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ARTICLE

Inherent linguistic preference outcompetes incidental alignment in cooperative partner choice

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Abstract
An important quality to assess in others is their cooperativeness. We hypothesized that people use linguistic markers in their partners' speech as a proxy of their cooperativeness in other tasks: specifically, we predicted that participants would prefer syntactically similar conversation partners as cooperation partners in a monetary game. We found that, indeed, participants preferably selected syntactically similar conversation partners as cooperation partners, but only when the participants could communicate using their naturally preferred constructions. In contrast, when participants were forced to communicate using dispreferred constructions, they rather cooperated with those partners that matched their natural preference than with those that matched their overt linguistic use. This pattern of results was likely driven by participants valuing representational alignment (i.e., being aligned on both linguistic features and their mental representations) more than incidental behavioral alignment (i.e., superficial convergence on similar linguistic features during interaction). This is because representational alignment is a potential indicator of group membership and may be associated with in-group benefits such as reputation, reciprocity and normative behavior. Those benefits may outweigh the benefits of simple behavioral alignment, which could be a potential indicator of others' willingness to cooperate. This has important implications for communication in intercultural settings where members of diverse linguistic groups negotiate cooperative actions.

Keywords: behavior; cooperation; linguistic alignment; linguistic preference; linguistic similarity; syntactic alignment

1. Introduction

In our everyday lives, but also throughout our evolutionary histories, it is and has been crucial to assess others as potential cooperation partners. Here, we investigate if

linguistic similarity influences the decision to choose one potential collaborator over another, and discuss possible reasons for why this might be the case.

Humans are exceptional among primates in the extent to which they cooperate with non-kin – this presents a major explanatory target, since for well-known game-theoretic reasons (e.g., Nowak et al., 2004), cooperation tends to be rare in nature. It has been proposed that one key mechanism in maintaining successful cooperation in our species has been cooperating selectively (see, e.g., Witteveen, 2021; Heintz & Scott-Phillips, 2023). Conceptualizing human groups as markets of potential cooperators (cf. Barclay, 2016; Noë & Hammerstein, 1994), it is important to choose partners who are not only competent (thus maximizing the benefits of cooperative interactions) but also trustworthy (minimizing the risk of defection).

There is a substantial body of indirect evidence suggesting that in humans, linguistic similarity may influence the decisions to choose a particular individual as a partner in cooperation[1], which we summarize in Sections 1.1 and 1.2. When considering this previous evidence, it becomes essential to distinguish two different manifestations of linguistic similarity: *linguistic alignedness*, that is, using similar linguistic choices from the outset of a conversation, and *linguistic alignment*, that is, converging on similar linguistic choices over the course of an interaction. Linguistic alignedness is most likely driven by the conversation partners having similar inherent preferences for particular linguistic variants, that is, they are sharing similar mental core representations of linguistic patterns. In contrast, during linguistic alignment, one conversation partner usually moves away from their original preference and overtly adapts their linguistic behavior to match their partner. Both *alignedness* and *alignment* have the potential to influence cooperation between individuals.

1.1 Linguistic alignedness

One reason why linguistic *alignedness*, including sharing the same mental representations, may influence the decision to cooperate is that speaking a similar language is an indicator of group membership, and that in-groups, particularly in closely-knit groups, tend to cooperate more with one another than with out-groups[2] (Balliet et al., 2014; Hewstone et al., 2002). Choosing to collaborate selectively with in-group members makes evolutionary sense because it reduces the risk of defection: within closely-knit groups, where individuals' track record can be spread more easily than outside of groups, individuals are less likely to defect (e.g., Dunbar, 1996). Many groups require their members to internalize cooperative norms, which on the one hand serve to punish noncooperators, and on the other hand, to make cooperation more efficient (Henrich & Boyd, 2001). Cooperation with in-groups also results in statistically higher benefits, as it increases inclusive fitness due to genetic relatedness (Hamilton, 1964a, 1964b).

A more general mechanism through which linguistic *alignedness* may aid cooperation is homophily: preexisting similarity on the level of language use

[1]Here, we investigate the potential cause-and-effect relationship in which linguistic similarity might influence cooperative partner choice. However, it is important to note that linguistic similarity and cooperation are likely to mutually influence each other, creating a positive feedback loop. Consequently, the degree of cooperation may also shape the extent to which we align with others linguistically.

[2]Note that also here, the relationship is a circular one: in-group members tend to cooperate more, and individuals who cooperate tend to form social groups.

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provides a reliable index of general similarity. Similar individuals are likely to share common goals, norms and behavioral patterns, which facilitates coordinating joint collaborative action, and this in turn makes working together more efficient (e.g., Gärdenfors, 2004).

