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Overspecification in written instruction*

ANJA ARTS, ALFONS MAES, LEO NOORDMAN, AND CAREL JANSEN

Abstract

A much debated question with respect to referential expressions is under what conditions speakers and writers produce overspecified expressions, i.e. expressions that contain more information than what is necessary for unique identification. In an earlier study we found that overspecifications facilitate the identification process for the understander, in particular if they contain complete object information and/or complete location information. In the present study, a production experiment is discussed in which the importance (high, low) of the instructed referential task was manipulated. In the high-importance condition more overspecifications were produced than in the low-importance condition, and this was particularly the case for overspecifications that facilitate identification for the understander.

1. Introduction

In referring to entities in spoken and written discourse, speakers and writers frequently use more explicit referential expressions than what is necessary for unique identification of the entities, e.g., *John, my neighbor* in cases where *John, my neighbor*, or *he* would be sufficient for identification. Such expressions are called overspecifications. The aim of this paper is to investigate conditions under which overspecifications occur, in a situation in which one individual object of a set has to be identified.

Overspecifications are not free stylistic variants of referential expressions but they serve particular functions both for recipient and producer of language. Overspecified expressions may indicate a thematic boundary in the discourse (Anderson et al. 1983; Karmiloff-Smith 1981; Marslen-Wilson et al. 1982; van Vliet 2008; Vonk et al. 1992), and may facilitate the identification of a referent in a visual display, and as such be profitable for the language recipient (Arts 2004; Arts et al. 2011).

Overspecifications may also be profitable for the language producer. They may enable the producer to formulate a referential expression even before he oversees all the alternatives in the environment.¹ That is, overspecifications may facilitate incremental production of referential expressions (Pechmann 1989). In an experiment conducted by Arnold and Griffin (2007) participants produced more overspecified expressions in describing a two-character cartoon than in describing a one-character cartoon. In the two-character cartoon they used first names instead of pronouns to refer to the characters, although the characters were of different gender, so pronouns could be used unambiguously. Arnold and Griffin attribute this extra production of overspecified expressions to the speaker's need to divide attention in the case of a two-character story. They suggest that additional characters, even when they are of different gender, "influence the amount of attention that the speaker is able to give to each character within a nonlinguistic discourse representation" (Arnold and Griffin 2007: 527). This results in first name overspecifications in the two-character cartoons. Engelhardt et al. (2006) claim that overspecified expressions are produced because they relieve the speaker from the burden of deciding what information is redundant and what information is not. Nadig and Sedivy (2002) state that the production of overspecified expressions does not hinder, but rather facilitates communication. According to van der Sluis and Kraemer (2007) overspecified expressions reflect the uncertainty of the speaker whether the addressee can identify the referent in the instructed task. Arnold (2008) provides a review of the research on the production of referential expressions, and discusses speaker-oriented and addressee-oriented factors. With respect to the latter, she relates the (conscious or nonconscious) decision whether or not to produce an explicit referential expression, to the perceived identification difficulty on the part of the addressee, and formulates this as the "expectancy hypothesis". The easier the producer expects that it is for the addressee to identify the referent the less explicit the referential expression will be.

These studies indicate that people have a tendency to overspecify, and reveal some factors that motivate these overspecifications: incremental production, division of attention, redundancy decision, and expected identification difficulty. In one way or another, these factors have to do with the difficulty of the factual referential task, i.e., the formulation of referential expressions and/or the identification of entities on the basis of referential expressions. But the referential task is in general not an isolated task that has to be performed for the sake of itself. The referential task takes place in an interaction between speaker/writer and listener/reader and is in general embedded in a wider context of task performance: the task environment.

2. Overspecification: underlying causes

We expect three specific aspects in communication to be related to overspecification: interactivity, characteristics of the factual referential task, and characteristics of the task environment.

2.1. *Interactivity*

Language use is a joint action and the basic situation of language use is face-to-face conversation (Clark 1996). Speaker and listener engage in joint actions and coordinate their individual actions. Both speaker and listener have a responsibility for the understanding of each utterance. Clark and Wilkes-Gibbs (1986) introduced the principle of mutual responsibility in conversation; producers and recipients try to minimize collaborative effort: The effort that both producers and recipients need to expend for mutual understanding of each utterance. Clark and Wilkes-Gibbs' analysis of referential expressions in a dialogue shows that in a feedback situation, speakers exploit the listener's presence by uttering minimally specified referents, or even underspecified referents, in the expectation that the listener, if identification proves to be too difficult, will respond with a request for clarification to which the producer can then provide a reply. Clark and Krych (2004) showed in a collaborative Lego-building task that speakers constantly monitor their listener to determine whether or not their contribution has been understood. Extra information is provided when this is required by the communicative needs of the task.

