
EDWARD J. WISNIEWSKI

English and other languages make a grammatical distinction between count nouns and mass nouns. For example, “dog” is primarily used as a count noun, and “mud” is primarily used as a mass noun. Count nouns but not mass nouns can be pluralized and preceded by numerals (as in “three dogs” but not “three muds”). Count nouns but not mass nouns can appear with the indefinite determiner “a” (as in “A dog ate the chicken” but not “A mud covered the chicken”). On the other hand, mass nouns can appear with indefinite quantifiers such as “much” or “little” (as in “much mud” but not “much dog”), whereas count nouns can appear with indefinite quantifiers such as “many” and “few” (as in “many dogs” but not “many muds”).

Many scholars have addressed the question of why there is a linguistic distinction between count nouns and mass nouns. Put another way, why do speakers use count and mass nouns in a language? If one broadly examines the use of count and mass nouns in English, the answer to this

1. Some languages such as classifier languages (e.g., Japanese) do not make a distinction between count and mass nouns. Nevertheless, they do have other mechanisms for indicating that an entity is or is not individuated (for discussions of cross-linguistic differences in the tendency to individuate, see Imai and Gentner, 1997; Lucy, 1992; Wisniewski et al., 2003).
question is not straightforward. Count nouns and mass nouns refer to diverse things, such as abstract entities (e.g., an idea vs. insanity), events (an explosion vs. sleep), and sounds (e.g., a knock vs. thunder). Count and mass nouns also refer to perceptually similar things (e.g., pebbles vs. gravel, leaves vs. foliage, garments vs. clothing, and advice vs. suggestions). In addition, many nouns are readily used either as a count or mass noun (e.g., “I’ll go buy a cake” vs. “I’ll have some cake,” “She is a curiosity” vs. “She is full of curiosity”). These observations reveal a paradox: the count—mass noun distinction is made across diverse domains that appear to have little in common and within domains that appear to have much in common.

Is there a conceptual basis to the grammatical distinction between count nouns and mass nouns? One answer is that this grammatical distinction is, to a very large degree, semantically opaque and unprincipled (e.g., Bloomfield, 1933; Gleason, 1969; Markman, 1985; McCawley, 1975; Palmer, 1971; Quine, 1960; Ware, 1979; Whorf, 1962). In general, people learn which nouns are typically used as count nouns and which are typically used as mass nouns without any understanding of why these differences in syntax occur. Another answer is that the grammatical distinction between count and mass nouns is to a very large degree conceptually based. That is, when speakers use count nouns to refer to things they implicitly have something in mind that they are trying to communicate that is common across all uses of count nouns. A similar view applies to the use of mass nouns. A third answer, and the one that I propose, is that the count—mass noun distinction is to a very large degree conceptually based, but there are exceptions. Some exceptions do not seem to have a clear explanation, but others may occur because of competing communicative functions of language.

The remainder of this chapter is organized in the following manner. I first describe the cognitive individuation hypothesis, which proposes that there is a conceptual basis for the count—mass noun distinction. Next I describe empirical evidence that is consistent with this hypothesis. Specifically, I describe experiments and linguistic analyses that evaluate the conceptual basis for the count—mass noun distinction across a diverse set of domains: aggregates (groups of small, relatively homogeneous entities, e.g., rice and toothpicks), superordinates (broad categories of perceptually heterogeneous entities, e.g., vehicles and clothing), and sounds. I also examine the conceptual basis for the use of collective nouns (singular nouns, e.g., team and constellation, that refer to multiple entities) and pluralia tantum (plural nouns, e.g., groceries and ruins, that refer to multiple entities or entity-like things). I then describe uses of count—mass noun syntax that contradict the cognitive individuation hypothesis. Some of these exceptions evidently arise because of the competing communicative functions of language. Finally, I describe the broader relationship between the count—mass noun distinction and cognition and perception.
The Cognitive Individuation Hypothesis

A number of scholars have proposed the cognitive individuation hypothesis as an explanation for a conceptual basis of the count—mass noun distinction (Bloom, 1990, 1996; Langacker, 1987; Mufwene, 1984; Soja et al., 1991; Wierzbicka, 1988; Wisniewski et al., 1996). According to this hypothesis, count nouns refer to individuals, and mass nouns refer to nonindividuated entities. For example, objects are prototypical individuals in being discrete, bounded entities that are separate from other aspects of the world. Substances are prototypical nonindividuated entities in being continuous, unbounded, and arbitrarily divisible (e.g., mud divided into a portion of any size is still mud). In corresponding fashion, most objects are labeled with count nouns (e.g., a cat, a computer), and most substances with mass nouns (e.g., clay, honey).

There are two other important aspects of the cognitive individuation view. First, the idea of an individual is broader than an object and includes more abstract individuals. For example, constellation refers to an abstract individual. Even though it is composed of objects (i.e., stars), the cognitive individuation view claims that people think of these stars as a single individual. Likewise, the idea of a nonindividuated entity is broader than substances and includes more abstract nonindividuated entities, such as curiosity, which can refer to an abstract quantity of a varying amount.

Second, the cognitive individuation view emphasizes the role of the human or cognitive agent in determining whether perceptual input from the world is interpreted or construed as an individual or as a nonindividuated entity. How we interact with things, our goals, and our focus of attention influence our interpretation of the perceptual input and affect whether we refer to something with a count noun or a mass noun. For example, in most contexts people interpret a bench as a distinct individual and hence refer to it as “a bench.” The perceptual input readily gives rise to the perception of a discrete, bounded object. However, a person who wants to sit on a crowded bench might tell those sitting there to “move over and give me some bench.” In this context, the person conceptualizes the bench as a nonindividuated entity (i.e., a flat expanse or quantity of space) and hence uses a mass noun.

The cognitive individuation view straightforwardly implies that perceptually similar entities may be conceptualized as individuated or as nonindividuated depending on the cognitive agent. This observation is important because scholars who suggest that the count—mass noun distinction is unprincipled cite pairs of count and mass nouns whose referents are perceptually similar (oats vs. wheat, Bloomfield, 1933; rice vs. beans, Gleason, 1969; pebbles vs. gravel, Markman, 1985; noodles vs. spaghetti, McCawley, 1975; foliage vs. leaves, Palmer, 1971; footwear vs. shoes, fuzz vs. cop, fruit vs. vegetable, Ware, 1979). However, these scholars have focused on the
perceptual similarity of these entities without taking into consideration the role of the cognitive agent.