Cooperation with similar individuals also tends to be more stable. Tag-based models of cooperation (e.g., Axelrod et al., 2004) claim that an individual's propensity to engage in cooperative behavior is often triggered by their ability to detect certain observable features (or tags) in others. Furthermore, they suggest that mutual similarity in the observable features of individuals often constitutes an additional tag to foster cooperation between them. Linguistic traits such as sharing a native language have been posited to be particularly effective tags (e.g., Nettle & Dunbar, 1997; Roberts, 2008). Cohen (2012) has proposed a tag-based model of cooperation specifically involving the accents of language users, suggesting that 'linguistic cues inherent in speech accent, or patterns of intonation and phonology, harbor special potential as reliable tags for the orientation of social and cooperative preferences among strangers' (p. 592). Cohen (2012) offers a detailed account of how one's speech accent fulfills the criteria of salience, individual's property, comparability, honesty, cost-effectiveness, discriminability, dynamism, anciency, universality and early acquisition – which all together make it a reliable cue of behavioral similarity, group membership and cooperation partner quality.

As previous evidence indicates, those links between linguistic *alignedness*, group membership and cooperation apply to linguistic similarity on a large scale, such as speaking the same native language, accent, or dialect. However, linguistic *alignedness* can also manifest itself on the level of syntactic or lexical choice, meaning that people share natural preferences for certain grammatical constructions or words. In this study, we investigate whether *alignedness* on those levels of linguistic communication also displays the potential to influence cooperative partner choice.

1.2 Alignment

Alignment, that is, the gradual convergence of interactants on similar behaviors, including linguistic choices, has the potential to foster cooperation because people might use it as a proxy for others' willingness and aptitude to adapt and cooperate. This may happen even if interactants converge on a superficial overt level, rather than on their mental core representations of behaviors. Hence, a*lignment* does not necessarily involve conscious or high-effort behaviors but can also happen on the level of subconscious or low-effort behaviors (cf. Wacewicz et al., 2017). The latter are 'low-level' phenomena (cf. Levinson, 2006) over which interactants have no, or very little, direct volitional control, which is why they cannot be easily faked by defectors or substandard cooperators, and may thus be reliable indicators of others' willingness to cooperate. A considerable body of research has shown that mutually aligning one's gestures, postures, or mannerisms promotes cooperation or its proxies, such as rapport or general prosociality (e.g., Bargh & Chartrand, 1999; Van Baaren et al., 2004; Lakens & Stel, 2011; Miles et al., 2009 – review in Wacewicz et al., 2017).

When it comes specifically to *linguistic alignment*, which is defined as 'a specific form of alignment which involves gradually converging on the same language choices' (Pickering & Garrod, 2004) that may have the same form, sequence or meaning (Rasenberg et al., 2020, 2022), there are several examples indicating its

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potential links to behavior in goal-oriented and cooperative tasks[3]. For instance, a corpus study has shown that the magnitude of syntactic alignment is greater in task-oriented conversations than in casual telephone conversations, and that the coadaptation of syntactic constructions increases performance in the task (Reitter & Moore, 2014). Furthermore, an experiment revealed that interlocutors rapidly adapted each other's vocabulary in a collaborative task, but their performance on that task depended on converging on specific task-related vocabulary, and not on overall lexical alignment (Fusaroli et al., 2012). The results of this study were extended in another experiment, which found that establishing local routines was a better predictor of task performance than alignment itself (Fusaroli & Tylén, 2016).

Further evidence for potential links between linguistic alignment and cooperation (or related concepts such as prosociality, liking or rapport) comes from van Baaren et al. (2003), who found that when waitresses verbally mimicked the speech of their clients, they got larger tips than when they paraphrased the clients' orders. Also, according to an experiment by Tobar-Henríquez et al. (2021), speakers who lexically aligned with an interlocutor from a different speech community tended to stick with the aligned terms when communicating with other members of this speech community while switching back to their natural linguistic choices when communicating with members of their own speech community. Since alignment was mediated by the speakers' knowledge about group membership, it can be assumed that speakers employed it to be selectively cooperative. However, there is also experimental evidence suggesting that the perception of alignment depends on the context in which it occurs. There is also evidence that lexical alignment that is perceived as being unnatural and unauthentic does not help to foster cooperative tendencies because it introduces cognitive processing costs on the side of the listeners, possibly because it constitutes a mismatch to their expectations (Martin et al., 2016).

Alignment itself has been observed to be mediated by a plethora of extralinguistic variables, such as social distance (Giles & Powesland, 1975), status or power (Danescu-Niculescu-Mizil et al., 2012; Lev-Ari & Peperkamp, 2017), prosocial behaviors (Kulesza et al., 2014) or expectations about the addressee, where the interlocutor's communicative capacity may play a role in the magnitude of alignment (see Branigan et al., 2011 for communication with computers; Ivanova et al., 2020 for dialogues between L1 and L2 speakers). Those factors may mediate potential relationships between alignment and cooperation.

