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# The interpretation of plural definites in discourse: the case of spatial adpositions

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## Abstract

*In this paper we offer a study on the interpretation of plural definites in discourse (the tank engines) and their interaction with spatial adpositions ('to' and 'at'). The novel empirical findings in the paper support the following assumptions on the contribution of spatial adpositions to the interpretation of plural definites. First, the interpretation of plural definites can be influenced by the lexical aspect type of adpositions. While 'to' as 'telic' predicate can license both a 'collective' and a 'distributive' reading for plural definites, 'at' as an 'atelic' predicate only licenses a 'collective' reading. Second, the precise lexical content of adpositions determines which interpretation is accessed. It is claimed that 'at' denotes a 'general location' relation between locatum and landmark object, and thus licenses a collective reading for plural definites.*

**KEYWORDS:** DEFINITES; ADPOSITIONS; DISCOURSE ANALYSIS; LEXICAL ASPECT; SENTENCE PROCESSING

## 1. Introduction

The goal of this paper is to present empirical evidence on the interaction of plural definite descriptions (plural definites), e.g. *the tank engines*, with spatial adpositions, e.g. *to* and *at*. We aim to reach this goal by investigating two topics. First, whether the interplay between adpositions and plural definites can determine the type of interpretation of a sentence (e.g. 'collective' vs.

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1 'distributive' reading) or not. Second, whether the lexical content of predicates  
 2 can also determine which interpretation of plural definites is accessed, or not.  
 3 In particular, we investigate whether *at* is interpreted as denoting a notion of  
 4 general location, or a more restricted notion of 'external' location. The paper  
 5 is organized as follows. In the remainder of this introduction, we spell out our  
 6 background. In section 2, we present our experiment and the findings. In sec-  
 7 tion 3, we offer some conclusions.

### 9 1.1. Theoretical background and questions

10 There is a long philosophical and linguistic debate on the interpretation of  
 11 plural definites such as *the boys* or *the tank engines*, and the sentences they  
 12 occur in. Two topics have probably played a central part in this debate, while  
 13 other topics have been somewhat neglected in the literature. We briefly intro-  
 14 duce and review both central topics, in order to pin-point and illustrate the  
 15 neglected topics we will focus on, in our paper.

16 A first central topic is whether plural definites are *referential* or *anaphoric*,  
 17 in their interpretation. If plural definites introduce new referents<sup>1</sup> in discourse,  
 18 then they depend on their interpretation from extra-linguistic knowledge (or  
 19 *implicit* context, e.g. von Stechow, 1994). If plural definites are anaphoric, then  
 20 they depend for their interpretation from previous discourse (or *explicit* con-  
 21 text, e.g. von Stechow, 1994).

22 A second central topic is whether plural definites, when they combine with  
 23 a predicate, license a *collective* or *distributive* interpretation<sup>2</sup> for the corre-  
 24 sponding sentence. That is, whether the combination of plural definites and a  
 25 Verb denotes a property that applies to the referents as a 'whole' (collective) or  
 26 to each referent, individually (distributive). The following examples illustrate  
 27 these distinctions ((1)–(2) are from Winter, 2001):

- 28  
 29 (1) *The boys* are lifting a piano  
 30 (2) *The boys* are smiling  
 31 (3) Some boys and some girls went away. *The boys* went to the station  
 32 (4) Mario, Wario and Luigi are boys, Peach and Rose are girls. *The boys*  
 33 are sleeping at the hotel

34  
 35 The sentences in (1)–(2) are typical cases in which the interpretation of the  
 36 plural definite *the boys* is computed with respect to the extra-linguistic con-  
 37 text. The plural definite appears at the beginning of the sentence, so no pre-  
 38 vious discourse is apparently accessible. The sentences in (3)–(4) are typical  
 39 cases in which previous discourse is explicitly accessible, since the plural defi-  
 40 nite *the boys* can occur in the second sentence of a mini-discourse. This plural  
 41 definite is interpreted as denoting those boys that fall in the denotation of  
 42

1 the indefinite *some boys*, in (3). In (4), the identity statement *Mario, Wario*  
 2 *and Luigi are boys* denotes the relevant referents (Nouwen, 2003; Brasovenau,  
 3 2008; Schwarz, 2009; among others).

4 The sentence in (1) also represents a typical example of collective inter-  
 5 pretation: the referents in the denotation of *the boys* are understood to lift  
 6 the piano as a 'single entity'. The sentence in (2), instead, represents an exam-  
 7 ple of distributive interpretation. We understand that each boy in the denota-  
 8 tion of *the boys* is smiling, on an individual basis (Schwarzschild, 1996, 2009;  
 9 Winter, 2001, 2002; a.o.). The interpretation of *the boys* in the second sentence  
 10 of examples (3) and (4) is, however, still in need of a clear explanation. The  
 11 interpretation of the plural definite *the boys* depends, to an extent, from the  
 12 interpretation of its anaphoric antecedent (i.e. *some boys* in (3), *Mario, Wario*  
 13 *and Luigi* in (4)). However, the exact contribution of the predicate it combines  
 14 with, respectively *went to the station* and *are sleeping at the hotel*, seems not  
 15 to be entirely clear. Two questions can be easily identified, and form the main  
 16 empirical questions that we aim to answer, to achieve our goal.

17 A first empirical question is whether the specific contribution to *lexical*  
 18 *aspect* of a predicate can influence the interpretation of plural definites. We  
 19 do not know whether a sentence including a plural definite can receive col-  
 20 lective or distributive interpretation. It is generally assumed that there is a  
 21 tight connection between lexical aspect, and type of reading that a predicate  
 22 contributes to a sentence. For instance, stative verbs (e.g. *to be*, *to sit*, etc.) are  
 23 often assumed to denote collective predicates (Brisson, 1998; 2003). It is also  
 24 generally assumed that spatial adpositions can contribute to lexical aspect. If  
 25 *to* combines with an activity verb such as *walk*, it can coerce this verb into  
 26 denoting an accomplishment (*walk to the station*: Krifka, 1998; Kratzer, 2003;  
 27 Zwarts, 2005, 2006; a.o.). So, an open question is whether an adposition such  
 28 as *to* or *at* can influence the emergence of a collective or distributive read-  
 29 ing, for a plural definite. Given examples such as (3)–(4), it is also not clear  
 30 whether this reading can bear on the anaphoric interpretation of *the boys*, for  
 31 instance.

32 A second empirical question is whether the fine-grained details of a predi-  
 33 cate's interpretation may offer another dimension of meaning to the interpre-  
 34 tation of definites. Some authors suggest that *at* refers to position of an entity  
 35 as being external and adjacent to a landmark object (Herskovits, 1986; Zwarts  
 36 and Winter, 2000; Kracht, 2002; a.o.). Others argue that *at* denotes a form of  
 37 general location, so it denotes a quite general and abstract relation between  
 38 locatum and landmark object.<sup>3</sup> If this 'at' relation holds, then one or more  
 39 entities can be located anywhere around (or even inside) a landmark object  
 40 (Coventry and Garrod, 2004; Feist, 2006; Ursini and Akagi, 2013; for exper-  
 41 imental data). The second hypothesis predicts that the mini-discourse in (4)  
 42

1 may describe a scenario in which Mario is front of the hotel, Wario behind,  
 2 and Luigi inside. The plural definite *the boys* appears to denote that the boys,  
 3 as a ‘collective’, are located in a general location, which is close to the hotel. So,  
 4 it is not clear whether the interpretation of plural definites may depend on the  
 5 lexical content of the predicate it combines with, as the *at* case suggests.