The cognitive individuation view raises the question of what is meant by an individuated or nonindividuated entity. Wisniewski et al. (2003) suggest that the distinction between an individual and a nonindividuated entity is determined by its scope of predication. People conceptualize an entity as an individual if they are able to predicate its central properties to that entity “as a whole” rather than to arbitrary portions or parts of that entity. For example, we typically conceptualize “postage stamp” as individuated. In turn, the central properties of a postage stamp, such as “is adhesive, is torn from a sheet, is used for mailing a letter, and is rectangular,” do not apply to arbitrary portions of a stamp. In contrast, people will consider an entity as nonindividuated if they are able to predicate it central properties to the entity that apply to arbitrary portions or parts of that entity. For example, we typically conceptualize “butter” as nonindividuated. In turn, central properties of butter, such as “melts, has a particular taste, used as a topping for food,” largely apply to arbitrary portions of butter. This hypothesis raises the question of what is meant by central properties. Roughly speaking, they are properties that are responsible for an entity “being what it is,” such that it would be difficult to imagine that entity existing without such properties” (for a candidate operational definition of this idea, see Sloman et al., 1998).

Evidence for the Cognitive Individuation Hypothesis

A number of psychological studies and linguistic analyses are consistent with the cognitive individuation hypothesis. In this section, I describe evidence from cognitive psychology and linguistics suggesting that speakers conceptually distinguish between the referents of count and mass nouns. The evidence spans a number of different kinds of categories (aggregates, superordinates, and sounds) and types of linguistic terms (collective nouns and pluralia tantum).

Aggregates

These entities consist of multiple, co-occurring, relatively small, homogeneous constituents. For example, rice is an aggregate. The term rice typically refers to a group of grains of rice, stored uncooked in bags and other containers, or appearing in cooked form in pots or bowls, or on plates. There are both aggregates named by count nouns (e.g., grapes, toothpicks, tacks) and aggregates named by mass nouns (e.g., sugar, grass, sand). Some pairs of aggregates consist of very similar elements even though one member of a pair is named by a count noun and the other by a mass noun (e.g., pebbles and gravel, snow flurries and snow, pills and aspirin, coins and change). Thus, it is not readily apparent whether a conceptual distinction exists between count- and mass-noun aggregates.
Wierzbicka (1988) proposed several reasons for why a conceptual distinction exists between count- and mass-noun aggregates. She suggested that differences in how speakers interact with the constituents of an aggregate determine whether they will individuate those constituents, which in turn will be reflected in the syntax of the language. For example, Wierzbicka notes that in Polish, groups of berrylike fruits (e.g., raspberries, currants, strawberries, and plums) are named by plural count nouns perhaps because Polish people usually interact with the constituents one by one (e.g., when picking them or eating them). In contrast, Polish farmers selling their wares at a market setting commonly refer to such fruits with mass nouns perhaps because they interact with them as quantities and not as individual entities. Wierzbicka also suggested that the ease of distinguishing the constituents of an aggregate influences whether a speaker construes those constituents as individuals. For example, she argues that “beans” is a plural count noun and “rice” a mass noun because beans are more perceptually distinguishable than are individual grains of rice. Thus, people view each bean as a distinct individual but rice as a nonindividuated group.

In a number of studies, Middleton et al. (2004) evaluated these hypotheses proposed by Wierzbicka. One experiment assessed whether perceptual distinguishability of elements composing familiar aggregates predicted their count—mass noun status. The experiment involved a large, diverse set of 112 aggregates. Undergraduates simply rated how easy it is to see or distinguish the individual elements that compose each aggregate, using a numerical scale ranging from 1 to 9, with 1 indicating that the elements were extremely easy to see and distinguish and 9 indicating that the elements were extremely hard to see and distinguish. (Numbers in between these extremes indicated intermediate degrees of perceptual distinguishability.) Each count-noun aggregate was presented in the format “a(n) X” (e.g., a bean), and every mass-noun aggregate was presented in the format “a unit of X” (e.g., a unit of rice). The referents of these phrases are single elements of an aggregate. For each element, participants were instructed to visualize a typical group of that element before making their rating. This procedure minimizes the effects of count—mass noun syntax on participants’ judgments. For example, participants’ judgments about the size of the elements of “rice” or “beans” could be influenced by their knowledge that rice is a mass noun and beans is a count noun.

Consistent with Wierzbicka’s hypothesis, the rated ease of distinguishing the elements of an aggregate was systematically related to whether the aggregate was named by a count or mass noun. Undergraduates gave lower ratings to count-noun aggregates than to mass-noun aggregates. (There were some exceptions to this result that I discuss further below.)

In another study in Middleton et al. (2004), undergraduates rated how often they interacted with one or a few of the elements of an aggregate, using a numerical scale ranging from 1 to 9, with 1 indicating that they frequently interacted with one or a few of the individual elements and
indicating that they rarely interacted with one or a few of the individual elements of the aggregate. (Numbers between these extremes indicated intermediate degrees of interaction with one or a few of the individual elements.) Consistent with Wierzbicka’s hypothesis, the rated likelihood of interacting with one or a few elements of an aggregate was systematically related to whether the aggregate was named by a count or mass noun: undergraduates gave lower ratings to count-noun aggregates than to mass-noun aggregates. (Again, there were some exceptions to this result that I discuss further below.)

To assess the generality of these findings, Middleton et al. (2004) conducted two additional studies that also involved ratings of perceptual distinguishability of aggregate elements and likelihood of interacting with one or a few versus multiple elements, and used another set of 80 aggregates that did not overlap with the first set and replicated the previous results.