[3]Here, we focus on alignment as an effect of socially driven processes. Alternatively, alignment can be viewed as being the result of mechanistic processes (Bock, 1986; Branigan et al., 1995). This mechanistic approach attempts to frame the convergence of linguistic expressions as a product of priming – which operates at all levels of linguistic representation, including phonological, lexical and structural levels. From this perspective, alignment is beyond the conscious control of interlocutors, and its primary role is to facilitate mutual comprehension (Pickering & Garrod, 2004). An alternative, but related, mechanistic explanation of alignment is based on implicit learning. According to Ferreira and Bock (2006), implicit learning occurs when, during sentence production (or comprehension), speakers map parts of the message to particular syntactic constructions. After using such mapping between the message and sentence levels, the tendency for the language comprehension/production system to use it again is stronger. Under this explanation, alignment occurs because speakers and listeners map particular aspects of sentence structure to specific parts of the situation model.

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In sum, while there is plenty of prior research on how various aspects of linguistic alignment influence various behaviors that can be proxies of cooperation, the direct influence of syntactic similarities on cooperation partner choice has hardly been explored.

1.4 Research questions, hypotheses and predictions

In this study, we focus on one clearly defined instance of linguistic similarity, namely syntactic similarity, and hypothesize that individuals are more likely to cooperate with those who are syntactically similar to them. 'Cooperative partner choice' is operationalized as a forced choice between potential partners with whom the participant will work together on a collaborative task.

To test our hypothesis, we conducted an online experiment in which the study participants communicated with others about ditransitive events in a picture-description task (cf. Bock, 1986). The ditransitive events could be described by either using a prepositional dative construction (e.g., 'The agent gives the object to the recipient'), or a double object construction (e.g., 'The agent gives the recipient the object'). This variation in constructions gave rise to two communicative situations: one in which the communication partners used syntactic constructions that were aligned with the ones used by the participants and another in which the communication partners did not align with the participants. We predicted that participants would prefer those partners as cooperation partners in a subsequent cooperation game that had previously communicated using the same syntactic construction as the participants.

A secondary aim of our study was to explore if people prefer linguistically similar conversation partners as cooperation partners either because of more deeply entrenched personal preferences for certain linguistic patterns, or because of preferences on a more superficial mechanistic level that may, for example, be caused by priming (Bock, 1986). To explore this, we tested two groups of participants: the first group (from now on, the *preference group*) could communicate using their own naturally preferred constructions, whereas the second group (from now on, the *dispreference group*) was forced to communicate using the construction opposed to their natural preference. This means that for half of the participants, the syntactically similar partners aligned with the participants' preferred construction (i.e., which may be indicative of the similarity in linguistic core representations) and for the other half, the syntactically similar partners aligned with the participants' dispreferred construction (i.e., which may be indicative of the similarity in superficial linguistic behavior).

If linguistic similarity leads to people being preferentially chosen as cooperative partners because of a deeply entrenched preference for a particular linguistic variant, we predicted that the positive effect of linguistic similarity on cooperation partner choice would only surface in the preference group, that is, in the participants who can communicate using their naturally preferred constructions. On the other hand, the positive effect of linguistic similarity was not expected to show up in the dispreference group, where communication partners were aligned with a variant that participants were forced to use in the experiment but would not naturally use themselves. Framing this in terms of the effects in a logistic regression model (see details of our specific model in Section 2.5), in such a scenario, there should be a significant interaction

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effect of syntactic similarity (yes/no) and group (preference/dispreference), that is, the two participant groups should behave differently with regard to how they react to similar versus dissimilar partners.

In contrast, if linguistic similarity leads to people being perceived as more cooperative because of similarities on a superficial mechanistic level or because of being regarded as adapting their linguistic choices, the positive effect of linguistic similarity on cooperation partner choice was predicted to surface irrespective of whether participants have a natural preference for the variant used by their partners. Thus, the effect was expected to show up in both the preference and the dispreference group. In a logistic regression model, this corresponds to the predicted main effect of syntactic similarity without any interaction effects.

2. Methods

2.1 Procedure and experimental conditions

The experiment consisted of three phases that are described in more detail below: the preference testing phase, the interaction phase and the cooperation game (Figure 1).