6 We attempt to answer these questions as follows. We first discuss the refer-  
 7 ential vs. anaphoric readings (section 1.2), then the distributive vs. collective  
 8 readings (section 1.3), then offer a brief synopsis of the discussion (section  
 9 1.4).

## 11 1.2. Theoretical background: Referential vs. anaphoric readings

12 The first topic has its roots in two classic and deeply influential views: the *ref-*  
 13 *erential* view introduced in Russell (1905), and the *saliency/anaphoric* view  
 14 introduced in Christophersen (1939).<sup>4</sup> The referential view holds that defi-  
 15 nites ‘refer’ to *new*, unique individuals in discourse with a certain property,  
 16 rather than to sets of individuals. The saliency view holds that definites *select*  
 17 which individual(s) is the most salient in *previous* discourse, with respect to  
 18 the speaker and hearers. The referential view correctly predicts that the plural  
 19 definite *the boys* denotes a ‘set’ of boys which has lifted a piano (or smiled),  
 20 in (1)–(2). However, this view has problems with (3)–(4), since *the boys* may  
 21 denote those boys who went to the station, rather than all those introduced in  
 22 the first sentence. The saliency view appears to work well with examples (3)  
 23 and (4). However, this view has problems with the interpretation of *the boys* in  
 24 (1)–(2), since there is no previous explicit context that introduces the referents  
 25 denoted by *the boys*. The saliency view does not offer a precise formulation of  
 26 the notion of saliency, at least not in an explicit way.

27 Such problems invited solutions that aimed to refine and possibly recon-  
 28 cile the two approaches. One is Kartunnen (1976), a work that proposed that  
 29 the notion of saliency (‘familiarity’, in his works) can be best understood as  
 30 familiarity *in discourse*. Definites may introduce referents which are ‘new’ in  
 31 discourse (e.g. (1)–(2)), or may refer to referents which have already been  
 32 explicitly introduced in previous sentences (e.g. (3)–(4)). Several proposals in  
 33 the Dynamic Semantics mould have refined this view. Several works assume  
 34 that definites are always interpreted with respect to some opportune context.  
 35 So, they usually incorporate a (formal) notion of familiarity (Heim, 1982;  
 36 Chierchia 1995; Grosz *et al.*, 1995; von Heusinger, 2003; Nouwen, 2003; Kamp  
 37 *et al.*, 2005; Brasovenau, 2008).

38 The view that definites are inherently anaphoric in meaning has not been  
 39 gone unchallenged, however. Certain classes of definites appear to resist  
 40 any anaphoric interpretation. Examples include superlative constructions  
 41 (e.g. *the best restaurant in town*), associative anaphora or bridging cases,  
 42

1 and other cases in which a suitable antecedent is not explicitly mentioned  
 2 in previous discourse.<sup>5</sup> Several works such observe that definites may often  
 3 appear in several other syntactic constructions that do not allow access to an  
 4 explicit context. They also observe that definites may only depend on world  
 5 knowledge, as the implicit context, for their interpretation (Löbner, 1985,  
 6 1998; Fraurud, 1990; Asher and Lascarides, 1998; Abbott, 1999, 2010, 2011).  
 7 A full discussion on similar other examples would lead us too far afield.  
 8 However a general observation is that both referential and anaphoric inter-  
 9 pretations for definites seem to co-exist. Their distribution seems to be in  
 10 complementary fashion, and to depend on the type and presence of an ante-  
 11 cedent, in context.

12 Intermediate positions have also been suggested in the literature, and appear  
 13 to have a solid empirical support. For instance, Poesio and Vieira (1998) is a  
 14 work that offers experimental evidence in support of this complementary dis-  
 15 tribution. This work investigates how speakers access the interpretation of  
 16 definites, singular and plural alike. They show that ‘initial mention’ definites,  
 17 as in (1)–(2), are for the most part interpreted referentially. They also show  
 18 that definites occurring in discourse, instead, are usually interpreted anaphor-  
 19 ically. In particular, plural definites are always interpreted anaphorically when  
 20 the referents making up the plural definite are explicitly introduced in dis-  
 21 course, as in (4). In these cases, plural definites establish an anaphoric relation  
 22 with the referents that the coordinated NPs denote. These referents constitute,  
 23 in turn, a relevant ‘collective’ referent, the one captured by the first sentence in  
 24 discourse (e.g. Brasoveanu, 2008: ch. 2–4). Experimental and cross-linguistic  
 25 evidence of this complementary distribution is offered by Schwarz (2009).  
 26 This work thoroughly and convincingly illustrates that languages such as  
 27 German and its dialects encode this distinction at a morpho-syntactic level.  
 28 For instance, several German dialects make a clear distinction between non-  
 29 contracted forms of definites (e.g. *zu dem*, lit. ‘at the’), and contracted forms  
 30 of definites (e.g. *zum*, a contraction of *zu* and *dem*). The first forms are only  
 31 possible in anaphoric (multi-sentential) examples, such as (3)–(4), the second  
 32 forms are for the most part licensed in cases such as (1)–(2).

33 We can therefore conclude that plural definites in discourse strongly tend  
 34 to be interpreted in an anaphoric way, in particular when there are suitable  
 35 antecedents. In such cases, the explicit context constrains the exact interpre-  
 36 tation of plural definites in a precise way. One case is (4), in which the coor-  
 37 dinated Noun Phrases *Mario*, *Wario* and *Luigi* denotes the ‘collective’ referent  
 38 for *the boys*, in the second sentence. So, the contribution of ‘previous’, ana-  
 39 phoric material in these examples is reasonably clear. However, the contri-  
 40 bution of ‘following’ material, the predicates plural definites combine with,  
 41 requires some specific discussion, especially when we consider the distinction  
 42

1 between collective and distributive interpretations. We discuss this aspect by  
 2 presenting the second important debate.

### 3 4 **1.3. Theoretical background: Collective, distributive, cumulative** 5 **readings**

6 The second debate has its roots in the analysis of singular and plural nouns'  
 7 interpretation, within a 'lattice-theoretic' approach (Scha, 1981; Link, 1983,  
 8 1998; Landman, 1991; Schwarzschild, 1996; Chierchia, 1998; Winter, 2001,  
 9 2002; a.o.). In this approach, plural nouns are assumed to denote a certain  
 10 type of model-theoretic objects, usually labelled as *sum individuals* or *sum*  
 11 *referents*. If Mario, Wario and Luigi are referents that fall in the denotation of  
 12 *boy*, then the plural noun *boys* denotes the *power-set* that can be generated by  
 13 the combination of these referents. Hence, a plural noun not only denotes the  
 14 single (or 'atomic') referents included in the denotation of the corresponding  
 15 singular nouns. It also denotes the 'pairs' and 'triples' that result by this gener-  
 16 ating process (e.g. 'Mario and Wario', 'Mario and Luigi', 'Wario and Luigi',  
 17 'Mario, Wario and Luigi').<sup>6</sup> Aside from this core assumption, two standard  
 18 assumptions play a crucial role in this approach.