These findings show that people are aware of differences between the referents of familiar count and mass-noun aggregates. That is, compared to the elements of mass-noun aggregates, people believe that the elements comprising familiar count-noun aggregates are more perceptually distinguishable and that their interactions with the elements more often involve one or a few elements at a time. However, these studies do not show that people’s knowledge of these differences causes them to conceptualize an aggregate as either individuated or as nonindividuated and consequently to name the aggregate with either a count noun or mass noun. To obtain more direct evidence for differences in conceptualization and their consequences, Middleton et al. (2004) conducted two other experiments in which undergraduates determined which of two novel aggregates was more likely to be referred to by a novel count noun (or in other cases, a novel mass noun).

In one experiment, the perceptual distinguishability of the elements making up novel aggregates varied. Undergraduates saw a series of pairs of novel aggregates accompanied by a phrase containing either a novel count or mass noun. (Pictures of novel aggregates were actually used.) Each pair of aggregates differed either in the size of their elements (relatively small versus large), in the spatial proximity of their elements (relatively close together or far apart), or along both dimensions. Figure 9.1 presents examples of each pair along with a novel count or mass-noun phrase that was presented with the pair. (Some participants saw a pair with a count-noun phrase, but other participants saw the same pair with a mass-noun phrase.) We assumed that the greater size of elements and the greater distance between elements increase their distinguishability. A participant’s task was to read the phrase below the pair of aggregates and to assume that someone had said the phrase when talking about one of the two aggregates. The participant was to pick the aggregate that this someone was likely to be talking about.

The results showed a strong effect of spatial contiguity. Consistent with our hypothesis, participants frequently chose novel count nouns as names.
for aggregates with noncontiguous elements but chose novel mass nouns as names for aggregates with contiguous elements. For example, figure 9.1E shows an aggregate with small elements close together (small-close) on the left and an aggregate with small elements relatively far apart (small-apart) on the right. Participants tended to choose the aggregate on the right for phrases containing novel count nouns (e.g., ‘These things are blickets’). However, other participants tended to choose the aggregate on the left for phrases containing novel mass nouns (e.g., ‘This stuff is blicket’). On the other hand, size did not matter. That is, participants did not tend to pick aggregates with large elements over those with small elements when a

**FIGURE 9.1** Examples of pairs of novel aggregates and phrases referring either to a novel count noun or to a novel mass noun (Middleton et al., 2004)
phrase contained a novel count noun (and vice versa, when a phrase contained a novel mass noun). In hindsight, we noticed that the elements of the small-noncontiguous aggregates are physically separate and can be seen as distinct from each other, even though they are relatively small. This factor may explain the lack of a size effect for the small-apart versus large-apart comparison (figure 9.1D). Conversely, for the small-together versus large-together comparison, it appears difficult to perceptually separate the elements in either aggregate, whether they are large or small (figure 9.1B). This factor may explain the lack of size effect for this comparison. These findings provide direct evidence that perceptual distinguishability affects how people conceptualize aggregates.

In a final experiment, Middleton et al. (2004) examined whether interacting with a novel aggregate would change the way that undergraduates conceptualize the aggregate. In a baseline condition (not involving interaction), participants examined a novel aggregate consisting of yellow, coarse-grain sugar formed into a circular-shaped pile inside an open box (see figure 9.2, top). They were asked to choose which of two novel phrases someone might say when referring to the contents of the box. One phrase contained a novel plural count noun (e.g., ‘We call these blickets’) and another contained a novel mass noun (e.g., ‘We call this blicket’). A majority of the participants (61%) selected a mass-noun phrase as best describing the aggregate.

In the interaction condition, other participants saw the same yellow coarse-grain sugar presented in the same box as in the baseline condition. However, they also interacted with single elements of the aggregates. In particular, participants were each given a board with holes big enough for a grain of sand to be dropped through and a small metal implement that enabled them to pick up a single grain of sugar and to drop it through one of the holes (see figure 9.2, bottom). The experimenter illustrated the task by carrying it out herself for two minutes and then signaling the subjects to begin with their own boards. The participants then carried out the task for fifteen minutes. Then, as in the baseline condition, participants were asked to choose which of two novel phrases someone might say when referring to the contents of the box. In contrast to the baseline condition, a majority (69%) of the participants selected a novel plural count-noun phrase as best describing the aggregate even though they observed the same identically displayed aggregate as did subjects in the baseline condition.

This study provides direct evidence that how people interact with an aggregate affects their conceptualization of that aggregate as individuated or as nonindividuated. When participants simply observed an aggregate consisting of many very small, spatially contiguous elements, they construed the aggregate as a nonindividuated group. In turn, given a choice between labeling the aggregate with a count or a mass noun, participants chose a mass noun (just as they did with this type of aggregate in the previous study). However, interacting with the elements of this aggregate
one at a time led participants to conceptualize the aggregate as a collection of distinct individuals. In turn, given a choice between labeling the aggregate with a count or a mass noun, they chose a count noun. Thus, participants conceptualized a perceptually identical entity in different ways depending on whether they interacted with that entity. These findings are consistent with the cognitive individuation hypothesis.

Taken together, the findings from these six experiments suggest that important properties of count-noun aggregates individually apply to each
aggregate element, whereas those of mass-noun aggregates apply to arbitrary-sized groups of elements. Thus, the two types of aggregates differ in their scope of predication. For example, the interaction “cleaning teeth” applies individually to each toothpick at a time and not to the aggregate of toothpicks at the same time, and “buttoning” applies individually to each button at a time and not to the aggregate of buttons at the same time. In contrast, for example, ‘flavors food’ applies to multiple grains of pepper or salt at a time and not to a single grain. Evidently, one can (to a large degree) predicate these properties of arbitrary size portions of a mass-noun aggregate (though we did not directly test this part of the hypothesis). For instance, there are a variety of amounts of pepper or salt that one could use to flavor food.

Superordinate Categories

Superordinates refer to broad categories of perceptually diverse things. For example, vehicle is a superordinate category whose members include car, bicycle, truck, balloon, boat, airplane, train, helicopter, and motorcycle. There are both count-noun superordinates (e.g., VEHICLES, ANIMALS, PLANTS, and TOOLS) and mass-noun superordinates (e.g., FURNITURE, CLOTHING, VEGETATION, and SKI GEAR). Both count-noun and mass-noun superordinates appear to refer to discrete objects—prototypical, individuated entities. For example, the referents of shirt, coat, and sweater are typically conceptualized as distinct individuals. Yet, they are also considered CLOTHING (a mass-noun superordinate). Why is there a grammatical distinction between count- and mass-noun superordinates if the members of all superordinates appear to be distinct individuals? Largely because of this paradox, researchers have suggested that the distinction between count- and mass-noun superordinates is not conceptually based (Gordon, 1985; Markman, 1985; McPherson, 1991; Murphy and Wisniewski, 1989; Ware, 1979).