2.2.1 Preference testing phase

The first phase, the preference testing phase, consisted of a single trial in which participants were shown a cartoon depicting a ditransitive event with an agent (e.g., a vet) lending an object (e.g., a hammer) to a recipient (e.g., a singer, Figure 2). In a forced-single-choice task, the participants had to choose from a set of four given

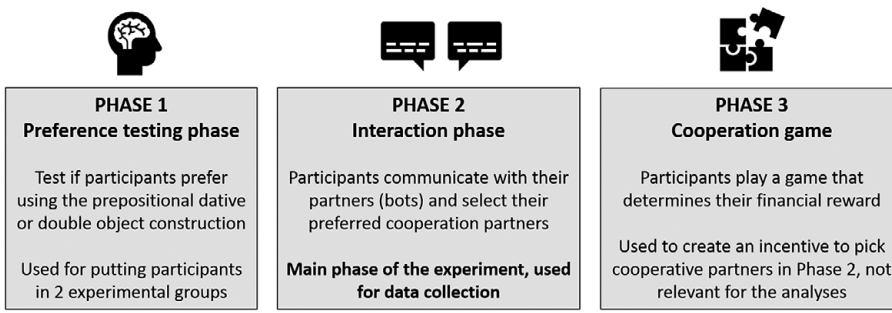

Figure 1. Overview of the experimental procedure.

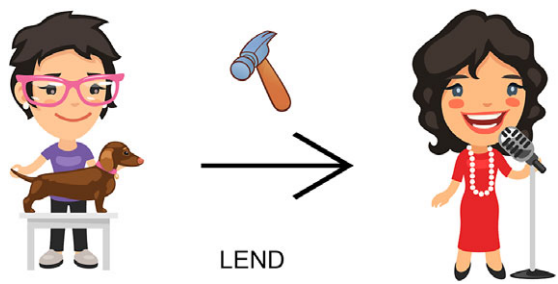

Figure 2. Example of a cartoon that participants had to describe in the experiment.

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sentences the one that, in their opinion, best described the picture. Two of the presented sentences were semantically correct but differed in the syntactic construction used to describe the ditransitive event: the prepositional dative construction (e.g., 'The vet lends the hammer to the singer') versus the double object construction (e.g., 'The vet lends the singer the hammer'). The other two sentences were semantically incorrect and served as distractors (e.g., 'The singer lends the hammer to the vet' and 'The singer lends the vet the hammer'). The order of the four presented sentences was randomized.

When the participants picked a semantically wrong sentence, they were told to revise their choice to a semantically correct one. This step acted as a training for the participants and highlighted the importance of choosing semantically correct options in the later stages of the experiment. When the participants chose one of the two semantically correct options, we recorded the chosen construction, that is, the prepositional dative or the double object construction, as the participants' preferred one. In the preference testing phase, 22 out of 100 participants chose the double object construction and 78 out of 100 participants chose the prepositional dative construction as their preference. This preference for a particular syntactic construction was used to assign the participants to one of two experimental groups (the preference group and the dispreference group) in the next step of the experiment, that is, the interaction phase (see details in Section 2.2.2).

In addition to measuring the participants' preference for a particular ditransitive construction, the preference testing phase also served the purpose of familiarizing the participants with the experiment. To the participants, this task was introduced as a 'training phase', that is, they were unaware that their grammatical preferences were determined during that phase.

2.2.2 Interaction phase

The second phase of the experiment, the interaction phase, consisted of 15 trials, each of which comprised a picture-description task followed by a partner choice task (cf. Branigan et al., 2000). In each trial, the participants described a cartoon showing a ditransitive event (Figure 3a) to other players that they believed to be other participants but that were in fact preprogrammed bots. The participants described the cartoon by choosing the semantically correct sentence from a set of four sentences, out of which three were semantically wrong distractors. In this task, one half of the participants, the so-called *preference group*, got to choose from sentences that described the picture with their previously determined preferred syntactic construction. The other half of the participants, the so-called *dispreference group*, got to choose from sentences that described the picture with the syntactic construction contrary to the one that they had picked in the preference testing phase (i.e., in the *dispreference group*, participants who preferred the prepositional dative construction got to choose from sentences using the double object construction, and vice versa).

To make the task more relevant for the participants, they were made to believe that their descriptions were used by the other players to identify the described picture in a set of many. After picture identification, the fictive players sent back their selected picture together with a description of the picture in their own words. To make it appear more plausible for the participants who they were playing with other human players and that there was some variation in their partners' answers, the fictive

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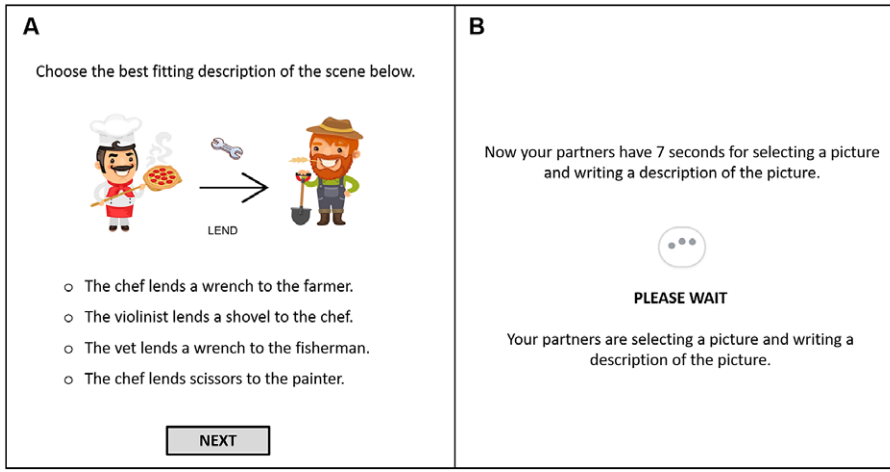