In other forms of language use, however, where producers are distant from their recipients in time, place, or both and where no feedback is possible, language users may be assumed to adhere to a modified version of the principle of mutual responsibility: the principle of distant responsibility (Clark and Wilkes-Gibbs 1986: 35). This principle states that "the speaker or writer tries to make sure, roughly by the initiation of each new contribution, that the addressees should have been able to understand his meaning in the last utterance to a criterion sufficient for current purposes". The underlying idea has not changed. Minimization of collaborative effort still forms the core of the principle, but the division of effort between language producer and language recipient has changed. In a nonfeedback situation, the language recipient cannot request clarification and as a result all referential effort needs to be expended by the language producer. In these conditions it is up to the producer to decide how much of the collaborative effort he will take upon himself to ensure that a referential expression will be correctly understood. The seriousness of the consequences of a misunderstanding and the explicitness of the referential expression may be related. In instructive texts that are produced in a situation where

the recipient cannot signal misunderstanding (nonfeedback), this relation may result in overspecified referential expressions; producers may feel extra responsible because failure to identify the referent will lead to the recipient's failure to execute the task. As a result, producers may take upon themselves all of the collaborative effort that needs to be expended for successful completion of the referential process (Arts 2004).

The effect of interactivity aspects on people's communicative behavior has been explored by Doherty-Sneddon et al. (1997). They found that participants who were present in the same place, elicited more listener feedback and checked their own understanding of previous messages more often in a collaborative task in which they had only audio information available than when they had both audio and visual information available. In addition, they found that face-to-face dialogues, in which nonverbal signals such as eye gaze and gestures were available, were shorter than dialogues in situations in which only verbal information was available.

Olson et al. (1997) compared face-to-face and remote group work in a collaborative design task. They observed that participants in the remote condition spent more time in discussing how to conduct the work and more time to clarify what was meant than in the face-to-face condition.

The issue of how people's referential expressions are affected by the interactivity conditions has also been explored by Anderson et al. (2007). They had engineering students perform a computer-assisted design task, either in a face-to-face situation or in a remote situation. In the remote condition, the students used a computer-supported collaborative work tool that provided views of the interlocutor's face and upper body, audio information and a joint view of the drawing task work space. Pairs of less experienced students and pairs of more experienced students took part in the experiment. Among the dependent variables were cursor pointing (pointing with the computer mouse) and gestures. The results show that there was more cursor pointing in the remote condition than in the face-to-face condition, but only for the less experienced students. The less experienced students used cursor pointing to build in extra redundancy in order to increase the chance that their referential expressions were understood. In addition, the less experienced students showed a more frequent use of gestures to accompany their verbal references, and this was particularly so in the remote condition. Thus, affordances of the media interacted with experience levels of the participants. The less experienced students apparently used a more cautious communicative strategy in the remote condition to increase success. And indeed, in this group there was a significant correlation between amount of gesturing and task performance.

The results of these studies suggest what might be expected: Speakers adapt their behavior when interactive situations differ.

2.2. Complexity of the factual referential task

One of the characteristics of the referential task that is often varied is the task's complexity. Russell and Schober (1999) demonstrated that the amount of information given in an instruction depends on the complexity of the referential task. Russell and Schober used a set of twelve different figures of irregular geometrical shapes, printed on a sheet of paper. These figures were difficult to describe but they resembled certain semantic categories, for instance, boats, houses, dogs, arches, or people. The sets of twelve figures were chosen in such a way that, on each page, eight of the figures resembled one semantic category (e.g., boats) while the remaining four figures resembled a different semantic category (e.g., ducks). The director was asked to describe the target figure that was circled on his sheet of paper for a matcher, who had a similar sheet of paper showing the same figures but arranged differently. The matcher either needed to single out the target figure from the set of twelve figures (high-criterion condition) or needed to determine whether the target figure fell inside or outside the subset that consisted of the four figures belonging to the one semantic category (low-criterion condition). Thus, in the high-criterion condition the referential task was more complex for both producer and recipient than in the low-criterion condition. For the matchers in the latter condition, the subset of four figures was circled within the group of twelve figures. The results showed that the language producers adapted their language behavior to a high degree to the matchers' referential tasks: in the high-criterion condition, 22 percent of the utterances initiated multiple-exchange contributions; i.e. contributions by which the director required an active contribution to the referential process on the part of the matcher, by requesting ongoing feedback from the matcher. In the low-criterion condition, this was only 9 percent.