In addressing this paradox, Wisniewski et al. (1996) suggested that people conceptualize count-noun and mass-noun superordinates differently. Specifically, people use count-noun superordinates to refer to one or more distinct individuals, each of which is a member of the count-noun superordinate category. In contrast, people use a mass-noun superordinate to refer to a nonindividuated group of multiple entities. (These differences in conceptualization are somewhat analogous to those that characterize count- and mass-noun aggregates.) For example, consider the count-noun superordinate VEHICLE and the mass-noun superordinate FURNITURE. When someone says, ‘The new truck made by Ford is a gas guzzling vehicle,’ that person is conceptualizing the new truck as an individual that is a member of the category of vehicles. When someone says, ‘Tow those vehicles!’ when referring to a truck and a car that are illegally parked, that person considers each one of those to be a member of the category VEHICLE. Hence, the referent of vehicles is an “individuated group.” But, when
someone using the mass noun furniture says, ‘The furniture makes the living room look cluttered,’ in the presence of two couches, several lamps, and a table and chairs, that person is not conceptualizing each of these entities as a member of the category of furniture. That is, in this context, the person is not thinking of an individual couch as furniture or an individual chair as furniture, and so forth. Rather the person is thinking of the couches, lamps, table, and chairs together as furniture.

As a consequence of this difference in conceptualization, a count-noun superordinate is a true taxonomic category, whereas a mass-noun superordinate is not a true taxonomic category (see also Bloom, 1990; Wierzbicka, 1988). Entities associated with a taxonomic count-noun category are each a member of the category and can inherit properties of the category that apply to each individual member. For example, if you are told that an opprobine is a vehicle, then you can infer that a particular opprobine probably has a steering wheel, is operated by one or two people, goes from one location to another, and so on. Figure 9.3 illustrates this hypothesized difference in conceptualization.

Wisniewski et al. (1996) conducted a number of studies in an attempt to provide converging evidence for this view, using a relatively large number of superordinates (twenty to forty per experiment). In a property inference task, undergraduates listed those properties that tended to characterize a superordinate category. Many of the properties could be classified as human interactions with superordinate categories (e.g., “eat” for food, “get sick from” for disease, “you play” for musical instrument). These properties are central to most superordinates. If people conceptualize a member of a count-noun superordinate as a single entity but conceptualize a group of entities as

![Diagram of conceptual differences between count- and mass-noun superordinates](image)

**FIGURE 9.3** Illustration of conceptual differences between count- and mass-noun superordinates
a member of a mass-noun superordinate, then count- and mass-noun superordinates should differ in their scope of predication. Thus, we predicted that the interactions listed for count-noun superordinates would more often involve a single entity of a count-noun superordinate, whereas the interactions listed for mass-noun superordinates would more often involve multiple entities.

To test this prediction, a different group of undergraduates judged whether each of these interactions involved mostly one or mostly more than one entity associated with the superordinate category. There was also an in-between option—“sometimes one and sometimes more than one.” The findings were consistent with our predictions. The average proportion of judgments that interactions involved mostly one entity was .43 for count-noun superordinates (e.g., “you play” for musical instrument, “get sick from” for disease) compared to .22 for mass-noun superordinates. The average proportion of judgments that interactions involved mostly more than one entity was .48 for mass-noun superordinates (e.g., “eat” for food, “wash” for clothing) compared to .25 for count-noun superordinates.

Participants in the property inference task also often listed parts of objects (e.g., “has windshield wipers” for “vehicle,” “has a handle” for “tool,” “has legs” for “animal”). These properties apply separately to a single entity rather than to a group. For example, “has windshield wipers” does not apply to a group of vehicles as a whole but to each individual vehicle. Likewise, the property “has a label” does not apply to a group of clothing as a whole but to each item of clothing. If people conceptualize a member of a count-noun superordinate as a single entity but conceptualize a group of entities as a member of a mass-noun superordinate, then count- and mass-noun superordinates should differ in their scope of predication with respect to these properties. Thus, Wisniewski et al. (1996) predicted that object parts should be listed more often for count-noun superordinates than for mass-noun superordinates. This prediction was confirmed—participants listed a greater number (and proportion) of object parts as properties of count-noun superordinates.

In the property inference task just described, undergraduates were given the names of count- and mass-noun superordinates and were instructed to list as many properties that tended to characterize the members of the superordinates. In a second property inference task, Wisniewski et al. (1996) presented undergraduates with entities that are typically associated with count-noun superordinates (e.g., “school” for building, “violin” for musical instrument) and with mass-noun superordinates (e.g., “tent” for camping equipment, “necklace” for jewelry), as well as entities that were atypical of the superordinates (e.g., “barn” for building, “lantern” for camping equipment). Participants were instructed to list the four things “that were most essential to knowing about the entity.” If people think of an entity as individually belonging to a
count-noun superordinate category but multiple entities together as belonging to mass-noun superordinate categories, then they should more often list “membership in a superordinate category” as an important property of an entity belonging to a count-noun superordinate category. For example, if people think of a single car as an individual vehicle then they should list “is a vehicle” as an important property of car. However, if people do not think of a single shirt as an individual item of clothing but rather think of shirt, pants, and socks together as clothing then they should be less likely to list “is clothing” as an important property of shirt. These predictions were confirmed. Participants listed membership in the superordinate category almost four times as frequently for a single entity of a count-noun superordinate than for a single entity of a mass-noun superordinate (38% vs. 10%, respectively).

