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Context, precision, and social perception: A sociopragmatic study

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ABSTRACT

In two perception experiments we explore the social indexicality of numerical expressions, comparing the evaluation of three variants: precise (e.g. 'forty-nine minutes') vs. explicitly approximate (e.g. 'about fifty minutes') vs. underspecified (e.g. 'fifty minutes'). We ask two questions: (i) What constellations of social meanings are associated with each of these variants? (ii) How are such indexical associations modulated by the conversational setting? We find that the choice of approximate vs. precise forms differentially impact speaker evaluation along the social dimensions of Status, Solidarity, and anti-Solidarity, with underspecified numbers showing a flexible behavior. Furthermore, these associations are to some extent affected by the conversational setting, in particular the demands on descriptive precision placed by the context and the interlocutors' goals. These findings reveal an intimate connection between pragmatic reasoning and social perception, highlighting the importance of integrating pragmatic theory in the study of social indexicality. (Social meaning, pragmatic variation, social perception, numerals, (im)precision)*

INTRODUCTION

The study of the social meaning of variation has increasingly broadened its scope to include pragmatic variables—that is, variables whose different variants come with non-trivially distinct conventional meanings, and which can thus be defined as sharing a common discourse function (Dines 1980) or functional equivalence (Lavandera 1978). A recent line of work, in particular, has highlighted a principled connection between the socio-indexical value and the semantic and pragmatic properties of many linguistic phenomena, including intensifiers (Beltrama & Staum Casasanto 2021), determiners and demonstratives (Acton & Potts 2014; Acton 2019; Hunt & Acton 2022), modals (Glass 2015), rising declaratives (Jeong 2021), and exclusive particles (Thomas 2021).

This research paved the way for an integration of semantic and pragmatic analysis in the study of sociolinguistic variation, suggesting that a full understanding of

the dynamics whereby pragmatic variables become invested with social meaning crucially requires considering the subtle differences in semantic meaning between different variants, and how this content interacts with general pragmatic principles governing language use. In this article, we extend the investigation of the link between pragmatic phenomena and social meaning by asking the following: how is the social meaning of a pragmatic variable mediated by the broader conversational setting in which the different variants are deployed? The importance of this issue is motivated by two interrelated reasons.

First, pragmatic theories converge on the idea that the interpretation of an utterance crucially hinges on contextual reasoning—that is, it results from listeners integrating the utterance's conventional content with inferences drawn on the basis of the broader communicative setting, as well as the speaker's intentions. For example, uttering that someone 'has beautiful handwriting' would normally be taken as a compliment; yet, the same utterance would likely suggest a negative assessment if it were the sole content of a recommendation letter for an academic position (Grice 1975). It follows that investigating pragmatic phenomena requires a careful consideration of the context in which such phenomena take place; and that, by the same token, embracing the dynamics of pragmatic variation—and the social meaning that it takes on—entails situating pragmatic variables in the scenarios in which they are deployed, and in the expectations and constraints that such scenarios generate. Second, context-sensitivity is central to the construction and perception of social meaning, above and beyond pragmatic variation. Specifically, the emergence and circulation of indexical traits has been shown to be a situated enterprise, which is part and parcel of the specific practices that interlocutors are engaging in, the goals they are pursuing, and the setting in which they are operating (Ochs 1992; Eckert 2008, 2012; Podesva 2011; Levon 2014).

These considerations suggest that an adequate understanding of pragmatic variation requires an understanding of how the use and interpretation of pragmatic variables is informed and constrained by the communicative setting. In this article, we aim to shed light on this issue by focusing on the phenomenon of (im)precision, the level of granularity that a speaker resorts to when reporting a numerical value—for example, choosing to describe a forty-nine-minute-long trip as 'forty-nine minutes', 'fifty minutes', or 'around fifty minutes'. Based on evidence from two social perception experiments, we show that precise vs. approximate uses of numerals index distinct social meanings, but that these social meanings are crucially modulated by the communicative setting in which interaction takes place. We additionally show that the salience of the indexical contrast between precision and approximation is affected by the design of the study and the presentation of the experimental materials. Taken together, these findings highlight the importance of pragmatic reasoning and contextual expectations in informing the social meaning of (im)precision, raising important issues for the study of social meaning in connection to pragmatic variation and beyond.

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The article is divided as follows. We first review previous pragmatic and sociolinguistic research on (im)precision; we then present our experiments. Finally, we discuss the main findings from the studies and their broader implications.

(IM)PRECISION: A CASE STUDY

Imprecision as a pragmatic variable

Whenever describing things, speakers face the task of choosing how precise they want to be—especially when it comes to using numerical expressions. The outcome of this choice is not always one in which the most precise option is chosen; in fact, speakers often choose to be more approximate in their utterances, even when more precise information is available to them (see van der Henst, Carles, & Sperber 2002 and Gibbs & Bryant 2008 for evidence of the prevalence of rounding; see Lewis 1979, Pinkal 1995, Lasersohn 1999, Krifka 2007, Solt 2014, Burnett 2014, Aparicio Terrasa 2017, Klecha 2018, and Beltrama & Hanink 2019 for further discussion of imprecision). For example, in a context where a train schedule shows the trip from downtown to the local airport to take exactly forty-nine minutes, a speaker with full knowledge of this fact could conceivably pick among at least three different options: they can be maximally precise as in (1a); they can round off the time to the closest round number as in (1b); or they can explicitly use an adverb like *about* to signal that their description is approximate as in (1c).

(1) a. The trip to the airport takes forty-nine minutes.
b. The trip to the airport takes fifty minutes.
c. The trip to the airport takes about fifty minutes.

Logically speaking, all options in (1) have distinct truth-conditions. From a communicative perspective, however, each of them is an acceptable description of the relevant state of affairs: while (1a) is undeniably the most accurate characterization, many speakers would nevertheless consider uttering (1b), even if it is false when interpreted literally, or (1c), even if it is noticeably more vague. The reason behind this plurality of options is that speaking imprecisely may come with a range of benefits that can compensate for the loss in descriptive accuracy: it allows speakers to be briefer (Krifka 2007); it diminishes the risk of providing irrelevant information (Lasersohn 1999); it can have a face-preserving function, minimizing the speaker's risk of being seen guilty of faulty judgment (Ochs 1976); and it presents processing benefits for the listener (van der Henst et al. 2002; Solt, Cummins, & Palmovic 2017). This space of possibilities highlights (im)precision as an instance of a pragmatic variable, resulting from a trade-off between descriptive accuracy and the advantages of speaking imprecisely; to navigate this trade-off, speakers are eventually required to choose among multiple possible variants—that is, different precision levels—which can be construed as alternative strategies to perform the same communicative function, namely describing a state of affairs.

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When it comes to the dynamics with which interlocutors effectively navigate this trade-off, it has been observed that speakers do not calibrate the precision level of their utterance in a vacuum; rather, they do so by reasoning about the communicative context, and in particular the relevance that details have in it. For example, van der Henst and colleagues (2002) demonstrate that speakers are less likely to give a rounded answer to a request for the time when the hearer is perceived as needing a precise value (e.g. when they are setting their watch). Similar claims have been made for instances of (im)precision across different domains of the grammar (see Lasersohn 1999; Krifka 2007; Klecha 2018).

In addition to these pragmatic considerations, variation in precision has also been shown to be socially meaningful. Work in social psychology, for example, has shown that the use of sharp numbers—for example, 'forty-nine', commonly taken to be associated with high levels of precision (Krifka 2007)—boosts the perceived competence of the speaker in comparison to the use of round numbers, enhancing the perceived accuracy of quantity estimation (Welsh, Navarro, & Begg 2011) and the effectiveness of negotiators' first offers (Mason, Lee, Wiley, & Ames 2013) while making a company look more competent (Xie & Kronrod 2012) or a product sound more likely to deliver on its promise (Zhang & Schwarz 2011).

By contrast, products described in round numbers are perceived as more stable and performing for a longer time, suggesting that a lower level of precision can also have positive associations (Pena-Marin & Bhargave 2016). Turning to sociolinguistic investigations, Beltrama (2018) finds that speakers describing events by means of sharp numbers are rated more highly than speakers using round numbers along two distinct clusters of attributes. One cluster includes traits such as 'articulate', 'intelligent', and 'educated'—a set of qualities often grouped under the category of Status in the sociolinguistic literature (see Milroy & Preston 1999 inter alia). The other cluster includes attributes such as 'annoying', 'pedantic', and 'uptight'; these qualities indicate a less favorable evaluation in terms of the speaker's warmth and likability—a dimension of evaluation often referred to as Solidarity (see above). The upshot is that variation in descriptive precision emerges as a productive domain for the emergence and circulation of social meanings, similar to what has been argued for examples of detail-orientedness in other domains of speech—for example, phonetic hyper-articulation (Bucholtz 2001).