The results by van der Sluis and Krahmer (2007) are also illustrative for referential task complexity. They required participants to identify objects by giving descriptions and/or by pointing. The experiment consisted of two conditions. In one condition, the objects were close to the participants and in the other condition the objects were farther away. In the latter condition it was more complex for the producer to formulate the referential expression that correctly identified the object. The results indicate that in the distant condition more words were produced, more location information was given and more gestures were made than in the close condition.

Kohlmann (1992), and von Stutterheim et al. (1993) showed that participants in a text production experiment employed reader-oriented referential strategies that were task-dependent: participants were either asked to produce a text that was intended to be an instruction for the addressee to assemble a complex multicolored toy object out of its ten parts, or to produce a text that simply described the toy object. This created a difference in the producer's

factual referential task. In the assembly condition, it was important that the initial references to the ten parts were made explicit by including color specification, because the recipient needed to be able to identify the intended referent on the basis of the referential expression so that he could continue building the toy object. When it was the single purpose of the text to provide a description of the toy for the listener, the initial references to the individual parts did not need to be as explicit. The difference in the factual referential task was reflected in the behavior of the participants; the initial references in the assembly condition were more explicit, i.e., contained more color specifications.

2.3. *Characteristics of the task environment*

The task environment, i.e., the wider context of task performance, includes the producer's and the recipient's assumptions of the goals (e.g., describing vs. instructing), and of the importance of the task. For example, the owner of a house may need to resolve a referential expression in a manual because he wants to activate the safety alarm when he leaves his house unattended for a short period (an hour), or for a long period (two weeks). In this paper we focus on one aspect of the task environment: the importance of the task as conceived by the language producer.

The distinction we make here between the reference resolution task as such and the wider context has been discussed extensively in the problem solving literature. In fact, finding the referent for a referring expression is a form of problem solving behavior. In theories about problem solving, the distinction is frequently made between the problem space, i.e., the internal representation of the problem, containing the starting position, the goal, the operators and the restrictions on the use of the operators, and the task environment, i.e., the situation in which the problem presents itself (Newell and Simon 1972). According to Newell and Simon, the task environment has consequences for the problem space and determines to a large extent the behavior of the problem solver. Part of the task environment is the instruction for the task (Hayes and Flower 1980) and variants of the instruction can differentially affect task performance. Simon and Hayes (1976) investigated problems that are isomorphic with each other, i.e., problems that can be represented in the same problem space with the same operators and legal moves. But these isomorphic problems differed in their problem formulation, i.e., in the verbal instructions for solving the problem. This change in the problem formulation affected the representation that problem solvers created and used in their solution attempts. This had dramatic effects on the percentage of correct solutions (Kotovsky et al. 1985). The difference between the problem isomorphs should be attributed "to differences in the manner in which the subject images or models or thinks about the problem"

and not to differences in the problem structure (Kotovsky et al. 1985: 251). That the way in which a problem is formulated affects participants' representations and performance, has also been demonstrated in experiments on deductive reasoning. In Wason's (1968) selection task, participants have to select those pieces of information that they need to determine whether a conditional rule is true or false. The selection task is much easier if the conditional rule is formulated with familiar material than with abstract, unfamiliar material (Johnson-Laird et al. 1972).

Depending on the language producer's knowledge about the task environment, the factual referential task may be approached in a different manner. This could lead to a difference in the referential expressions that are produced. In this paper, we focus on one characteristic of the task environment: the instruction to the language producer about the importance of the task.