A final task examined category verification times for a single entity versus multiple entities associated with a superordinate category.Subjects more quickly verified that a single item belonged to a count-noun superordinate than to a mass-noun superordinate but were slightly faster to judge that several items belonged to a mass-noun superordinate than to a count-noun superordinate. For example, participants were faster to verify sentences such as “A bomb is a kind of weapon” (single entity, count-noun superordinate) than ones such as “A chair is a kind of furniture” (single item, mass-noun superordinate), but they were slightly faster to verify sentences such as “Chair and table are furniture” (several entities, mass-noun superordinate) than ones such as “A gun and a bomb are weapons” (several entities, count-noun superordinate). Again, these results suggest that people conceptualize members of a count-noun superordinate as individually belonging to that category. But, they conceptualize a group of entities together as belonging to a mass-noun superordinate category.

Taken together, our findings suggest that count-noun superordinates but not mass-noun superordinates are true taxonomic categories. However, “members” of mass-noun superordinates are groups of entities, and properties of these superordinates more often characterize the group rather than applying separately to each entity of that group. Thus, it is misleading to refer to one or more entities as individually belonging to a mass-noun superordinate category. The findings also underscore the importance of the cognitive agent in determining the reference of a term. Prima facie, the referents of both count and mass-noun superordinates appear equivalent in generally being prototypical objects. This apparent equivalency is one reason for the view that the count–mass noun distinction between superordinates is not conceptually motivated. However, the results of the first property inference task suggest that people’s conceptualizations of these entities are different, arising at least in part because of differences in how the cognitive agent interacts with those entities.
Sounds

People refer to sounds by using count nouns (e.g., a shriek, a click) as well as mass nouns (e.g., thunder, yelling). Why do we apparently individuate some sounds and not others? Little empirical work has addressed this issue. One exception is a study by Bloom (1990). He examined whether the use of count- and mass-noun syntax was sensitive to temporal properties of novel sounds. In particular, undergraduates read descriptions of two types of sounds that were produced by a machine. One sound was described as a series of temporal events with silence between, and the other as one long continuous sound:

**Sound-discreet intervals:** John attached the moop-producer to his stereo and switched it on. It started off very loud and then was silent. Then loud, then silent. This went on for many hours.

**Sound-continuous interval:** John attached the moop-producer to his stereo and switched it on. It started off very loud and stayed loud; the volume never changed. This went on for many hours.

Participants then chose a sentence that best described the sound. Bloom found that participants preferred sentences referring to novel count nouns for the discrete sounds (e.g., “The machine produced a lot of moops”) but sentences referring to novel mass nouns for the continuous sounds (e.g., “The machine produced a lot of moop”).

Sounds have a number of temporal properties that could be related to individuation: onset, offset, and duration of a sound, and the intersound interval of silence in the case of multiple occurrences of a sound. A sound may be individuated to the extent that its onset and offset are rapid and its duration is relatively short (for a related view, see Langacker, 1987: 58). Such a sound should tend to stand out because its boundary is “sharper” and more likely to be in short-term memory (because of the sound’s short duration). Whether multiple occurrences of a sound are individuated will also depend on having sufficiently long intervals of silence between the sounds. In this case, it should be easier to distinguish the boundary of one occurrence from the boundary of another occurrence.

It also appears that the gerund form of count nouns that name sounds (e.g., yelling, grunting, barking, clicking) systematically refer to nonindividuated sounds and use mass-noun syntax (e.g., ‘I heard some yelling in the bedroom,’ ‘Loud knocking at 3 A.M. woke me up’). Langacker (1987) suggests that any temporal event term formed by adding -ing is conceptualized as an ongoing process with the end points of the process outside the scope of reference. Thus, according to Langacker, one reason that these terms are mass nouns is because they refer to unbounded entities. Applying this analysis to sounds, people may conceptualize the referent of a term such as “barking” as an ongoing sound without an onset or offset.
Collective Nouns

A number of singular count nouns are associated with multiple entities and are often called “collective nouns.” This diverse group of nouns includes family, constellation, team, alphabet, jury, bouquet, army, herd, flock, buffet, orchestra, outfit, and committee. Given that a collective noun is a singular count noun, the cognitive individuation hypothesis predicts that people should conceptualize its referent as an individuated entity. Specifically, Wisniewski et al. (2005) suggest that the referent of a collective noun is an abstract individual in the sense that it is not a prototypical individual (compare chair, woman), but rather a group of multiple entities conceptualized as a unit or a whole (see also Markman, 1989; Smith and Rizzo, 1982). For example, consider five undergraduates who play basketball for their university—Marcella, Marisa, Carmella, LaChesa, and Esperanza. Although each one can be conceptualized individually as a woman, a student, or a basketball player, in other contexts (e.g., playing together on a basketball court) they are simultaneously conceptualized as a single, more abstract individual—a team.

On this view, the referents of collective nouns have a scope of predication that applies to the entities conceptualized as a whole. That is, central properties apply to the unit or whole of which the multiple entities are composed. They are not predicated individually to each entity that comprises the unit or to arbitrary subsets of these entities. Wisniewski et al. (2005) present an informal analysis of collective nouns that supports this view. For example, a constellation typically refers to a fixed group of stars named after some object, animal, or mythological being that it is shaped like in outline. This property of shape is predicated of the stars as a unit but not of any individual star or of any subset of the stars that composes the constellation. For instance, a single star or arbitrary subset of stars that composes the big dipper does not resemble a dipper in shape. As another example, consider a basketball team. People typically conceptualize a basketball team winning or losing a game rather than a team member or an arbitrary number of team members winning or losing. As a third example, consider a symphony orchestra. People usually conceptualize the conductor and musicians as playing the symphony rather than a single member or arbitrary number of members.

Some research demonstrates factors that induce people to conceptualize multiple entities as an abstract individual. In one experiment, Bloom and Veres (1999) showed that when individual entities in close spatial proximity undergo certain types of synchronized movement, they are perceived as a single unit. Further, on the basis of this synchronized movement, people predicate intention to this unit and not to the entities comprising the unit. Familiar examples of collective nouns that correspond to this type of abstract individual include flocks of birds, herds of animals, and crowds of people moving in unison from or to a location.
There are other factors that lead people to conceptualize multiple entities as a single unit. Wisniewski et al.’s (2005) analysis also revealed that many collective nouns have an internal structure, creating cohesion that may contribute to their conceptualization as an abstract individual. For example, an alphabet is a collection of letters that are linked together in a specific sequence by the successor relation. A suit typically consists of clothing items that are linked together by well-defined spatial relationships (e.g., shirt above pants, tie connected to shirt collar and located in the front middle of shirt). As a final example, consider a family. Many families are characterized as having two adults and some number of children. The adults are linked to each other by a spouse relation and to their children by a parent relation. The children are linked to each other by various brother and sister relations.