19 A first standard assumption is that plural definites, as the combination of a  
 20 plural noun with a definite article, denote the maximal referent in the deno-  
 21 tation of a plural noun. In our toy example, this maximal sum referent is the  
 22 trio composed of Mario, Wario and Luigi taken as a 'single' entity, the refer-  
 23 ent denoted by *the boys*. A second standard assumption is that the interpre-  
 24 tation of plural definites depends, to a good extent, to the contribution of the  
 25 predicate they combine with. Examples such as (1) invite an interpretation in  
 26 which the plural definite *the boys* denotes a 'collective' of boys which lift the  
 27 piano in a concerted effort. Examples such as (2) invite instead an interpreta-  
 28 tion in which each of the three boys making up a maximal sum individual is  
 29 currently smiling. The first interpretation is generally known as having *collec-*  
 30 *tive* reference, since it involves several referents interpreted as being a 'unique'  
 31 or 'collective' entity. The second interpretation is known as having *distributive*  
 32 reference, since it involves a property that holds (it is 'distributed') for each ref-  
 33 erent in the denotation of the plural definite.

34 A similar argument has been offered in various works within the 'Event  
 35 Semantics' literature. Event Semantics approaches assume that verbs and  
 36 adpositions denote predicates which include implicit referents, denoting the  
 37 spatio-temporal particulars in which nominal referents are involved. Within  
 38 this approach sentence (1), in its collective interpretation, denotes at least one  
 39 event in which a collective of boys lifts a certain piano. Sentence (2) denotes  
 40 a 'set' of events in which each boy performs a smiling event. Several works  
 41 have suggested that this relation is mediated by thematic relations, which are  
 42



1 determined by the lexical content of a verb. In its standard interpretation, *to*  
 2 *lift* requires a ‘collective’ referent as the ‘agent’ acting in an underlying event  
 3 of lifting. The verb *to smile* requires that each of ‘agents’ is involved a differ-  
 4 ent event of smiling, each event ‘distributed’ to each referent (Parsons, 1990;  
 5 Krifka, 1990, 1992, 1996; Landman, 1997, 2000; 2004; Kratzer, 2003; a.o.).

6 Recent works, however, suggest that the picture is more complex than it  
 7 may appear at first glance. The contribution to *lexical aspect* of a verb seems  
 8 to play a vital role in determining the emergence of a collective or distributive  
 9 reading. The predicate denoted by a verb can force a collective or distributive  
 10 interpretation on a plural definite. This form of semantic coercion seems to  
 11 depend on the lexical aspect of the predicate (Verkuyl, 1993, 2008; Fong, 1997,  
 12 2001; Kratzer, 2003; Rothstein, 2004; a.o.). It is also widely acknowledged that  
 13 spatial adpositions can contribute to lexical aspect in their combination with  
 14 verbs. Intuitively, the combination of verb and adposition can be treated as a  
 15 ‘complex’ predicate (e.g. *went to the station*). The lexical aspect of this pred-  
 16 icate can then be determined by the compositional combination of verb and  
 17 adposition. Take an activity verb such as *walked*, and an ‘achievement’ adpo-  
 18 sition (phrase) such as *to the station*. The resulting complex predicate *walked*  
 19 *to the station* should denote an achievement event, as a result (Parsons, 1990;  
 20 Krifka, 1998; Kratzer, 2003; a.o.). So, a complex predicate can also determine  
 21 whether a plural definite is interpreted as collective or distributive, in a com-  
 22 positional way (Brisson, 1998, 2003; Zwarts, 2005, 2008; a.o.).

23 We discuss the precise compositional details, as they play an important part  
 24 in our discussion. Verbs denoting *states* and *activities* tend to be unambiguous  
 25 in their interpretation, although this interpretation depends to an extent to the  
 26 lexical content of the predicate. Verbs denoting achievements and accomplish-  
 27 ments, on the other hand, are usually ambiguous between the two readings.  
 28 For instance, *lift* in (1) can be seen as an activity verb that has an inherently  
 29 collective interpretation. However, *smile* in (2) can be seen as a verb that can  
 30 be ambiguous between a distributive and a collective reading<sup>7</sup> (Schwarzschild,  
 31 2009; a.o.). The following examples illustrate instead verbs that can be ambig-  
 32 uous between the two readings:

- 33  
 34 (5) *The boys* are eating a pizza  
 35 (6) *The boys* are sleeping at a hotel  
 36 (7) *The boys* are sitting in the room  
 37 (8) *The boys* have gone to the pub

38  
 39 Example (5) can be interpreted as denoting a set of events in which each  
 40 boy eats a corresponding pizza, or as a single event in which the boys share  
 41 slices of a single pizza. Examples (6) and (7) allow us to discuss the precise  
 42



1 contribution of spatial adpositions to lexical aspect and, given the consid-  
 2 erations regarding the interplay between lexical aspect and plural definites'  
 3 interpretation, the interaction between *the boys* and the various adpositions in  
 4 the examples. Since the distinction between 'states' and 'activities' and the one  
 5 between 'achievements' and 'accomplishments' are immaterial for our pur-  
 6 poses, we shall only maintain a distinction between 'telic' (states, activities)  
 7 and 'atelic' (achievements, accomplishments) predicates.

8 Several authors have observed that spatial adpositions contribute to lexi-  
 9 cal aspect in a subtle way, depending on the type of specific spatial interpreta-  
 10 tion of an adposition. A general consensus in the literature is that 'locative' or  
 11 'static' adpositions, such as *at* in (6), denote atelic predicates (states e.g. Par-  
 12 sons, 1990; Krifka, 1998; Zwarts, 2005). The same reasoning may be applied to  
 13 the copula *to be*, which does not include its own aspectual contribution. The  
 14 contribution of adpositions, in particular the ones in (5)–(8), requires some  
 15 discussion.

16 As atelic predicates, *at* and *in* in (6) and (7) have unambiguous reference.  
 17 For instance, *at* imposes a collective reference on the Noun Phrases it com-  
 18 bines with (Nam, 1995; Zwarts and Winter, 2000). This collective reference  
 19 is the result of *at* denoting a general location for the referents it applies to. If  
 20 each boy is sleeping in a different location which is related to the hotel (e.g.  
 21 inside, in front, behind the hotel), then each boy is 'at' the hotel. So, the boys as  
 22 a sum individual also sleep at the hotel. In this case, then, the collective read-  
 23 ing emerges in a 'bottom-up' manner. The result of *at* denoting the location of  
 24 each boy is that *at* also denotes the location of the boys as a 'collective' referent<sup>8</sup>  
 25 (Feist, 2006). The interpretation of *in*, instead, tends to force a (trivially) dis-  
 26 tributive reference on a plural definite. In (7), for instance, we understand that  
 27 each boy sits in the same location, so the same relation holds between room  
 28 and each boy. In certain cases, a collective interpretation can emerge with *in*,  
 29 too, for instance when a collective verb such as *gather* occurs (e.g. Brisson,  
 30 1998; 2003; a.o.). However, spatial adpositions tend to determine the interpre-  
 31 tation of definites such as *the boys*, insofar as they combine with aspectually  
 32 neutral Verbs.<sup>9</sup> Consequently, the interpretation of *the boys* is for the most part  
 33 determined by interpretation of the adposition phrases *at the hotel* and *in the*  
 34 *room*, as predicates.

