PLURAL REFERENCE: ATOMIC INDIVIDUALS OR ASSEMBLAGE?

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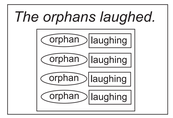
Topic

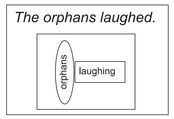
How does the human mind represent entities denoted by plural expressions (e.g., *the houses*, *most visitors of the museum*, *my cars*, *they*)?

Two Representational Views

- **Atomic-Individuals Representation**
  - + The atomic individuals are mentally kept apart.
  - + Each atomic individual is represented by a distinct token.

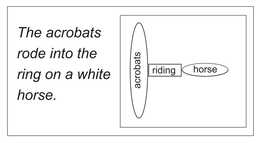


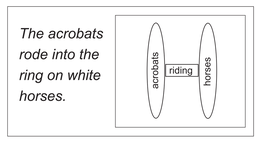
- **Assemblage Representation**
  - + The individuals are conceived of as an integrated whole.
  - + One token represents the whole assemblage.



Linguistic Observations

- **Collective Predicates**
  - + Example: 'to assemble' as in *The orphans assembled at the bus station.*
  - + Collective predicates are predicates that only apply to more than one individual.
  - → Collective predicates speak against atomic-individuals representations: There are only atomic tokens, none of which can take on the collective predicate.
- **Number marking of internal arguments**
  - + Example: *The acrobats rode into the ring on a white horse.*
    This sentence seems to describe a situation in which the acrobats together are sitting on one horse. If they are each sitting on a different horse, the appropriate sentence would be *The acrobats rode into the ring on white horses.*
  - → The predicate of a sentence with a plural subject NP (such as *The acrobats*) is taken to apply to the assemblage of individuals.
  - → Number marking phenomena speak for assemblage representations.





- **Partitioning Plural Expressions**
  - + However, *Most of the acrobats rode into the ring on a white horse* seems to describe a situation with several horses. The corresponding statement with a plural number marking (i.e., *Most of the acrobats rode into the ring on white horses.*) sounds odd, because it suggests that some acrobats rode on more than one horse.
  - → Partitioning plural expressions (e.g., *most of the acrobats*, *both*) seem to differ from non-partitioning plural expressions (e.g., *the acrobats*, *they*) with respect to predicate interpretation. With a partitioning plural expression, the predicate seems to be interpreted as applying to each of the atomic individuals separately.
  - → Partitioning plural expressions are linked to atomic-individuals representations.

Proposal

- A non-partitioning plural expression (e.g, *the orphans*, *they*) is used for and understood as denoting an assemblage.
- A partitioning plural expression (e.g., *most of the orphans*, *both*) is used for and understood as denoting atomic individuals.

This proposal was investigated in two experiments involving German participants. In both experiments, sentences containing the non-partitioning expression *sie* (*they*) were contrasted with ones containing the partitioning expression *beide* (*both*).

EXP 1: Predicate Interpretation

Participants were presented with two sets of sentences. In each set, the subject of the sentences was varied, being either *sie* (*they*) or *beide* (*both*). The participants were told in advance that the sentences always referred to two particular characters, Fritz and Maria.

SET 1 ("UNCONSTRAINED"):
The VPs of the sentences described actions that could in principle be performed by each of the characters alone as well as by the two characters together. For each sentence, participants were asked a particular "diagnostic" question that was designed to disclose whether they interpreted the predicate as applying to each character separately or to the assemblage of the two characters. In addition, participants were asked to rate the acceptability of the sentence on a scale from 1 (perfectly acceptable) to 5 (unacceptable).

Example

Stimulus Sentence	They brought a gift.	or	Both brought a gift.
Diagnostic Question	How many gifts were brought?		
Rating Task	How acceptable do you find the sentence?		

Scoring of the Responses to the Diagnostic Question:

"one"	Interpretation Score = 1 (Assemblage Only)
"one, maybe two"	Interpretation Score = 2 (Assemblage Preferred)
"either one or two"	Interpretation Score = 3 (Ambiguous)
"two, maybe one"	Interpretation Score = 4 (Atomic-Individuals Preferred)
"two"	Interpretation Score = 5 (Atomic-Individuals Only)

Predictions
- + With *they* as subject, the response to the diagnostic question indicates an assemblage interpretation, with *both* as subject it indicates an atomic-individuals interpretation.
- + Sentences that are interpreted according to the predictions are rated as more favorable than sentences interpreted contrary to the predictions.

Results
- + Interpretation scores were significantly lower with *they* ($\bar{x}$ = 1.4) than they were with *both* ($\bar{x}$ = 3.5) [t1(59) = 17.5, t2(8) = 4.8; p < .01].
- + For Interpretation Category "Assemblage Only", *they*-sentences were rated as more favorable than *both*-sentences [t1(103) = 4.69, t2(16) = 2.98; p <. 01]. For "Atomic Only", in contrast, *both*-sentences were rated as more favorable [t1(66) = 4.03, p < .01; t2(12) = 1.37, p <. 10 (one-tailed)].