In summary, collective nouns appear to refer to abstract individuals—multiple entities that people conceptualize as a single unit or a whole. The central properties of an abstract individual apply to this single unit or whole and not individually to the entities making up the whole or to a subset of entities that are part of that whole. In addition, some collective nouns have an internal structure that links together their constituents, contributing to their conceptualization as a unit.

**Pluralia Tantum**

A number of plural nouns are associated with multiple objects or objectlike entities and are often called pluralia tantum. This diverse group of nouns includes soapsuds, remains, scissors, groceries, intestines, eyeglasses, supplies, and leftovers. Given that these nouns are grammatically plural, the cognitive individuation hypothesis implies that they should refer to a group of individuated entities (compare plural aggregates, e.g., keys and toothpicks). However, one typically does not use the singular form of a plurale tantum to refer to an entity of which it is composed. For example, it is very unusual to hear someone refer to “a soapsud” or to “a content” (compare “a key” and “a toothpick”). Wisniewski et al. (2005) suggest that pluralia tantum refer to semi-individuated entities. Specifically, these nouns are plural in order to convey the multiplicity of co-occurring entities that are somewhat distinct. At the same time, their important properties apply to a group of entities as a whole and not individually to the entities making up the group. Thus, their scope of predication is similar to that of collective nouns. There is very little psychological research on the semantics of such terms. Thus, my analysis of pluralia tantum will be speculative, drawing on parts of Wierzbicka’s (1988) analysis of these terms.

**Pluralia tantum** can be divided into two broad types: those associated with co-occurring objectlike entities and those associated with co-occurring objects. Some of these terms refer to multiple entities that are objectlike in the sense that each entity is partially but not completely separate from the
other entities (e.g., bleachers, stairs, soapsuds, intestines). For instance, an objectlike entity that is part of the stairs is somewhat separate from other such entities. At the same time, it is connected to one or two of these entities. Other pluralia tantum refer to multiple entities that are objectlike entities in the sense of being degraded versions of previously good individuals. Ruins may include degraded walls, window frames, columns, statues, and so forth, of an ancient building. Remains are often degraded parts of a deceased animal.

A subset of objectlike pluralia tantum refer to dual entities and are typically called summation plurals. They include scissors, eyeglasses, pants, goggles, pliers, binoculars, tweezers, earmuffs, and headphones. According to Wierzbicka (1988: 515), these terms “designate objects which have two identical parts fulfilling the same function within the whole.” The two parts are partially separated from another so that one can think of them as being objectlike. However, they are also joined together as a necessary condition for the object to achieve its function. For example, one cannot cut things with just one of the identical objectlike entities of scissors, nor keep the ears warm with just one of the objectlike entities of earmuffs. On this view, the important properties of summation plurals apply to its entities as a unit or as a whole. Correspondingly, the entities (i.e., the two identical parts) lack these important properties, and one does not refer to either of the parts with the singular form of the category (e.g., a scissor). At the same time, the co-occurring parts look somewhat like distinct objects. Thus, members of these categories are named with plural nouns.

The hypothesized conceptual basis for these pluralia tantum is reinforced by contrasting them with other dual entities that are not summation plurals but rather refer to two distinct individuals. They include ears, eyes, gloves, socks, shoes, hands, and legs. Although these terms refer to dual entities as do summation plurals, they have a different scope of predication. Specifically, important properties of these dual entities apply to each entity making up the duo. Thus, people can also use a singular count noun to refer to one of the entities of the duo, unlike summation plurals. There appears to be evidence that is consistent with this view. For example, consider ears and eyes. Although we primarily use both ears to hear and both eyes to see, we can achieve these functions with just one ear or just one eye (compare trying to cut something with one part of scissors, a plurale tantum). In addition, we often interact in the same way with both ears and eyes, but the interactions are temporally separate. For instance, one puts a pair of earrings on the ears one ear at a time and puts eye drops in the eyes one eye at a time. In contrast, important interactions with entities named by summation plurals apply to both entities simultaneously (e.g., we

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2. Some languages (e.g., Dutch and German) use singular nouns to refer to objects with identical pairs of objectlike parts (Bock et al., 2001). One might expect such language differences given that the status of these objectlike parts as individuals is ambiguous.
simultaneously attach the two objectlike entities of the earmuffs to the ears). These differences in mode of interaction may give rise to the perception of important predicates applying individually or as a whole, respectively. As another example, many important functions of hands can be carried out with either hand (e.g., waving goodbye, picking something up, knocking on a door).

The second type of pluralia tantum typically consists of groups of objects rather than objectlike entities. These object-based pluralia tantum include leftovers, groceries, contents, refreshments, goods, goodies, spoils, supplies, odds and ends, belongings, and valuables. Wierzbicka (1988: 540) suggests that these pluralia tantum refer to “a number of different things” that “are given jointly a common name . . . because they are all in the same place, at the same time, and . . . they are in that place at that time for the same reason.”

To illustrate these characteristics consider the object-based pluralia tantum groceries and contents. Groceries are typically found together in a grocery cart, having been put there by someone who is shopping. Later, a grocery bagger places them into bags, and the shopper transports the bags home. Furthermore, the entities that comprise groceries can vary greatly—one could refer to a bag containing apples, paper towels, dog biscuits, shrimp, a newspaper, milk, and contact lens solution as groceries (if these items had been purchased together at the supermarket). As another example, contents exist together (e.g., in a closet) and were put there by someone. One could refer to a collection of virtually any group of entities as the contents of a closet as long as they existed together in the closet.

Like objectlike pluralia tantum, people may conceptualize the important properties of object-based pluralia tantum as applying to the collection of entities as a whole and not individually to each entity making up the collection. For instance, one pays an amount of money that covers the cost of all the groceries together, transports them together, carries them together into one’s residence (which are usually contained together in bags), and so on.

