Event construal through social verbs in English and German: The LISADA corpus

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Abstract

How do people understand linguistic descriptions of inherently and potentially social events, such as *to meet* and *to dance*, and how do these interpretations align or differ across languages? To explore these questions, we developed an empirical database (LISADA), containing ratings for 240 verbs in English and German along two social dimensions: mutuality and jointness. While both languages show an overall positive correlation between these dimensions, hierarchical cluster analyses reveal meaningful within- and cross-linguistic differences. Through an exemplary test case, we demonstrate how these differences can provide insights into the linguistic and conceptual representations of social events, focusing on the role of morphosyntactic marking in event construal.

Keywords: social event cognition, linguistic construal, corpus, hierarchical cluster analysis, cross-linguistic comparison

Introduction

Humans are inherently social: Every day we meet other people, interact with them, and exchange various kinds of social cues. To successfully navigate this complex and constantly evolving social environment, we rely on a number of specialized cognitive and neural mechanisms that allow us to interpret socially relevant events within milliseconds and to detect *who does what to whom* (e.g., Hafri et al., 2013; Hafri et al., 2018; Papeo & Abassi, 2019; Pitcher & Ungerleider, 2021, Vestner et al., 2021).

Beyond these mechanisms, top-down influences, such as linguistic framing, play a crucial role in shaping how events are mentally construed (e.g., Misersky et al., 2021; Slivac et al., 2021; Sauppe & Flecken, 2021; Wittenberg & Levy, 2017). Specifically, language acts as a strong conceptual scaffold because it evokes representations that are rich with category-diagnostic sensory details (Lupyan, 2012). For example, describing Figure 1 as *two people dancing* versus *two people arguing* will strongly influence how the event is interpreted, particularly when the nature of an interaction is perceptually ambiguous.

Figure 1: An ambiguous social event (adapted from Papeo, Stein & Soto-Faraco, 2017). Are the actors dancing, or are they arguing?

Furthermore, event construal is not always tied to perceptual input, but can be based on language alone, requiring the comprehender to build a mental model of the event by drawing on available lexical and grammatical cues. Languages differ in their lexical and grammatical means and thus often emphasize distinct aspects of event structure (Boroditsky, 2006; Lupyan, 2012; Lupyan et al., 2020). There is considerable evidence showing that these linguistic differences influence how people mentally represent events (e.g., Papafragou et al., 2006; Papafragou et al., 2008; Trueswell & Papafragou, 2010; Von Stutterheim et al., 2012). However, how language affects the construal of social events specifically remains largely underexplored.

In this paper, we aim to address this gap by (a) exploring language-specific construal of social events and (b) investigating cross-linguistic differences that may guide it. For this purpose, we have developed a corpus of social event verb interpretation collected from English and German native speakers, focusing on two semantic dimensions of socialness: *mutuality* and *jointness*. To allow for meaningful baseline comparisons across languages, we probed construal of lexical translation equivalents in their infinite forms. Additionally, we report a case of application, where we analyze whether differences in morphosyntactic encoding between English and German influence how social events are construed along both dimensions.

Across languages, considerable variation can be observed in the syntactic expressions used to encode social relationships between participants. Most notably, some languages use reciprocal constructions to indicate mutual actions, while others allow for more ambiguous expressions that do not overtly specify the nature of the interaction. Consider, for example, verbs such as *admire*, *wash*, or *hurt*. In German, the sentence *Ida und Leo bewundern sich* is

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ambiguous because the anaphor *sich,* when combined with a plural subject, can be interpreted as either reciprocal or reflexive (Gast and Haas, 2008; Wiemer and Nedjalkov, 2007), allowing for both readings *Ida and Leo admire each other*, and *Ida and Leo admire themselves*. Thus, the sentence can represent a social event, involving a bidirectional action between at least two participants (Haspelmath, 2007; Haas, 2009; Lichtenberk, 1985), or it can describe two non-social events in which each subject acts independently on oneself (Nedjalkov, 2007). In contrast, English grammar requires reflexivity and reciprocity to be morphologically distinguished (Haas, 2009).