Figure 3. Snapshots of the experimental interface: (a) participants describe a cartoon and (b) participants wait for their fictive partners' response.

interaction partners had just 7 seconds to finish this task. Since it was crucial for our task that the participants believed that their interaction partners were typing their responses on their own, rather than selecting them from a list like the participants, we highlighted in the instructions that the partners were typing their responses in their own words and displayed a message saying 'Please wait. Your partners are writing a description of the picture'. during the waiting time of each trial. Additionally, we showed three moving dots that typically indicate typing in popular messenger services such as WhatsApp or Telegram (Figure 3b).

Finally, the participants were shown the selected pictures and written descriptions of two other randomly chosen fictive partners and picked their preferred partner for a subsequent cooperation game in a two-alternative-forced-choice task (Figure 4). They made their choices based on how well they thought the partners had performed in the picture identification and description task. The participants were made to believe that the program would automatically calculate their preferred cooperation partner across all 15 trials in this phase.

This partner choice task was our main task of interest and included our experimental conditions: the test condition, the control condition and the scam condition. In the *test condition*, one of the fictive interaction partners answered with a syntactic construction identical to the one used by the participant, and the other interaction partner answered with a syntactic construction different to the one used by the participant (six trials). Both partners had picked the correct picture and their answers were semantically correct. We randomized which construction was shown on the left and right sides of the screen. We predicted that in the test condition, the participants would choose the syntactically similar partner as their preferred partner for the cooperation game.

In the *control condition*, the two displayed pictures and sentences were identical (three trials with both partners using the double object construction, and three trials with both partners using the prepositional dative construction) and semantically correct. We predicted that in this condition, participants would choose their preferred partners randomly.

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Condition	Example	Prediction
Test		Participants will preferably select the aligned partner as a cooperation partner.
Control		Participants will select their preferred cooperation partners randomly.
Scam		Participants will preferably select the partner that chose the correct picture, described the correct picture and made no spelling mistakes.

Figure 4. Snapshots of the experimental interface in the three experimental conditions and respective predictions.

In the *scam condition* (three trials), only one of the fictive partners had picked the correct picture and replied with a semantically correct sentence, whereas the other fictive partner had selected a wrong picture, described the wrong picture, and replied with a sentence containing spelling mistakes. We predicted that in this condition, the participants would regard the semantically wrong partners that made spelling mistakes as inattentive and sloppy. Therefore, we expected that they would choose the semantically correct partner without spelling mistakes as their preferred cooperation partner in the scam condition. The scam condition was used to assess the participants' attention during the experiment.

The first trial was always a scam trial, and the presentation of all other trials was randomized. The order of cartoons was pseudo-randomized across conditions.

2.2.3 Cooperation game

To motivate the participants to choose cooperative partners in the interaction phase, they were told at the beginning of the experiment that, in the end, they would play a cooperation game with their preferred partner, the success of which would determine

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the exact amount of their financial reward for participation. Determining the exact amount of their financial reward was the only purpose of the cooperation game, and it was not relevant to any of our variables of interest. In the cooperation game, the participants and their fictive partners had to change the color of the 16 squares displayed on the screen by clicking on them. The fictive partner's moves in the game were preprogrammed, and the participant had to change the color of the remaining squares within 15 seconds to get an extra reward.

2.3 Participants and setting

We tested 100 participants (47 female, 45 male, 8 other; mean age: 35.15 ± SD 13.16 years), who were all native speakers of English. We did not make any restrictions regarding the variety of English used by the participants. The participants were recruited via the crowdsourcing platform Prolific and were rewarded with £ 1.0 for their participation. To increase the participants' motivation to choose their cooperation partners carefully, we provided an additional bonus payment of £ 0.5 for those participants who successfully completed the cooperation task within the set time limit of 15 seconds. A total of 57 participants succeeded and received this bonus payment.

For all participants, the experiment was administered via the experiment platform Labvanced (Finger et al., 2017). The participants received a link to the experiment and completed the experiment on their own devices. After the experiment, the participants completed a short questionnaire asking for information about their attention to their partners' language use and their reasons for their partner choices. At the end of the questionnaire, the participants were debriefed, cleared up on the fact that they had played with bots instead of real partners, and informed about the possibilities to receive further information about the study.

In total, the experiment lasted about 12 minutes per participant. The participants had the opportunity to drop out from the experiment at any time without consequences. The study protocol was approved by the Ethics Committee of the University of Vienna (reference number: 00569), and all participants gave their informed consent in accordance with the Declaration of Helsinki.