35 Adpositions that express motion, known as 'directional' or 'dynamic' adpo-  
 36 sitions, are usually assumed to denote telic predicates, from a perspective of  
 37 lexical aspect. Examples include *to*, but other directional adpositions such as  
 38 *from*, *through*, also fall in this category (Krifka, 1998; Fong, 1997, 2001; Zwarts,  
 39 2005; a.o.). Several directional adpositions can also be ambiguous between an  
 40 activity (or 'atelic') reading and an achievement reading. So, they license both  
 41 a collective and a referential interpretation, in two slightly different ways (e.g.  
 42

1 *across, over, around*: Winter, 2006; Zwarts, 2006). For our purposes, it suf-  
 2 fices to say that directional adpositions, when combining with verbs denot-  
 3 ing directed motion such as *have gone* in (8) (i.e. telic verbs), form a complex  
 4 telic predicate, *have gone to a pub*. This predicate can be ambiguous in trig-  
 5 gering a collective or distributive interpretation, sentence-wise. So, a sentence  
 6 such as (8) can be interpreted in two ways. First, it can denote a single event in  
 7 which the boys, as a collective, have reached a possibly unique pub. Second, it  
 8 can denote several distinct events that involve one (different) boy, and the pub.  
 9 Hence, we label directional adpositions, such as *to*, as ‘telic’ and static adposi-  
 10 tions such as *at* as ‘atelic’ for expository purposes. One *proviso* we make is that  
 11 these two adpositions are closer in interpretation than these labels suggest,  
 12 since the readings they license may partially overlap.

13 The presence of an explicit context may furthermore contribute to the  
 14 interpretation of this plural definite. The explicit context may offer informa-  
 15 tion about the referents that are part of its denotation of a sentence, and are  
 16 involved in a ‘collective’ or ‘distributive’ event. Consider the following mini-  
 17 discourse examples:

18 (9) Mario, Wario and Luigi are boys. *The boys* have gone to the pub

19 (10) Mario, Wario and Luigi are boys. *The boys* are sleeping at the hotel

20  
 21 The example (9) can be either understood as denoting a single event in  
 22 which the boys went to the pub together, or several events in which each  
 23 boy reached the pub alone. Since the first sentence offers an explicit context  
 24 which also licenses an anaphoric interpretation, the mini-discourse in (9)  
 25 can be ambiguous between two interpretations. Under the collective inter-  
 26 pretation, the ‘trio’ composed of Mario, Wario and Luigi collectively reach  
 27 the pub in a single event of motion. Under the distributive interpretation,  
 28 each boy reaches the pub in a distinct event, one by one. The example in  
 29 (10), instead, is understood as denoting a single state, in which the afore-  
 30 mentioned trio sleeps somewhere with respect to the hotel. Informally, the  
 31 static adposition *at* contributes a collective reading to the anaphoric inter-  
 32 pretation of the plural definite *the boys*.

#### 34 1.4. Theoretical background: Theoretical answers, experimental 35 questions

36 Our discussion in the previous two sections invites the following conclusions.  
 37 The interpretation of plural definites can be defined on at least two distinct,  
 38 but closely interacting dimensions of meaning. One dimension pertains to  
 39 the ability of plural definites to be either referential or anaphoric. Plural def-  
 40 inites can be either interpreted with respect to an implicit or explicit context

1 (i.e. world knowledge or previous discourse). Another dimension pertains to  
 2 their ability to have collective or distributive interpretation, and be interpreted  
 3 as denoting a single state involving a trio of boys (e.g. (10)), or a collection of  
 4 similar events of reaching a pub, each involving a different boy (e.g. (9)). In  
 5 the context of discourse, the anaphoric interpretation of plural definites is the  
 6 favourite reading, if the context introduces the referents which are part of the  
 7 denotation of a plural definite, as in (9)–(10). Whether a plural definite in a  
 8 sentence has collective or distributive reference, then, depends on the predi-  
 9 cate it combines with. This property holds whether a verb or a combination of  
 10 verb and adposition denotes the relevant predicate.

11 We can now focus on our two initial questions, and offer two positive  
 12 answers, at least from a theoretical perspective. Our first answer is that the  
 13 contribution to lexical aspect of predicates can also influence the inter-  
 14 pretation of plural definites. Hence, our second answer is that the specific  
 15 aspectual contribution of a predicate may trigger a collective, distributive  
 16 or ambiguous reference for a plural definite. For instance, if plural definites  
 17 combine with telic spatial adpositions (e.g. *to*), then they can be ambiguous  
 18 between a collective and a distributive reading. If they combine with atelic  
 19 spatial adpositions (e.g. *at*), then their interpretation will depend from the  
 20 lexical aspect value of the adposition. While *at* triggers an inherently collec-  
 21 tive reading, *in* triggers an inherently distributive reading. This reading can  
 22 depend from the interpretation assigned to an adposition, e.g. *at* as denoting  
 23 general location.

24 These answers find some quite indirect support by experimental evidence.  
 25 For instance, works on the interaction between noun phrases and verb predi-  
 26 cates support the view that noun phrases and predicates interact with respect  
 27 to the collective/distributive distinction. Papers include Poesio and Vieira  
 28 (1998); Frazier *et al.* (1999); Vieira and Poesio (2000); Poesio (2003); Frisson  
 29 and Frazier (2005); Pylkkänen and McElree (2006); a.o.. However, little evi-  
 30 dence is offered in favour of these answers for spatial adpositions, which offer  
 31 an interesting, and subtle testing ground for this interplay between plural def-  
 32 inites and predicates. An experimental answer would offer us a better under-  
 33 standing of this phenomenon, both on how a predicted reading is actually  
 34 accessed, and how ambiguous readings are resolved. That is, we may discover  
 35 how speakers can access a collective or distributive reading, or whether they  
 36 access either reading, in opportune licensing conditions.

37 The remainder of the paper aims to fill this void and address these two  
 38 questions from an experimental perspective, since it tests whether our answers  
 39 regarding the interaction of plural definites and spatial adpositions correctly  
 40 predict the interpretation of these interacting elements by native speakers of  
 41 English.

## 2. The experiment

The goal of this section is to present an experiment that investigates our empirical questions, and discuss which answers the findings support.

### 2.1. Participants

Participants were undergraduate students from the Psychology and Linguistics Departments ( $N=53$ ). The participants were divided into two groups, as follows. A first group of participants participated in the testing of the first experimental hypothesis, clarified in the next section ( $N=30$ ). A second group participated in the testing of the second experimental hypothesis, also clarified in the next section ( $N=23$ ). All participants were native monolingual speakers of English. Each participant received course credit for attendance.

### 2.2. Procedure

In this section we introduce the specific experimental method used to test participants, a variant of the *Truth-Value Judgement Task* (henceforth: TVJT or TVJ task, Crain and Thornton, 1999). We discuss the nature of the TVJT first, and then explain what changes we brought to this task for our specific requirements.

The TVJ task was originally designed to test children's intuitions on the interpretation of sentences in discourse. In the original design, two experimenters are involved in an experimental session with children. One experimenter presents a story involving some fictional characters (e.g. animals, cartoon characters, etc.) to the child. The other experimenter uses a hand puppet, and impersonates an external character that watches the stories, alongside the child and the experimenter(s). This experimenter offers questions to the child at the end of each story, with the aim of testing children's *intuitive* understanding of language via their *spontaneous* answers to questions. This experimenter may also ask follow-up questions, aimed at testing whether children's answers are motivated by a correct understanding of the experimental hypothesis or not.