Another type of ambiguity arises within languages from the lexical items themselves: verbs like *play*, *walk*, or *dance* can give rise to many different event construals (Gleitman, 1965; Gleitman et al., 1996). For example, the sentence *Ida and Leo play* is ambiguous because it can refer to either a single interactive event (*Ida and Leo play with each other*) or two independent events (*Ida plays* and *Leo plays*). In other words, *play* can describe a social event involving coordination (Evans, 2008; Kemmer, 1993), or two non-social events in which the subjects engage in two parallel but independent actions. This type of ambiguity is not limited to English, but can also be observed in other languages, such as German.

Verbs can also be inherently symmetric (Haas, 2009; König & Gast, 2008; König & Kokutani, 2006) and exhibit bidirectional implications in their base form. These are verbs whose dominant or only sense is reciprocal, such as *marry*, *meet*, *argue*, or *share*. In English, such verbs do not necessarily require explicit reciprocal markers like *each other* when used with a plural subject; in German, however, only a limited number of these verbs allow for such an empty object position (e.g., *heiraten* 'marry'; König & Kokutani, 2006; Wiemer & Nedjalkov, 2007). Furthermore, German employs additional strategies for expressing reciprocity in social events, such as the use of the prefix *zusammen* ('together'). Examples include *zusammenstoßen* ('collide'), *zusammenarbeiten* ('cooperate'), and *zusammenprallen* ('clash'; König & Kokutani, 2006). The same prefix can also be used adverbially to express joint action, as in phrases like *zusammen spielen* ('play together').

As illustrated above, both grammatical and lexical distinctions shape how social events are construed from language. Considering the syntactic and morphological diversity both within and across languages, it is an open challenge to understand the event structures that native speakers have in mind when hearing descriptions of social events – whether ambiguous or not. Notably, a few studies have previously explored the *socialness* of words (e.g., Binder et al., 2016; Dieica et al., 2022, Troche et al., 2017), linking socialness ratings to unique aspects of word meaning that are distinct from other semantic constructs and can account for individual differences in lexical tasks.

Here, we report explicit ratings relevant to the encoding of social events that create a nuanced corpus of linguistic interpretation, the LISADA corpus (Linguistic Impact on Social Action construal Database) in both English and German. We extend the definition of socialness beyond the simple dichotomy of "social" versus "non-social" to distinguish between two key semantic components of social actions: mutual, reciprocal meanings (doing something to each other) and joint, collective meanings (doing something together). This distinction, which might capture distinct meanings relevant to the construal of social events, has not yet been systematically explored and may thus provide new insights into social event construal.

In addition, by collecting ratings in both English and German, we demonstrate how this corpus can be used for cross-linguistic comparisons, for instance, to gain a broader perspective on how grammatical distinctions influence the conceptual representation of social events. Specifically, we investigated German verbs that occur with the ambiguous marker *sich* and their English equivalents to determine whether this morphosyntactic ambiguity influences participants' judgments and increases disagreement among participants, both within and across languages.

English LISADA corpus

Participants

We recruited 141 self-reported native English speakers via Prolific. Participants were only included in the analysis if they met our inclusion criteria (see Procedure). Eighteen participants were excluded from the statistical analysis based on these criteria (9 in the mutuality, 9 in the jointness task; between-subjects design). The final dataset included 123 participants, distributed as follows: Mutuality Task (n=60; 31 female, 28 male, 1 other; M_{age}=37.68, SD=13.05 [range=18-67]); Jointness Task (n=63; 31 female, 31 male, 1 other; M_{age}=40.74, SD=13.37 [range=18-74]).

The study was approved by the Psychological Research Ethics Board of Central European University in Vienna, Austria, and conducted in accordance with institutional guidelines. Informed consent was obtained from all participants prior to participation.

Materials

The critical stimuli consisted of 240 English infinitive verbs selected from Levin (1993) and Nedjalkov and Geniušienė (2007). Only verbs that express potential social scenarios involving multiple participants were included.

We pre-classified the selected verbs into four types based on semantic and grammatical criteria for expressing mutuality and jointness (see Fig. 2). First, we considered whether verbs express events that are inherently social, i.e., necessarily involve multiple participants. If such inherently social verbs can express mutuality or jointness without explicit morphosyntactic markers (e.g., *argue*, as in *Ida and Leo argue*), we classified them as Type A verbs. If they occur

only with overt reciprocal markers (e.g., *greet*, as in *Ida and Leo greet each other*), we classified them as Type B verbs.