Maes et al. (2004) report the results of an experiment that may be illustrative for this line of thought. Participants wrote an instruction for an alarm clock, either in a *reading-to-do condition* or in a *reading-to-learn condition*. In a reading-to-do situation, it is the sole goal of the instructive text to have the reader execute the actions correctly (set the alarm clock once). In a reading-to-learn situation, the goal of the instructive text is also to have the reader remember the actions (set the alarm clock every night). This additional aspect of a reading-to-learn situation may affect the importance of the task in the view of not only the reader but also the writer. The writer may attribute more importance to the task, and, as a result, may feel more responsible when instructing a reader in a reading-to-learn situation as opposed to instructing a reader in a reading-to-do situation. It was observed that the reading-to-learn condition triggered more overspecification than the reading-to-do condition. A possible explanation is that task importance is a consideration for the writer to increase the number of overspecified expressions; the experimental conditions may have created a difference in the writer's mindset.

It has been shown that overspecified referential expressions may lead to more efficient object identification by the addressee than minimal specification (Arts et al. 2011). In addition, if the writer anticipates the perceived importance of the task (Maes et al. 2004), one may hypothesize that language producers will overspecify more as the task becomes more important. This will be tested in the present production experiment. Central question is if and how the importance of the task, as perceived by the language producer, has an effect on the production of referential expressions. One may expect that increased perceived importance of the task results in a higher feeling of responsibility of the writer for a successful completion of the referential process, in a stronger wish to avoid task failures, and in an increase of overspecifications.

Only the task environment was manipulated in this production experiment. In order to single out the effect of the task environment on overspecification,

the two other factors were kept constant. The interactive situation was kept constant. With respect to interactivity, we chose a situation in which much overspecification was to be expected, i.e., not face to face communication but simulated, remote communication. The experiment dealt with written instructions. There was no interaction between language users. The factual referential task was kept constant as well. The difficulty of the task was the same in the two conditions: Describing an object, given a number of dimensions on which the objects differ so as to make overspecification possible.

The task environment was manipulated by varying the participants' mindset: They were asked to describe the object in a high-importance condition or in a low-importance condition. In the high-importance condition, participants were told that the description they had to produce was an instruction in long-distance medical surgery. In the low-importance condition, the participants were asked to describe the object. According to the instructions given to the participants, in the high-importance condition failure to identify the intended referent would have a stronger impact than in the low-importance condition. This difference in the task environment was expected to create a different mindset on the part of the language producer. This different mindset might cause language producers in the high-importance condition to adhere more closely to the principle of distant responsibility (Clark and Wilkes-Gibbs 1986) than language producers in the low-importance condition. For this reason, it was expected that more overspecified referential expressions would be produced in the high-importance condition than in the low-importance condition. The first hypothesis relates the perceived importance of the task to the degree of overspecification, the importance being determined by the instruction to the language producer.

Hypothesis 1: Referential expressions show a higher degree of overspecification in a high-importance situation than in a low-importance situation.

Hypotheses 2 and 3 spring from the basic assumption that the writer anticipates the reader's needs and therefore particularly produces overspecified expressions that he assumes to be most effective for the reader. Hypotheses 2 and 3 are thus based on specific expectations regarding the type of information included in the referential expression (Arts et al. 2011). They are related to the completeness of the object description (Hypothesis 2) and to the act of linguistic pointing (Hypothesis 3).

The results of the perception experiment conducted by Arts et al. (2011) indicate that exhaustive object descriptions lead to more effective identification of the object, or, in other words, to more effective referent resolution than nonexhaustive object descriptions. Deutsch (1976), Mangold (1988), Sonnenschein (1984) and Sonnenschein and Whitehurst (1982) show that extra in-

formation about an object is beneficial for easy identification because it facilitates referent resolution, even if the information is nondiscriminating (i.e., overspecified).

In situations where the task is assigned a high degree of importance, effective referent resolution may be deemed more important by the language producer than in situations where the task is assigned a low degree of importance. An obvious conclusion follows: A complete object description aids the conversational partner in resolving the referential expression and, if the importance of the task calls for it (in the high-importance situation) then the language producer may be more inclined to provide such a complete object description than if the task is perceived to be less important (the low-importance situation). This leads to Hypothesis 2:

Hypothesis 2: Referential expressions that contain an exhaustive object description occur more often in a high-importance situation than in a low-importance situation.

The results of the perception experiment conducted by Arts et al. (2011) furthermore indicate that identification is most effective when either a combined reference to the vertical and horizontal axis is made, or when a single reference to the vertical axis is made.

