

Mass–Count Distinction

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INTRODUCTION

The mass–count distinction is reflected in the syntax and semantics of nouns, verbs, adjectives, and quantifiers. Sometimes called by other names (e.g., countable vs. uncountable), the distinction was first made in modern times by O. Jespersen and L. Bloomfield and has since been discussed by linguists, philosophers of language, and psychologists alike. The distinction is of broad interest because it offers a tractable problem for natural language semantics but also because it relates clearly to important topics in cognitive development (e.g., object permanence) and is subject to significant cross–linguistic variation, raising questions about the relationship between linguistic diversity and its effects on nonlinguistic thought. Recently, work on the topic has extended into psycholinguistics and the neurosciences as a fundamental case study for exploring the psychological representations that underlie natural language syntax and semantics.

EDITED COLLECTIONS

There are two influential collections on the mass–count distinction, both edited by F. Jeffry Pelletier. Pelletier 1979 is a collection of mostly philosophically oriented essays exploring the empirical and ontological implications of mass terms. Pelletier 2010 contains not only philosophical and linguistic works on kind–denoting terms and mass nouns but also papers that attempt to link this work to the experimental and acquisitional literature.

Pelletier, F. Jeffry, ed. 1979. *Mass terms: Some philosophical problems*. Synthese Language Library 6. Dordrecht, The Netherlands: Reidel.

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A collection of philosophical essays that explore both the empirical landscape of mass terms and the ontological requirements involved in theoretical accounts of such terms.

Pelletier, F. Jeffry, ed. 2010. *Kinds, things, and stuff: Mass terms and generics*. New Directions in Cognitive Science. Oxford: Oxford Univ. Press.

A collection of philosophical, linguistic, and psychological essays on mass terms and kind–denoting terms. The philosophical and linguistic papers discuss the semantics of such terms through a model–

theoretical perspective. The psychological papers discuss how these theoretical accounts are connected to the experimental and acquisitional literature.

REFERENCE RESOURCES

The works cited in this section include two books on English grammar (written by linguists) and a bibliography published in the philosophical journal *Synthese*. [Quirk, et al. 1985](#) and [Huddleston and Pullum 2002](#) contain excellent and comprehensive empirical descriptions of the mass–count distinction in English and thus are essential reading for any linguist, psychologist, or philosopher. [Pelletier 1975](#) contains a relatively complete list of philosophical articles on mass terms written prior to 1975. Such works provide an excellent foundation for reading the more recent philosophical literature.

Huddleston, R., and G. Pullum, eds. 2002. *The Cambridge grammar of the English language*. Cambridge, UK: Cambridge Univ. Press.

Chapter five of this book contains a thorough review of the mass–count distinction in English, including the distribution of quantifiers and the flexible use of nominal terms.

Pelletier, F. Jeffry. 1975. A bibliography of recent work on mass terms. *Synthese* 31.3–4: 523–526
[DOI: [10.1007/BF00485220](#)]

A list of philosophically oriented papers on mass terms prior to 1975. Available [online](#) to subscribers.

Quirk, R., S. Greenbaum, G. Leech, and J. Svartvik. 1985. *A comprehensive grammar of the English language*. London: Longman.

This book on English grammar includes a comprehensive description of the distribution of mass nouns and count nouns, especially with respect to quantification.

FOUNDATIONAL WORKS

Interest in the mass–count distinction began with three very influential books, two written by linguists and another by a philosopher. [Jespersen 1924](#) was the first work to mention mass terms as a possible subcategory of nouns, although the focus was on the semantic characterization of such nouns rather than syntactic distribution. [Bloomfield 1933](#) provides a much broader empirical characterization of the mass–count distinction, including discussions of quantifier distribution and the flexible use of certain terms in either subcategory. [Quine 1960](#) discusses the role the mass–count distinction might play in acquisition and development, particularly focusing on the link between the ontological status of a word's referent and its acquired meaning.

Bloomfield, L. 1933. *Language*. New York: Henry Holt.

One of the earliest works in linguistics to discuss the syntactic distinction between mass and count nouns, including their interaction with quantifiers (chapter 12) as well as lexical facts concerning flexible terms and coercion (chapter 16).

Jespersen, O. 1924. *Mass-words: The philosophy of grammar*. London: Allen and Unwin.

Perhaps the first modern work to distinguish between mass and count nouns, with a focus on semantics rather than syntax. See pages 198–201 in particular.

Quine, W. V. O. 1960. *Word and object*. Studies in Communication. Cambridge, MA: MIT Press.

A comprehensive discussion of the link between words and the world, including an analysis of the links between divided-reference and count nouns as well as cumulative-reference and mass nouns. Quine also observes that a proper subset of adjectives can be cumulative in its application to a subject and hypothesizes that mass nouns can only combine with such adjectives.

THEORETICAL APPROACHES

There are many perspectives one can take when discussing the various theoretical approaches to the mass–count distinction. In this section four categories are considered. The first, labeled Descriptive, contains works that are theoretically oriented but whose main contribution is a thorough discussion of the salient data points that any adequate scientific proposal must account for. The second category, Cognitive Semantics, lists papers that discuss how semantic representations of the mass–count distinction are linked to conceptual representations such as those employed by psychologists. The third category, Lattice-Theoretical Semantics, lists papers that are representative of the bulk of current theoretical research. These papers focus on how model-theoretical characterizations of the mereological part–whole relationship provide an adequate theory of plurality and mass terms. The fourth category, labeled Philosophical, contains a small sample of papers that focus largely on the status of mass nouns in a theory of truth. Often such papers discuss how to translate mass terms into a predicate logic and the consequences such a translation would have for the treatment of logical quantifiers and the representation of logical reasoning (natural and syllogistic deductions).

Descriptive

Although these papers outline informal grammatical proposals, their main contribution is a thorough description of the range of data to be explained by a theory of the mass–count distinction, including the interaction of nouns with quantifiers, adjectives, and verbs. Allan 1980 discusses how any adequate theory of the mass–count distinction must account for the detailed and seemingly idiosyncratic distributions of quantifiers and nouns in English. K. Allan's facts are mainly syntactic, at least in terms of surface analyses. In

contrast, [McCawley 1979](#) proposes that the principal facts to be captured by a theoretical account are essentially conceptual in nature, divorced from word–world connections. This author discusses a variety of ways to detect the nuances of lexical meaning independent of reference. [Ware 1979](#), building off observations in [Bloomfield 1933](#) (cited under [Foundational Works](#)), focuses attention on the flexible use of nominal terms in both mass and count contexts, citing this as a critical data point in developing a formal theory. While other papers focus on a specific aspect of nominal syntax or semantics, [Verkuyl 1972](#) expands the empirical landscape by demonstrating that the mass–count distinction is linked to the telic–atelic distinction among verb phrases. Thus any adequate theory of these nominal subcategories must also explain these telicity effects.

Allan, K. 1980. Nouns and countability. *Language* 56.3: 541–567.

[DOI: [10.2307/414449](#)]

A detailed survey of the idiosyncratic distributional interactions between mass nouns, count nouns, and different types of determiners and quantifiers in English.

McCawley, J. D. 1979. Lexicography and the count–mass distinction. In *Adverbs, vowels, and other objects of wonder*. Edited by J. D. McCawley, 165–173. Chicago: Univ. of Chicago Press.

Asks whether mass–count syntax is predictable on the basis of lexical semantics, where the meanings of words are distinguished from the properties of the things to which they refer. Concludes that count nouns differ from mass nouns in the area of individuation.

Verkuyl, H. J. 1972. *On the compositional nature of the aspects*. Foundations of Language, Supplementary Series 15. Dordrecht, The Netherlands: Reidel.

Describes the interaction among mass nouns, count nouns, quantifiers, and verbs. Demonstrates how the category of noun and the type of quantification can affect the aspectual category of the verb phrase.

Ware, X. 1979. Some bits and pieces. In *Mass terms: Some philosophical problems*. Edited by F. Jeffry Pelletier, 15–29. Synthese Language Library 6. Dordrecht, The Netherlands: Reidel.