Given this analysis it is instructive to summarize the conceptual differences and similarities among pluralia tantum, aggregates, mass-noun superordinates, and collective nouns. Pluralia tantum are similar to aggregates, mass-noun superordinates, and collective nouns in that their referents are associated with multiple entities. At the same time, they are grammatically different from these other language terms, suggesting that they are conceptually different as well.

Pluralia tantum contrast with count-noun aggregates in scope of predication. Important properties of pluralia tantum apply to multiple entities as a whole, whereas they apply to each constituent of the count-noun aggregate. Pluralia tantum and mass-noun aggregates appear to differ in two ways. First, the constituents of pluralia tantum are perceived more as distinct entities than those of mass-noun aggregates. (Recall that the constituents composing mass-noun aggregates are more difficult to perceptually distinguish than
those of count-noun aggregates.) Second, pluralia tantum and mass-noun aggregates may differ in scope of predication. Important properties apply to pluralia tantum as a whole but not to arbitrary subsets of their constituents. For example, one uses the term groceries to denote a particular collection of items purchased on a specific occasion. Thus, one probably would not consider an arbitrary subset of these items to be groceries. As another example, an important property of stairs is “allows one to go from one floor to another floor.” This property does not apply to an arbitrary subset of these stairs. In contrast, as previously discussed, important properties of mass-noun aggregates can apply to arbitrary sets of their constituents. For example, an important property of rice is that ‘it is consumed,’ and people can consume varying amounts of rice or a person can eat varying amounts on different occasions. The contrast in scope of predication between pluralia tantum and mass-noun aggregates may also apply to pluralia tantum and mass-noun superordinates. That is, important properties apply to pluralia tantum as a whole but not to arbitrary subsets of their constituents, as they appear to do with mass-noun superordinates.

Finally, pluralia tantum are similar in scope of predication to collective nouns (i.e., important properties apply to multiple entities as a whole). However, they lack the internal structure and relations between entities that give rise to the conceptualization of those entities as a single unit (compare groceries, contents, and leftovers vs. family, constellation, and alphabet). For example, the stars that compose a constellation have well-defined, psychologically fixed spatial relations and distances between them, leading to the perception of a single entity. In contrast, such relationships characterize a shopping cart or bag of groceries to a much lesser degree.

Summary

In this section, I have presented evidence from a variety of areas that supports the cognitive individuation hypothesis. This evidence suggests that people tend to use count nouns when they have distinct individuals in mind but mass nouns when they have nonindividuated entities in mind. Thus, there is a systematic relationship between the use of count and mass nouns and how we conceptualize the referents of these terms. The evidence also shows that how people interact with entities strongly affects whether they conceptualize entities as individuated or nonindividuated. Some of the evidence also reveals a conceptual basis for the count—mass noun distinction among language terms for which a conceptual basis was thought not to exist (e.g., superordinate categories).

Beyond the Cognitive Individuation Hypothesis

Although there is strong evidence for a systematic relationship between conceptualization and count—mass noun syntax, the relationship is not
perfect. For example, in the studies of aggregates described previously, Middleton et al. (2004) found that 19 of the 192 aggregates contradicted their predictions. That is, the perceptual distinguishability and interaction ratings predicted that a count-noun aggregate should have mass-noun syntax (or vice versa for a mass-noun aggregate).

Some of these exceptions may be explained by other factors that affect whether entities are conceptualized as individuated. Thus, they may not be true exceptions to the cognitive individuation hypothesis. For example, four of the count-noun exceptions (*fleas, bacteria, maggots, and lice*) were animate. Even though their perceptual distinguishability and interaction ratings predict that they should have mass-noun syntax, animacy may also cause people to individuate the elements of an aggregate. (There do not appear to be any aggregates of animate entities that are nonindividuated.)

Nevertheless, Middleton et al. (2004) identified nine exceptions that could not be explained on the basis of other factors relevant to individuation (*fibers, aspirin, Advil, Tylenol, firewood, asparagus, bacon, money* [in a wallet], and *candy*). For example, the mass-noun exceptions *aspirin* and *bacon* appear to have retained the syntax that reflects how their original referents were conceptualized. At one time, they referred to prototypical nonindividuated entities. In particular, aspirin used to be manufactured and administered as a powder, and *bacon* used to refer to fresh pig meat. Today, though, aspirin are tablets and people typically interact with them one or a few at a time (as we found in the interaction rating study). Still, people call them *aspirin* (compare vitamins). Likewise, *bacon* now refers to a cured slab that is presliced, and people typically eat one or a few at a time (as we found in the interaction rating task). Yet, people call them *bacon* (compare *french fries*). It is unclear why English speakers have retained the mass-noun syntax of these entities. As another example, Paul Bloom, a major proponent of the cognitive individuation hypothesis, has said: “I have no doubt that I think of a piece of toast as a singular individual, but—due to a quirk of English—I have to talk about it using the word ‘toast,’ a mass noun. So I ask you, ‘Do you want more toast?’ while thinking of a singular entity.”

Importantly, the syntax of a language may serve multiple communicative functions that compete with each other. Because speakers may wish to convey some other important aspect of an entity, they may refer to that entity using syntax that conflicts with the individuation function (i.e., the tendency to use count-noun syntax to refer to an individuated entity and mass-noun syntax to refer to a nonindividuated entity).

Wisniewski et al. (2003) noted that food is a domain in which communicating about other aspects of an entity takes precedence over the individuation function. Various kinds of foods undergo transformations that change their status from individuals to nonindividuated entities as a result

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of chopping, dicing, mashing, scrambling, and so forth. For example, people dice tomatoes, chop peanuts, scramble eggs, and mash potatoes. These transformations destroy the integrity of the individuals and produce substances. Yet, the syntax of the names for these entities does not reflect this change to a nonindividuated entity. For example, American English speakers refer to potatoes that have been mashed as “mashed potatoes” and to eggs that have been scrambled as “scrambled eggs.” However, it doubtful that speakers conceptualize them as multiple individuals, as the syntax would imply.