2.4 Stimulus material

The individual cartoon characters and objects were purchased from a commercial online cartoon database and then pasted together to create scenes depicting ditransitive actions. All characters were clearly identifiable by their professions and associated items in the cartoons (e.g., astronaut, architect or chef). All objects were common tools or household items. Thus, the participants were able to easily identify the correct descriptions of the scenes.

All scenes depicted actions in which a person transferred an object to another person. In order to minimize the influence of subcategorization bias, we queried the British National Corpus (Burnard, 2007) via Sketch Engine (www.sketchengine.eu/) for the occurrence of main verbs typically used in psycholinguistic studies (*give, hand, lend, loan, offer, post, sell, send, show* and *throw*) in either prepositional dative or double object constructions. Our query revealed that the ratio of the frequency of

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these two constructions is closest to 1 (185 prepositional datives and 259 double objects) for *lend*, which we subsequently chose as the main verb in our study.

2.5 Analyses

To analyze whether the participants' partner choices were influenced by the partners' syntactic similarity and by the participants' syntactic preference, we fitted a generalized linear mixed effects model (Baayen, 2008) with a logit link function (McCullagh & Nelder, 1989). *Condition* (with the levels 'test' and 'control') and *participant group* (with the levels 'preference group' vs. 'dispreference group'), as well as their interaction, were included as fixed effects into the model. Additionally, we included random intercept effects of *participant* and *pictured scenario* as well as random slopes of condition within participant and condition within pictured scenario in the model. The dependent variable in our model was whether the participants had chosen their partners according to our prediction (with the levels 'yes' and 'no'). Responses were coded as matching our prediction when the participants chose the aligned partner in the test trials and a randomly predefined partner in the control trials. The sample size of this model was 1200 data points (100 individuals tested on 2 conditions with 6 trials each), 637 of which were partner choice responses that matched our prediction. We used the *preference group* and the *control condition* as reference levels in the model. Additionally, to facilitate an easy interpretation of all effects, we report releveled models with the *preference group* and the *test condition* (Supplementary Table 1) as well as with the *dispreference group* and the *test condition* (Supplementary Table 2) as reference levels in the Supplementary materials. The model was fitted in R (version 4.2.1; R Development Core Team, 2018) using the function *glmer* of the R-package *lme4* (version 1.1-30; Bates et al., 2015).

To test the overall significance of *condition* (i.e., its main effect and its potential interaction with the *participant group*) on partner choice, we used a likelihood ratio test to compare our full model to a null model that did not include *condition* and its interaction with *participant group* but only the random intercepts of *participant* and pictured scenario (R function *anova*; Dobson, 2002).

To assess the goodness-of-fit of our model, we calculated the marginal and conditional R^2 values for our full model (Nakagawa & Schielzeth, 2013). The marginal R^2 (R^2_m) indicates the variance explained by the total of the fixed effects, and the conditional R^2 (R^2_c) indicates the variance explained by the total of the fixed and random effects. Thus, these measures assess the effect size of the full model. We calculated R^2_m and R^2_c using the *r.squaredGLMM* function from the 'MuMIn' package, using the 'theoretical' method (Barton, 2018).

We preregistered all hypotheses, study protocols and analyses, including provisional R files, on the Open Science Framework (preregistration date: December 20, 2022; https://osf.io/2qrnm/).

3. Results

The comparison of the full and null models revealed an effect of condition, participant group or their interaction on partner choice (likelihood ratio test: $\chi^2 = 34.69$, $df = 3$, $p < 0.001$; effect size for the full model: $R^2_m = 0.14$, $R^2_c = 0.41$). More precisely, the full model showed that the interaction effect of condition and the participant

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Table 1. Results of the linear mixed model exploring the effects of test condition and participant group on cooperation partner choice in a two-alternative-forced choice task. The table reports the estimated model coefficients (estimate), standard errors (SE), z-values (z) and p-values (p). Reference levels: preference group and control condition

Full model	Estimate	SE	z	p
Intercept	0.09	0.12	0.80	0.42
Condition_Test	1.75	0.38	4.65	< 0.001
ParticipantGroup_Dispreference	0.03	0.17	0.16	0.87
Condition_Test: ParticipantGroup_Dispreference	−2.43	0.49	−5.00	< 0.001

group was significant, which indicates that participants performed differently in the test and control condition, depending on whether they got to use their preferred syntactic construction or not (Table 1: model results). Specifically, as predicted, in the control condition, participants chose their partners randomly (Figure 5: 95% confidence intervals including 50% of choosing the predicted partner). In the test condition, the participants chose their partners significantly differently from chance (Figure 5: 95% confidence intervals do not include 50%). However, only participants in the preference group, that is, the participants who could use their preferred syntactic constructions, preferred the aligned partners as cooperation partners as we had predicted (95% confidence interval above 50%, ranging from 69.00% to 85.00%). In contrast, participants in the dispreference group, that is, those