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Describes the flexible nature of the mass–count distinction in English, demonstrating that almost any nominal term can be used in either category, sometimes with almost no differentiation between uses (e.g., “many more data” vs. “much more data”).

Cognitive Semantics

These approaches take the starting point of semantics to be the interface problem: how semantic representations interact with nonlinguistic conceptual representations. As a result, they couch semantic

distinctions in terms that translate readily to conceptual distinctions like those made by psychologists. For example, [Wierzbicka 1988](#) proposes that the mass–count distinction is tightly linked to individuation: if an entity is easy to individuate conceptually, then the words associated with that entity are classified as count nouns. A consequence of this theory is that psychological factors determine nominal categorizations. [Jackendoff 1991](#), taking a similar approach, links the mass–count distinction to the conceptual features [\pm bounded] (whether the conceptual entity has well-defined boundaries or not) and [\pm internal structure] (whether the conceptual entity has a mereological structure or not). The feature [\pm bounded] also affects the telicity of verb phrases. Like [Jackendoff 1991](#), [Langacker 2008](#) exploits the conceptual feature of boundedness in his account of the mass–count distinction.

Jackendoff, R. 1991. *Parts and boundaries*. *Cognition* 41:9–45.

[DOI: [10.1016/0010-0277\(91\)90031-X](https://doi.org/10.1016/0010-0277(91)90031-X)]

Hypothesizes that nouns and verbs share common features, $\pm b$ for \pm bounded and $\pm i$ for \pm internal structure. Jackendoff uses these features to account not only for the mass–count distinction among nouns but also the telic versus atelic (bounded vs. unbounded) distinction among verb phrases as well as the contribution of mass nouns to the unbounded interpretation of verb phrases.

Langacker, R. W. 2008. *Cognitive grammar: A basic introduction*. Oxford Scholarship Online. New York: Oxford Univ. Press.

Argues that the mass–count distinction reflects an underlying conceptual distinction whereby count nouns represent things as conceptually bounded, whereas mass nouns represent them as amorphous and undifferentiated. As part of this proposal, Langacker claims that plurals (e.g., diamonds) are a type of mass noun. E–book.

Wierzbicka, A. 1988. *The semantics of grammar*. Studies in Language Companion Series 18. Amsterdam: John Benjamins.

Proposes that the mass–count distinction is characterized by individuation and that psychological factors determine whether an entity is treated grammatically as an individual or not and thus as mass or count.

Lattice–Theoretical Semantics

Lattice theory provides an algebraic framework for describing sets/aggregates and relations between sets/aggregates, especially with regard to orderings among them. As a result, this approach is useful in accounting for mereological (part–whole) relations and also formalizing the nature of mass quantification (quantification over sets that do not necessarily contain individuals). [Bunt 1979](#), with the author’s theory of ensembles, provides one of the first attempts to formalize the mereological relations inherent in the mass–count distinction. A more complete formalization, employing lattice theory, was eventually developed in [Link](#)

1983. Besides the addition of a rigorous characterization of mereologies, Link 1983 also proposes that mass-noun denotations are structures without atomic minimal parts (contrary to the spirit of Bunt 1979). Working within the lattice-theoretical framework, Gillon 1992 observes that the empirical evidence speaks against G. Link's proposal with respect to mass nouns and instead suggests that mass denotations are underspecified with respect to whether they contain atomic minimal parts or not. Contrary to Link 1983 and Gillon 1992, Chierchia 1998 takes the rather radical position that all mass-noun denotations have minimal parts and attempts to account for the empirical facts by appealing to vagueness and context sensitivity. G. Chierchia reestablishes the nominal subcategories by defining a contrast between stable atoms (context-independent atoms) and unstable atoms (context-dependent atoms). Influenced by the discussion in Chierchia 1998, Rothstein 2010 also proposes that there are two kinds of atoms: semantic atoms that are exclusive to count-noun denotations and natural atoms that are a part of a subset of mass-noun denotations. Much like the theory advanced in Bale and Barner 2009 (cited under Semantic Tests), S. Rothstein proposes that count-noun denotations are derived from mass denotations. Higginbotham 1994 concentrates less on the nuances of lexical denotations and instead focuses on the measurement requirements imposed by the use of mass and count quantifiers.

Bunt, H. C. 1979. Ensembles and the formal semantic properties of mass terms. In *Mass terms: Some philosophical problems*. Edited by F. Jeffry Pelletier, 249–277. Dordrecht, The Netherlands: Reidel.

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Hypothesizes that count nouns are interpreted as atomic ensembles (i.e., complete-join semilattices with generating atoms) and thus that their denotations contain minimal parts (i.e., individuals). Mass nouns, in contrast, are underspecified with respect to whether their interpretation is atomic, continuous (i.e., contains no minimal parts), or a mixture of the two.

Chierchia, G. 1998. Plurality of mass nouns and the notion of “semantic parameter.” In *Events and grammar*. Edited by S. Rothstein, 53–103. Studies in Linguistics and Philosophy 70. Dordrecht, The Netherlands: Kluwer.

Draws a parallel between plural-count nouns and mass nouns by claiming that both denotations are generated from minimal parts (i.e., atoms). All mass-noun denotations have minimal parts, but unlike count-noun denotations, the minimal parts for some mass-noun denotations (e.g., “rice,” “water”) are only vaguely defined and hence can often vary from context to context.

Gillon, B. 1992. Towards a common semantics for English count and mass nouns. *Linguistics and Philosophy* 15.6: 597–640.

[DOI: [10.1007/BF00628112](https://doi.org/10.1007/BF00628112)]

Develops a theory according to which mass nouns and plural-count nouns denote complete-join semilattices with a unit element (i.e., a unique topmost element). The major difference between the two

categories is that plural-count nouns are required (as part of the grammatical system) to have minimal parts, whereas mass nouns are underspecified in this respect (some have minimal parts and others do not). Available [online](#) to subscribers.

Higginbotham, J. 1994. Mass and count quantifiers. *Linguistics and Philosophy* 17.5: 447–480.

[DOI: [10.1007/BF00985831](https://doi.org/10.1007/BF00985831)]

Adopts a Boolean algebraic semantics for mass nouns (a join semilattice with a topmost member) and develops a semantics for mass quantifiers based on these structures. Critically, it is proposed that an adequate theory of mass quantification requires measurement functions.

Link, G. 1983. The logical analysis of plurals and mass terms: A lattice-theoretical approach. In *Meaning, use, and interpretation of language*. Edited by R. Bauerle, C. Schwarze, and A. Stechow, 302–323. Berlin: de Gruyter.

Proposes that all mass nouns denote complete-join semilattices without minimal parts, whereas plural count nouns denote a set of all groups that can be generated from the set of individuals in the singular denotation of the noun. The interpretation of plural count nouns is equivalent to a complete-join semilattice minus the minimal parts.

Rothstein, S. 2010. Counting and the mass/count distinction. *Journal of Semantics* 27.3: 343–397.

[DOI: [10.1093/jos/ffq007](https://doi.org/10.1093/jos/ffq007)]

Takes a Boolean algebraic approach to mass and count nouns and argues that count nouns contain semantic atoms that are derived from mass-noun denotations (a derivation often influenced by context). In contrast, mass nouns do not contain semantic atoms, although they do sometimes contain natural atoms. According to this view, these differences in denotation determine the syntactic properties of mass and count nouns in natural language.

