16.204 | .713 | .535 | .764 |
| 4. Secrets | 16.885 | 15.019 | .723 | .527 | .760 |
| 5. Help in a move | 16.397 | 20.112 | .528 | .304 | .819 |
| 6. Altruistic defense | 17.077 | 16.975 | .565 | .351 | .810 |

## APPENDIX C

### INSTRUCTIONS

In this game you (Participant 1) will have to make some decisions at the same time as another person (Participant 2) on whether to share some points with the other person or try to keep them. You will do this twice. First, you will do it with one of the people from the group you mentioned in the questionnaire as a person you trust. Next, you will play with another person from the group, one that you did not mention. There will be three rounds of decisions in each task. Depending on your decisions and those of the other person, you will obtain points that in the end you will be able to exchange for a prize. The more points you obtain, the better the prize you will receive.

Both of you will perform the task at the same time but in different places, to make sure that neither gets to know who the other player was. In addition, both will have to make your decision before knowing the decision of the other. Once your decision is made, you will know the decision of the other, and you will continue with the next round. The other player has the same information as you have.

The points you will get are summarised in the following table. If both decide to share, each will get three points. In one decides to share but the other decides to keep the points, all six points will go to the latter. If both decide to keep the points, each player will obtain one point.

| Participant 1 | | | Participant 2 |
|---|---|---|---|
| S | 3 | 3 | S |
| G | 6 | | S |
| S | | 6 | G |
| G | 1 | 1 | G |

C= Try to share the points
G= Try to get the points

The prize obtained at the end will result from the sum of points achieved in the total six rounds of the game. The prizes will be awarded when all the participants have finished the game.

In general, to make your decision, you can consider both your desire about what you want to do and your expectations about your partner's behaviour, what you want to earn, and what you want the other person to earn.

Note that the maximum you can earn with a decision will be six points and the minimum zero points, similar to your partner. Basically, you will decide if you want to try to get the six points or share them with the partner before knowing her decision.

Please do not begin until you are sure you understand the game. If you have any questions, you may ask the researcher. It is very important to say absolutely nothing about the task or questionnaires to anyone until you are notified that all the participants have completed it. All of this information are confidential and only the data will be used anonymously.

Next, you will take several tests to be sure that you have understood the task well.

## APPENDIX D

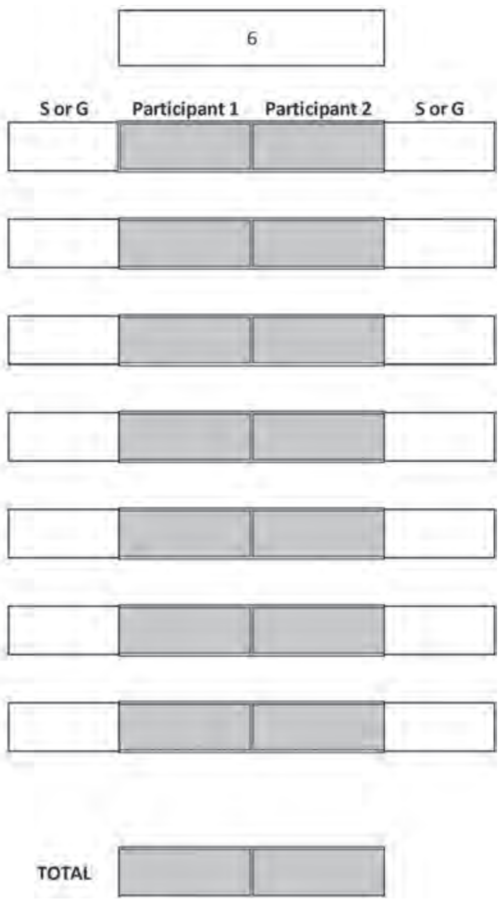
## TEST

Now, would you please answer some questions?