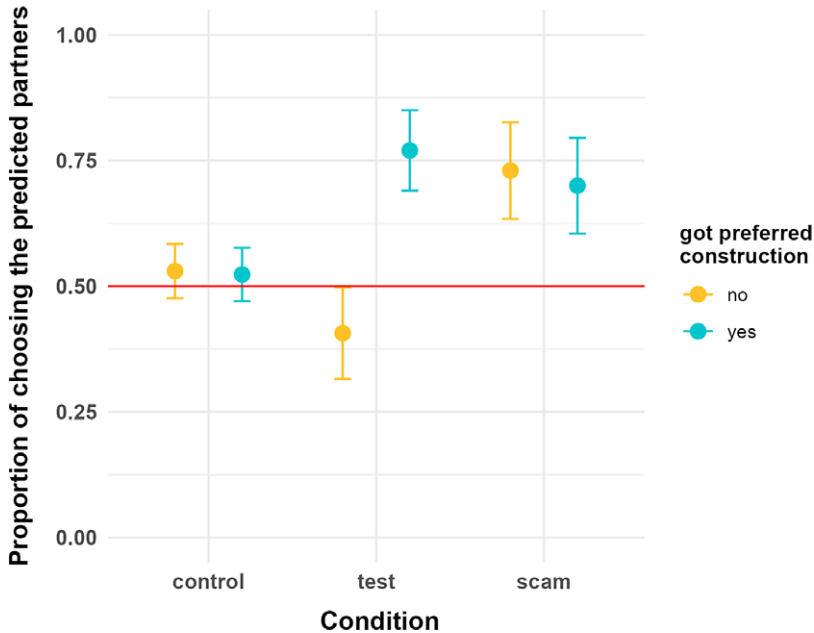

Figure 5. Proportions of choosing the predicted partner (i.e., the aligned partner in the test condition, a random partner in the control condition and the correct partner in the scam condition; see Figure 4) in the three experimental conditions. Points and whiskers indicate the mean and 95% confidence intervals of the participants' responses. Nonoverlapping confidence intervals indicate significant differences between the groups. Confidence intervals that do not overlap with the red line at y = 0.50 indicate significant differences from chance performance (Cumming & Finch, 2005).

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participants who were forced to use a syntactic construction different from their naturally preferred one, did not preferably choose the overtly aligned partners as cooperation partners (95% confidence interval below 50%, ranging from 31.53% to 49.80%). Instead, they chose to cooperate with partners who used a syntactic construction aligned with their personal preference.

In the post-experiment questionnaire, 89 participants reported to have paid attention, whereas 11 participants reported to not have paid attention to their partners' language. Additional exploratory analyses distinguishing between those two groups of participants can be found in Section 2 of the Supplementary Materials. In essence, the results for only those participants who paid attention to their partners' language are identical to those of the full set of participants, whereas no effects were revealed for the group of participants who did not pay attention to their partners' language. This suggests that paying attention to language may boost the observed effects; however, due to the low number of participants in the latter group, further research is needed to corroborate such speculation. The participants' individual comments on what they have noticed about their partners' language and on why they have chosen a particular partner can be explored in Section 3 of the Supplementary Materials and in our dataset uploaded to osf (for the link see Section 2.5).

4. Discussion

In this study, we focused on one aspect of the relationship between language and cooperation, namely the influence of linguistic similarity on cooperative partner choice: we tested whether structurally similar interlocutors were more often picked as partners in a cooperative game than those who were not similar. Overall, the results are in line with our prediction that syntactically similar communication partners are selected as cooperation partners more frequently than dissimilar ones. In addition, our results shed light on the reasons that might have led to those partner choice patterns.

In the preference group, where participants could communicate using their naturally preferred syntactic constructions, they chose the linguistically aligned interlocutor significantly more often as a cooperation partner than the nonaligned one. Since in real-life settings, people mostly use their naturally preferred constructions, this effect is likely to occur outside of experimental contexts. In contrast, in the dispreference group, where participants were forced to communicate using a dispreferred syntactic construction, they chose the nonaligned partner more frequently than the aligned one. There are certain contexts in which people use, or are forced to use, dispreferred constructions, for example, in contexts that involve status differences, such as the educational environment where students are often required to give up their preferred linguistic choices related to lexis and syntax to meet classroom standards (e.g., the use of double negation in English classes; Lee, 1986; Yu et al., 2022). However, in most situations and specifically informal interaction, on which this study was focused, people rarely use dispreferred constructions; hence, the results of the dispreference group are not directly transferable to most real-life settings but rather serve to understand what participants value more when making their partner choice.