Philosophical

This small sample of philosophical papers focuses largely on the status of mass nouns in a theory of truth, whether they act as predicates (i.e., sets) or refer to particulars (i.e., actual masses). Often such papers discuss how to translate mass terms into a predicate logic and the consequences such a translation would have for the treatment of logical quantifiers and the representation of logical reasoning (natural and syllogistic deductions). [Pelletier 2010](#) provides a broad overview of the philosophical issues and the different approaches over the last half-century. However, the collection of papers listed here is more selective. It begins with one of the first attempts to provide a first-order predicate logic that can represent the truth conditions of sentences with mass terms ([Parsons 1970](#)). Some philosophers believe that this project is horribly misguided. For example, [Moravcsik 1973](#) argues that an adequate analysis of abstract mass terms

could never be achieved with a first-order predicate logic. In a similar vein as [Parsons 1970](#), [Burge 1972](#) attempts to argue that mass terms should be represented as ordinary predicates in a theory of truth and attempts to discredit arguments to the contrary, specifically arguments that focus on identity statements. In the philosophical discussions of how to translate mass terms into predicate logic, one of the central pieces of evidence was the participation of mass terms in syllogistic reasoning. The very influential [Roeper 1983](#) challenges the long-standing premise that predicates that participate in syllogistic reasoning must quantify over individuals. P. Roeper demonstrates that truth conditions can be adopted where some predicates, like those associated with mass terms, do not quantify over individuals yet are still able to participate in syllogistic reasoning. These papers, and the philosophical discussions they represent, heavily influenced the more theoretically oriented papers that employ lattice theory. [Lønning 1987](#) provides a bridge from the philosophical literature to the lattice-theoretical literature. J. T. Lønning demonstrates that a theory of truth can be developed where mass terms are interpreted as elements in a Boolean algebra. Such elements can participate in syllogistic reasoning without quantifying over individuals.

Burge, T. 1972. Truth and mass terms. *Journal of Philosophy* 64:263–282.

[DOI: [10.2307/2024729](https://doi.org/10.2307/2024729)]

Challenges Strawson's view that mass nouns like "snow" or "gold" do not admit statements of identity (e.g., "same gold") due to their failure to specify criteria of individuation, arguing that this view confuses syntax and semantics. Burge instead argues that mass terms should be represented as ordinary predicates in a theory of truth.

Lønning, J. T. 1987. Mass terms and quantification. *Linguistics and Philosophy* 10:1–52.

[DOI: [10.1007/BF00603391](https://doi.org/10.1007/BF00603391)]

Proposes that mass nouns (in fact homogeneous predicates in general) are interpreted as elements in a Boolean algebra. In contrast, count nouns and nonhomogeneous predicates are interpreted as sets. It is argued that such a distinction can account for the behavior of mass terms in syllogistic reasoning and the interaction between mass terms and negation.

Moravcsik, J. M. E. 1973. Mass terms in English. In *Approaches to natural language*. Edited by J. Hintikka, J. M. E. Moravcsik, and P. Suppes, 263–285. Dordrecht, The Netherlands: Reidel.

Discusses how the semantic properties of concrete mass nouns might be extended to abstract terms. Proposes that mass terms should be analyzed as denoting mereological units with an inherent part-of relation that can be different for different nouns. This proposal is incompatible with first-order translation projects such as the one specified in [Parsons 1970](#).

Parsons, T. 1970. An analysis of mass and amount terms. *Foundations of Language* 6:362–388.

Develops a theory where mass nouns name particulars and where predication and quantification are

achieved through (primitive) relations that specify whether an entity is a quantity of (Q relation), constituted of (C relation), or equal to the mass particular. A translation procedure (from natural language to predicate logic) is proposed based on this theory.

Pelletier, F. Jeffry. 2010. A philosophical introduction to mass nouns. In *Kinds, things, and stuff*. Edited by F. Jeffry Pelletier, 123–131. New Directions in Cognitive Science. New York: Oxford Univ. Press.

Provides a broad overview of philosophical approaches to the analysis of mass terms.

Roeper, P. 1983. Semantics for mass terms with quantifier. *Noûs* 17:251–265.

[DOI: [10.2307/2215145](https://doi.org/10.2307/2215145)]

Challenges the premise that for mass nouns to be counted as predicates that participate in syllogistic reasoning it must be assumed that they quantify over individuals. It is argued that standard Aristotelian syllogistic reasoning can be maintained with quantifiers and predicates that do not involve individuals.

SEMANTIC TESTS

These papers present an array of tests and grammatical environments used to distinguish different types of denotations that are relevant to mass and count nouns, including tests that involve distributivity (divisity), cumulativeness, homogeneity, and comparative judgments. The papers often discuss and even attempt to resolve the mismatch between these denotational properties and the syntactic mass–count distinction. [Cheng 1973](#) suggests that mass terms are defined not only by their cumulative reference (as described in [Quine 1960](#), cited under [Foundational Works](#)) but also by a property this author calls “distributive reference.” C. Y. Cheng notes that for most mass terms, if there is an element that belongs to the extension of that mass term, each subpart of that element also belongs to the extension. For example, every subpart of mud counts as mud and every subpart of water counts as water. [Sharvey 1979](#) challenges Cheng’s claim that this is a defining characteristic. R. Sharvey points out that there are many mass terms, such as “succotash,” that do not have the property of distributivity (not every subpart of succotash counts as succotash). [Ter Meulen 1981](#), building from the discussions of homogeneous reference in [Bunt 1979](#) (cited under [Lattice-Theoretical Semantics](#)), attempts to define an intensional property, called homogeneity, from which cumulativeness and distributivity can be derived. Counterexamples are largely ignored. Unlike the previously mentioned papers, [Cresswell 1976](#) focuses on comparative constructions in examining mass nouns. This author claims that such constructions support an analysis of all nominal terms using a semantic framework with degrees and argues that the mass–count distinction correlates with the different types of scales that are inherently represented in nouns. [Bale and Barner 2009](#) uses M. J. Cresswell’s basic methodology to establish two generalizations: (1) that some mass nouns have the exact same type of denotation as do plural–count nouns in that they both allow for a comparison via counting; and (2) that any noun that can be used flexibly as a mass or count noun

licenses a comparison by counting as a count noun but never as a mass noun. To account for both generalizations, these authors propose that count denotations are derived from mass denotations (compare with [Rothstein 2010](#), cited under [Lattice-Theoretical Semantics](#)).

Bale, A., and D. Barner. 2009. The interpretation of functional heads: Using comparatives to explore the mass/count distinction. *Journal of Semantics* 26.3: 217–252.

[DOI: [10.1093/jos/ffp003](https://doi.org/10.1093/jos/ffp003)]

Demonstrates that comparative judgments are the most reliable means of accessing the denotational properties of both mass and count terms. Also provides a model theoretical interpretation of mass and count-functional heads. Comparative judgments are used to establish (1) that some mass terms behave like count terms and (2) that the count-functional head invokes comparisons via the number of individuals.

Cheng, C. Y. 1973. Response to Moravcsik. In *Approaches to natural language*. Edited by J. Hintikka, J. Moravcsik, and P. Suppes, 286–288. Dordrecht, The Netherlands: Reidel.

Observes that mass nouns are used to refer distributively in that for any object or substance that belongs to the extension of a mass term, the proper subparts of that object or substance also belong to the extension (e.g., for any amount of stuff that counts as “water,” any proper subpart of that stuff also counts as “water”). Cheng proposes that this is a defining quality of mass denotations.

Cresswell, M. J. 1976. The semantics of degree. In *Montague grammar*. Edited by B. Partee, 261–292. New York: Academic Press.

Establishes a degree-based semantics for adjectives and the comparative modifier “more” before examining the interaction of “more” with nominal complements. With respect to nominal complements, it is noted that the mass-count distinction affects the dimension of comparison, in particular that count nouns induce a comparison via the number of individuals.

Sharvey, R. 1979. The indeterminacy of mass predication. In *Mass terms: Some philosophical problems*. Edited by F. Jeffry Pelletier, 47–54. Synthese Language Library 6. Dordrecht, The Netherlands: Reidel.

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Discusses the context-dependent interpretation of mass terms but in the process observes that many mass terms do not refer distributively (contra [Cheng 1973](#)). For example, it is not the case that every proper subpart of a substance that counts as “succotash” is itself “succotash” (e.g., succotash contains corn, but corn by itself cannot be called “succotash”).