In a feedback situation, where the producer and the recipient of language can see and hear one another, and where spoken language is produced, the language producer may deem a physical pointing gesture to be beneficial for the recipient (Beun and Cremers 1998; van der Sluis and Krahmer 2007). In a nonfeedback situation where written language is produced, references to location attributes of objects can be viewed as linguistic pointing gestures, and can be explained by the willingness of the language producer to expend extra effort to achieve easy referent resolution on the part of the recipient. Therefore, it is the expectation that references to location attributes are more pervasive in the high-importance situation than in the low-importance situation.

Hypothesis 3: Referential expressions that contain location attributes of objects (reference to the vertical or horizontal axis, or both) occur more often in a high-importance situation than in a low-importance situation.

3. Method

Participants were asked to look at a visual display on a computer screen; at the bottom of the screen, they were to type in a referential expression that described one of the objects in the display.

3.1. Participants and design

Fifty-three students of Tilburg University took part in the experiment: twenty-five students in the low-importance condition and twenty-eight students in the high-importance condition.

3.2. Materials

There were thirty experimental displays, each of which contained four objects. The thirty displays were presented via a web based application. The displays were constructed in such a way that every object could be referred to by mentioning five types of referential units: three types of object-information units and two types of location-information units (see Figure 1):

object-information units:

- shape (round, square, triangular, rectangular)
- size (large, small)
- color (white, black)

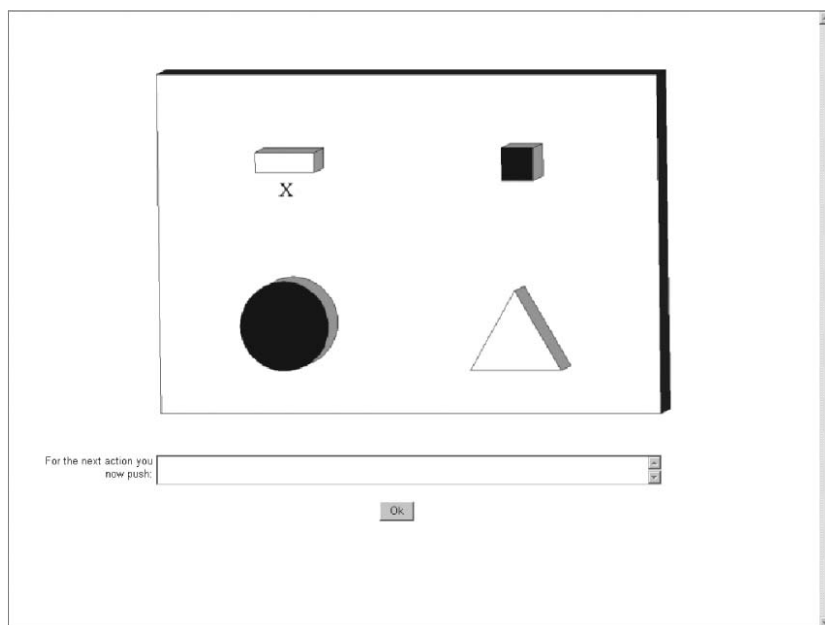


Figure 1. Experimental material: a display in the high-importance condition

location-information units:

- position on the vertical axis (top, bottom)
- position on the horizontal axis (left, right)

A display always contained two small objects, one black and one white, and two large objects, again one black and one white. All four shapes were used in every display. The positions of the objects remained constant: one object in the top-left corner, one object in the top-right corner, one object in the bottom-left corner and one object in the bottom-right corner. The different characteristics that the objects could display resulted in a total of sixteen different objects that could be used: Every shape (four values) could be either black or white, and either small or large.

In each trial, one object needed to be referred to; this object was marked with an x. We made sure that each corner of the display contained the marked object an equal number of times.

3.3. Procedure

The experiment was conducted in a classroom situation. The experimenter explained the experimental task to the participants and a written explanation of the task was available to them as well.

In the low-importance condition, the display was presented as *a configuration containing four elements*. The participants were asked to type in at the bottom of the screen which element had been marked with an x. They were told to do this in such a way that the marked element was uniquely identifiable.