Verbs that do not express social events per se, but can potentially involve multiple participants, were classified as Type C verbs. These were further divided into two subtypes: Type C-Mutual verbs occur with reciprocal markers to express mutuality (e.g., *admire*, as in *Ida and Leo admire each other*), and Type C-Joint verbs occur with explicit morphosyntactic markers to express jointness (e.g., *dance*, as in *Ida and Leo dance together*). To achieve a balanced set of stimuli, we included 60 verbs for each verb type.

As attention checks, we included a set of 10 pseudoverbs created using Wuggy (Keuleers & Brysbaert, 2010) to match the subsyllabic structure and transition frequency of English verbs. All linguistic materials are publicly available at https://osf.io/xzdqc/.

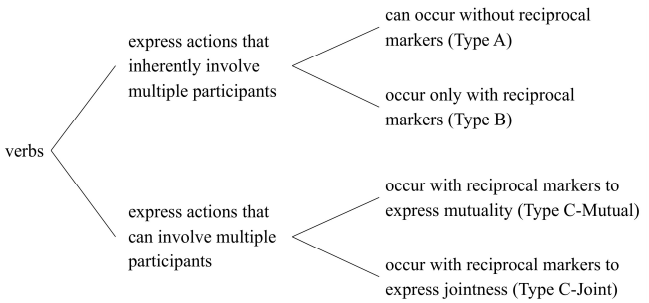

Figure 2: Types of verbs categorized in terms of number of participants and linguistic expression of mutuality and jointness.

Procedure

Participants were presented with verbs, one at a time, in the center of the screen. For each verb, they completed a forced-choice task to indicate whether the presented verb expressed a typically social or a non-social, independent action. Participants were tested in one of two tasks: In the Mutuality Task, they judged whether the presented verbs expressed a mutual or a self-directed action by selecting one of two response options: "to each other" or "to yourself." In the Jointness Task, participants judged whether the verbs typically indicated a joint action or an individual action. The response buttons said either "together" or "alone" (see Fig. 3 for illustrations of the task). In both conditions, participants were instructed to also pay attention to whether the verbs presented were real English words. If a pseudo-verb was presented, they could indicate this by clicking on a middle button labelled "not a word in English". The attention criterion was met if 8 out of 10 pseudoverbs were identified with no more than 2 false positives.

Participants completed a total of 250 trials (240 critical, 10 attention checks). The order of the trials was fully randomized for each participant. Conditions were tested in two separate experiments, programmed with PsychoPy and run on Pavlovia.org.

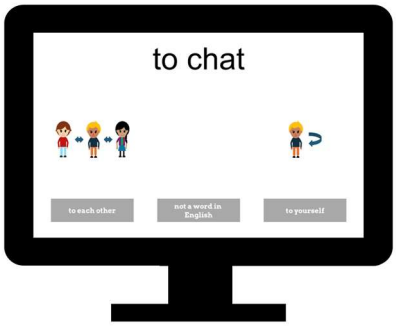

Figure 3: Example of a trial in the mutual condition.

Statistical analysis

To identify clusters of verbs grouped along the dimensions of mutuality and jointness, we performed a hierarchical cluster analysis (Borelli et al., 2018). Verbs were treated as clustering objects; the predictors, i.e., mutuality and jointness scores, were computed as overall means from the ratings of all participants, with values ranging from -1 (indicating low mutuality or jointness) to 1 (indicating high mutuality or jointness). For clustering, we used Ward's method as the linkage criterion and Euclidean squared distance as the distance measure. To determine the optimal number of clusters, we used three validation methods: the elbow method, the average silhouette method, and the gap statistic (Crowther et al., 2020; Kassambara, 2017).

To assess group differences within each dimension, we performed a non-parametric Kruskal-Wallis rank sum test, followed by post-hoc comparisons to examine differences between individual clusters. We also computed zero-order correlations between mutuality and jointness means, to confirm their relationship. All analyses were carried out in R (R Core Team, 2024).

Results

The cluster analysis revealed distinct groupings of verbs, with mean rating scores for mutuality and jointness in each verb cluster depicted in Table 1.