Ter Meulen, Alice. 1981. An intensional logic for mass terms. *Philosophical Studies* 40.1: 105–125.

[DOI: [10.1007/BF00646389](https://doi.org/10.1007/BF00646389)]

Defines an intensional property called homogeneity that is claimed to be unique and definitive of mass-noun interpretations. A term's interpretation has this property if and only if in all contexts and for all objects or substances that are part of the term's extension all the parts and sums of those objects or substances are also part of the term's extension. Available [online](#) to subscribers.

VERBS AND ADJECTIVES

These papers examine whether the mass-count distinction affects verbs and adjectives. [Bunt 1985](#) provides a thorough discussion of adjectives and the mass-count distinction. Building on some observations originally made by [Quine 1960](#) (cited under [Foundational Works](#)), [Bunt 1985](#) notes that adjectives can be divided into two semantic categories: those that have homogeneous reference (e.g., "blue" and "cold") and those that do not (e.g., "small" and "cubical"). H. C. Bunt claims that only homogeneous adjectives can modify mass nouns coherently, although he spends a significant amount of time discussing potential counterexamples, such as "small furniture" and "cubical sugar." The other papers listed in this section concentrate on the influence of the mass-count distinction among verbs and verb phrases. [Bach 1986](#) points out a number of parallelisms between the nominal mass-count distinction and the verbal telic-atelic distinction. [Krifka 1989](#) provides a detailed lattice-theoretical account of these parallelisms that also addresses the effects of object noun phrases on the telicity of a verb phrase. Similar to [Krifka 1989](#), [Verkuyl 1993](#) provides a detailed theoretical account of the influence of mass nouns on telicity but does so with time intervals. [Harley 2005](#) discusses the connection between mass nouns and telicity more directly by examining the differences between denominal verbs formed from mass nouns and those formed from count nouns. Verbs derived from mass noun roots tend to be atelic.

Bach, E. 1986. *The algebra of events*. *Linguistics and Philosophy* 9:5-16.

Describes parallelisms between noun and verb denotations from a lattice-theoretical perspective. Discusses how both nouns and verb phrases are subject to similar kinds of coercion (packaging and grinding) and also how they behave similarly with respect to counting.

Bunt, H. C. 1985. *Mass terms and model-theoretic semantics*. *Cambridge Studies in Linguistics* 42. New York: Cambridge Univ. Press.

Defines a general property called homogeneity that applies to mass nouns (like "water") and a subset of adjectives (like "blue" and "cold" but crucially not "small" or "cubical"). Claims that only homogeneous adjectives can modify mass nouns but then develops a two-tiered semantics to explain why nonhomogeneous adjectives like "small" and "cubical" can combine with mass nouns like "furniture."

Harley, H. 2005. *How do verbs get their names? Denominal verbs, manner incorporation, and the*

ontology of verb roots in English. In *The syntax of aspect*. Edited by N. Erteschik-Shir and T. Rapoport, 42–64. Oxford Studies in Theoretical Linguistics 10. Oxford: Oxford Univ. Press.

Discusses how the unbounded nature of mass nouns and the bounded nature of count nouns can affect the telicity of the denominal verbs. Such verbs tend to be atelic if derived from mass noun roots but telic if derived from count noun roots, although the exact nature of the Aktionsart of the verb is partially determined by whether the root denotes an event or thing.

Krifka, M. 1989. Nominal reference, temporal constitution, and quantification in event semantics. Paper presented at the Sixth Amsterdam Colloquium, April 1987. In *Semantics and contextual expression*. Edited by R. Bartsch, J. van Benthem, and P. van Emde Boas, 75–115. Groningen–Amsterdam Studies in Semantics 11. Dordrecht, The Netherlands: Foris.

Provides a detailed lattice-theoretical account of how the mass–count distinction among nouns contributes to the telic–atelic (bounded–unbounded) distinction among verb phrases. It connects the quantificational characterizations of noun phrases with respect to individuals to the event denotations of verb phrases.

Verkuyl, H. 1993. *A theory of aspectuality: The interaction between temporal and atemporal structure*. Cambridge Studies in Linguistics 64. Cambridge, UK: Cambridge Univ. Press.

[DOI: [10.1017/CBO9780511597848](https://doi.org/10.1017/CBO9780511597848)]

Provides a thorough discussion of the empirical facts regarding the interaction between verbs and various types of quantified mass nouns and count nouns. Develops a proposal in the model-theoretical tradition that attempts to account for such facts using time intervals.

CROSS-LINGUISTIC VARIATION (CLASSIFIER LANGUAGES)

These studies explore the grammatical relationship between the mass–count distinction in languages like English and parallel structures in other languages like Japanese and Mandarin Chinese. [Krifka 1995](#) is one of the first works to provide a detailed connection between the interpretation of count nouns in English and the interpretation of sortal (default) classifiers in Mandarin Chinese. Influenced by this hypothesis, [Cheng and Sybesma 1998](#) discusses the syntactic distribution of sortal versus nonsortal classifiers in Mandarin Chinese noting some of the important parallels and differences between count syntax and classifier syntax. [Cheng and Sybesma 1999](#) expands on this work in the authors' attempts to account for the connection among nominal denotations, classifiers, and null determiners in Mandarin and Cantonese. [Senft 2000](#) provides even more details on the syntactic and semantic differences between sortal and nonsortal classifiers.

Cheng, L. L. S., and R. Sybesma. 1998. *Yi-wan tang, yi-ge tang: Classifiers and massifiers*. *Tsing Hua Journal of Chinese Studies*, n.s., 28.3: 385–412.

Discusses the different syntactic properties of classifiers that provide a relevant unit for counting (“mass classifiers” or simply “massifiers”) and classifiers that adopt the complement noun’s default unit for counting (“count classifiers” or simply “classifiers”).

Cheng, L. L. S., and R. Sybesma. 1999. Bare and not-so-bare nouns and the structure of NP. *Linguistic Inquiry* 30.4: 509–542.

[DOI: [10.1162/002438999554192](https://doi.org/10.1162/002438999554192)]

Building from the work of [Chierchia 1998](#) (cited under [Lattice-Theoretical Semantics](#)), Cheng and Sybesma argue that Mandarin and Cantonese have a mass-count distinction ontologically but not syntactically. They then exploit the semantic properties of such nouns along with the idiosyncratic syntactic properties of Mandarin and Cantonese to explain the distribution of null determiners in these two languages.

Krifka, M. 1995. Common nouns: A contrastive analysis of Chinese and English. In *The generic book*. Edited by G. Carlson and F. Pelletier, 398–411. Chicago: Univ. of Chicago Press.

Presents a thorough discussion of the potential parallelisms and differences between classifiers and count syntax from a lattice-theoretical perspective. Suggests that count-noun phrases in English share a semantic basis with classifier-noun phrases in Chinese and discusses whether count syntax might involve a covert classifier-like operator incorporated into the noun or numeral modifier.

Senft, G. 2000. What do we really know about nominal classification systems? In *Systems of nominal classification*. Edited by G. Senft, 11–49. *Language, Culture, and Cognition* 4. Cambridge, UK: Cambridge Univ. Press.

Demonstrates that nominal classifiers in Mandarin can be divided into two types: sortal versus nonsortal. Sortal classifiers divide a reference based on kind (what counts as an individual according to the semantics of the complement noun), whereas nonsortal classifiers divide a reference based on a specific unit of measurement provided by the semantics of the nonsortal classifier itself.