A standard TVJT story presents a set of events in which most, but not all of the characters perform a certain action. For instance, a simple story may involve five horses who decide to have a jumping competition, and challenge themselves to jump a quite high fence. While four of them are able to jump this fence, a fifth horse cannot complete the task and tumbles. After all the events of jumping unfold, the puppet (e.g. a 'Kermit the frog' puppet), poses a question to the child, saying that he is not sure about what happened. Consider a case in which the experiment aims to test the child's understanding of

1 sentences with the universal quantifier *every*. In this case, the puppet may ask  
 2 a sentence such as:

3  
 4 (11) Did every horse jump over the fence?

5  
 6 In this case, only a ‘no’ response would be correct, because one horse tum-  
 7 bled and failed to jump over the fence. The child’s response, then, will deter-  
 8 mine whether he is able to correctly interpret *every*. If she answers ‘yes’, then  
 9 she probably cannot access the meaning of *every* as a property holding for  
 10 each horse:<sup>10</sup> one horse has not successfully jumped over the fence. If she  
 11 answers ‘no’, then she can probably access the standard interpretation of  
 12 *every*, since she will correctly reject that a property holds for each horse, in  
 13 this story.

14 Three aspects of the TVJ task are particularly relevant, for experimental  
 15 purposes. First, since the puppet offers the question, children will not feel  
 16 pressured to answer positively to appease the *adult* experimenters. Instead,  
 17 they will offer an answer which will present their intuitive understanding of  
 18 the sentence. Second, the child is not asked to make a meta-judgement on  
 19 a property of linguistic expressions, but just to answer ‘yes’ or ‘no’ to a rela-  
 20 tively simple question. The design of the experiment, however, allows from  
 21 this simple binary answer to assess whether child’s understanding is accord-  
 22 ing to an experimental hypothesis or not. Third, a story is presented in such a  
 23 way that both a ‘yes’ and a ‘no’ answer correspond to outcomes that could have  
 24 been instantiated at some point in the story. However, only one turned out  
 25 to be correct: this is known as the *Condition of Plausible Dissent* (Crain and  
 26 Thornton, 1999; Meroni *et al.*, 2006).

27 The TVJT is thus a task that requires time and resources when used to  
 28 test children and their more limited attentional resources. Once one sets his  
 29 experimental focus on adults, it can be simplified to exploit adults’ broader  
 30 attention resources and understanding. For this reason we used a variant of  
 31 TVJT which differs from the basic task in the following details.

32 First, instead of acting out a story in front of the participants, we prepared a  
 33 power-point presentation presenting the story as a sequence of slides, depict-  
 34 ing the succession of events in a story. We narrated aloud the story to the  
 35 participants, while scrolling the power-point presentation. Before any stories  
 36 where presented, an introductory sequence of slides presented the main char-  
 37 acters appearing in the story and the instructions on how to offer the answers.  
 38 Participants were instructed to circle their chosen answer (‘yes’ or ‘no’) on an  
 39 answer sheet, after the target question was introduced. Beside the main char-  
 40 acters, the introduction presented another character, the amnesiac teddy bear  
 41 ‘Mr. Little Bears’. Mr. Little Bears<sup>11</sup> was described as watching the stories with  
 42

1 the participants. Because of his bouts of amnesia, he had to ask the partici-  
2 pants whether a certain event occurred or not. In this way, he played the part  
3 of the puppet in the experimental design.

4 Second, we tested up to four participants per session, with each participant  
5 sitting at the same distance from the screen on which the presentation was  
6 run. No participant was aware of the nature of the experiment and the exper-  
7 imental hypotheses. Each participant was invited to sign an ethics approval  
8 form before the experiment. The experimental sessions lasted an average of 10  
9 minutes per experiment.

10 Third, since we aimed at testing two hypotheses rather than one, we divided  
11 the participants in two sequential 'streams' of testing. The first stream of 30  
12 participants watched a story which involved an ambiguous question at the  
13 end, since it contained the adposition *to*. The second stream of 23 partici-  
14 pants<sup>12</sup> watched a story which involved a non-ambiguous question at the end,  
15 since it contained the adposition *at*. In the first stream, participants were asked  
16 to write an answer on an answer sheet, choosing between three options: 'yes',  
17 'no' and 'not sure'. The 'not sure' option was introduced in order to test whether  
18 participants could find the question too ambiguous to warrant a 'yes' or 'no'  
19 answer. If participants wanted to change answer, they were instructed to cross  
20 their first answer and choose a second answer. Only the second answer was  
21 considered valid, for scoring purposes. Only one participant chose the 'not  
22 sure' option in this first experiment. Hence, we decided to reduce choices to  
23 'yes', 'no' in the second stream.

24 Fourth, since this experimental paradigm required less direct involvement  
25 from the experimenters, we took turns in attending the experimental sessions  
26 and narrating the story to the participants, as well as collecting the data and  
27 ensuring that all bureaucratic matters were taken care of. Let us look at the  
28 materials, then.

### 29 **2.3. Materials**

30 The materials used to test the experimental hypotheses were as follows. We  
31 focused on our two adpositions, *to* and *at*, to respectively test the contribution  
32 of ambiguous (dynamic) prepositions and of non-ambiguous (static) prepo-  
33 sitions. A few words on these prepositions will clarify their exact semantic  
34 contribution in discourse and thus the scenarios they describe, beside their  
35 contribution to the collective or distributive reading of definites.  
36

37 A standard assumption regarding the interpretation of *to* is that this prepo-  
38 sition refers to a sequence of events in which a moving entity reaches a certain  
39 location, when the last event is completed (Parsons, 1990; Fong, 1997; Zwarts,  
40 2005). The interpretation of *at* seems to be more controversial. Some authors  
41 treat this adposition as denoting a form of 'general location' (Nam, 1995; Feist,  
42

1 2006; Ursini, in press; for a related analysis). Others treat this adposition as  
 2 denoting an external, adjacent location to a ground (Herskovits, 1986; Zwarts  
 3 and Winter, 2000; a.o.). We would like to suggest that *at* denotes a form of gen-  
 4 eral location, as previous findings suggest (Feist, 2006). So, our findings would  
 5 also shed light on the purely spatial meaning shade of *at*.

6 The testing of these hypotheses was carried out via the presentation of  
 7 two distinct stories. Both stories had five main protagonists, characters taken  
 8 from ‘Thomas The Tank Engine’ line of toys. These characters were: Thomas,  
 9 Arthur, Spencer, Diesel 10 and Duncan. Aside Mr Little Bears, in both stories  
 10 other characters and locations were introduced, and played a relevant role in  
 11 the story.