Collectively, the three validation methods yielded 4 clusters as the optimal solution (see Fig. 4). Cluster 1 included verbs with high mutuality and jointness, while the verbs in Cluster 4 were low on both dimensions. Clusters 2 and 3 included verbs with intermediate levels of mutuality and jointness, with Cluster 3 exhibiting the highest variability compared to the other clusters.

The Kruskal-Wallis test revealed significant differences between the clusters, both in terms of mutuality

Table 1: Mean mutuality and jointness scores for English verbs clusters. Standard deviation is reported in brackets.

Cluster	Mutuality score M (SD)	Jointness score M (SD)
1 (n = 58)	0.87 (0.11)	0.73 (0.14)
2 (n = 62)	0.63 (0.18)	0.14 (0.22)
3 (n = 44)	0.01 (0.22)	-0.317 (0.25)
4 (n = 76)	-0.67 (0.18)	-0.74 (0.15)

(H(3)=211.18, p<.001) and jointness (H(3)=211.74, p<.001). Follow-up comparisons of the mean ranks between clusters showed that each pair of clusters significantly differed on both measures. The relationship between mutuality and jointness was statistically supported by a strong positive correlation (Spearman ρ=0.92; Kendall τ=0.75).

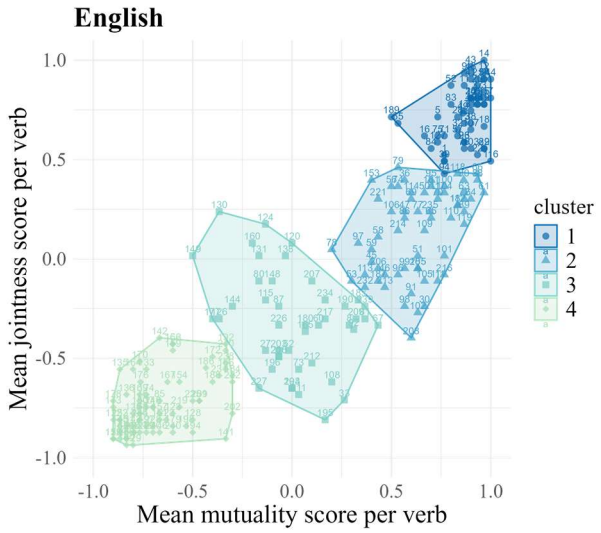

Figure 4: Scatterplot of the 4-cluster solution for English. Individual verbs are numbered from 1 to 240.

Discussion of the English LISADA corpus

In analyzing the database, we aimed to explore how English verbs cluster along mutuality and jointness. We found a strong positive correlation between the two dimensions. Verbs rated highly in mutuality also tended to receive high scores in jointness (Cluster 1, e.g., *to argue*, *to debate*, *to mingle*), while verbs rated low on mutuality also tended to score low on jointness (Cluster 4, e.g., *to find, to meditate*, *to write*). In these cases, where verbs were interpreted as either highly social or non-social, mutuality and jointness did not seem to highlight different nuances of socialness.

However, the two dimensions did not always converge: verbs in Cluster 2 exhibited intermediate levels of jointness but tended to score higher in mutuality (e.g., *to cheer*, *to gather*, *to speak*), while the reverse was true for Cluster 3. Here, verbs clustered around an intermediate level of mutuality, but scored slightly lower on jointness (e.g., *to avoid*, *to cheat*, *to observe*).

With regard to Clusters 2 and 3, one question is how to interpret intermediate levels of ratings. Since participants had to make a forced choice for each verb, intermediate mean scores are likely to result from disagreement between participants who chose one option and participants who chose the other. This disagreement could reflect flexibility in interpretation: participants may have imagined certain actions as both mutual and self-directed, or as joint and individual. In Cluster 2, verbs like *to cheer* could easily be construed as either joint or individual. However, when such actions were construed as social, they were more likely to be construed as directed toward others rather than toward oneself. In Cluster 3, verbs like *to avoid* were more likely to be construed as individual rather than joint. When asked about mutuality, participants were equally likely to rate them as mutual or self-directed. Thus, even if not jointly coordinated, some of these verbs may imply a certain relation to others, resulting in low jointness, but mixed mutuality.

Overall, differences between clusters underscore the subtle ways in which people interpret the socialness of an action, depending on whether they are asked about its mutual or joint aspects. To investigate cross-linguistic patterns, we developed an equivalent German LISADA corpus, allowing us to explore similarities and differences between the two languages.