LANGUAGE ACQUISITION

The mass-count distinction has figured prominently in many different debates in the acquisition literature, including arguments about stages of syntactic development, semantic bootstrapping, conceptual correlations to grammatical structure, and the acquisition of classifiers. Influential studies that document how and when children acquire the syntactic correlates of the mass-count distinction are listed under the heading [Syntactic Development](#). These studies mainly focus on the English plural morpheme and quasi-numeral quantifiers, such as “much” and “many.” Under the heading [Bootstrapping](#) are papers that discuss whether children use

basic conceptual information (e.g., substance vs. physical object) to assign syntactic categories to nouns (especially during the initial stages of language acquisition). References listed under the heading Conceptual Categories are particularly relevant to this type of hypothesis. These papers present experiments that explore the close connection between the syntactic categories mass versus count and the conceptual categories substance versus object. All discussions of acquisition and the mass–count distinction rely on accurate testing of how a child (or adult) construes a particular referent (whether it be as a substance or an object). One method discussed in the literature involves quantity judgments. Papers that thoroughly examine the consequences of this methodology are listed under the heading Quantification. Children not engaged in acquiring a mass–count distinction (i.e., those acquiring a classifier language) nonetheless need to acquire other types of grammatical mechanisms that allow for individuation and quantification. Comparing such children with those acquiring a mass–count distinction provides a more complete picture of language acquisition. Papers that endeavor to make such a comparison are listed under the heading Classifier Languages and Acquisition.

Syntactic Development

These studies focus on children’s acquisition of grammatical correlates of mass–count syntax. The use of plural morphology (which is exclusive to count nouns in adult speech) is particularly relevant to the acquisition of the mass–count distinction, and hence many of the papers listed here focus on this morpheme. For example, Cazden 1968 describes a longitudinal study that documents the use of nominal and verbal inflection in three children; in particular it records how and when these children use the plural morpheme. Mervis and Johnson 1991 also documents the use of plural morphology although through a study of parental diary entries that focuses exclusively on the time between the ages of eighteen and thirty months. In contrast to these longitudinal studies, Kouider, et al. 2006 uses experimental evidence to demonstrate that children are sensitive to plural marking at the age of twenty–four months but not twenty months. Other studies focus not only on plural morphology but also on quantifier selection. Of particular relevance is the use of “many” versus “much” (in adult speech, “many” is used exclusively with count nouns, whereas “much” is used only with mass nouns). Gathercole 1985, concentrating on this one type of quantifier, demonstrates that children learn the selectional restrictions of “many” before they learn those of “much.” Gordon 1988 considers whether children are sensitive to all the different syntactic environments that distinguish mass nouns from count, including both plural morphology and the selectional restrictions of “many” and “much.” In a study of a corpus of child speech, P. Gordon found that by the age of two children consistently use mass and count nouns in their appropriate syntactic frames.

Cazden, C. B. 1968. The acquisition of noun and verb inflections. *Child Development* 3.2: 443–448.

A widely cited longitudinal study of three children and their use of noun and verb inflection, including the plural. Available online to subscribers.

Gathercole, V. C. 1985. He has too much hard questions: The acquisition of the linguistic mass–count distinction in *much* and *many*. *Journal of Child Language* 12.2: 395–415.

A study of three- to nine-year-olds that tests knowledge of the selectional restrictions of “much” and “many” and finds that children restrict “many” to modifying count nouns before they learn that “much” is restricted to mass nouns. Available [online](#) to subscribers.

Gordon, P. 1988. Mass/count category acquisition: Distributional distinctions in children’s speech. *Journal of Child Language* 15:109–128.

[DOI: [10.1017/S0305000900012083](#)]

An early corpus study that finds that children use mass and count nouns in appropriate syntactic frames beginning by the age of two. Available [online](#) to subscribers.

Kouider, S., J. Halberda, J. Wood, and S. Carey. 2006. Acquisition of English number marking: The singular-plural distinction. *Language Learning and Development* 2.1: 1–25.

[DOI: [10.1207/s15473341l1d0201_1](#)]

A preferential looking study that reports evidence that twenty-four-month-olds, but not twenty-month-olds, are sensitive to singular-plural marking on verbs when interpreting novel nouns.

Mervis, C. B., and K. E. Johnson. 1991. Acquisition of the plural morpheme: A case study. *Developmental Psychology* 27.2: 222–235.

[DOI: [10.1037/0012-1649.27.2.222](#)]

A diary study of plural usage in a single child between eighteen and thirty months old that recorded utterances, their referents, other aspects of context, and adult responses. Available [online](#) to subscribers.

Bootstrapping

Extending discussions of semantic bootstrapping that emerged in the 1970s in the language- acquisition literature, a series of studies in the 1980s and 1990s tested the idea that children might bootstrap the syntactic categories “mass” and “count” from preexisting semantic categories. For example, [Macnamara 1982](#) proposes that children initially acquire nouns used to label objects as count nouns and those used to label substances as mass nouns. From this initial set of words, children abstract syntactic distinctions between mass and count nouns that are then used to assign more abstract nouns to their proper subcategory. [Braine 1992](#) discusses the kind of semantic architecture that would be needed to support Macnamara’s bootstrapping theory. Contrary to Macnamara, [Gordon 1985](#) uses experimental evidence to argue against the bootstrapping hypothesis, demonstrating that children are more sensitive to syntactic environments than they are to semantic properties when assigning words to categories. In support of P. Gordon’s criticism, [Chierchia 1994](#) discusses the subtle syntactic rather than semantic cues that might aid in the acquisition of the mass-count distinction. [Bloom 1999](#) attempts to revive the bootstrapping hypothesis, suggesting that

although children might not use the contrast between object and substance to assign words to subcategories, they might use the more abstract semantic distinction between individuals and nonindividuals.

Bloom, P. 1999. The role of semantics in solving the bootstrapping problem. In *Language, logic, and concepts: Essays in memory of John Macnamara*. Edited by R. Jackendoff, P. Bloom, and K. Wynn, 285–310. Cambridge, MA: MIT Press.

In this book chapter dedicated to John Macnamara, Bloom argues that children bootstrap syntax from semantics using bidirectional mappings of the form “individual \leftrightarrow count noun” and “nonindividual \leftrightarrow mass noun.”

Braine, M. D. S. 1992. What sort of innate structure is needed to “bootstrap” into syntax?. *Cognition* 45.1: 77–100.

[DOI: [10.1016/0010-0277\(92\)90024-C](https://doi.org/10.1016/0010-0277(92)90024-C)]

Argues that innate constraints on phrase structure rules are not required given a sufficiently rich semantic architecture, which can be used to construct syntax via semantic “assimilation.”

Chierchia, G. 1994. Syntactic bootstrapping and the acquisition of noun meanings: The mass–count issue. Paper presented at a symposium held at Cornell University, 24–26 April 1992. In *Syntactic theory and first language acquisition: Cross–linguistic perspectives*. Vol. 1, *Heads, projections, and learnability*. Edited by B. Lust, M. Suñer, and J. Whitman, 301–318. Hillsdale, NJ: Lawrence Erlbaum.

An exploration of how syntactic cues to mass–count status might guide learning about the lexical semantics of nouns.

Gordon, P. 1985. Evaluating the semantic categories hypothesis: The case of the mass/count distinction. *Cognition* 20.3: 209–242.

[DOI: [10.1016/0010-0277\(85\)90009-5](https://doi.org/10.1016/0010-0277(85)90009-5)]

Gordon argues against the semantic bootstrapping theory of Macnamara, presenting evidence from word–learning experiments that children are more sensitive to syntactic distribution than semantic properties when determining the syntactic category of a novel noun.

Macnamara, J. 1982. *Names for things: A study of human learning*. Cambridge, MA: MIT Press.

A broad study of how children use nouns as labels, this book includes an early discussion of semantic bootstrapping, which posits that syntactic categories are constructed from earlier semantic ones.

Conceptual Categories

The differences and parallelisms between conceptual categories and the syntactic mass–count distinction are particularly relevant for theories of acquisition that advocate semantic and syntactic bootstrapping (see [Bootstrapping](#)). The studies listed here focus on the relationship between mass–count syntax and conceptual categories like “object” and “substance.” For example, [Brown 1973](#) describes a word extension task that demonstrates that children are sensitive to the association between count syntax and objects as well as mass syntax and substances. [Soja 1992](#) tests children in the same kind of task at two and a half years of age, showing that they too are sensitive to these associations. [Waxman and Hall 1993](#) discusses evidence that fifteen- to twenty-one-month-olds associate count syntax with taxonomic categories. [Samuelson and Smith 1999](#) explores the kinds of attributes that lead children to make distinctions between whether a referent is an object or a substance (shape, material, and degree of solidity). [Subrahmanyam, et al. 1999](#) reports that the association between objects and count syntax as well as substances and mass syntax grows stronger as children age. They focus particularly on children between three and four years of age.