Completing the picture: Context-sensitivity and approximate variants

In light of these considerations, (im)precision emerges as an ideal variable for shedding light on the relationship between pragmatics, indexicality, and context sensitivity. In the remainder of the article, we explore this issue by focusing on two questions.

First, what is the range of socio-indexical traits linked to the choice of speaking more or less precisely? By comparing sharp and round numbers, previous studies

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contrasted the perception of a necessarily precise variant with a variant that is essentially underspecified for precision: while round numbers are indeed typically taken to be less precise than sharp ones, they are actually compatible with both imprecise and precise interpretations, making it difficult to know with certainty the level of precision at which they were interpreted in the experiment. Moreover, these studies only considered the dimensions of social evaluation that positively correlated with high precision, for example, the constellation of traits indexing high Status (e.g. 'articulate', 'intelligent') and low Solidarity (e.g. 'uptight', 'pedantic'). This leaves the question open as to what the indexical associations of necessarily imprecise variants such as about fifty minutes are, and whether these associations also include traits that positively correlate with explicit approximation/low precision—as opposed to with high precision. To this point, existing research suggests that the choice to use an imprecise form is in some cases motivated by hearer-based considerations, whether this be rounding to reduce the hearer's processing costs (van der Henst et al. 2002) or the use of hedges such as *about* as a politeness strategy (Brown & Levinson 1987). This raises the possibility that (potentially or necessarily) approximate variants may have the potential to signal an orientation towards the hearer's needs, which in turn could lead to a correlation with high Solidarity traits such as 'friendly' or 'likeable'—which were not directly tested in previous work.

Second, how is the perception of these social meanings mediated by the factors that underlie the choice of speaking more or less precisely? If this choice is impacted by aspects the conversational setting such as the hearer's precision needs, then we would expect that such factors will likewise affect the inferences that are drawn about the reasons behind the speaker's choice, and even about the properties of the speaker themself. This is particularly the case for approximate forms, which might be chosen for a variety of different reasons, from simple lack of precise knowledge to considerations of politeness or face saving, or a desire to facilitate hearer comprehension. Correspondingly, while in one context—say, a scientist presenting their research to a layperson (Dubois 1987)—the choice of an approximate form might signal Solidarity-related properties, in another—for example, an employee at an information desk providing train departure times—the same form might signal incompetence or uncooperativeness. As Beltrama's materials contained no information as to the broader setting in which the conversation was taking place, such factors could not be explored; these findings thus miss out on a fundamental pragmatic factor that is likely to condition the social meaning of precision.

We now present two experimental studies that explore these issues.

EXPERIMENT 1

In experiment 1 we test the social perception of numerical expressions by crossing two manipulations, Precision and Scenario, in a 3 x 4 design, leading to twelve different conditions. We now discuss each manipulation in detail.

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The Precision manipulation

As indicated above, work investigating the social meanings of numerals has typically contrasted 'sharp' numbers, necessarily interpreted precisely, with round numbers, which are not specified for the level of precision. This contrast, however, excludes numerical expressions that have a necessarily approximate interpretation, a crucial piece to attain a full representation of the space of pragmatic variation encompassing the use of numerals. We therefore test the following three expression types:

- An approximate variant, with a round number modified by an approximator *about* or *around*: for example, around fifty minutes.
- An unspecified variant, with an unmodified round number: for example, fifty minutes.
- A precise variant, with an unmodified sharp number: for example, forty-nine minutes.

The Scenario manipulation

The second manipulation involves the communicative context in which the numerical expression is used. Findings from the research discussed in the previous section provide a starting point for formulating hypotheses regarding which particular aspects of the communicative situation are likely to be relevant.

First, as noted above, van der Henst and colleagues (2002) observe that speakers are sensitive to hearers' precision needs when choosing between forms, rounding less frequently when they perceive their interlocutor to require more precise information. Assuming that hearers expect speakers to behave in this way, we predict that need for precision will likewise play a role in the associations conveyed by the speaker's choice among variants. When a high degree of precision is needed or expected by convention, it will be the benefits of precision that will be highlighted, leading to a more favorable evaluation of precise speakers, and a less favorable evaluation of approximate speakers, who might be perceived as uninformed or lacking confidence. An example of such a context is when the speaker is providing information 'for the official record' (e.g. testifying in court), where even small details might be important. But, when the situation is such that high precision is not relevant—for example, when two acquaintances are making small talk and nothing hinges on communicating precise information—we expect the benefits of approximation to be highlighted, and thus the choice of an approximate number to be evaluated favorably.

A second dimension relates to interlocutor goals. Recall that Beltrama (2018) found that precise variants themselves convey both high Status associations (e.g. 'intelligent') and low Solidarity ones (e.g. 'pedantic'). We hypothesize that which of these is more salient depends on the purpose of the discourse and the goals of the speaker. The Status associations are expected to emerge in situations in which this particular constellation of properties is especially relevant, that is,

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when the speaker's intelligence, knowledgeability, or credibility are at issue. Providing information for official purposes (e.g. in court) is again an obvious example; the above-cited research in marketing and social psychology suggests that another such case involves persuasive contexts (e.g. selling a product, negotiating). Conversely, we expect the low Solidarity associations of precise forms to be particularly salient in contexts where these are most incompatible with the goals of the interlocutors. For example, in a social setting where the focus is on building personal relationships, the possibility for precision to signal undesirable qualities such as 'uptight' is likely to be particularly pronounced. If, as suggested above, approximate forms have the potential to index Solidarity associations such as friendliness and likeability, we expect that this type of context will likewise be one where these are particularly salient.

Based on these hypotheses, we developed four types of communicative scenarios in which to evaluate precise versus imprecise variants, each of which is distinguished by different communicative goals and expectations for precision level.

- FOR THE RECORD: the speaker is providing information for official purposes, in a setting where it will be recorded—for example, testifying in court (Precision need: highest; speaker goal: providing information for the record).
- PERSUASION: the speaker is aiming to persuade their interlocutor(s) to take a certain course of action—for example, buy a car, propose a bill (Precision need: medium; speaker goal: persuasive).
- STRANGER: the interlocutors are strangers to one another who are making small talk in a public setting—for example, at a bus stop, on a commuter train (Precision need: low; speaker goal: making small talk).
- BONDING: the interlocutors are acquaintances or new colleagues in a social setting who are seeking to get to know each other better—for example, at a party or over a casual meal (Precision need: lowest; speaker goal: working on intersubjective relationship).

Methods

Each experimental item began with a sequence of two context sentences, the first describing the scenario and the second highlighting the interlocutors' goals in that scenario. Four versions of each item were developed, corresponding to the four scenario types described above. Following the context sentences, each item featured a target utterance, produced by one of the characters in the scenario. The utterance always contained two numerical expressions, each of which came in one of the three precision levels described above. An example of a full experimental item in all its possible twelve conditions is provided in (2).

(2) Sample experimental item
CONTEXT SENTENCES
a. FOR THE RECORD: A person is testifying in court as part of a lawsuit relating to the dysfunctional public transportation system in their area. It is crucial to be accurate.

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b. PERSUASIVE: A person is trying to persuade a town council member to propose a bill that would increase funding for public transportation in the area. The person is trying to make the most convincing argument possible.
c. STRANGER: A person is on a local commuter train, chatting with the stranger sitting next to them about public transportation in the area. They are just making small talk.
d. BONDING: A person is bonding with some new colleagues, commiserating with them about the poor public transportation in the area. They are enjoying hanging out together and getting to know each other better.

TARGET UTTERANCE

a. APPROXIMATE: 'Normally the trip to the airport takes around twenty minutes, but since the storm damage to the tracks last year it takes about fifty minutes.'
b. UNDERSPECIFIED: 'Normally the trip to the airport takes twenty minutes, but since the storm damage to the tracks last year it takes fifty minutes.'
c. PRECISE: 'Normally the trip to the airport takes twenty-one minutes, but since the storm damage to the tracks last year it takes forty-nine minutes.'

Six items of this form were created, each in twelve (4 x 3) versions. A variety of measures were included (e.g. durations, proportions, cardinalities); in all cases the items were designed such that it was plausible that the speaker would know the exact value.