12 The design of the stories was the following. In the *to* story, the five tank  
 13 engines woke up and decided to have breakfast at Harold the helicopter’s farm.  
 14 While Thomas, Duncan, Spencer and Diesel 10 reached the farm and received  
 15 free bread from Harold the helicopter, Arthur decided to stop mid-way and  
 16 have a shower at a water tower, hence not reaching the farm and free bread.  
 17 Each tank engine reached the farm independently, so there were a total of four  
 18 arrival events, plus one ‘aborted’ arrival event, that of Arthur. Each ‘arrival  
 19 event’ was depicted in a different slide, including Arthur’s change of mind.  
 20 In the first and the second story, there was a unique location that the engines  
 21 could reach: a tank engines station. In this way, participants could access the  
 22 collective reading of both sentences. Since the relevant tank engines reached  
 23 the same location, the four events in which each engine performed this action  
 24 could be combined in a ‘collective’ event in which a certain group of engines  
 25 reached a single station. The same reasoning holds for the second story. The  
 26 engines ended up ‘at’ the hotel, as the result of each engine reaching one spe-  
 27 cific location related to the hotel.

28 This minimal diversion from a purely ‘collective’ story had one strong  
 29 design-driven reason.<sup>13</sup> In the first story, this diversion granted that that the  
 30 CPD was met, and thus that participants could entertain both answers as  
 31 equally acceptable. Each of the events constituting the ‘collective’ event under  
 32 discussion was spelt out. The story motivated why a certain engine did not go  
 33 to the station, and why the remaining engines participated in ‘collective’ event,  
 34 in which they all reached the station. In the second story, the diversion allowed  
 35 to illustrate that each engine reached a different position with respect to the  
 36 Hotel (i.e. in front, behind, even inside). Each arrival event was described in  
 37 detail. In this way, participants could easily evaluate whether the tank engines,  
 38 as a ‘collective’, were at the station, with the story providing the opportune  
 39 explicit context. Hence, both stories had a virtually identical experimental and  
 40 theoretical set-up, and tested the two different experimental hypotheses and  
 41 predictions about collective and distributive reference. At the end of this story,  
 42



1 Mr Little Bears appeared and offered the following comment and question to  
 2 the participants:

3  
 4 (12) 'Our tank engines are very hungry today! But I am not sure about one  
 5 thing:

6 *Have the tank engines gone to the station?*

7  
 8 According to our predictions, then, participants could have answered 'yes' or  
 9 'no' in equal measure, with 'not sure' at chance rate. The reasons for these  
 10 answers are as follows. If the plural definite *the tank engines* was interpreted  
 11 collectively, then all the engines except Arthur formed a 'collective' that  
 12 reached the station. Hence, participants could answer 'yes' and indicate that  
 13 these four engines, as a 'collective', reached the station. If the plural definite  
 14 was interpreted distributively, then each engine played a role in the evalua-  
 15 tion of the story. Hence, Arthur's change of plans warranted a 'no' as the cor-  
 16 rect answer. If the participants were not really able to make up their mind, they  
 17 could have answered 'not sure'.

18 In the *at* story, the five tank engines were tired from a gruesome week of  
 19 work and decided to have a night of rest at the Powerpuff girls' Hotel. Each  
 20 of the engines went to this Hotel alone. The Powerpuff girl 'Blossom', another  
 21 fictional character, offered a different accommodation to each of the tank  
 22 engines, in her role as the Hotel's owner. Given our discussion of *at* as a gen-  
 23 eral location adposition, the locations for the tank engines were the follow-  
 24 ing. Thomas slept *inside* the Hotel, Diesel 10 and Arthur in front of the Hotel,  
 25 Duncan on top, Spencer behind. Each arrival and choice of sleeping location  
 26 was depicted in a different slide, so that there were a total of five arrival events.  
 27 Thomas initially decided to sleep outside, but since he was feeling cold, he  
 28 opted for sleeping inside, instead. The CPD was also met, via change of plans  
 29 that made an 'external location' answer a possible choice, at some point in the  
 30 story. In this story, the collective interpretation arose as a result of the tank  
 31 engines occupying different regions related to the Powerpuff Hotel, that could  
 32 collectively labelled as 'at' the Hotel. While each tank engine was in some spec-  
 33 ific location, the engines as a collective were 'at' the Hotel. At the end of the  
 34 story, Mr Little Bears appeared and offered the following comment and ques-  
 35 tion to the participants:

36  
 37 (13) 'Our tank engines are very tired today! But I am not sure about one  
 38 thing:

39 *Are the tank engines sleeping at the Powerpuff Hotel?*

40  
 41 According to our predictions, then, the participants could have answered  
 42 only 'yes', with 'no' as a mistake in interpretation. Since we assume that the

1 exact interpretation of *at* corresponds to that of general location, the correct  
 2 answer should have been unanimously positive. If this assumption is incor-  
 3 rect, then a unanimous negative answer should be observed, instead. Before  
 4 moving to the predictions, we observe that our story presented a scenario in  
 5 which the engines occupied regions of space that were all adjacent to the land-  
 6 mark object. We did not attempt to test whether *at*, as denoting general loca-  
 7 tion, could also be considered acceptable if tank engines were 'far' from the  
 8 Hotel. However, the story (and the matching picture) made clear that at least  
 9 one engine, Thomas, was not outside the Hotel, but inside this location.

10 Summing up, the predictions for both stories are as follows. For the *to*  
 11 story, which included three possible answers, we predict that 'yes' and 'no'  
 12 answers would have been even. Hence, the 'not sure' answer should occur at  
 13 chance rate. For the *at* story, which did not include a 'not sure' answer, the 'yes'  
 14 answers should have been the norm, while the 'no' answers should have been  
 15 due to performance factors. The next section presents the results.

#### 17 2.4. Results and discussion

18 The main findings of the experiments were that the predictions were borne  
 19 out. The results are as follows.

20 For the *to* story, a total of 30 participants was interviewed. Fourteen partic-  
 21 ipants answered 'yes', 15 participants answered 'no', one participant answered  
 22 'not sure'. The percentages were respectively 46.6%, 50% and 3.4%, as per pre-  
 23 dictions (including a chance rate for 'not sure'). Note that four participants  
 24 chose to re-interpret their initial answer, from 'yes' to 'no', while two partici-  
 25 pants made the inverse choice, and the lone 'not sure' participant made this  
 26 choice after initially choosing a positive answer. After the experiment, partic-  
 27 ipants were asked to motivate their particular answer to the question, as  
 28 a follow-up. Each participant that answered 'yes' pointed out that a relevant  
 29 'group' of engines indeed reached the station. Each participant that answered  
 30 'no' pointed out that one engine, Arthur, did not reach the station and made  
 31 the underlying story false. The 'not sure' participant decided to answer in this  
 32 way only after some thinking. She motivated her answer by saying that she was  
 33 not sure about which answer was really the 'correct' one. No other participant  
 34 chose a 'not sure' answer, a fact that led us to slightly change the experimental  
 35 set-up for the *at* story.

36 For the *at* story, a total of 23 participants was interviewed. Twenty-two par-  
 37 ticipants answered 'yes', one participant answered 'no'. The percentages were  
 38 respectively 95.7% and 4.3%. All the participants chose not only the collec-  
 39 tive interpretation for *the tank engines*, as answers were mostly of one type.  
 40 They also interpreted *at* as expressing general location, rather than 'exter-  
 41 nal' location, since answers were mostly 'yes'. The only participant answering  
 42

1 'no' pointed out that one engine's position was more accurately described as  
 2 being 'in' the hotel, so a 'yes' answer was more problematic ('border-line true',  
 3 according to the participant, for one engine. For this reason, she preferred to  
 4 answer 'no', after some reflection. We think that these data invite the following  
 5 generalizations.