Brown, R. 1973. *A first language: The early stages*. Cambridge, MA: Harvard Univ. Press.

A classic work on language acquisition, this book includes a description of word extension experiments that show that children are sensitive to mass–count syntax when applying novel words to objects and substances.

Samuelson, L. K., and L. B. Smith. 1999. Early noun vocabularies: Do ontology, category structure, and syntax correspond?. *Cognition* 73:1–33.

[DOI: [10.1016/S0010-0277\(99\)00034-7](https://doi.org/10.1016/S0010-0277(99)00034-7)]

This study documents how mass–count syntax is related to referential properties like solidity, material substance, and shape. It also tests how young children extend labels that refer to solid and nonsolid entities.

Soja, N. N. 1992. Inferences about the meanings of nouns: The relationship between perception and syntax. *Cognitive Development* 7.1: 29–45.

[DOI: [10.1016/0885-2014\(92\)90003-A](https://doi.org/10.1016/0885-2014(92)90003-A)]

Evidence that children exhibit sensitivity to mass–count syntax by age thirty–six months in a word–extension task.

Subrahmanyam, K., B. Landau, and R. Gelman. 1999. Shape, material, and syntax: Interacting forces in children’s learning in novel words for objects and substances. *Language and Cognitive Processes* 14.3: 249–281.

[DOI: [10.1080/016909699386301](https://doi.org/10.1080/016909699386301)]

Reports increasing sensitivity to the association between mass–count syntax and the object–substance distinction between three and four years of age in a noun–learning task.

Waxman, S. R., and D. G. Hall. 1993. The development of a linkage between count nouns and object categories: Evidence from fifteen- to twenty-one-month-old infants. *Child Development* 64:1224-1241.

[DOI: [10.2307/1131336](https://doi.org/10.2307/1131336)]

Uses a word-extension task to show that count nouns focus attention on taxonomic categories as early as sixteen months of age.

Quantification

These studies explore the acquisition of mass-count semantics through the use of quantity-judgment tasks. [Gathercole 1985](#) is one of the first papers to use such tasks to test children's sensitivity to the mass-count distinction. Building on these initial experiments, [Barner and Snedeker 2005](#) uses comparative judgments to show that although children and adults associate count syntax with individuals, they do not associate mass syntax with nonindividuals (contrary to the theory advocated in [Bloom 1999](#), cited under [Bootstrapping](#)). The experimental results demonstrate that children and adults allow mass syntax to refer to both individuals and nonindividuals, thus supporting hypotheses according to which mass syntax is underspecified with respect to individuation (see [Gillon 1992](#) and [Rothstein 2010](#), cited under [Lattice-Theoretical Semantics](#), and [Bale and Barner 2009](#), cited under [Semantic Tests](#)). In support of these comparative judgments, [Barner and Snedeker 2006](#) demonstrates that children readily learn mass nouns that denote countable objects.

Barner, D., and J. Snedeker. 2005. Quantity judgments and individuation: Evidence that mass nouns count. *Cognition* 97:41-66.

[DOI: [10.1016/j.cognition.2004.06.009](https://doi.org/10.1016/j.cognition.2004.06.009)]

This study uses quantity judgments to argue that whereas count syntax specifies reference to individuals, mass syntax allows reference to individuals (e.g., "furniture") as well as nonindividuals (e.g., "butter").

Barner, D., and J. Snedeker. 2006. Children's early understanding of mass-count syntax: Individuation, lexical content, and the number asymmetry hypothesis. *Language Learning and Development* 2.3: 163-194.

[DOI: [10.1207/s15473341l1d0203_2](https://doi.org/10.1207/s15473341l1d0203_2)]

A word-learning study that shows that children readily learn mass nouns that denote countable objects.

Gathercole, V. 1985. More and more and more about more. *Journal of Experimental Child Psychology* 40:73-104.

[DOI: [10.1016/0022-0965\(85\)90066-9](https://doi.org/10.1016/0022-0965(85)90066-9)]

Tests children's sensitivity to mass-count syntax using a quantity-judgment task.

Classifier Languages and Acquisition

These studies investigate classifier acquisition and include discussion of how this problem is related to acquiring mass-count syntax in English. Matsumoto 1987, in which the authors test classifier comprehension in Japanese five- to seven-year-olds, documents the order in which classifiers are acquired and the age at which they are acquired. This author argues that many classifiers are acquired quite late in language acquisition (after the age of five). Yamamoto and Keil 2000 challenges Y. Matsumoto's conclusions, demonstrating that Japanese three-year-olds have some understanding of numeral classifiers. Chien, et al. 2003 expands on Matsumoto's experimental work by testing Chinese-speaking children on their comprehension of the different types of classifiers (sortal vs. nonsortal). Li, et al. 2008 also tests the comprehension of Chinese-speaking children, focusing on some of the more subtle shape implications that certain types of classifiers have.

Chien, Y. C., B. Lust, and C. P. Chiang. 2003. Chinese children's comprehension of count-classifiers and mass-classifiers. *Journal of East Asian Linguistics* 12:91-120.

[DOI: [10.1023/A:1022401006521](https://doi.org/10.1023/A:1022401006521)]

Tests Chinese-speaking children's knowledge of associations between nouns and different types of classifiers, which Chien and colleagues label "mass" (nonsortal) and "count" (sortal) classifiers, following Cheng and Sybesma 1999 (cited under Cross-Linguistic Variation (Classifier Languages)).

Li, P., D. Barner, and B. Huang. 2008. Classifiers as count syntax: Individuation and measurement in the acquisition of Mandarin Chinese. *Language, Learning, and Development* 4.4: 249-290.

[DOI: [10.1080/15475440802333858](https://doi.org/10.1080/15475440802333858)]

Examines Mandarin-speaking children's comprehension of classifiers and measures words when combined with novel words.

Matsumoto, Y. 1987. Order of acquisition in the lexicon: Implication from Japanese numeral classifiers. In *Children's language*. Vol. 6. Edited by K. E. Nelson and A. van Kleeck, 229-269. Hillsdale, NJ: Lawrence Erlbaum.

Tests classifier comprehension in five- to seven-year-old Japanese-speaking children using both familiar and novel stimuli and documents the order in which classifiers are learned.

Yamamoto, K., and F. Keil. 2000. The acquisition of Japanese numeral classifiers: Linkage between grammatical forms and conceptual categories. *Journal of East Asian Linguistics* 9.4: 379-409.

[DOI: [10.1023/A:1008308724059](https://doi.org/10.1023/A:1008308724059)]

Tests the acquisition of numeral classifiers in Japanese three-year-olds and argues that previous studies (e.g., Matsumoto 1987) underestimate children's classifier comprehension.

PSYCHOLINGUISTICS

Psycholinguistic studies of the mass–count distinction have focused on heterogeneous issues, using a broad array of methods, including lexical decision tasks, similarity judgments, categorization, and quantity judgment. Some of the psycholinguistic studies have focused mainly on the issue of whether mass nouns can denote individuals or not. For example, [Gillon, et al. 1999](#) argues from reaction–time studies that mass nouns like “furniture” denote countable individuals, thus supporting B. Gillon’s theory that mass nouns are underspecified with respect to individuation (see [Gillon 1992](#), cited under [Lattice–Theoretical Semantics](#)). [Barner, et al. 2008](#) reaches similar conclusions but uses data gathered from quantity judgments and deverbal nouns. Barner, et al.’s experiments demonstrate that some mass nouns individuate (those formed from telic verbs) while others do not (those formed from atelic verbs). Other psycholinguistic papers have focused on the interaction between mass nouns and superordinate categories. For instance, [Markman 1985](#) presents data from word–learning experiments, arguing that mass nouns facilitate the learning of superordinate categories. Building from E. Markman’s observations, [Wisniewski, et al. 1996](#) attempts to provide experimental evidence that mass superordinate terms like “furniture” do not individuate (contrary to [Gillon, et al. 1999](#)). Rather, the group of items that count as furniture is conceived of as an unindividuated whole. In contrast to the other papers listed here, [Iwasaki, et al. 2010](#) addresses the issue of whether grammatically encoding the mass–count distinction affects the formation of concepts or other types of semantic representations independent of language. These authors conduct experiments demonstrating that English and Japanese speakers are equally sensitive to the semantic correlates of the mass–count distinction and conclude that semantic representations and conceptual structure are not influenced by whether one’s language encodes the mass–count distinction or not.