Following each item, participants were asked to respond to ten evaluation questions about the speaker. Four questions pertain to the Status dimension: two of these scales—*intelligent* and *articulate*—had been shown to positively correlate with precision in Beltrama (2018); the other two—*confident* and *trustworthy*—were included building on the claim from the social psychology literature that they also correlate with high precision. Four scales—*friendly*, *cool*, *laid-back*, *likable*—pertain to the Solidarity dimension. As discussed above, we hypothesize that these should positively correlate with approximation. Finally, we include two attributes—*pedantic*, *uptight*—that, while also pertaining to Solidarity, express qualities that indicate a low rather than high value along this dimension. We thus group these attributes as part of the anti- Solidarity dimension; following the results from Beltrama (2018), we predict them to correlate with high precision. All scales included seven points. A full list is provided in Figure 1.

The twelve conditions were rotated into twelve lists with a partial Latin Square Design. Each list contained six experimental items (one per scenario): two items for each precision condition, and at least one item for each scenario condition. This ensured that all participants would see all variants of precision twice, and all scenario types at least once. Six fillers (50% of total trials) were also included, three of which were followed by a comprehension question.[1]

Participants

216 self-declared native speakers of American English (eighteen per list) were recruited on Amazon Mechanical Turk and compensated $2 to complete the study ($12/hour rate). Sixty-one participants were excluded due to failing at least one

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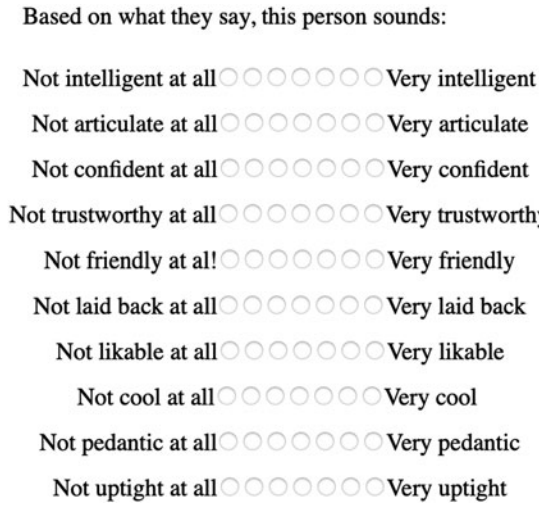

FIGURE 1. Evaluation scales. The scales were presented incrementally in a randomized order.

comprehension check. All participants provided informed consent approved by the Ethics Committee of the Deutsche Gesellschaft für Sprachwissenschaft (DGfS) in the context of SFB 1412 'Register'.

Results

Principal component analysis. Our first step was to assess whether the ten evaluation scales deployed in the study could indeed be grouped in the three categories of Status, Solidarity, and anti-Solidarity proposed above. We thus carried out a principal components analysis (PCA), with the goal of reducing multiple dependent variables (i.e. our attributes) to fewer underlying categories (i.e. factors). The PCA outcome, summarized in Table 1, suggests that our ten evaluation scales behave as predicted: they can be reduced to three factors (which account for 68% of the variance), and they are distributed across such factors in a way that by-and-large reflects our expected categorization. This can be seen by inspecting the factors loadings in the table,[2] which indicate the correlation between each attribute and each of the three factors: articulate, intelligent, confident, and trustworthy distinctively correlate with factor 1, which we take to correspond to Status; likable, friendly, cool, and laid-back distinctively correlate with factor 2, which we take to correspond to Solidarity; and pedantic and uptight distinctively correlate with factor 3, which we take to correspond to anti-Solidarity.[3] Loadings above 0.3 are highlighted in boldface.

Main analysis. For each of these three dimensions we fit a mixed-effects model with Precision, Scenario, and their interaction as fixed effects and random

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TABLE 1. *PCA factor loadings, experiment 1.*

Attribute	Factor 1	Factor 2	Factor 3	Commonalities
Articulate	**0.81**	0.09	0.12	1.1
Intelligent	**0.79**	0.16	0.05	1.1
Confident	**0.81**	0.15	0.07	1.1
Trustworthy	**0.71**	**0.33**	0.09	1.4
Likable	**0.41**	**0.74**	0.02	1.6
Friendly	**0.39**	**0.66**	0.02	1.6
Cool	0.24	**0.80**	0.09	1.2
Laid-back	0.09	**0.84**	0.10	1.1
Pedantic	0.08	0.10	**0.85**	1.1
Uptight	0.11	0.00	**0.86**	1.0
SS loadings	2.84	2.51	1.50	
Proportion variance	0.28	0.25	0.15	
Cumulative variance	0.28	0.53	0.68	

intercepts for Subjects and Items. The composite scores for each dimension were used as dependent variables.[4] Both factors were simple coded: each level was compared to a reference level, with the intercepts corresponding to the grand mean of all observations. As can be recalled, our investigation is driven by two goals: (i) comparing the indexical associations linked to numerals at different precision levels, and (ii) observing how these associations are affected by the communicative situation. To investigate the first question, we explored how, averaging across all Scenarios, variation in precision affected the social evaluation of the speaker. To this end, we adopted Approximation as our reference level, so as to be able to assess whether the evaluation of precise and underspecified variants differs from approximate ones. To complete the picture, we additionally carried out post-hoc comparisons between precise and underspecified variants—a comparison that could not be inferred directly from the model summary.[5] To address the second question, we tested for interaction effects involving Precision and Scenario. By virtue of placing the highest demands on precision, For-the-record was selected as reference for Scenario: interaction predictors in the model revealed whether the evaluations of our three variants were affected by moving from this scenario towards scenarios that placed lower demands on precision. To complete the picture, we explored the other possible interactions effects in the model by re-ordering our levels in Scenario and Precision—that is, by choosing a different reference level and assessing the contrasts that could not be extracted from the initial model summary.

The model summary is reported in Table 2.

We now discuss our findings for each dimension separately. We focus on the parts of the model output that are relevant to our questions: the effects of Precision (rows 2–3); and the interactions between Precision and Scenario (rows 7–12).

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TABLE 2. *Model summary: experiment 1. Reference level for Precision: Approximate; Reference level for Scenario: For-the-record. Intercept: grand mean.*

		STATUS			SOLIDARITY			ANTI-SOLIDARITY		
	LEVEL	*β*	SE	*p*	*β*	SE	*p*	*β*	SE	*p*
1	Intercept	4.94	0.09	<.001	4.47	0.09	<0.001	4.21	0.09	<0.001
2	Underspecified	0.10	0.05	0.05	−0.08	0.05	0.13	0.08	0.06	0.17
3	Precise	0.15	0.05	<0.01	−0.19	0.05	<0.01	0.27	0.06	<0.001
4	Persuasive	0.09	0.06	0.15	−0.06	0.06	0.31	−0.05	0.17	0.45
5	Stranger	−0.04	0.06	0.52	0.20	0.06	<0.01	−0.16	0.07	<0.01
6	Bonding	0.04	0.06	0.52	0.03	0.06	0.55	−0.08	0.07	0.28
7	Undersp.*Pers	−0.05	0.17	0.73	0.04	0.18	0.81	0.22	0.21	0.28
8	Prec.*Pers	−0.24	0.17	0.15	0.06	0.18	0.71	0.00	0.21	0.97
9	Undersp.*Stran	−0.08	0.16	0.60	0.19	0.17	0.25	0.27	0.19	0.16
10	Prec.*Stran	−0.24	0.16	0.13	0.17	0.17	0.32	0.17	0.20	0.38
11	Undersp.*Bonding	−0.03	0.16	0.83	−0.11	0.17	0.52	0.47	0.20	<0.05
12	Prec.*Bonding	−0.38	0.15	<0.05	0.03	0.17	0.85	0.30	0.19	0.11

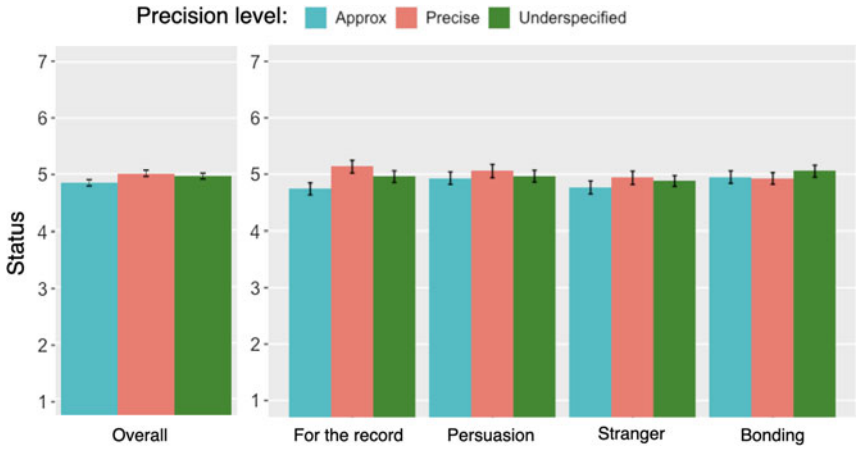

FIGURE 2. Experiment 1: Status ratings. Error bars indicate standard error.