1. Imagine that you, Participant 1, decide to share the points and Participant 2 decides to try to get the points. In that case, how much would you get? How much would Participant 2 get?
2. Now imagine that you decide to try to get the points and your partner decides to share them. How much would you get this time? How much would your partner get?
3. If you decide to share the points and your partner too, how much would you earn? How much would your partner earn?
4. If you decide to try to get the points and your partner also tries to get them, how much would you earn now? And your partner?
5. Again, you decide to try t**o** get the points and the other person tries to share them. How much would you earn? How much would the other player earn?
6. Now you try to share the points and your partner too. How much would you get? How much would your partner get?
7. Finally, you decide to share the points and your partner tries to get them. How much would you win? How much would your partner earn?

(For the researcher: Repeat the questions as many times as you consider necessary to verify that the participant has understood the game).

| P1 | P1 | P2 | P2 |
|---|---|---|---|
| S | 3 | 3 | S |
| G | 6 | | S |
| S | | 6 | G |
| G | 1 | 1 | G |



## APPENDIX E

**TABLE E1**
Comparison of general and personal trust scores between SCH and FISH groups (Mann–Whiney tests of significance).

| | | *Trust scores* | | |
|---|---|---|---|---|
| | | *SCH* | *FISH* | *Mann–Whitney test* |
| General trust | Mean ± *SE* | 48.24 ± 2.69 | 41.14 ± 2.45 | U = 247 |
| | *SD* | 15.49 | 11.25 | z = -1.77 |
| | *N* | 33 | 21 | *p* < .07 |
| | | | | *r* = −.24 |
| | Mean | 86.85 ± 2.27 | 81.05 ± 4.77 | U = 328 |
| Personal trust | *SD* | 13.08 | 21.88 | z = −0.33 |
| | *N* | 33 | 21 | *p* < .7 |
| | | | | *r* = −.04 |

**TABLE E2**
Differences in cooperation between SCH and FISH (Prisoner's Dilemma)

| | | *Pearson Chi-square tests* |
|---|---|---|
| TC | Tot*** | $\chi^2$ (1, *n* = 54) = 12.173, *p* < .001 |
| | 3Cop | $\chi^2$ (1, *n* = 54) = 1.650, *p* < .2 |
| | 1st | $\chi^2$ (1, *n* = 54) = 3.560, *p* < .06 |
| | 3rd | $\chi^2$ (1, *n* = 54) = 2.455, *p* < .12 |
| NTC | Tot*** | $\chi^2$ (1, *n* = 54) = 25.593, *p* < .001 |
| | 3Cop* | $\chi^2$ (1, *n* = 54) = 6.312, *p* < .02 |
| | 1st** | $\chi^2$ (1, *n* = 54) = 10.368, *p* < .002 |
| | 3rd** | $\chi^2$ (1, *n* = 54) = 10.368, *p* < .002 |

Tot = refers to the total proportion of cooperative decisions; 3Cop = the proportion of participants who cooperated in all three decisions; and 1st and 3rd = the proportions of cooperative decisions in the first and in the third rounds, respectively. The previous TC or NTC refers to trust or non-trust conditions.
(*) (**) (***) Significant differences—Pearson chi-square tests.

**TABLE E3**
Differences in SCH cooperation between TC and NTC in the prisoner's dilemma

| | *Cooperative decisions (%)* | | |
|---|---|---|---|
| | *TC (%)* | *NTC (%)* | *One-tailed McNemar tests* |
| Tot | 86.87 | 84.85 | $\chi^2$ (1, *n* = 33) = 1.53, *p* < .06 |
| 3Cop | 69.70 | 63.64 | $\chi^2$ (1, *n* = 33) = 0.66, *p* < .3 |
| 1st | 87.88 | 87.88 | $\chi^2$ (1, *n* = 33) = 0.14, *p* < .7 |
| 3rd | 84.85 | 87.88 | $\chi^2$ (1, *n* = 33) = 0.14, *p* < .7 |

Abbreviations explained above.