Barner, D., L. Wagner, and J. Snedeker. 2008. Events and the ontology of individuals: Verbs as a source of individuating mass and count nouns. *Cognition* 106.2: 805–832.

[DOI: [10.1016/j.cognition.2007.05.001](https://doi.org/10.1016/j.cognition.2007.05.001)]

Reports experimental evidence that mass nouns that denote punctual events (“some jumping”) individuate whereas mass nouns that denote durative events (“some dancing”) do not. Count usages of these words, however, always individuate, regardless of whether they are punctual (“some jumps”) or durative (“some dances”).

Gillon, B., E. Kehayia, and V. Taler. 1999. The mass count distinction: Evidence from on–line psycholinguistic performance. *Brain and Language* 68:205–211.

[DOI: [10.1006/brln.1999.2081](https://doi.org/10.1006/brln.1999.2081)]

Based on reaction time data, this study argues that mass nouns like “furniture” denote countable individuals and share grammatical features with plural–count nouns.

Iwasaki, N., D. P. Vinson, and G. Vigliocco. 2010. Does the grammatical count/mass distinction

affect semantic representations? Evidence from experiments in English and Japanese. *Language and Cognitive Processes* 25.2: 189–223.

[DOI: [10.1080/01690960902978517](https://doi.org/10.1080/01690960902978517)]

Shows that speakers of both English and Japanese are sensitive to semantic correlates of the English mass–count distinction, suggesting that learning the distinction does not affect speakers’ semantic representations.

Markman, E. 1985. Why superordinate category terms can be mass nouns. *Cognition* 19.1: 31–53.

[DOI: [10.1016/0010-0277\(85\)90030-7](https://doi.org/10.1016/0010-0277(85)90030-7)]

Presents data from a cross–linguistic analysis as well as from word–learning experiments to argue that mass nouns facilitate the learning of superordinate category structure.

Wisniewski, E. J., M. Imai, and L. Casey. 1996. On the equivalence of superordinate concepts. *Cognition* 60:269–298.

[DOI: [10.1016/0010-0277\(96\)00707-X](https://doi.org/10.1016/0010-0277(96)00707-X)]

Argues that mass superordinates like “furniture” refer to “unindividuated groups of objects,” based on evidence that their referents tend to co–occur more frequently than do those of count superordinates and are more likely to be encountered in groups.

NEUROSCIENCE

Studies of brain–damaged patients, in addition to work on unimpaired individuals, have enabled researchers to explore whether different cortical regions are responsible for syntactic and semantic aspects of mass–count processing and whether different areas support processing of mass and count features. For example, [Semenza, et al. 1997](#) describes an agrammatic patient who has a selective syntactic impairment with mass nouns. The patient is predisposed to use mass nouns in syntactic frames that usually require count nouns. Such evidence suggests that processing of mass and count nouns might be localized to specific brain regions. In support of this hypothesis, [Mondini, et al. 2008](#) reports an event–related potentials (ERP) study demonstrating that mass and count nouns activate different cortical regions during processing. Some neurolinguistic papers are less focused on localization and more focused on correlations between impairments and specific kinds of diseases. For example, [Crossman, et al. 1994](#) reports that Parkinson’s patients are impaired in recognizing or selecting the appropriate quantifier for mass and count nouns. Other studies attempt to use the mass–count distinction to demonstrate that grammatical information about a word is accessible even when phonology is not. For instance, [Vigliocco, et al. 1999](#) shows that anomic patients and unimpaired individuals who are unable to access the pronunciation of a noun (i.e., they are in a tip–of–the–tongue state) are nonetheless able to correctly determine the noun’s syntactic subcategory (its status as a mass or count noun).

Grossman, M., S. Carvell, and L. Peltzer. 1994. The sum and substance of it: The appreciation of mass and count quantifiers in Parkinson's disease. *Brain and Language* 44.4: 351–384.

[DOI: [10.1006/brln.1993.1022](https://doi.org/10.1006/brln.1993.1022)]

Reports that Parkinson's patients were impaired in matching mass versus count quantifiers to referents, in performing mass-count grammaticality judgments, and in performing a sentence completion task. Available [online](#) to subscribers.

Mondini, S., A. Angrilli, P. Bisiacchi, C. Spironelli, K. Marinelli, and C. Semenza. 2008. Mass and count nouns activate different brain regions: An ERP study on early components. *Neuroscience Letters* 430.1: 48–53.

[DOI: [10.1016/j.neulet.2007.10.020](https://doi.org/10.1016/j.neulet.2007.10.020)]

Reports evidence that count nouns and mass nouns activate different cortical regions. Count nouns activated left visual associative areas related to object recognition, whereas mass nouns activated more diffuse language-related areas. Available [online](#) to subscribers.

Semenza, C., S. Mondini, and M. Cappelletti. 1997. The grammatical properties of mass nouns: An aphasia case study. *Neuropsychologia* 35:669–675.

[DOI: [10.1016/S0028-3932\(96\)00124-8](https://doi.org/10.1016/S0028-3932(96)00124-8)]

Reports a case study of a patient who has selective impairment of mass nouns with no other agrammatic symptoms. In particular, the patient is predisposed to use mass nouns in count syntax and to prefer ungrammatical sentences in which mass nouns are used in count syntax. Available [online](#) to subscribers.

Vigliocco, G., D. Vinson, R. Martin, and M. Garrett. 1999. Is count and mass information available when the noun is not? An investigation of tip of the tongue states and anomia. *Journal of Memory and Language* 40:534–558.

[DOI: [10.1006/jmla.1998.2626](https://doi.org/10.1006/jmla.1998.2626)]

Shows that anomic patients and English speakers in a tip-of-the-tongue state are able to access the mass-count status of words that they could not name.

LINGUISTIC RELATIVITY

Researchers interested in linguistic relativity (i.e., the Sapir-Whorf hypothesis) have contributed significantly to the empirical study of the mass-count distinction. Beginning with the hypothesis that learning count syntax might be necessary for representing entities as individuals ([Quine 1960](#), cited under [Foundational](#)

Works), researchers have asked whether speakers of diverse languages like English, Japanese, Mandarin Chinese, and Yucatec Mayan perceive objects differently as a function of whether mass–count syntax is present in the language. In support of the Sapir–Whorf hypothesis, J. A. Lucy ([Lucy 1992](#)) conducted experiments on English and Yucatec Mayan speakers, attempting to show that those with a mass–count distinction (English speakers) are more predisposed to conceive of a referent as an individual than those without such a distinction (Yucatec Mayan speakers). [Mazuka and Friedman 2000](#) attempts to replicate Lucy’s results by testing Japanese speakers who also do not have a mass–count distinction. Contrary to Lucy’s hypothesis, no differences were detected between the two populations. [Mazuka and Friedman 2000](#) concludes that the mass–count distinction is not responsible for the differences reported in Lucy’s original experiments. In support of [Mazuka and Friedman 2000](#), [Barner, et al. 2009](#) finds that Japanese and English speakers have similar semantic representations for common nouns despite the Japanese language’s lack of a mass–count distinction. In further support, [Li, et al. 2009](#) describes a collection of experimental studies that find no difference in object perception between different linguistic populations. Both [Barner, et al. 2009](#) and [Li, et al. 2009](#) suggests that online syntactic processing rather than conceptual representation is responsible for the different experimental results reported in previously conducted word–learning tasks.