German LISADA corpus

Participants

We collected data from 168 self-reported native German speakers, using the same recruitment platform, exclusion criteria, and ethical guidelines as in the English study. After excluding 29 participants with incomplete data and 18 who did not meet inclusion criteria (9 per task), the final dataset included 121 participants, distributed as follows: Mutuality Task (n=60; 30 female, 27 male, 3 other; M_{age}=36.63, SD=12.33 [range=21-72]); Jointness Task (n=61; 23 female, 32 male, 6 other; M_{age}=36.79, SD=11.95 [range=22-73]).

Materials, procedure, and analysis

Stimuli consisted of 240 German infinitive verbs that were translation equivalents of the English verbs. As in the English study, we included 10 German pseudoverbs, generated by Wuggy, as attention checks. The experimental procedure and statistical analysis were identical to those used above.

Results

The validation methods suggested 2 clusters for the German data (see Fig. 6), with the mean rating scores for mutuality and jointness in each verb cluster shown in Table 2.

Overall, verbs in Cluster 1 exhibited higher mean scores for both mutuality and jointness, while those in Cluster 2 exhibited lower mean scores on these dimensions.

The Kruskal-Wallis test revealed significant differences between the clusters in their mutuality (H(1)=173.47, p<.001) and jointness scores (H(1)=153.84, p<.001).

Table 2: Mean mutuality and jointness scores for German verbs clusters. Standard deviation is reported in brackets.

Cluster	Mutuality score M (SD)	Jointness score M (SD)
1 (n = X)	0.76 (0.23)	0.35 (0.40)
2 (n = X)	-0.52 (0.39)	-0.62 (0.31)

Like in the English LISADA corpus, mean mutuality and jointness scores were positively correlated (Spearman ρ=0.84; Kendall τ=0.65).

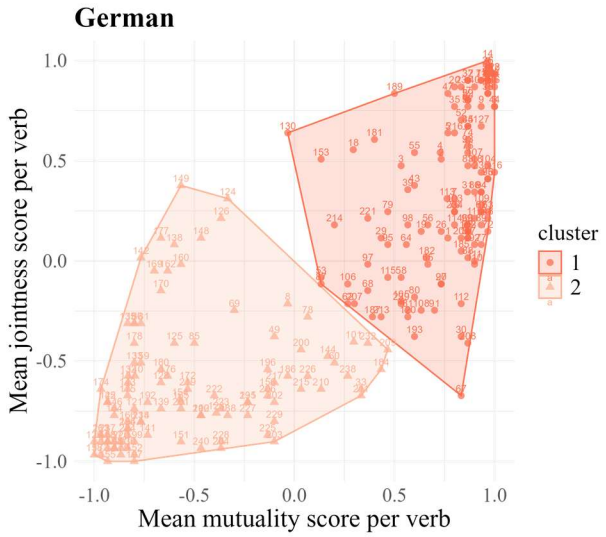

Figure 5: Scatterplot of the 2-cluster solution for German. Individual verbs are numbered from 1 to 240 (corresponding to numbers in Fig. 4)

Discussion of the German LISADA corpus

The German data largely replicated the overall pattern from the English corpus, with a positive correlation between mutuality and jointness scores. However, two important differences emerged: the German data showed fewer clusters and greater internal variability within these clusters. Thus, it appears that semantic distinctions along mutuality and jointness may be less categorical in German than in English.

Apart from more consistent mutuality scores in Cluster 1, there was considerable variability in the jointness dimension for both clusters and in the mutuality dimension for Cluster 2. This suggests a clearer agreement on the socialness of highly mutual verbs, while there is flexibility for other potentially social verbs and in the construal of joint actions. These results highlight that mutuality and jointness do not map directly onto each other, and thus their relevance for the construal of social action verbs.

Example of a cross-linguistic comparison

Although we found a positive correlation between mutuality and jointness in both languages, the cluster analyses revealed subtle differences in the conceptual construal of social events between them. In the following, we showcase how our database can be used to explore the nature of these nuances, by distinguishing different dimensions of socialness.