While we do report effects of Scenario in Table 2 (rows 4–6), we do not discuss these effects further, since we are not concerned with investigating the impact of Scenario on social evaluation independent of precision.

Status. The average Status ratings are plotted in Figure 2.

As indicated by row 3 in Table 2, precise variants across scenarios (M = 5.01, SD = 0.95) were rated higher than approximate (M = 4.84, SD = 0.99) ones. Moreover, underspecified variants (M = 4.96, SD = 0.99) trended towards being rated higher than approximate ones (row 2). Finally, precise and underspecified numbers did not differ significantly, per the post-hoc analysis (t(759) = 1.00; $p = 0.57$).

In addition an interaction was found involving For-the-record vs. Bonding, reported in row 12: while the difference between precision and approximation is markedly large in For-the-record (Precise: M = 5.13; SD = 1.02 vs. Approximate: M = 4.74; SD = 0.97), it was not present in Bonding (Precise: M = 4.93; SD = 0.96 vs. Approximate: M = 4.95; SD = 0.96). No other interactions were found between Precision and Scenario.

Solidarity. The average Solidarity ratings are plotted in Figure 3.

As indicated by row 3, speakers using precise numbers (M = 4.37, SD = 1.08) were rated significantly lower in Solidarity than speakers using approximate ones (M = 4.58, SD = 0.99); approximate variants, however, did not differ significantly from underspecified ones (M = 4.49, SD = 1.00; row 2). Moreover, no difference was found between precise and underspecified variants, per the post-hoc analysis (t(759) = 1.89; $p = 0.14$).

No interactions were found between Precision and Scenario.

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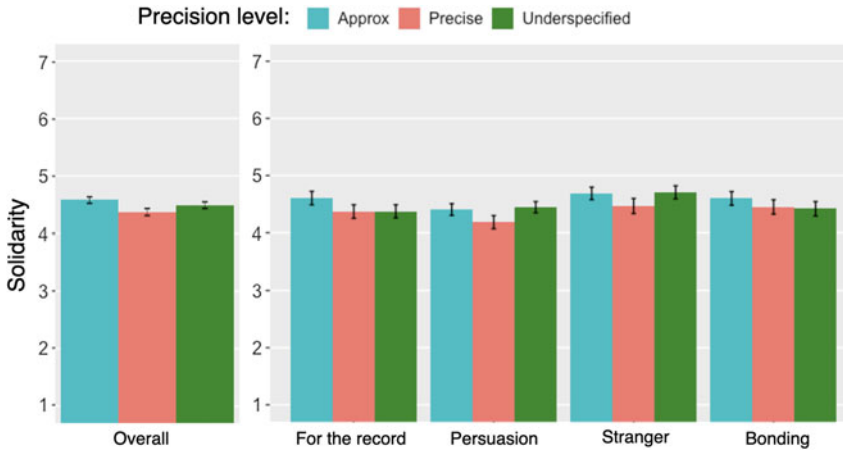

FIGURE 3. Experiment 1: Solidarity ratings. Error bars indicate standard error.

Anti-Solidarity. The average anti-Solidarity ratings are plotted in Figure 4.

Across contexts, speakers using precise variants (M = 4.37, SD = 1.22) were rated higher than speakers using approximate ones (M = 4.10, SD = 1.24; see row 3); however, underspecified variants (M = 4.19, SD = 1.24) did not differ from approximate ones overall (row 2). Finally, speakers using precise variants were rated significantly higher than those using underspecified ones, per the post-hoc analysis ($t(759) = 2.76$; $p < 0.05$).

Finally, we observe a significant interaction involving the approximate vs. underspecified variants in the For-the-record and Bonding scenarios (row 11): while, following the overall pattern, these two variants did not differ in For-the-record (approximate: M = 4.21; SD = 1.09; underspecified: M = 4.20; SD = 1.15), the underspecified variant (M = 4.37, SD = 1.24) was rated significantly higher than the approximate one (M = 3.98, SD = 1.33) in Bonding. No other interactions were found between Precision and Scenario.

Discussion

The findings from experiment 1 suggest three main takeaways.

First, the contrast between approximate and precise variants underlies all tested dimensions of social evaluation—and always in the expected direction: precise variants were associated with higher Status and anti-Solidarity ratings than approximate ones, consistent with the findings from previous work; moreover, approximate ones were associated with higher Solidarity ratings, revealing a further, previously untested dimension of the indexicality of this variable.

Second, the behavior of the underspecified variant with respect to the other two changes depending on the dimension of evaluation: underspecified numbers pattern

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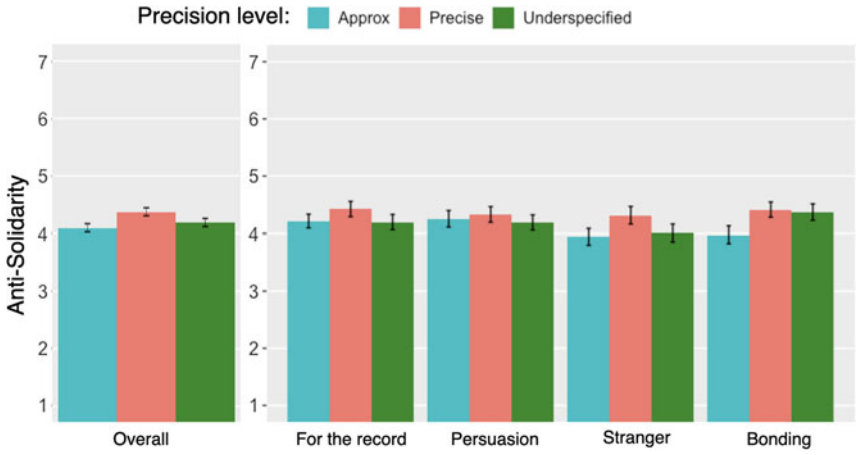

FIGURE 4. Experiment 1: Anti-Solidarity ratings. Error bars indicate standard error.

with sharp precise ones and against (to a marginally significant extent) approximate ones with respect to Status; they pattern with approximate ones and against precise ones along anti-Solidarity; and they are not clearly differentiated from either along Solidarity. These findings suggest that, for the purposes of social evaluation, round numbers were not treated on par with explicitly approximate ones, thus unveiling an additional level of complexity in the social meaning of these expressions that could not be detected by comparing sharp and round numerals alone.

Third, the indexical contrasts between variants of precision were partially affected by the communicative context. While Solidarity evaluations hold robustly across scenarios, those relative to Status and anti-Solidarity are subject to contextual modulation, revealed by the interactions between Precision and Scenario involving the Bonding and the For-the-record scenarios. In Bonding, we do not see the contrast in Status between approximation and precision, which is instead especially pronounced in For-the-record; however, in Bonding underspecified variants are (like precise ones) rated higher in anti-Solidarity than approximate ones—a contrast that is not observed in For-the-record (or in any of the other contexts). The nature of this modulation highlights a connection between social evaluation and the communicative requirements and interlocutor goals of the utterance situation. When precision is needed the most, and when the speaker's competence and trustworthiness are at stake—that is, in For-the-record—the unfavorable effect of approximation versus precision on Status-related perceptions is especially pronounced. Conversely, when precision is needed the least from a pragmatic standpoint, and when likeability is more relevant than competence to the speaker's goals—that is, in Bonding—approximation does not have the unfavorable associations it has elsewhere, whereas the potential of other forms to convey perceptions of anti-Solidarity is heightened.

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Two puzzles emerge from these results. First, how should the fluctuating indexical profile of the underspecified variant be interpreted vis-a-vis the indexical opposition between precision and approximation? Our findings strongly suggest that explicitly approximate and round numbers cannot be treated on par from the standpoint of social evaluation; however, they also raise the question of what this result reveals about the social meanings of the three variants we tested. Before addressing this issue in detail (see *The indexicality of precision vs. approximation*), however, a further step is needed, namely to establish a firmer picture of the profile of the underspecified variant, in particular with respect to the Solidarity dimension. Contrary to what we observed for Status and anti-Solidarity, underspecified (round) numbers did not clearly separate from either approximate or precise ones on this dimension; however, it is worth noting that they nevertheless trend towards patterning in between them. This raises the possibility that one (and possibly both) of these trending differences might reflect an actual indexical opposition between underspecified and precise/approximate variants, which was simply not detected in the present experimental design. It is possible that an indexical distinction between the evaluation of round vs. precise/approximate numbers along Solidarity could emerge more clearly in an experimental setting that makes the precision manipulation more prominent to participants—and thus more likely to affect social evaluation.