In the high-importance condition, the display was presented as *a control panel containing four push buttons*. It was said that the control panel was being used for long-distance surgery. The buttons were to be pushed for the execution of successive surgical actions. The participants were asked to imagine themselves in a situation in which they had to inform the surgeon which button to push. The surgeon could not speak to them, hear them, or see them, because the surgery was being performed in South Africa. The participants were in the Netherlands, and the surgeon fully depended on their instructions for successful performance of the surgery. The participants were asked to type in at the bottom of the screen which button had been marked with an x. In instructing the participants in the high-importance condition we tried to create a different mindset. We did not try in any way to make them believe that there indeed was a surgeon in South Africa awaiting their instructions. We asked them to imagine themselves in such a situation. So, the importance manipulation did not change the factual referential task, but only its representation in the mind of the participant.

We decided to use the words ‘button’ and ‘element’ as part of the experimental manipulation because the word ‘button’ may be associated more with a particular device that has a specific function, whereas the word ‘element’ refers to more neutral concepts.

In building a referential expression, the attribute shape can be used as head of the noun phrase whereas the attributes size and color cannot be used as head of the noun phrase. This difference between the three object-oriented attributes would make it impossible to determine whether participants chose to include the attribute shape as part of the referential expression because of its syntactic function, because of its attributive function, or both. For this reason the experimenter specifically requested participants to use the noun ‘element’ (low-importance condition) or ‘button’ (high-importance condition) in producing the expression.

The participants were asked to open the presentation that contained the experimental material and were presented with 30 displays. At the bottom of the screen participants were to type in the referential expression. With a pop-up message the participants were reminded to use the word ‘element’ or ‘button’. This pop-up message disappeared as soon as the participant started typing.

3.4. *Data analysis*

In analyzing the referential expressions that were produced by the participants, we looked at the number of referential units that were used to build the expression. The point of departure in determining the number of overspecified referential units was that the minimal description should be as minimal as possible for correct identification of the object in the display. This means that for an item such as *the large square button at the top left* (referential units size, shape, horizontal and vertical) the minimal description for identification is just the unit shape. Consequently, size, horizontal and vertical are overspecifications, which leads to three overspecified units. It was possible, for all trials, to refer to the object in the display by just mentioning its shape. This alone would suffice for correct identification. So, whenever shape was a part of the referential expression that was produced, the overspecification of that referential expression consisted of all other referential units that were used in the expression. Whenever shape was not a part of the referential expression that was produced, we counted the number of referential units in the expression that was minimally needed for correct identification of the object in the display, and deducted this number from the total number of referential units in the expression to determine the number of overspecified units. The data were analyzed using one-tailed t-tests for independent samples.

4. Results

Fifty-three participants produced a total of 1590 referential expressions: 25 participants produced 750 expressions in the low-importance condition and 28 participants produced 840 expressions in the high-importance condition. The number of analyzed referential expressions per participant fluctuated because expressions that did not contain the word ‘element’ or ‘button’ were excluded from the analysis (110 expressions, 14.7% in the low-importance condition and 73 expressions, 8.7% in the high-importance condition). Where applicable, the reported results are proportionate to the number of analyzed expressions per participant.

Table 1 lists the frequencies of the analyzed referential expressions.

Thirteen expressions were used, while 27 expressions were possible (see for the total set of possible expressions Arts et al. 2011). Hardly any expressions violated the canonical Dutch adjective order.

Overall, the expressions that were produced contained at least a reference to the shape of the object, or a reference to both location axes. Table 1 shows one exception: the occurrence of the referential expression *size/color* in the low-importance condition. All expressions allowed for unique identification of the object; no underspecified expressions, such as pronouns, demonstratives, or single references to size or color were produced. This makes sense, given the fact that the task was a written, noninteractive identification task, and the objects to be identified were inanimate, which makes pronouns even less likely.

The average number of overspecified referential units per expression that participants used in producing the expressions in the low-importance condition was .88 and in the high-importance condition 1.87. This difference was significant: $t(51) = 4.59, p < .001$.

Table 2 shows the average proportion of analyzed expressions per participant that contained an exhaustive object description and a location description.

Exhaustive object descriptions occurred very frequently: in the low-importance condition in about one quarter of the items; in the high-importance condition in slightly less than one half of the items. The difference between the two conditions was significant: $t(51) = 1.97, p < .05$. Reference to both the vertical and the horizontal axes occurred more often in the high-importance condition than in the low-importance condition: $t(51) = 2.75, p < .01$.