Mean Acceptability Ratings as a Function of Pronoun and Interpretation Category

	sie (they)		beide (both)	
Interpretation Category	Acceptability	n	Acceptability	n
1 Assemblage Only	1.41	212	2.12	79
2 Assemblage Preferred	2.04	21	2.07	14
3 Ambiguous	2.57	9	2.93	9
4 Atomic Preferred	2.67	7	1.98	15
5 Atomic Only	3.18	11	1.97	147
Mean (unweighed)	2.38		2.21	

Conclusion
With *they* as subject, the predicate is interpreted as applying to the assemblage of the two characters, with *both* as subject it is interpreted as applying to each of the characters.

SET 2 ("CONSTRAINED"):
The VPs of the sentences described actions that could only be performed by the two characters together. Acceptability ratings were recorded.

Example

Stimulus Sentence	They met at the cinema.	or	Both met at the cinema.
Rating Task	How acceptable do you find the sentence?		

Predictions
Acceptability ratings are more favorable with *they* than with *both* as grammatical subject, because the predicate can only apply to assemblages, not to atomic individuals.

Results
They-sentences were rated as more favorable than *both*-sentences [$\bar{x}$ = 1.3 vs. $\bar{x}$ = 2.1; t1(59) = 9.33, t2(8) = 4.41; p < .01].

Conclusion
Both, in contrast to *they,* is interpreted as referring to atomic individuals, and combinations of *both* with a collective predicate therefore receive "bad" acceptability ratings.

EXP 2: Anaphor Resolution

Hypotheses
- + If a non-partitioning expression (e.g., *they*) refers to individuals that were introduced separately, then the reader needs to group the individuals in order to set up the assemblage token. Assuming that grouping is easier when the individuals have more in common, the degree of commonality should have an impact on the resolution of *they*, unless the appropriate assemblage token has already been set up before.
- + A partitioning plural expression (e.g., *both*) does not require grouping, and a commonality effect is therefore not expected for these kinds of expressions.

Method
Participants read narratives, sentence by sentence, self paced. In each narrative, two characters were introduced separately, and the degree of commonality among them was varied (in terms of place and goals of actions). Subsequently the two characters were referred to by either *they* or *both* in the "first-anaphora sentence", and then always by *they* in the "second-anaphora sentence" (see sample story in next column). The reading times for the anaphora sentences were measured.
Design: 4 (degree of commonality) x 2 (condition: they-they vs. both-they) x 2(sentence: first- vs. second-anaphora sentence).

Predictions
- + The degree of commonality affects the reading times of the first-anaphora sentence in the they-they condition, and of the second-anpahora sentence in the both-they condition (because in both cases the reader needs to group the characters in order to set up the assemblage token).
- + The degree of commonality does not affect the reading times of the first- anaphora sentence in the both-they condition (because no assemblage token is being set up), nor the reading times of the second-anaphora sentence in the they-they condition (because the assemblage token is already available from processing the previous sentence).

Sample Story

Setting	Mary is doing the dishes in the kitchen. She wants the apartment to look as nice as possible for the house warming party that will be held in the evening.
Different Goal / Far	Harry cannot help with drying the dishes because he promised his colleagues that he would bring some cookies to tomorrow's meeting at work. He is currently on his way to the bakery to buy the cookies.
Same Goal / Far	Harry is currently buying some fresh cookies for the party at the bakery. On the way, he also does some shopping for tomorrow's meeting at work
Different Goal / Close	Harry cannot help with drying the dishes because he promised his colleagues to bake some cookies for tomorrow's meeting at work. He is currently taking the cookies out of the oven.
Same Goal / Close	Harry made some cookies for the party and is currently waiting for them to get finished so that he can take them out of the oven. While he is waiting, he dries the dishes.
1st Anaphor	They/Both are enjoying the new apartment.
2nd Anaphor	They are curious if the guests will like the apartment, too.

Results
The 3-way interaction of commonality, pronoun, and sentence was significant [F1(3,168) = 3.30, p < .05; F2(3,45) = 2.84, p < .05]. Breaking up the interaction yielded an effect of the degree of commonality on the sentence reading times in the following conditions:

Effect of Commonality on the Sentence Reading Times

	Anaphora Sentence	
Pronouns in Anaphora Sentences	First	Second
They ... . They	p < .05	ns
Both ... . They	ns	p < .05

Discussion
The results correspond to the hypotheses. The degree of commonality has no impact on the resolution of *both*, but does affect the resolution of *they*, unless the appropriate assemblage token was already set up before.

Conclusions

- The results indicate that there are specific differences between *they* and *both* that affect predicate assignment and anaphor resolution.
- The pattern of results is consistent with the view that a non-partitioning expression (like *they*) is understood as denoting an assemblage, whereas a partitioning expression (like *both*) is understood as denoting distinct individuals.