The second puzzle concerns the observation that the indexical associations found in experiment 1 are by-and-large robust across scenarios, showing only a moderate effect of the communicative context.

By contrast, this finding could reflect the fact that the social evaluation of precision is indeed only marginally context-sensitive—that is, that it is affected by the conversational setting only in scenarios which place extremely high or low contextual demands on descriptive precision.

However, an alternative explanation remains open, once again suggested by methodological considerations: that the contrast between the different scenarios was not sufficiently salient to participants throughout the study—either due to the modality of presentation of the crucial contextual information, or to the nature of the design. Again, we believe that this distinction can be empirically tested by designing a study in which the differences between communicative contexts are made more prominent than they were in experiment 1.

To shed light on these issues, we conducted a second study which addresses the same central questions as experiment 1, but incorporates several methodological adjustments that allow us to tease out these possibilities.

EXPERIMENT 2

The goal of experiment 2 was to enhance the prominence of both the precision and the context manipulations, so as to be in a better position to interpret the puzzles raised from experiment 1. To this end, we implemented methodological modifications in three core areas.

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First, to boost the salience of the scenario manipulation, we presented the scenarios visually as well as textually, thus allowing for a more integrated presentation of contextual information and conversational content to the participants, and reducing the effort needed to track all of the relevant information. To keep the text as short as possible and invite participants to focus on the images, we refrained from providing an extended discussion of the issue and the speakers' conversational goals in the prose, framing the conversation as an exchange in which one interlocutor asks a question, with the target utterance provided as a response to this question.

Second, to enhance the salience of the precision manipulation, we shortened the target utterance: while it still included two instances of numerals, they were preceded by a much shorter preamble than in experiment 1, and thus could stand out more by virtue of taking up a larger share of the assertion. In addition, shortening the utterance made it possible to exclude lexical material that could have incidentally affected the evaluation of the speaker independently of the numerals, thus potentially diluting the effectiveness of the manipulation. Finally, the target utterance was also presented visually, via a speech bubble.

Third, the design was implemented in the form of a single item, full between-subject design—that is, a set up in which each participant only saw one trial. This made it possible to shorten the length of the study considerably, minimizing the risk of an attentiveness decrease throughout the experiment.

Methods

Using the online software Pixton, four different illustrations were created, one for each scenario. The scenarios were adapted from one corresponding item set in experiment 1.[6] In each scenario, two characters engaged in a conversation in which one person asked a question, and the other person responded with the target utterance.

The dialogue was presented incrementally over three separate frames: one in which both characters are silent; one in which one character asks the question; and finally, one in which the other character responds. The response utterance came in three conditions, corresponding to the three precision levels manipulated in experiment 1. Figures 5–8 illustrate the visual scenarios as well as the target utterance for the approximate condition.

The three different precision conditions for the target utterance are shown in (3).

(3) It used to be {twenty-one/twenty/around twenty minutes}, but now it takes {forty-nine/fifty/about fifty}.

After seeing the dialogue, participants were asked to rate the speaker of the target utterance on the same evaluation scales used in experiment 1. Finally, they were asked to respond to a comprehension question.

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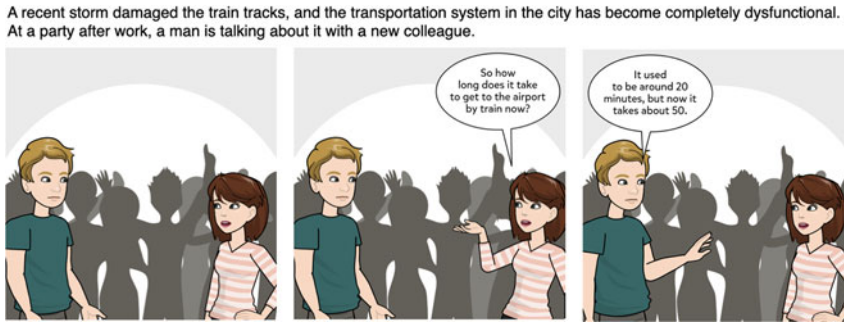

FIGURE 5. Experiment 2: Bonding scenario.

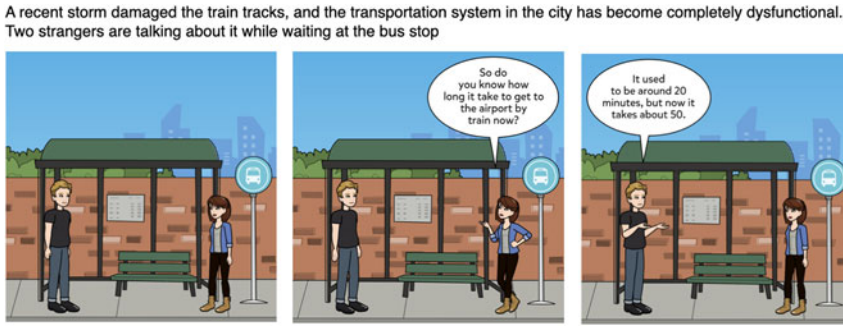

FIGURE 6. Experiment 2: Stranger scenario.

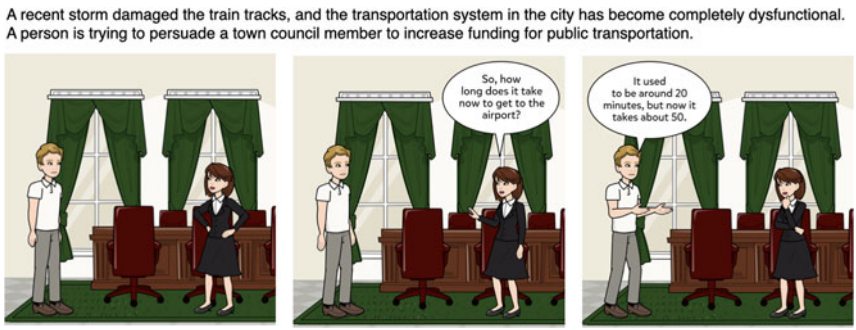

FIGURE 7. Experiment 2: Persuasive scenario.

Participants. 960 participants were recruited (eighty per condition) on Amazon Mechanical Turk. All participants provided informed consent approved by the authors' institution's Institutional Review Board. 150 participants were excluded due to failing the comprehension check.

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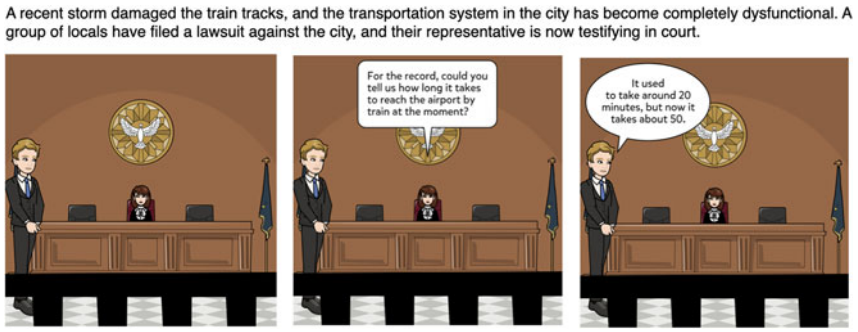

FIGURE 8. Experiment 2: For the record scenario.

TABLE 3. *PCA factor loadings: experiment 2.*

Attribute	Factor 1	Factor 2	Factor 3	Commonalities
Articulate	**0.84**	0.14	0.04	1.1
Intelligent	**0.81**	0.09	0.01	1.1
Confident	**0.80**	0.03	0.06	1.1
Trustworthy	**0.77**	0.28	0.05	1.4
Likable	**0.59**	**0.66**	0.04	1.6
Friendly	**0.58**	**0.56**	0.02	1.6
Cool	**0.44**	**0.67**	0.016	1.2
Laid-back	0.10	**0.84**	0.20	1.1
Pedantic	0.03	0.13	**0.87**	1.1
Uptight	0.3	0.28	**0.80**	1.0
SS loadings	3.52	2.11	1.48	
Proportion variance	0.35	0.21	0.15	
Cumulative variance	0.35	0.56	0.71	

Results

Principal component analysis. As for experiment 1, a PCA was performed on the evaluation scales. The factor loadings for each attribute are provided in Table 3 (loadings higher than 0.3 are highlighted in boldface). Similar to experiment 1, we conclude that the outcome indicated the ten scales can be reduced to three underlying factors (71% of the cumulative variance), and take factors 1, 2, and 3 to represent Status, Solidarity, and anti-Solidarity respectively.