Evidently, speakers base their names for these substances on information that characterizes how the substances originated. Specifically, the names mashed potatoes and scrambled eggs reflect the type of transformation and type of entity to which the transformation was applied. For example, one may refer to a yellowish, fluffy, edible substance with the plural count-noun phrase “scrambled eggs” because the scrambling was applied to multiple individuals (i.e., eggs). Thus, the name for the resulting substance inherits the count—mass noun syntax of the entity that was transformed to produce that substance. People also may be reluctant to use the mass-noun phrase “scrambled egg” because it would incorrectly imply that the scrambling was applied to a substance.

Wisniewski et al. (2003) report results of an internet search that supports this view. They found that the percentage of hits for “scrambled eggs” or “some scrambled eggs” compared to “scrambled egg” or “some scrambled egg” was 89% (out of 38,374 hits). Likewise, the percentage of hits for “mashed potatoes” or “some mashed potatoes” compared to “mashed potato” or “some mashed potato” was also 89% (out of 116,620 hits). Presumably, in coining the phrases “mashed potatoes” and “scrambled eggs,” information about the origin of and process that produced the substance was more important to convey about the entity than its individuation status. Wisniewski et al. (2003) also found that the names of many fruit or vegetable substances provide information about the type of transformation and type of entity (i.e., multiple individuals) to which the transformation was applied. As a result, the name for the substance inherited the count-noun syntax of the multiple individuals that were transformed into that substance. For example, phrases such as chopped radishes, diced radishes, and mashed radishes, were much more frequent than chopped radish, diced radish, and mashed radish, even though the latter phrases refer to foods transformed into substances.

There are also nonfood cases in which communicating about other aspects of an entity takes precedence over the individuation function. For example, speakers use the count-noun phrases eye drops and artificial tears to refer to a variety of liquids contained in small bottles (and manufacturers have labeled the bottles with these names). When referring to one of these liquids with a plural count noun it is doubtful that people are thinking of the liquid as a collection of individual drops of liquid or tears. Instead, these
names have dual reference. They refer to actual drops of liquid or tearlike liquid as well to the liquid contents of small bottles. Evidently, the names reflect the important functions of these liquids (i.e., placing drops of liquid into the eyes to correct eye problems). Naming the actual liquid based on function took precedence over naming based on the individuation function.

The phrase *pine needles* may be an example of naming based on resemblance. The phrase was coined to refer to the leaves of a pine tree that resemble needles (they are also prickly to some extent like needles). Actual needles are good examples of individuals. People frequently interact with them one at a time and the important properties of needles are predicated of each individual needle (e.g., sewing a button, drawing blood, administering a vaccine). In contrast, pine needles are a good example of a nonindividuated entity. They occur as multiple entities found on the ground in very close proximity and are difficult to perceptually distinguish. People also interact with multiple pine needles at a time (when using them as mulch). Further, individual pine needles are not seen falling from a tree as is the case with other leaves. These characteristics are associated with aggregates consisting of nonindividuated entities. Evidently, whoever named pine needles *pine needles* was struck by their resemblance to needles and retained the count syntax of needle at the expense of the individuation function.

As another example, of the interaction between multiple communicative functions, Malt et al. (1999) emphasize that a person may accept a name for an entity because it facilitates communication and thus focus less on its similarity to other entities in that category. For example, someone may adopt a product name provided by an advertiser because it is known to and used by others. With respect to the count—mass noun distinction, a recent example is *Egg Beaters*. This name refers to processed egg white *substance*. Evidently, manufacturers based its name on function, which took precedence over naming based on the individuation function. (It is called *Egg Beaters* because it “beats” the cholesterol problem associated with eggs.)

The Role of Individuation in Cognition

The conceptualization of an entity as individuated or nonindividuated appears to be a very basic process that pervades all of cognition. For example, counting requires that one individuate some number of entities. Categorizing entities requires that they be individuated or treated as non-individuated, depending on the type of entity. For example, categorizing some entity as a cat requires that one conceptualize the cat as a distinct individual, and to categorize something as sand one must conceptualize that sand as nonindividuated.

The process of individuation may also affect memory and attention. For example, consider differences in how people might attend to a nonindividuated entity such as a substance versus an individuated entity such as a physical object. Construing something as a nonindividuated substance
suggests that its texture and color are important and that shape is irrelevant. In contrast, construing something as an individuated physical object suggests that shape is important and that texture and color are less relevant (see also Imai and Gentner, 1997; Soja et al., 1991). As a result, people might attend to different features in the two cases that in turn could affect memory for these features.

Individuation also affects the types of inferences that people draw about the environment. For example, the inferences that one makes when hearing “some chicken” versus “a chicken” can be dramatically different. The former can refer to a nonindividuated substancelike entity that is likely to be found in a kitchen, have an expiration date, and be cooked and eaten. The latter can refer to a live bird and hence is likely to be found on a farm, have wings, fly, be alive, and so forth. These different inferences depend on specific knowledge about chickens. However, it is the distinction between a count noun and a mass noun that indicates whether the chicken refers to an individuated or nonindividuated entity, which in turn enables people to access the appropriate information. Sometimes differences in inferences can be quite subtle. For example, if you heard someone say, “I heard some noise in the kitchen” versus “I heard a noise,” you might infer that the former was of longer duration. As another example, the phrase “too much curiosity” typically refers to an amount of curiosity, whereas “a curiosity” refers to a cause of the curiosity.

Summary and Conclusions

Scholars have long debated why English and other languages make a grammatical distinction between count and mass nouns. These debaters fall into two camps: one maintains that the distinction is primarily an arbitrary convention of language, and the other maintains that the distinction is primarily conceptually motivated. They account for any apparent arbitrariness by postulating that the referents of count and mass nouns cannot always be identified on the basis of their obvious perceptual characteristics. Rather, speakers flexibly construe the referents of count and mass nouns as individuated and nonindividuated entities, respectively. I have described a range of evidence that supports this conceptually motivated distinction. At the same time, this view must be qualified. Other functions of language can interact with the individuation function conveyed by count- and mass-noun syntax. Future work needs to specify the nature of these interactions and address other domains that make a grammatical distinction between count and mass nouns (e.g., abstract concepts, sounds).

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