Barner, D., S. Inagaki, and P. Li. 2009. Language, thought, and real nouns. *Cognition* 111:329–344.

[DOI: [10.1016/j.cognition.2009.02.008](#)]

Shows that, despite syntactic differences between the languages, speakers of Japanese and English have similar semantic representations for common nouns. Argues that online syntactic processes, rather than conceptual differences, mediate previously reported cross–linguistic differences on word–learning tasks.

Barner, D., P. Li, and J. Snedeker. 2010. Words as windows to thought: The case of object representation. *Current Directions in Psychological Science* 19.3: 195–200.

[DOI: [10.1177/0963721410370294](#)]

Reviews evidence from a series of case studies to argue that learning mass–count syntax does not fundamentally change the ways speakers perceive or reason about the world.

Li, P., Y. Dunham, and S. Carey. 2009. Of substance: The nature of language effects on entity construal. *Cognitive Psychology* 58.4: 487–524.

[DOI: [10.1016/j.cogpsych.2008.12.001](#)]

Presents a collection of studies that find no differences in object perception across languages and argues that cross–linguistic effects on word–learning tasks occur because of online syntactic processes rather than differences in thought.

Lucy, J. A. 1992. *Language diversity and thought: A reformulation of the linguistic relativity*

hypothesis. Studies in the Social and Cultural Foundations of Language 12. Cambridge, UK: Cambridge Univ. Press.

An in-depth introduction to Whorfian thought and its history and part of a two-book study that includes experiments on Yucatec Mayan that suggest a role for mass-count syntax in shaping thought.

Mazuka, R., and R. Friedman. 2000. Linguistic relativity in Japanese and English: Is language the primary determinant in object classification? *Journal of East Asian Linguistics* 9.4: 353–377.

[DOI: [10.1023/A:1008356620617](https://doi.org/10.1023/A:1008356620617)]

A critical re-examination of J. A. Lucy's claim that cross-linguistic differences in mass-count syntax cause differences in thought. This study fails to replicate Lucy's results in a population of educated Japanese participants.

Acquisition

The study of Whorfian effects has frequently involved comparing children at different stages of language acquisition to test whether the acquisition of specific grammatical structures affects how children perceive and reason about the world. A particularly productive area of research has been the mass-count distinction, where researchers have asked whether acquiring count syntax changes the way children perceive objects. Imai and Gentner 1997 presents evidence that two-year-old English children are more likely to construe novel referents as objects than two-year-old Japanese children. From such evidence, Gentner and Boroditsky 2001 argues that the acquisition of mass-count syntax affects the development of a child's ability to individuate. Soja, et al. 1991 demonstrates that the ability to individuate is not dependent on language. Children recognize the difference between objects and substances long before they learn the mass-count distinction. Contrary to the hypothesis of Gentner and Boroditsky 2001, Li, et al. 2009 demonstrates that English, Japanese, and Mandarin Chinese children all make a conceptual distinction between singular and plural sets at the same stage in development. This similarity holds despite the fact that only English exhibits a mass-count distinction with plural marking.

Gentner, D., and L. Boroditsky. 2001. Individuation, relativity, and early word learning. In *Language acquisition and conceptual development*. Edited by M. Bowerman and S. Levinson, 215–256. *Language, Culture and Cognition* 3. Cambridge, UK: Cambridge Univ. Press.

Argues that the perception of entities is organized along an “individuation continuum,” which can be affected by cross-linguistic differences in mass-count syntax.

Imai, M., and D. Gentner. 1997. A cross-linguistic study of early word meaning: Universal ontology and linguistic influence. *Cognition* 62.2: 169–200.

[DOI: [10.1016/S0010-0277\(96\)00784-6](https://doi.org/10.1016/S0010-0277(96)00784-6)]

Presents evidence that two-year-olds learning English, a mass-count language, are more likely to

construe novel referents as objects than two-year-olds learning Japanese, a classifier language.

Li, P., T. Ogura, D. Barner, S. Yang, and S. Carey. 2009. Does the conceptual distinction between singular and plural sets depend on language?. *Developmental Psychology* 45.6: 1644–1653.

[DOI: [10.1037/a0015553](https://doi.org/10.1037/a0015553)]

Shows that two-year-olds learning English, Japanese, and Mandarin Chinese make a conceptual distinction between singular and plural sets at around the same stage in development, although only English exhibits mass-count syntax and plural marking.

Soja, N. N., S. Carey, and E. Spelke. 1991. Ontological categories guide young children's inductions of word meaning: Object terms and substance terms. *Cognition* 38.2: 179–211.

[DOI: [10.1016/0010-0277\(91\)90051-5](https://doi.org/10.1016/0010-0277(91)90051-5)]

Against the strong Whorfian predictions laid out in [Quine 1960](#) (cited under [Foundational Works](#)), this study shows that children represent a conceptual distinction between objects and substances before they learn mass-count syntax.

NONLINGUISTIC FOUNDATIONS

In the late 20th and early 21st centuries psychologists have made significant progress toward understanding infants' prelinguistic representations of objects and number. In many cases, this work has been explicitly tied to the problem of learning grammatical distinctions like mass versus count. Prelinguistic representations of individuals, by some accounts, may form a hypothesis space for acquiring count syntax and thus begin the process of acquiring a distinction between mass and count. For example, [Spelke 1985](#) and [Xu and Carey 1996](#) explore the origin of object concepts and their relation to sortals, while [Huntley-Fenner, et al. 2002](#) investigates infants' prelinguistic distinction between objects and substances. Other studies test infants' abstraction of number from sets ([Starkey, et al. 1990](#)) and the possible nonlinguistic precursors to set representations in nonhuman animals ([Barner, et al. 2008](#)).

Barner, D., J. Wood, M. Hauser, and S. Carey. 2008. Evidence for a non-linguistic distinction between singular and plural sets in rhesus monkeys. *Cognition* 107:603–622.

[DOI: [10.1016/j.cognition.2007.11.010](https://doi.org/10.1016/j.cognition.2007.11.010)]

Evidence that rhesus macaques differentiate singleton and plurals sets under circumstances when they do not encode absolute numerosity of the sets.

Huntley-Fenner, G., S. Carey, and S. Solimando. 2002. Objects are individuals but stuff doesn't count: Perceived rigidity and cohesiveness influence infants' representations of small groups of

discrete entities. *Cognition* 85.3: 203–221.

[DOI: [10.1016/S0010-0277\(02\)00088-4](https://doi.org/10.1016/S0010-0277(02)00088-4)]

A study of infants' prelinguistic sensitivity to the distinction between objects and substances. Available [online](#) to subscribers.

Spelke, E. 1985. Perception of unity, persistence, and identity: Thoughts on infants' conception of objects. In *Neonate cognition: Beyond the blooming buzzing confusion*. Edited by J. Mehler and R. Fox, 89–113. Hillsdale, NJ: Lawrence Erlbaum.

Presents a theory of infant object representation according to which innate principles guide the perception of object unity, persistence, and identity.

Starkey, P., E. S. Spelke, and R. Gelman. 1990. Numerical abstraction by human infants. *Cognition* 36:97–128.

[DOI: [10.1016/0010-0277\(90\)90001-Z](https://doi.org/10.1016/0010-0277(90)90001-Z)]

Early evidence that infants are sensitive to the number of objects contained in a small set, a possible precursor to later representations of individuals and number in language.

Xu, F., and S. Carey. 1996. Infants' metaphysics: The case of numerical identity. *Cognitive Psychology* 30.2: 111–153.

[DOI: [10.1006/cogp.1996.0005](https://doi.org/10.1006/cogp.1996.0005)]

Presents arguments that infants' early representations of objects are guided by an "object sortal," which is a precursor to lexical sortals like "car" and "cup" and to count nouns more generally.

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