Main analysis. As we did for experiment 1, we fit a linear model for each composite score with Precision level, Scenario, and their interactions as predictors. Given the one-item, fully between-subjects design, no random effects could be included. Again, Approximate and For-the-record were selected as reference levels for precision and scenario, respectively. To complete the picture

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of the precision effects, post-hoc pairwise comparisons were extracted using the same procedure followed in experiment 1; to complete the picture of the interaction effects, the same model was re-fit changing the reference level for Scenario. Again, we first report the summary of the models (Table 4) and then discuss the findings for each dimension separately.

Status. The average Status ratings are plotted in Figure 9.

As shown by row 3 in Table 4, precise variants (M = 5.16; SD = 0.82) were rated higher than approximate ones (M = 4.90; SD = 0.85); moreover, underspecified variants (M = 5.06; SD = 0.73) were also rated higher than approximate ones (see row 2), substantiating the near-significant trend from the previous study. Per the post-hoc analysis, precise and underspecified variants did not differ ($t(798) = 1.31$; $p = 0.34$).

In addition, an interaction between Precision and the Persuasive vs. For-the-record contexts was found (see row 7). While in For-the-record, consistent with the overall pattern, the underspecified variant (M = 4.84; SD = 0.74) did not differ from the precise one (M = 4.90; SD = 0.84), in Persuasive the precise variant (M = 5.23; SD = 0.74) was rated higher than the underspecified one (M = 4.98; SD = 0.81). No other interactions were found.

Solidarity. The average Solidarity ratings are plotted in Figure 10.

As shown by rows 2 and 3, precise variants (M = 4.15; SD = 0.97) and underspecified variants (M = 4.60; SD = 0.90) were rated lower than approximate ones (M = 4.84; SD = 0.85). Additionally, per the post-hoc analysis, precise variants were rated lower than underspecified ones ($t(798) = 2.54$; $p < 0.05$).

Moreover, following a re-ordering of the levels, an interaction was found between Precision and Scenario involving precise vs. underspecified ($\beta = 0.43$; SE = 0.21; $p < 0.05$): while in Stranger the contrast between the underspecified and the precise variant is especially pronounced (precise: M = 4.34; SD = 1.01; underspecified: M = 4.78; SD = 0.77), in For-the-record it is neutralized (precise: M = 3.88; SD = 0.95; underspecified: M = 3.89; SD = 0.71). No other interactions between Precision and Scenario were found.

Anti-Solidarity. The average anti-Solidarity ratings are plotted in Figure 11.

As shown in row 3 of Table 4, precise variants (M = 3.85; SD = 1.05) were rated higher than approximate ones (M = 3.49; SD = 1.13); no difference was found between approximate and underspecified (M = 3.59; SD = 1.14) ones (see row 2); and precise variants were rated significantly higher than underspecified ones, per the post-hoc analysis ($t(798) = -2.79$, $p < 0.05$). No interactions were found between Precision and Scenario.

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TABLE 4. *Model summary: experiment 2. Reference level for Precision: Approximate; Reference level for Scenario: For-the-record. Intercept: grand mean.*

		STATUS			SOLIDARITY			ANTI-SOLIDARITY		
	LEVEL	β	SE	p	β	SE	p	β	SE	p
1	Intercept	5.03	0.02	<0.001	4.46	0.03	<0.001	3.36	0.03	<0.001
2	Underspecified	0.16	0.06	<0.05	−0.27	0.07	<0.001	0.10	0.00	0.28
3	Precise	0.25	0.06	<0.001	−0.46	0.07	<0.001	0.36	0.09	<0.001
4	Persuasive	0.37	0.07	<0.001	0.21	0.08	<0.05	−0.05	0.11	0.07
5	Stranger	0.50	0.07	<0.001	0.65	0.08	<0.001	−0.16	0.11	<0.05
6	Bonding	0.36	0.07	<0.001	0.39	0.08	<0.05	−0.08	0.10	0.38
7	Undersp.*Pers	−0.50	0.19	<0.001	0.22	0.21	0.29	0.22	0.27	0.65
8	Prec.*Pers	−0.31	0.19	0.10	0.14	0.21	0.49	0.00	0.27	0.99
9	Undersp.*Stran	−0.16	0.19	0.40	0.17	0.21	0.25	0.27	0.27	0.70
10	Prec.*Stran	−0.26	0.19	0.18	−0.17	0.22	0.41	0.17	0.27	0.34
11	Undersp.*Bonding	−0.26	0.19	0.15	0.37	0.21	0.08	0.47	0.26	0.95
12	Prec.*Bonding	−0.22	0.19	0.23	0.14	0.21	0.48	0.30	0.26	0.26

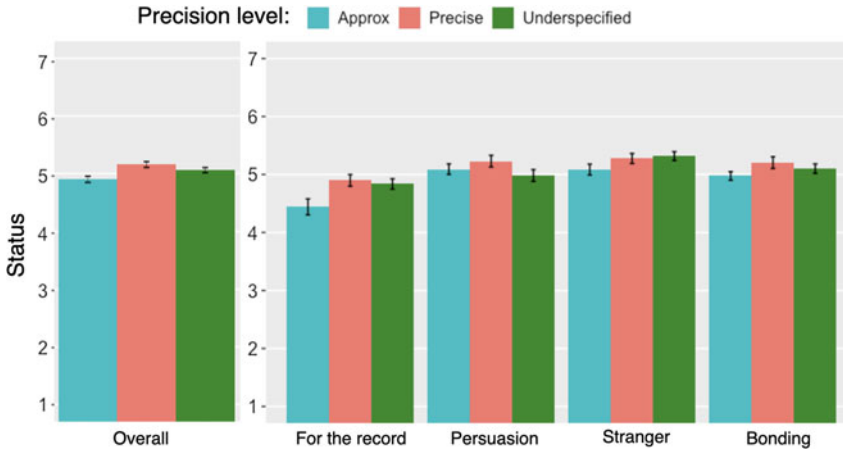

FIGURE 9. Experiment 2: Status ratings. Error bars indicate standard error.

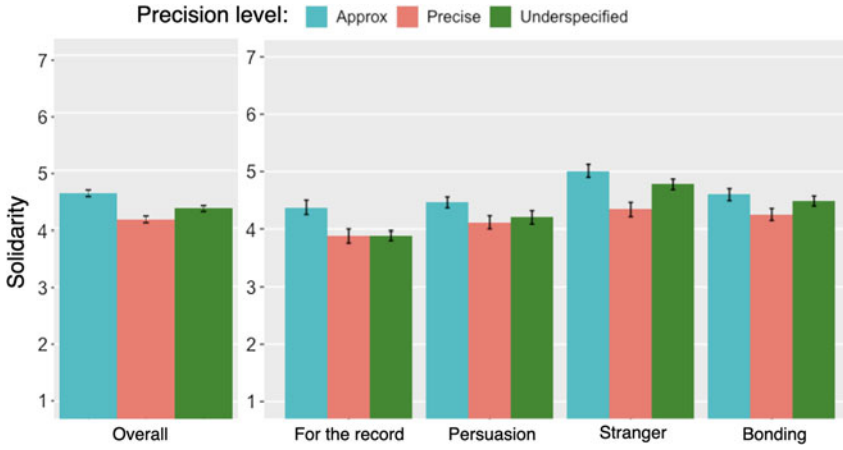

FIGURE 10. Experiment 2: Solidarity ratings. Error bars indicate standard error.

Discussion

The first finding of experiment 2 is that the overall indexical contrasts found in experiment 1 were replicated: approximate variants were confirmed to be perceived as lower in Status than both underspecified and precise ones, and higher in Solidarity than precise ones; furthermore, precise variants were again perceived as higher on anti-Solidarity than underspecified and approximate ones.