6 First, all of our predictions are substantially borne out. Recall that telic  
 7 adpositions such as *to* should license both a collective and a distributive read-  
 8 ing, for a plural definite such as *the tank engines*, on equal grounds. In answer-  
 9 ing the first target question, participants could choose to consider the four  
 10 relevant engines, as a collective, to be the salient entity in discourse and thus  
 11 answer 'yes'. The results mirror this equal possibility for one of the two answers  
 12 to occur. Atelic adpositions such as *at*, instead, are not ambiguous and thus  
 13 can only license a collective interpretation for *the tank engines*. Only one read-  
 14 ing is predicted, and only one reading is observed. Note, furthermore, that  
 15 our assumptions about the precise 'spatial' interpretation of *at* are borne out  
 16 as well. Participants invariably answered positively to the target question.  
 17 This is sharply in contrast with a theory of *at* as expressing external location  
 18 (e.g. Kracht, 2002), and perfectly in line with our (and others') theory of *at*  
 19 as expressing 'general' location (e.g. Nam, 1995). Importantly, these data also  
 20 show that one central prediction is borne out, although in a rather indirect  
 21 way. Plural definites in discourse are interpreted in an inherently anaphoric  
 22 way. Participants offered their answers by considering the definite *the tank*  
 23 *engines* as referring to the five tank engines in the story, as the answers inher-  
 24 ently prove. Overall, participants could access readings as per predictions.

25 Second, the details regarding participants' answers, collected in the exper-  
 26 iment's follow-ups, confirm the validity of the experimental hypotheses. The  
 27 only participant who offered a 'not sure' answer did so after changing mind. In  
 28 the experiment's aftermath, she commented that she made her second choice  
 29 because she felt that her intuitions about the experiment were not clear and  
 30 spontaneous any more. Other participants invariably commented that they  
 31 chose the answer they found the most appropriate, out of two possible options.  
 32 In the second experiment, the more straightforward options resulted in a  
 33 'swift' set of answers. In general, participants were sure about their choice:  
 34 only one participant changed her answer. Interestingly, the only participant  
 35 answering negatively commented that her answer was based on Thomas being  
 36 the only tank engine who was 'at' the hotel, according to her understanding of  
 37 the question. Other tank engines were somewhere else, but not 'at' the hotel,  
 38 according to her interpretation. Overall, participants had a clear idea what was  
 39 the correct answer to the experimental question.

40 Third, we observe that our data broadly not only support the single pre-  
 41 dictions we have made about the interaction between spatial adpositions and  
 42

1 plural definite. They also support the general assumption that plural definites  
 2 are interpreted in an anaphoric way, when the explicit context introduces the  
 3 referents making up the denotation of a plural definites. Participants always  
 4 mentioned that, in offering their choice, they took in consideration the infor-  
 5 mation provided in the story leading up to the question. For instance, in  
 6 offering an answer to the first question, participants either mentioned that  
 7 a collective of tank engines went to the station, so the 'yes' answer was more  
 8 appropriate. Or, that Arthur changed idea during the story, so a 'no' answer  
 9 was more appropriate. In offering an answer to the second question, partici-  
 10 pants always mentioned that the tank engines as a collective were occupying  
 11 some location related to the hotel. So, the tank engines were effectively 'at' the  
 12 hotel. Overall, the anaphoric component plays a part in interpretation, at least  
 13 in discourse.

### 15 3. Conclusion

16 In this paper we have presented novel experimental evidence regarding the  
 17 interaction between plural definites and spatial adpositions, in discourse.  
 18 These novel data offer a further insight on at least three topics regarding the  
 19 interpretation of definites in discourse.

20 First, these data suggest that spatial adpositions can determine the inter-  
 21 pretation of plural definites, according to the type of collective or distributive  
 22 reading that they can license in a sentence. This type is in turn determined,  
 23 to some extent, by the lexical aspect contribution of the predicate they com-  
 24 bine with, i.e. whether a predicate is telic or atelic. Since adpositions act as  
 25 predicates, alone or in combination with verbs, they may determine whether  
 26 a plural definite is interpreted as having collective or distributive denotation.  
 27 They denote whether a certain property holds of a referent denoted by a plural  
 28 definite as a 'collective', or for each referent in the denotation of a plural defi-  
 29 nite. In our specific case, we have seen that the directional/dynamic adposi-  
 30 tion *to* may license both readings for a plural definite such as *the tank engines*  
 31 on equal grounds. The locative/static adposition *at* only licenses the collective  
 32 reading. This finding is consistent with general assumptions about predicates  
 33 and their interaction with plural definites (e.g. Brisson, 1998, 2003; Landman,  
 34 2000, 2004; *inter alia*). It extends these assumptions to cover a still understud-  
 35 ied set of predicates, that of spatial adpositions. Since it investigates what is the  
 36 role of lexical aspect, it sheds light on how the collective/distributive readings  
 37 can be accessed.

38 Second, these data suggest that the contribution of predicates to the inter-  
 39 pretation of plural definites, what we have defined as their 'lexical content',  
 40 plays a vital role in sentence interpretation. The second experiment focused  
 41  
 42

1 on the ability of *at* to license only a collective reading for plural definites, and  
 2 offered clear evidence in this regard. If telic predicates forcibly license only  
 3 one type of interpretation (either collective or distributive), then plural defi-  
 4 nites should be interpreted only in one way, accordingly. The vast majority of  
 5 ‘yes’ answers in the *at* experiment support this account. These answers further  
 6 suggest that the collective reading for plural definites can in a sense emerge in  
 7 discourse, as the result of apparently different predicates holding at the same  
 8 time. If each tank engine instantiates one possible ‘at’ location, then the tank  
 9 engines as a collective will certainly occupy a ‘complex’ ‘at’ location. Import-  
 10 antly, this form of entailment pattern is licensed also because the landmark  
 11 object denoted by the singular definite *the hotel* is unique. If each of the tank  
 12 engines is ‘at’ the same hotel, then the tank engines as a collective are ‘at’ the  
 13 hotel, as well.

14 Third, these data also suggest that *at* denotes a related which can be roughly  
 15 defined as denoting a general location relation. Our second experiment  
 16 strongly suggests that this adposition denotes a relation between locatum and  
 17 landmark object which is in a sense underspecified with respect<sup>14</sup> to the exact  
 18 position of the locatum. Since participants systematically accepted *at* as also  
 19 denoting a case in which one of the tank engines was inside the hotel, rather  
 20 than outside, the hypothesis that *at* denotes external location is not borne out.  
 21 Some important observations pertain to the validity of the data offered in  
 22 these experiments. We list two possible observations.

23 First, both experiments offer evidence pertaining to the collective inter-  
 24 pretation of *to* and *at* that is in part indirect, in nature. We aimed to strike  
 25 a balance between the needs of experimental set-ups and the testing of our  
 26 experimental hypothesis. Hence we used stories in which the collective read-  
 27 ing arises from the unfolding of our stories. This balance turned out to be  
 28 fine-grained enough to offer sound evidence regarding this reading, as the  
 29 data show. However, it would be in theory possible to test what we could call  
 30 a ‘true’ collective reading, e.g. a case in which a story shows that all the rel-  
 31 evant engines except one jointly reach the station, or end up sleeping at the  
 32 hotel.<sup>15</sup> We leave the testing of such an experimental set-up for future research,  
 33 however.