In cooperative partner choice, interactants may prefer others who align on the level of linguistic representations, rather than those who only match their superficial linguistic behavior. Let us elaborate: In Pickering and Garrod's (2004) terms, alignment operates at the level of representations. That is, a particular event can be

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represented in a number of ways by interlocutors, for instance, as a double object event or as a prepositional dative one. Since half of our participants were forced to use the construction they did not prefer, the way they aligned with their interlocutors was not representational but purely behavioral in the sense that they used the description of an event of one type, but their actual representation of that event was likely to be different. This might have influenced their choice in the final part of the experiment: when presented with the choice of a representationally aligned versus behaviorally aligned partner, they opted for the former. Under this explanation, what really counts for interlocutors is actual representational alignment rather than superficial behavioral alignment on linguistic features that may result from priming.

This suggests that linguistic similarity in a single interaction can be interpreted as a reliable indicator of deeper general similarity (linked to alignedness, and possibly group allegiance – see Section 1.1), rather than as a potential signal of willingness to cooperate or even a first cognitive investment in the cooperation (linked to superficial behavioral alignment – see Section 1.2). Here, one interpretation could be that the potential benefits of in-group cooperation, such as reciprocity or behavior according to group norms (e.g., Dunbar, 1996; Hamilton, 1964a, 1964b; Henrich & Boyd, 2001), outweigh the potential benefits of initial investments, such as the signaled willingness to cooperate, to (superficially) adapt to the partner or to be integrated into a new group (e.g., Wacewicz et al., 2017).

Our results are in line with the results of modeling and experimental studies that investigated the role of egocentricity in the spreading of communication variants and referring labels. In a simulation that modeled the propagation of communication variants in a population, egocentricity – defined as the preference of self-produced over other-produced variants – turned out to have an inhibitory effect on the convergence of a population on the same communication variants (Tamariz et al., 2014). Similar results were obtained in experiments: participants tended to rely more on self-produced referential expressions than on other-produced expressions (Knutsen & Le Bigot, 2014) or prioritize information from their own perspective (Keysar et al., 2000), indicating the role of egocentricity in dialogue.

Our study comes with a number of limitations that should be addressed in future studies. Most importantly, our participants communicated with their partners via selecting sentences from a set of given options. While this has the advantage that communication is carefully controlled, participants might identify less with prespecified linguistic constructions than with descriptions that they write on their own. This may affect how emotionally engaged they are and how they interpret their partners' responses. Thus, to make the task more realistic, a future study could include conversations with an advanced AI-based chatbot, where participants can type individual picture descriptions manually. This would also take into account that participants' linguistic preferences may differ, depending on the picture they are describing. Additionally, such a study could include different double object verbs (e.g., *give*, *send* or *bring*) to broaden the generalizability and impact of the results.

In addition, a future study could focus on teasing apart the effects of alignedness and alignment in a more direct way, by testing communication in longer stretches of interaction. Although much more logistically challenging, such a study could investigate differences in cooperation partner choice between partners who are linguistically aligned from the start of the interaction (as a potential signal of group membership) and those who gradually align during the conversation (as a potential signal of a first investment and willingness).

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In general, investigations of alignment have received more attention (e.g., Branigan et al., 2007; 2010; Pickering & Garrod, 2004) than those of alignedness, let alone the comparison of those two types of linguistic similarity. The outcome of our study suggests that this comparison merits more research, both theoretical and empirical. For example, it is an exciting challenge to disentangle from the existing literature, particularly from the literature on the evolutionary roots of human sociality (e.g., Kenrick, 2012; Mesoudi, 2009; Van den Bergh, 2018), cultural markers of both linguistic similarity and dissimilarity. Experimental studies could then identify which elements of linguistic behavior, such as lexis, syntax or style, have the largest impact on the interpretation of alignedness and alignment. Another promising line of research is to investigate the relationships between linguistic and non-linguistic forms of alignedness and alignment in multimodal communication. Finally, alignedness in itself is also interesting from the perspective of the dynamics of converging on the same linguistic structures. It is possible that people who speak the same dialect or language or share beliefs might find it easier to align over the course of conversation compared with speakers who do not exhibit at least some initial alignedness. The influence of alignedness on alignment is a promising avenue for future studies.

5. Conclusion

Our study addresses the potential causal relationships between linguistic similarity and cooperation. An important aspect that our study contributes to the discussion is the finding that linguistic similarity promotes cooperative tendencies in humans. However, it is crucial to distinguish the underlying mechanisms how this similarity comes about: people seem to cooperate with those interactants who share their core linguistic representations rather than with those who are aligned on an incidental and superficial behavioral level. This opens up further avenues of research and has implications for gaining a better understanding of decision-making in groups, such as stakeholder decisions in diverse linguistic settings. Furthermore, this study can serve as a starting point for investigating potential (co-)evolutionary links between language and cooperation.

Supplementary material. The supplementary material for this article can be found at http://doi.org/10.1017/langcog.2024.27.

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