**TABLE E4**
Differences in FISH cooperation between TC and NTC in the iterated prisoner's dilemma

| | *Cooperative decisions (%)* | | |
|---|---|---|---|
| | *TC (%)* | *NTC (%)* | *One-tailed McNemar tests* |
| Tot | 63.49 | 47,62 | $\chi^2$ (1, *n* = 21) = 6, *p* < .3 |
| *3Cop | 52.38 | 28.57 | $\chi^2$ (1, *n* = 21) = 5, *p* < .02 |
| *1st | 66.67 | 47.62 | $\chi^2$ (1, *n* = 21) = 4, *p* < .02 |
| 3rd | 66.67 | 47.62 | $\chi^2$ (1, *n* = 21) = 2.66, *p* < .10 |

Abbreviations explained above. (*) Significant differences—One-tailed McNemar tests.

**TABLE E5**
Differences in SCH cooperation between female and male in the iterated prisoner's dilemma

| | | *Cooperative decisions (%)* | | |
|---|---|---|---|---|
| | | *Female (%)* | *Male (%)* | *Contingency tests* |
| TC | Tot | 88.89 | 73,33 | $\chi^2$ (1, *n* = 33) = 0.28, *p* < .3 |
| | 3Cop | 70.83 | 66.67 | $\chi^2$ (1, *n* = 33) = 0.04, *p* < .9 |
| | 1st | 91.67 | 77.78 | $\chi^2$ (1, *n* = 33) = 0.18, *p* < .3 |
| | 3rd | 83.33 | 88.89 | $\chi^2$ (1, *n* = 33) = 0.06, *p* < .7 |
| NTC | Tot | 86.11 | 73.33 | $\chi^2$ (1, *n* = 33) = 0.31, *p* < .2 |
| | 3Cop | 62.50 | 66.67 | $\chi^2$ (1, *n* = 33) = 0.03, *p* < .9 |
| | 1st | 91.67 | 77.78 | $\chi^2$ (1, *n* = 33) = 0.18, *p* < .3 |
| | 3rd | 83.33 | 100.00 | $\chi^2$ (1, *n* = 33) = 0.22, *p* < .2 |

Abbreviations explained above.

**TABLE E6**
Differences in FISH cooperation between female and male in the iterated prisoner's dilemma

| | | *Cooperative decisions (%)* | | |
|---|---|---|---|---|
| | | *Female (%)* | *Male (%)* | *Contingency tests* |
| TC | Tot | 33.33 | 65.00 | $\chi^2$ (1, *n* = 21) = 0.48, *p* < .1 |
| | 3Cop | 0.00 | 55.00 | $\chi^2$ (1, *n* = 21) = 0.22, *p* < .3 |
| | 1st | 0.00 | 70.00 | $\chi^2$ (1, *n* = 21) = 0.30, *p* < .2 |
| | 3rd | 0.00 | 70.00 | $\chi^2$ (1, *n* = 21) = 0.30, *p* < .2 |
| NTC | Tot | 33.33 | 48.33 | $\chi^2$ (1, *n* = 21) = 0.33, *p* < .5 |
| | 3Cop | 0.00 | 30.00 | $\chi^2$ (1, *n* = 21) = 0.14, *p* < .6 |
| | 1st | 0.00 | 50.00 | $\chi^2$ (1, *n* = 21) = 0.20, *p* < .4 |
| | 3rd | 0.00 | 50.00 | $\chi^2$ (1, *n* = 21) = 0.20, *p* < .4 |

Abbreviations explained above.