34 Second, the second experiment does not offer what could be called ‘defini-  
 35 tive’ evidence that *at* denotes an ‘unrestricted’ form of general location. In the  
 36 experimental set-up, each tank engine occupied a position which was very  
 37 close to the hotel, so participants could have been biased by the implicit con-  
 38 text to answer in a positive manner. We also leave such a question for future  
 39 research.

40 We can nevertheless conclude that our initial empirical questions find exper-  
 41 imental answers which are positive. Speakers of English interpret (anaphoric)  
 42

1 plural definites has having collective or distributive reference, depending on  
 2 whether the predicate they combine with licenses one or both interpretation.  
 3 In the case of spatial adpositions, telic adpositions such as *to* license both  
 4 interpretations (collective or distributive). So, speakers access both interpre-  
 5 tations in context. Atelic adpositions such as *at* license either one, so speakers  
 6 will only access one interpretation. The first question receives a positive exper-  
 7 imental answer. Furthermore, speakers interpret plural definites has having  
 8 a unique interpretation, when the predicate they combine with licenses one  
 9 interpretation. So, speakers always interpret plural definites as having collec-  
 10 tive reference, when combining with *at*. The second question also receives a  
 11 positive experimental answer.

12 It should be obvious that these three topics and, in general, the empirical  
 13 findings we offered in this paper do not exhaust the whole debate regarding  
 14 the interpretation of definites. We would like to suggest three topics we have  
 15 not addressed in this paper, and that we would like to investigate in further  
 16 research.

17 First, we have left open the possibility that certain predicates may *only*  
 18 license a distributive reading. Some verbs seem to behave in this way (see  
 19 Schwarzschild, 2009 for discussion). Some authors suggest that *in* may be an  
 20 adposition denoting an inherently distributive predicate (e.g. Brisson, 1998;  
 21 2003). A similar suggestion could be made for the so-called *projective* locative  
 22 adpositions, such as *in front of* or *behind*. Whether this suggestion is on the  
 23 right track or not, is something that we leave for future research.

24 Second, although we have proposed that our findings hold for telic and  
 25 atelic adpositions, it is nevertheless an open problem whether these gener-  
 26 alisations hold for each adposition within these broad classes. One prob-  
 27 lem is whether our experiments would have yielded the same results if we  
 28 would have used adpositions such as *through* and *from*, rather than *at* and  
 29 *to*. These adpositions express different spatial configurations, but it is not  
 30 clear whether this difference is relevant or not. Several directional/dynamic  
 31 adpositions can be ambiguous between a 'telic' and an 'atelic' reading. So,  
 32 they may either receive an ambiguous or unique interpretation, depending  
 33 on which lexical aspect interpretation is accessed. Furthermore, the exact  
 34 interpretation of an adposition also depends on the verb it combines with,  
 35 as it is well-known in the literature (e.g. Zwarts, 2005). We thus leave for  
 36 future research an exploration of this complex 'layer' of interpretation for  
 37 adpositions.

38 Third, we have not addressed whether our treatment of adpositions and  
 39 plural definites can be extended to singular definites as well, whether they  
 40 are anaphoric or referential in nature. Our experiments very indirectly tested  
 41 the contribution of singular, referential definites, since the target questions  
 42

involved the singular definites *the station* and *the hotel* in object position. We think that the data in Poesio and Vieira (1998) offer empirical evidence which is in line with our findings. However, it is an open question whether singular definites have the same interpretative properties as plural definites, both in discourse and in subject position. We also leave an answer to this question for future research.

We therefore conclude that, if our analysis is correct, our data can offer a novel and more accurate analysis of the interpretation of plural definites in discourse, and sheds light on their with spatial adpositions as predicates.

## Notes

1. In this paper, we shall adopt the DRT convention and call ‘referents’ all model-theoretic entities that represent extra-linguistic entities at a linguistic level. See Kamp *et al.* (2005: 750–760) for a basic discussion.

2. Other labels for this reading are *maximal* (collective) vs. *non-maximal* or *partitive* (distributive), as in Brisson (1998, 2003). We will only use the labels ‘collective’ and ‘distributive’, to avoid confusion. See Le Bruyn (2007, 2008) for discussion, and Note 8 for a further clarification.

3. Here we use rather neutral labels to define the located entity and the entity acting as a reference, but the most common terms are respectively *figure* and *ground* (e.g. Talmy, 1978, 2000).

4. The label ‘anaphoric’ is sometimes considered synonymous with ‘salient’ in the literature on definites. As we show in the remainder of the introduction, the two concepts are different, and in a sense saliency readings are only one type of anaphoric readings.

5. We would like to thank an anonymous reviewer for bringing this literature and examples to our attention, in particular for pointing us to Schwarz (2009).

6. In set-theoretic, extensional notation, the denotation of *boy* would be **boy**'={Mario, Luigi, Wario}, whereas the denotation of *boys* would be **boys**'={Mario, Luigi, Wario, {Mario, Luigi}, {Mario, Wario}, {Luigi, Wario}, {Mario, Luigi, Wario}}. The definite article would select the ‘ideal’ element in this power-set, i.e. we have **the boys**'={Mario, Luigi, Wario}. See e.g. Link (1998: ch. 1) for a more thorough introduction to theories of plurality, and Schwarzschild (1996: ch. 1) for a discussion between set-theoretic and lattice-theoretic notations.

7. A distributive reading may be licensed, but only in the opportune implicit context. For instance, each boy may lift a toy piano, possibly light in weight. This aspect is immaterial, for our discussion.

8. In the literature, this type of collective reading is often defined as a *cumulative* reading (e.g. Krifka, 1998; Rothstein, 2004). For the discussion at hand, our coarse-grained treatment of cumulativity and collectivity as virtually the same phenomenon, and their interplay with distributivity, is precise enough, and refer the reader to the literature for a more thorough analysis of this property (e.g. Beck and Sauerland, 2000; Rothstein, 2004). We would like to thank an anonymous reviewer for bringing this aspect of the discussion to our attention.

9. We thank an anonymous reviewer for raising the issue, and inviting us to discuss this aspect in detail.

10. Although there is an intense debate on how children interpret ‘every’ and other ‘logical’ words (e.g. whether is similar or different to adults’), many current proposals suggest that their interpretation is adult-like, once they can access their processing resources are ‘powerful’ enough to understand such words. See Notley *et al.* (2008) for a recent analysis.



1 11. This name is a pun, as it is the literal translation of the first author's surname into Eng-  
 2 lish. We only explained this detail to participants if asked to.

3 12. The asymmetry in number of participants stems from contingent reasons. While 30  
 4 participants per stream were registered, four participants did not attend the experimental ses-  
 5 sions for various reasons, not related to the experiment. Data from three participants were also  
 6 discarded, as they were bilinguals, but still had the right to participate in the experiment.

7 13. We remind the reader that the sub-type of collective reading under discussion is the  
 8 cumulative reading. Our experimental design aims to capture precisely this reading, as well as  
 9 meeting the CPD condition.

10 14. We would like to thank a second anonymous reviewer for bringing this aspect to our  
 11 attention.

12 15. We would like to thank again a second anonymous reviewer for bringing this aspect to  
 13 our attention.

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