For example, once can examine the role of morphosyntactic marking in social event construal. In German, the marker *sich* is ambiguous between a reciprocal (mutual) or reflexive (self-directed) reading, whereas English uses different grammatical markers for each. This raises the question of whether ambiguous morphosyntactic marking increases variance within a language (i.e., between German *sich*-verbs and verbs that occur without *sich*), and across languages (i.e., between languages with and without ambiguous markers). To address this, we used confidence intervals (CIs) to assess the reliability of verb ratings, as they reflect the uncertainty of the estimated mean due to disagreement in participant responses (Cumming & Finch, 2001; Hazra, 2017).

Statistical analysis

We ran two exploratory series of nested regressions (Models 1ABC and 2ABC). As dependent variable, we coded the CI size ($CI_{UPPER} - CI_{LOWER}$) for jointness (Models 1) and mutuality scores (Models 2). The independent variable was incrementally refined across the nested models: Models A included language (English vs. German) as a predictor; Models B added occurrence with *sich* in German as a predictor (*sich* vs. no *sich*; in English, obviously, *sich* never occurs; the translation equivalent was coded based on the German property to assess whether there are conceptual similarities across languages); Models C added the interaction between both predictors to Models B.

Each model was fitted using a mixed-effects linear regression, with verb items as a random intercept. We compared nested models using likelihood ratio tests to evaluate model fit depending on increasing complexity.

Results

Results are depicted in Figure 6. For mutuality, CI sizes were slightly larger for English (M_{eng}=0.36, SD=0.12) than for German (M_{ger}= 0.33, SD=0.14) and *sich*-verbs (M_{sich}=0.36, SD=0.13) than verbs occurring without *sich* ($M_{no\text{-}sich}$= 0.32, SD=0.12). While this difference was more pronounced in English (M_{eng_sich}=0.38, SD=0.12 vs. $M_{eng\_no\text{-}sich}$=0.35, SD=0.12) than in German (M_{ger_sich}= 0.34, SD=0.14 vs. $M_{ger\_no\text{-}sich}$= 0.32, SD=0.15), the statistical analysis did

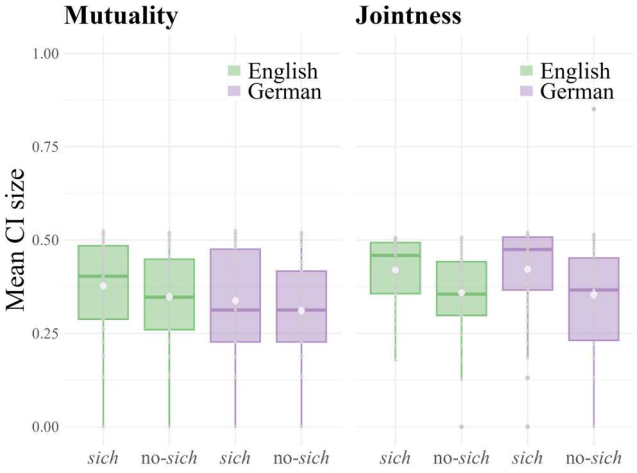

Figure 6: Comparison of CI sizes for mutuality and jointness scores between English and German. Box plots represent the distribution of CI sizes for individual verbs; light dots represent overall means.

notshow improvements for Model 2B (df=1, χ^2=2.67, p=0.10) or Model 2C (df=1, χ^2=0.31, p=0.58).

For jointness, CI sizes were comparable between languages (M_{eng}=0.39, SD=0.10 vs. M_{ger}=0.39, SD=0.13). However, *sich*-verbs had larger CIs than those occurring without *sich* (M_{SICH}=0.42, SD=0.10 vs. $M_{NO\text{-}SICH}$= 0.36, SD=0.11). This pattern was consistent across both languages (M_{eng_sich}=0.42, SD=0.09; M_{ger_sich}= 0.42, SD=0.11 vs. $M_{eng\_no\text{-}sich}$=0.36, SD=0.10, $M_{ger\_no\text{-}sich}$=0.35, SD=0.13).

Statistically, Model 1B (language + occurrence with *sich*) significantly improved model fit over Model 1A (language only, df=1, χ^2=24.30, p<.001), suggesting that the marker *sich* explains additional variance in CI size. Model 1C (language + *sich* + interaction) did not improve model fit over Model 1B (df=1, χ^2=0.28, p=0.59).