**TABLE E7**
Differences in SCH cooperation between COOP and IMIT strategies

| | | *Pearson Chi-square tests* |
|---|---|---|
| **TC** | Tot | $\chi^2$ (1, *n* = 33) = 0.198, *p* < .6 |
| | 3Cop | $\chi^2$ (1, *n* = 33) = 0.005, *p* < .9 |
| | 1st | $\chi^2$ (1, *n* = 33) = 2.343, *p* < .1 |
| | 3rd | $\chi^2$ (1, *n* = 33) = 1.411, *p* < .2 |
| **NTC** | Tot | $\chi^2$ (1, *n* = 33) = 1.625, *p* < .2 |
| | 3Cop | $\chi^2$ (1, *n* = 33) = 0.351, *p* < .5 |
| | 1st | $\chi^2$ (1, *n* = 33) = 0.004, *p* < .9 |
| | 3rd* | $\chi^2$ (1, *n* = 33) = 4.284, *p* < .04 |

Abbreviations explained above.
(*) Significant differences—Pearson chi-square tests.

**TABLE E8**
Differences in FISH cooperation between COOP and IMIT strategies (prisoner's dilemma)

| | | *Pearson Chi-square tests* |
|---|---|---|
| TC | Tot | $\chi^2$ (1, *n* = 21) = 0.001, *p* < .1 |
| | 3Cop | $\chi^2$ (1, *n* = 21) = 0.444, *p* < .5 |
| | 1st | $\chi^2$ (1, *n* = 21) = 0.382, *p* < .5 |
| | 3rd | $\chi^2$ (1, *n* = 21) = 0.382, *p* < .5 |
| NTC | Tot | $\chi^2$ (1, *n* = 21) = 0.750, *p* < .3 |
| | 3Cop | $\chi^2$ (1, *n* = 21) = 2.938, *p* < .08 |
| | 1st | $\chi^2$ (1, *n* = 21) = 0.043, *p* < .8 |
| | 3rd | $\chi^2$ (1, *n* = 21) = 1.173, *p* < .2 |

Abbreviations explained above.

**TABLE E9**
Differences in network structures between SCH and FISH

| *Global measures* | *SCH* | *FISH* | *Individual measures* | *Mann–Whitney tests* |
|---|---|---|---|---|
| Av. Clustering Coef.** | 0.249 | 0.379 | Clustering Coef.** | $U = 213$, $z = -3.874$, $N = 65$, $p < 0.001$, $r = -.48$ |
| Modularity | 0.235 | 0.182 | Modularity | $U = 439$, $z = -0.861$, $N = 65$, $p < 0.4$, $r = -.106$ |
| Graph density** | 0.129 | 0.212 | Connected components** | $U = 102.5$, $z = -5.804$, $N = 65$, $p < 0.001$, $r = -.720$ |
| Av. Path** Length | 2.555 | 2.016 | Closeness** Centrality | $U = 270.5$, $z = -3.103$, $N = 65$, $p < 0.003$, $r = -.385$ |
| Diameter** | 6 | 4 | Eccentricity** | $U = 193$, $z = -4.240$, $N = 65$, $p < 0.001$, $r = -0.526$ |
| Av. degree | 5.025 | 5.08 | Degree | $U = 491$, $z = -0.122$, $N = 65$, $p < 0.9$, $r = -.015$ |

(**) Significant differences—Mann–Whitney tests.

**TABLE E10**
Differences in network structures between SCH and FISH

| | *SCH* | *FISH* | *Mann–Whitney tests* |
|---|---|---|---|
| Authority** | 0.013 | 0.040 | $U = 219$, $z = -3.802$, $N = 65$, $p < 0.001$, $r = -.314$ |
| Hub* | 0.011 | 0.040 | $U = 313$, $z = -2.533$, $N = 65$, $p < 0.02$, $r = -.314$ |
| PageRank** | 0.013 | 0.040 | $U = 217$, $z = -3.816$, $N = 65$, $p < 0.001$, $r = -.473$ |
| Eigenvector centrality** | 0.099 | 0.456 | $U = 155.5$, $z = 4.645$, $N = 65$, $p < 0.001$, $r = -.576$ |

(**) Significant differences—Mann–Whitney tests.