The results presented so far focus on the differences between the experimental conditions, with regard to the degree of overspecification and the type of referential expressions produced, as formulated in the hypotheses. The referential expressions produced in the low-importance condition show fewer overspecifications. Consequently, there should be more minimally specified expressions in the low-importance condition than in the high-importance condition. Table 3, derived from Table 1, provides a summary of the minimally

Table 1. *Produced expression types as a function of experimental condition*

expression type	low-importance n = 640 25 participants		high-importance n = 767 28 participants	
	freq.	%	freq.	%
shape <i>the square button</i>	199	31.1	20	2.6
shape size <i>the large square button</i>	6	0.9	8	1.0
shape color <i>the square black button</i>	211	33.0	102	13.3
shape size color <i>the large square black button</i>	134	20.9	317	41.3
shape color horizontal <i>the square black button at the top</i>	–	–	2	0.3
shape vertical horizontal <i>the square button at the top left</i>	–	–	129	16.8
shape size vertical horizontal <i>the large square button at the top left</i>	–	–	6	0.8
shape color vertical horizontal <i>the square black button at the top left</i>	21	3.3	106	13.8
shape size color vertical horizontal <i>the large square black button at the top left</i>	–	–	25	3.3
size color <i>the large black button</i>	1	0.2	–	–
size color vertical horizontal <i>the large black button at the top left</i>	–	–	1	0.1
color vertical horizontal <i>the black button at the top left</i>	–	–	2	0.3
vertical horizontal <i>the button at the top left</i>	68	10.6	49	6.4

Table 2. *Average proportion of expressions per participant containing an exhaustive object description and a location description as a function of experimental condition*

	low-importance (n = 25)	high-importance (n = 28)
exhaustive object description (shape, color and size)	0.23	0.43
vertical and horizontal axes	0.12	0.44
vertical axis only	0.00	0.00
horizontal axis only	0.00	0.00

Table 3. Frequency of expression types as a function of experimental condition

		low-importance n = 640 25 participants		high-importance n = 767 28 participants	
		freq.	%	freq.	%
Object information					
minimally specified	shape	199	31.1	20	2.6
	size and color	1	0.2	0	0.0
overspecified	shape with size or color	217	33.9	110	14.3
exhaustively overspecified	shape with size and color	134	20.9	317	41.3
Location information					
minimally specified	hor + vert	68	10.6	49	6.4
Location and object information					
overspecified	hor + vert and one or more object attributes	21	3.3	271	35.4

specified and overspecified references produced in both conditions. Both for object information and for location information, a distinction is made between minimally specified expressions and overspecified expressions. Since shape is the attribute that is most pervasively used (see also Table 1), the object information in Table 3 is categorized with respect to shape.

For the items with object information, the minimal expressions are produced more frequently in the low-importance condition than in the high-importance condition. Overspecifications in which either size or color is added to shape, also occur more frequently in the low-importance condition than in the high-importance condition. Only if shape is overspecified resulting in an exhaustive description then the frequency is higher in the high-importance condition than in the low-importance condition.

For the items with location information, the minimal expression (location only) occurs more frequently in the low-importance condition than in the high-importance condition. In contrast, if location is overspecified then the frequency is higher in the high-importance condition than in the low-importance condition.

5. Discussion and conclusions

The results indicate that the perceived importance of the instructed task did increase overspecification. This may be attributed to the language producer's

increased feeling of responsibility for the instructive task (Clark and Wilkes-Gibbs 1986). The results confirm Hypothesis 1; an increase was observed in the high-importance condition. It should, however, be noted that overspecification occurred pervasively in both experimental conditions, although reference to the object could easily be effected by mentioning just its shape in a minimally specified expression. This pervasive production of overspecified referential expressions in both conditions is not inconsistent with results reported by Wardlow Lane et al. (2006). They describe a production experiment in which speakers were to refer to objects visible to both the speaker and listener. These objects had size-contrasting matches, but these were only visible to the speaker. The results show that speakers were more likely to give away information about the size of the matching object when they were explicitly asked to conceal this size. This suggests that speakers tend to refer to redundant attributive information of an object, and even more so when they are explicitly asked not to. This may indicate that the production of redundant information is “not under speakers’ intentional control” (Wardlow Lane et al. 2006: 274) and that overspecification happens inadvertently.