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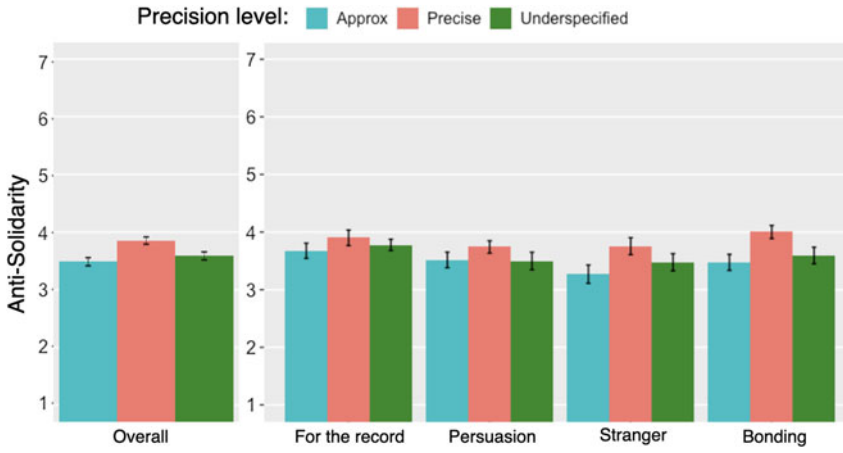

FIGURE 11. Experiment 2: Anti-Solidarity ratings. Error bars indicate standard error.

Beyond this, two further Solidarity contrasts emerged: underspecified variants were rated both lower than approximate and higher than precise ones. Notably, these contrasts were not detected in experiment 1, suggesting that the methodological modifications implemented in experiment 2 effectively made the precision manipulation more prominent.

Third, the social perception of numerals is once again, to a certain extent, modulated by the conversational context; however, the results from experiment 2 provide a different perspective on this modulation than those from experiment 1. Contrary to the prior study, no interaction between Precision and Scenario involving the For-the-record vs. Bonding contrast was found, but two novel interactions were unveiled. Specifically, we observe a Status preference for precise over underspecified variants in the Persuasion context, which is not seen in For-the-record (or in the overall pattern). This suggests that the Status correlation with precision is sufficiently robust to set sharp numbers apart from round ones in certain situations in which their use can serve as a resource for the speaker to establish credibility (i.e. the Persuasion context); quite strikingly, however, no difference in Status is observed between precise and approximate numbers in this context (see *The effect of context* below for further discussion). Moreover, the Solidarity contrast between underspecified and precise variants, found in the overall pattern, is especially pronounced in Stranger, but neutralized in For-the-record; this suggests that, in contexts that require high precision (e.g. testifying in court), the negative correlation between precision and Solidarity, while still present, is somewhat mitigated. In both cases, these results are by-and-large in line with our general predictions about the context modulation, pointing to an enhanced Status benefit and a reduced Solidarity penalty for precision in situations in which

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descriptive accuracy is contextually relevant. Yet, the absence of context modulation effects for the Bonding context, which were instead found in experiment 1, suggest that our efforts to make the context manipulation more prominent did not directly translate into more widespread or stronger context effects across the board.

GENERAL DISCUSSION

We now turn to a general discussion of our findings, addressing what they reveal about the social indexicality of (im)precision and modulation by the speech setting, and discussing their broader implications for the study of pragmatic variation.

The indexicality of precision vs. approximation: A (revised) overview

As discussed in above, previous studies on the indexicality of (im)precision could only yield a partial picture. First, they considered only two possible variants: sharp numbers, which are necessarily precise variants; and round numbers, which are underspecified for precision though typically taken to be imprecise. This leaves open the question of what the social indexicality of necessarily imprecise variants might be, and how these would differ from the other two. Second, they only considered dimensions of social evaluation that positively correlate with high precision, specifically Status and anti-Solidarity, raising the question of whether there are also indexical traits that positively correlate with low precision/approximation. Two findings from our study are especially relevant to shed light on these questions. The first one is that the contrast between explicitly approximate vs. explicitly precise variants—for example, about/around fifty minutes vs. forty-nine minutes—is highly robust: across both experiments, and for every tested social dimension, we always see a significant difference in the evaluation of these two variants. Crucially, such contrasts span three core dimensions of social indexicality: while precise variants are rated higher than approximate ones in Status and anti-Solidarity, approximate forms show a positive correlation with Solidarity dimensions. This suggests that the indexical opposition between precise and approximate variants includes not only attributes that positively correlate with the former, as already shown by previous work, but also attributes that positively correlate with the latter, thus allowing us to attain a more comprehensive picture of the social indexicality of (im)precision.

The second takeaway is that underspecified variants do not uniformly pattern with precise or approximate ones; rather, their relative status with respect to the other two depends on two factors. One—whose influence appears to be consistent across the two studies—is the dimension of evaluation: round numbers are rated higher than approximate ones and as high as precise ones in Status; lower than precise ones and as low as imprecise ones in anti-Solidarity; and higher than

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precise ones and lower than approximate ones in Solidarity in experiment 2, with a pattern trending in the same direction in experiment 1. The other factor, which is discussed more extensively below, is the communicative setting: while the indexical distinctions between the different variants are by-and-large robust across contexts, in certain scenarios round numbers pattern differently from one of the other two, while in others they do not. This flexibility suggests that, even though round numbers have been claimed in the pragmatics literature to normally receive an approximate interpretation (Krifka 2007; see above), they do not pattern consistently with explicitly approximate forms for the purpose of drawing social inferences, raising an intriguing puzzle: what does the flexible indexicality of the underspecified variant reveal about the social meanings of approximation vs. precision? We consider two possible interpretations, both of which are compatible with our results.

One view would hinge on the assumption that underspecified numbers, by virtue of being unmarked for either precision or approximation, can be construed as an indexically 'neutral' variant, and thus serve as a diagnostic to tease out which variant among precision and approximation is driving a particular indexical contrast. Specifically, whenever either precision or approximation patterns with underspecified and the other one patterns differently, this would indicate that the observed indexical distinction is driven by the differently-patterning variant—that is, the one that features the unique pragmatic trait that the other two do not possess. Accordingly, the fact that the underspecified variant patterns with the precise one and differently from the approximate one with respect to Status would suggest that this should be interpreted as an approximation-driven downgrade, rather than a precision-driven increase; that round numbers pattern instead with approximate ones and differently from precise ones in anti-Solidarity points to a precision-driven increase; and, finally, round numbers' different evaluation from both precise and approximate ones along Solidarity (see experiment 2) would indicate that both precision and approximation are contributing to the social meaning along this dimension, pulling in opposite directions and thus 'stranding' the underspecified variant in the middle.

This interpretation would align with similar patterns unveiled by previous sociolinguistic work on phonological variation—and in particular, by Campbell-Kibler's (2011) experimental study of the social meanings indexed by different variants of (ING). This investigation similarly hinges on a contrastive analysis between variants, comparing the commonly observed apical vs. velar realizations of (ING)—that is, -in vs. -ing—with a neutral, unmarked variant—implemented as a guise with (ING) tokens covered by white noise. In that study, consistent with what we observed in our experiments, neutral variants sometimes patterned with one variant and sometimes with the other, depending on the particular dimension of evaluation, leading Campbell-Kibler to propose that different variants of (ING) operate as independent, separate loci of social indexicality. Mutatis mutandis, the similarly fluctuating behavior of underspecified variants in comparison to precise vs. approximate ones could be taken to suggest that precision and approximation also introduce distinct constellations of social meanings, thus

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providing further support to the idea that, more generally, social indexicality should be seen as emerging at the level of individual variants, as opposed to the broader variables in which they are embedded (see Campbell-Kibler 2011 and Maddeaux & Dinkin 2017 for further discussion).

There is, however, an alternate possible interpretation that we would like to highlight: that round numbers, rather than simply being neutral, come with their own social indexicality—one that is as chameleonic as their pragmatic profile and that allows them to partake of the indexicality of both precision and approximation, depending on the situation. This possibility is worth considering because, in contrast to the neutral guise used by Campbell-Kibler to investigate (ING), round numbers are full-fledged, semantically contentful linguistic expressions: they are an option speakers may choose to describe the world, alongside precise and approximate ones. Accordingly, it might be the case that the underspecified character of round numbers itself—their amenability to being interpreted precisely or approximately, as observed in the pragmatics literature—crucially allows them to share some of the indexical features of the two other variants. On this view, precise variants could be seen as effectively leading to an upgrade in Status, and their lack of differentiation from underspecified ones would be explained by the fact that round numbers remain potentially amenable to being interpreted precisely, and could therefore have access to the same constellation of social meanings. The upshot is that, once the fluctuating behavior of underspecified numbers is linked to their flexible pragmatics, the social meanings of precision vs. approximation could still be seen as part and parcel of the same, overarching indexical opposition, rather than as contributing separate indexical constellations.

A possible avenue to adjudicate between these two views could involve exploring the indexicality of precise vs. approximate variants through the lens of a truly neutral variant—for example, one resulting from replacing round numbers with uninterpretable, blurred out tokens of numerical expressions, thus closely resembling Campbell-Kibler's (2011) white noise guises. If such neutral guises showed the same fluctuating behavior exhibited by round numbers in our studies, this result would crucially strengthen the support in favor of the first view presented here—namely that precision and approximation introduce orthogonal indexical constellations, which can indeed be teased out on a case-by-case basis by using the neutral variant as a diagnostic.