Discussion of cross-linguistic comparison

The cross-linguistic analysis suggests that jointness gives rise to two distinct conceptual categories. Specifically, verbs occurring with the marker *sich* in German showed more inter-participant variability in jointness ratings than those without *sich*. This difference was present in both languages, despite the lack of an equivalent grammatical marker in English. In contrast, *sich*-verbs did not show greater inter-participant variability along the mutuality dimension for either German or their English equivalents. Thus, *sich*-verbs appear to reflect existing conceptual distinctions in jointness, but, at least in the infinitive form, they do not encode ambiguity about mutuality.

Overall, these results suggest that the observed variance is rooted in conceptual rather than morphosyntactic factors. The cross-linguistic similarity in participants' judgments is also consistent with previous research showing that verbs rapidly activate conceptual knowledge about possible agents, patients, and instruments (Ferretti et al., 2011).

General discussion

The aim of this paper was to develop an empirical database (LISADA) on how native speakers of English and German interpret social event verbs, shedding light on language-specific construal. We collected participants' ratings on two dimensions of socialness, mutuality and jointness, to target a finer-grained conceptual distinction than previous work (e.g., Binder et al., 2016; Dieica et al., 2022, Troche et al., 2017) and to explore correlational patterns of these dimensions. Using two hierarchical cluster analyses, we identified different clustering patterns between the two languages. As expected, we found a strong positive correlation between mutuality and jointness in both languages, with nuanced differences between clusters depending on whether the focus was on the mutual or joint aspects of social actions.

English verbs formed four distinct clusters based on mutuality and jointness, while German verbs grouped into two clusters. German verbs also showed a weaker correlation between mutuality and jointness and greater internal variability within clusters, highlighting cases where these two dimensions do not map directly onto each other. In both German and English, some verbs followed a clear pattern: either highly social (i.e., high mutuality and high jointness) or non-social (i.e., low mutuality and low jointness). However, both datasets contained verbs that showed differences along these dimensions, scoring low on mutuality but high on jointness, or vice versa.

In both mutual and joint events, multiple participants perform the same action and play two roles in the event. The important difference is that in a joint event, each participant acts as an agent and a "companion" to the other; none of them serves as an object, as is the case in a mutual event (Kemmer, 1993). This distinction between mutuality and jointness has often been overlooked in linguistic research (as discussed in Evans, 2010; Haas, 2009), despite its potential relevance for understanding how social events are conceptually encoded across languages. Here we show that although mutuality and jointness are related, they capture distinct dimensions that play a role in the way social verbs are comprehended: as inherently social or as social depending on the question under discussion (mutuality, or jointness).

Furthermore, in this paper, we demonstrated the practical use of our newly developed database by conducting a cross-linguistic comparison of morphosyntactic encoding differences in English and German. Specifically, we investigated whether the German marker *sich* reflects conceptual ambiguity, influencing participants' judgments of certain verbs (i.e., verbs that occur with *sich* in German) and increasing participants' disagreement within and across languages. Our findings suggest that, across languages, the conceptual construal of *sich*-verbs leads to greater inter-participant disagreement when jointness is under discussion, as reflected in wider confidence intervals.

Cross-linguistic comparisons can reveal patterns of variability that may remain hidden when only one language is studied: while in German the greater inter-participant disagreement between *sich*-verbs and non-*sich* verbs may be mistakenly attributed to the occurrence with *sich* and its ambiguous meaning, this explanation falls short for English, which lacks this grammatical marker. Conversely, detecting and explaining the same pattern in English verbs would be difficult without the comparison to German. Taken together, both databases suggest that the observed variance is rooted in the conceptual construal of certain social events rather than in morphosyntactic factors – a finding that is also supported by our pre-classification of the stimuli: *sich*-verbs corresponded predominantly to Type B and Type C-Mutual verbs, while verbs without *sich* corresponded to Type A and Type C-Joint verbs. Further suitable analyses, such as vector semantics, should explore this distinction in more detail.

In summary, the LISADA corpus captures nuanced distinctions in the construal of social events, supporting cross-linguistic research and insights into language comprehension and social event cognition. While verbs typically occur in rich linguistic contexts, our corpus contains mutuality and jointness ratings based on isolated words. As such, it provides a basis for understanding event construal from lexical meaning and a starting point for future research.

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