The results in Table 2 confirm Hypothesis 2 and Hypothesis 3. Complete object descriptions (mention of all object-information units) occurred more often in the high-importance condition than in the low-importance condition, as did simultaneous references to the horizontal and vertical axes. However, single reference to the vertical axis did not occur, and single reference to the horizontal axis occurred only twice; apparently, there seems to be such a strong association between the terms referring to the horizontal and vertical dimensions that language producers almost always provide a reference to both axes if they decide to refer to location attributes.

In the perception experiment (Arts et al. 2011) evidence was found for the facilitating effect of complete object descriptions. A complete object description facilitates the identification process, because it enables the reader to build a mental image that can be mapped in its entirety within the physical task context. This is in accordance with the suggestion of Levelt (1989), who mentions in this respect the creation of a “Gestalt” of the object that needs to be identified. The same perception experiment also provided evidence for a facilitating effect of simultaneous references to the vertical and horizontal axes. A reference to both axes limits the search process to one specific section of the perceptual image and can be seen as a linguistic pointing act that mimics the physical gesture that a language producer may use when the discourse participants can see one another. The fact that the language producers used this type of overspecification more pervasively in a situation characterized by high importance of the instructed task may be interpreted as a willingness on their part to expend extra effort to achieve easy referent resolution on the part of the recipient.

Specific results in Table 1 are consistent with conclusions reported by Viethen and Dale (2008) and Belke and Meyer (2002). Viethen and Dale report on research that focuses on Natural Language Generation algorithm development. They observed spatial overspecification in 231 (36.6%) of a total of 630 descriptions elicited in a web-based production experiment; participants mentioned location information although this was never necessary for the identification of the object. Belke and Meyer (2002) found in a naming experiment that color was overspecified substantially more often than size. Also, when participants had the choice of including either size or color to build a minimally specified expression, color was specified more often than size (68.1 percent, 128 utterances versus 9 percent, 17 utterances); the remaining utterances (22.9 percent, 43 utterances) were overspecified (both the size and the color were specified). Belke and Meyer claim that this preference for a reference to the color of an object as opposed to the size of an object originates in visual perception and is linked to size being a relative dimension and color an absolute dimension. The size of an object can only be determined in comparison with another object in the physical task context. The color of an object can be determined independent of other objects in the physical task context. The results in Table 1 with respect to the expressions *shape/color* (211, 102) and *shape/color/vertical/horizontal* (21, 106) and the expressions *shape/size* (6, 8) and *shape/size/vertical/horizontal* (0, 6) seem to confirm this preference for a reference to color: The combination *shape/color* was produced far more often in building a referential expression than the combination *shape/size*, in cases where the referential expression contained two object-oriented attributes. The combination *shape/color* seems to have been regarded as an efficient way to refer to the objects whereas the opposite seems to be the case for the combination *shape/size*.

In summary, the importance of the task proved to be a strong determinant of the degree of overspecification of referential expressions and of the type of information that was included in the referential expressions. Language producers provided more overspecified referential expressions for the identification of objects when they were asked to imagine that the task was very important. They preferred to provide a complete description of the object, which accommodated the construction of a mental image, and they verbalized physical pointing by providing information on the location of the object. The importance of the task strongly influenced the number and type of overspecifications produced. It should be noted that the importance of the task was manipulated purely in the mind of the participant. The task itself was the same, but we changed the way in which the participant “images or models or thinks about the problem” (Kotovsky et al. 1985: 251). And just this mental manipulation affected task performance. Then one may expect that if the importance of the task itself is manipu-

lated in a more direct way, this will *a fortiori* lead to the production of overspecifications.

The results as reported may partly be attributed to the nonfeedback situation that characterized the production experiment. Further research is needed, in which the perceived importance of the task is varied in different interactive conditions such as face-to-face interaction and remote interaction. On the basis of the research discussed in the introduction, one may expect that less overspecification, or even underspecification, will occur in the face-to-face condition than in the remote condition. On the basis of the present results one may expect, however, that the importance of the task will continue to have an effect on the overspecification of referential expressions.

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1. *He* meaning 'he' or 'she'

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