The effect of context

The other issue central to our study concerns how the evaluation of (im)precision is constrained by the speech setting. Our findings suggest that the interaction between the choice to speak precisely vs. approximately and the communicative context is indeed central to the indexicality of this variable, highlighting a principled connection between social evaluation and the conversational goals that the interlocutors are pursuing.

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Most instances of context modulation involved the For-the-record scenario. This setting affects social evaluations in two directions: it foregrounds the positive associations with precision, as evidenced by the especially marked Status edge of precision over approximation (experiment 1); and it conversely limits the unfavorable associations with precision, as indicated by the fact that, contrary to the overall pattern, precise variants are not rated lower in Solidarity than underspecified ones (experiment 2). Following our initial hypothesis, this pattern follows from the particular pragmatic profile of this scenario: it not only places the highest demand on descriptive precision—when providing information for official purposes, even minor details might be highly consequential—but also represents a situation in which Status-related attributes (e.g. intelligent, trustworthy) are likely to be especially relevant. Correspondingly, favorable associations are highlighted for the form (sharp numbers) that is maximally conducive to helping the speaker attain their conversational goals.

The Persuasive context was another one in which precision was expected to enhance the speaker's credibility and thus serve as a resource to convince the listener to take a particular course of action. Consistent with this, this context stood out in evoking a Status advantage for precise vs. underspecified variants (experiment 2), which was not found in other contexts. Yet, beyond this, no enhanced advantages for precision were found in this scenario; particularly notable, in fact, is that, despite the contrast between precise and underspecified numbers, precise and approximate ones do not differ along this dimension in experiment 2. While we do not have a full explanation for these patterns, one suggestive possibility is that the scenarios we developed differed in some crucial way from the persuasive situations described in the literature (e.g. negotiation, advertising), making it difficult to replicate the observations from that literature; for instance, the scenario in experiment 2 (persuading a town council member) might come with specific features, for example, the building of rapport between the interlocutors, that offset the Status-related advantages that might come with deploying descriptive precision for a persuasive effect.

In contrast, effects in the opposite direction were observed in the Bonding and (to a lesser extent) Stranger scenarios. Recall that these two scenarios were designed to place the lowest demands on descriptive accuracy. Furthermore, Bonding differs from For-the-record in that it highlights Solidarity rather than Status attributes as especially conducive to the speaker's goals, namely building interpersonal relationships. In line with this, the Status advantage of precision vs. approximation that is especially prominent in For-the-record (experiment 1) is neutralized in Bonding. Conversely, in both Bonding and Stranger, distinctions emerge on (anti-)Solidarity dimensions that are not observed overall or specifically in the For-the-record context: in Bonding, higher ratings for underspecified vs. approximate variants on anti-Solidarity (experiment 1); and in Stranger, a particularly pronounced precise vs. underspecified difference in Solidarity (experiment 2). These findings suggest that, when precision is the least necessary pragmatically, and when

likeability rather than competence is at stake, the potential for the choice between variants to convey indexical meaning relating to (anti-)Solidarity is enhanced, while the Status-related unfavorable associations of approximate forms are reduced.

While these patterns highlight the role of the conversational scenario in modulating the social indexicality of (im)precision, the effect of the conversational setting is limited, or at least less pronounced than expected, in two distinct ways. First, it largely involves the contrast between underspecified and precise/approximate variants, and only marginally that between precise vs. approximation ones. This suggests that the indexical opposition between these two variants is so central to the social meaning of (im)precision that it transcends the specifics of the interactional setting; pragmatic considerations about the interlocutors' needs and goals are instead more consequential with respect to relatively subtle distinctions between underspecified and precise/approximate forms.

Secondly, context effects do not emerge consistently across the two experiments. To some extent these differences likely reflect differing methodological choices with respect to how the context was represented, and the relative weight of contextual content vs. instances of the variable under investigation (see Hilton & Jeong 2019 for related findings). But these effects could also indicate that respondents were sensitive to subtle aspects of the test scenarios beyond those reflecting the intended manipulations, calling for further research into how the way in which contextual information is represented experimentally affects the social perception of a particular variant.

The broader picture

Looking at the broader picture, our findings highlight a tight connection between social meaning inferences, commonly explored in sociolinguistics, and inferences targeting the descriptive content of an utterance, typically investigated in pragmatics. Not only can the two be licensed by the same sort of expressions—for example, numerals; but also, and most importantly, they appear to be conditioned by similar contextual factors. For example, just they can be taken to index different social meanings depending on the informational demands of the context, round numbers are known to invite distinct pragmatic inferences as function of similar constraints: in response to the question 'How many people attended the meeting?', which invites an accurate description of the meeting attendance, an utterance of 'There were more than ten people at the meeting' tends to implicate that not more than twenty people were present; but this inference is less likely to arise when the question is 'Did at least ten people attended the meeting?', which merely requires the speaker to indicate whether a certain numerical threshold was met (Cummins, Sauerland, & Solt 2012). The emerging picture is one in which both social and pragmatic inferences are similarly grounded in interlocutors' reasoning about what communicative goals the speaker is aiming to achieve in a

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context, and what alternatives could have been deployed to fulfill that goal (see Beltrama 2020 inter alia for further discussion).

We take this connection to be central to the study of social indexicality in two related ways. First, it provides novel empirical support to recent endeavors aiming at formalizing social inferences via the same tools applied to descriptive ones (see Burnett 2017, 2019; Acton 2019). Second, it extends previous work at the interface of pragmatics and sociolinguistics (see INTRODUCTION), further delineating the link between pragmatic variables and social meaning as linguistically motivated—that is, as grounded not only in the sociohistorical dynamics at work in the world in which interlocutors operate, but also in the forces that govern information exchange at the descriptive/referential level, such linguistic forms' conventional meaning, and the reasoning through which this meaning is interpreted.

At the same time, observing an overlap between social and descriptive/pragmatic inferences should not be taken to mean that one of the two necessarily could, or should, be reduced to the other. In fact, much remains to be seen on how the pragmatic constraints explored above interact with the forces that underlie the emergence of social meanings across different domains of variation, and that are likely at play with pragmatic variables too. For example, it has been extensively shown that, over time and use, social meanings, through the enregisterment process, undergo a certain degree of crystallization, becoming widely available to members of a speech community above and beyond the specific contextual circumstances in which they originated (Agha 2005). On this view, enregisterment can be seen operating in the opposite direction of pragmatic reasoning—that is, as stabilizing indexical associations across situations, as opposed to modulating them from context to context. This raises a question that opens up an intriguing direction for further investigation: what is the division of labor between these two processes in determining the indexical value of a given pragmatic variable? We believe that this issue would be empirically testable via a similar approach to the one adopted here—that is, by exploring to what degree, in contexts that tend to suppress descriptive inferences, distinctions at the socio-indexical level are affected accordingly or alternately remain unchanged. For example, one could explore whether, in contexts that place an extreme pressure on descriptive accuracy and are thus likely to inhibit the pragmatic interpretation of round numbers as approximate, sharp and round numbers still maintain separate indexical profiles, which would highlight that the social meaning of the former has become enregistered to a significant extent; or whether their social meanings would also eventually overlap, further highlighting the role of pragmatic considerations as a leading force behind the indexicality of this particular variable.

As we leave these issues to future work, we see the approach developed here as a viable starting point to investigate phenomena that simultaneously involve different dimensions of meaning—and which are therefore best approached by bringing together distinct traditions in linguistics research.

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SUPPLEMENTARY MATERIAL

To view supplementary material for this article, please visit https://doi.org/10.1017/S0047404522000240.

NOTES

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[1]Method: Principal components with varimax rotation using the principal function in the R package psych (Revelle 2020).

[2]Note that some traits show a > 0.3 correlation for multiple factors: e.g. friendly/likable also correlate with Status; and trustworthy with Solidarity. However, the correlation is always stronger for one factor than the other (here, Status for trustworthy; Solidarity for friendly/likable); we take this to indicate that these traits primarily contributed to the factor with which they are maximally correlated.

[3]The scores for both experiment 1 and experiment 2 were also obtained via the Principal function of the R package 'psych'.

[4]Post-hoc analyses on the models were run with the emmeans package in R.

[5]This particular item was chosen due to its propensity to being represented visually. Responses to this item did not differ substantially from responses to other items in experiment 1.

[6]Note that friendly/likable, while highly correlated with Solidarity (as predicted), also correlate with Status.

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