# Modeling Comparatives in English Based On a Pragmatic Handling of the Sorites Paradox

**Shaoni C. White**

Department of Linguistics

Swarthmore College

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# Contents

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# 1 Introduction

Vagueness is an essential feature of natural language. Some scholars argue that vague predicates such as *bald, flat,* and *tall* are necessary because humans are faced every day with situations where their ability to discriminate one thing from another is too limited to draw sharp boundaries (van Rooij 2011a). Others hold that without vagueness, the processing costs of natural language are too high; it might be harder to decide which non-vague term (e.g. *exactly six feet tall*) to use rather than to resort to a vague one (van Rooij 2011a). Game theorists such as Myerson (1991) and de Jaegher (2003) argue that vague or "noisy" utterances communicate more than non-vague utterances in instances where the preferences of the speaker and the listener are not completely aligned or where the speaker is unsure of the listener's preferences. Still others suspect that vagueness is important because it helps with value judgments. (An example used by van Rooij (2011a) is that someone who already knows that "Quiza" is four feet tall might learn something new and relevant upon hearing that "Quiza" is "tall for a Martian.")

According to Kennedy (2007), a predicate is vague if all of (1a-c) apply.

(1) a. it occurs in utterances with contextually variable truth conditions,

b. there exist borderline cases where it is difficult to discern whether or not the predicate applies, and

c. it gives rise to the Sorites paradox, also known as the paradox of the heap.

Any complete analysis of vagueness must rely on an analysis of the Sorites paradox.

The word *Sorites* comes from the Greek word *soros*, or heap (Hyde 2018). The paradox is traditionally presented in words as follows. Say that you have a heap of wheat. You know that it is composed of a million grains of wheat, although you are not capable of picking out any individual grain with your naked eye. Now say that I remove one grain. Do you still have a heap of wheat? Yes. It is reasonable to state that adding or removing a single grain of wheat will not make a difference in whether or not the heap remains a heap—a single grain is too small to matter. But this logic would have you removing grain after grain until you have one or even zero grains of wheat and still arguing that you have a heap, even though you obviously do not. The paradox is a matter of mathematical induction and may be separated into its key premises as follows:

(2) *The Sorites paradox*

P1. One million grains of wheat is a heap.

P2. Removing one grain of wheat from a heap will not change the fact that it is a heap.

C. Therefore, any number of grains of wheat is a heap.

Much work has gone into formulating semantic responses to the paradox of the heap, but comparatively little scholarship is devoted to pragmatic explanations of the phenomenon. I show that the pragmatic approach is favorable because it is the only way to properly account for speakers' intuitions about the Sorites, i.e. that one grain of wheat is not enough to make a meaningful difference in a heap of a million grains,

but the Sorites' ultimate conclusion (that one grain of wheat is still a heap) is false. In normal discourse, the Sorites rarely causes problems with meaning-making and communication. Speakers use terms like *tall* or *heap* all the time, but most people will go their whole lives without ever walking step by step through the paradox of the heap. Linguists and philosophers call this situation a "forced march Sorites," distinguishing the paradox as it might be created in a hypothetical scenario from the paradox as mere logical argument, for a reason (Horgan 1994). The Sorites is not encountered in real speech unless a discourse participant intentionally flouts the standard practices for using vague terms in order to create it. If a speaker has a reason to add to a collection of wheat in such a manner that they count every grain, then they probably have reason to use a more exact term than *heap*. Pragmatic guidelines push us away from using language in such a way that the Sorites is produced.

In this paper, I develop this pragmatic response to the paradox and present a new model for English comparatives, a type of vague predicate. Comparative utterances come in two forms, explicit (3a-b) and implicit (3c-d). Explicit comparatives possess the comparative morphology, which in English can be the suffix *-er* or the word *more*. Implicit comparatives consist of the positive form of the predicate and do not possess the comparative morphology.

(3) a. Rekha is taller than Ji Su.

b. Rekha is more cautious than Ji Su.

c. Compared to Ji Su, Rekha is tall.

d. Of Rekha and Ji Su, Rekha is the cautious one.

The following section provides a brief overview of the major approaches to solving (or accepting) the paradox of the heap with a consideration of which elements are persuasive for our purposes and which ones are not. Then, section three discusses van Rooij (2011b)'s pragmatically-influenced response to the Sorites paradox, assesses its compelling elements and its flaws, and outlines my own pragmatic approach. Many scholars operate under the assumption that implicit comparison is vague but explicit comparison is not, but in section four I argue that explicit comparison is indeed vague. In section five, I present a new model for comparison in English based on my contention that explicit comparison is vague and that the use of vague predicates in Sorites situations is pragmatically precluded. Finally, I discuss future possibilities for research that are beyond the scope of this paper.

## 2 Semantic approaches to the Sorites paradox

In the days when ideal language doctrines held sway, logicians such as Gottlob Frege and Bertrand Russell argued that there was little point to contemplating the paradox of the heap because logic did not apply to natural language and Soritical expressions should ideally be eliminated from speech (Hyde 2018). However, as ideal language doctrines began to lose their influence, scholars grew to acknowledge that vagueness was a pervasive feature of natural language and that the issue of how logic might apply to the Sorites was worthy of serious consideration. Linguists and philosophers began

to formulate solutions to the paradox.

Some philosophers have argued that the paradox of the heap is not a semantic issue at all, but a problem of human ignorance (Hyde 2018). This argument, generally referred to as the epistemic theory, is founded on the premise that there truly is a an exact number of grains of wheat that constitute the lower bound of grains permitted in a heap (Hyde 2018). If one grain of wheat were to be removed from a heap of this size, it would no longer be a heap. Speakers are merely incapable of knowing this number of grains. The epistemic theory has been criticized for its insistence on the existence of unknowable functions that determine unknowable rules (Raffman 2013)—if these rules are completely inaccessible by speakers, then to what extent can they be said to exist?

Some scholars have revised the claims of the epistemic theory to incorporate a view of the sharp boundaries that delineate heap from not a heap as changing depending on where the speaker's attention is placed and what the speaker's interests are (Fara 2000). Although the epistemic theory is not the backbone of my analysis, this particular notion, called *interest relativity*, is relevant to my analysis of comparatives.

An influential category of semantic solutions to the paradox of the heap is supervaluationism. Supervaluationism models vague predicates as dividing individuals into those to whom the predicate definitely applies, those to whom the predicate definitely does not apply, and borderline cases, also called penumbral cases, where the predicate does not definitely apply or not apply (Hyde 2018). This attempts to model the apparent lack of sharp boundaries between what counts as a heap (or as tall, or as bald, etc.) and what does not. However, many philosophers and linguists have found

that supervaluationism causes the same problem it attempts to solve: it implies a sharp boundary between what counts as definitely tall, or definitely a heap, or definitely bald, and what is a borderline case of tallness or heap-ness or baldness (van Rooij 2011a). This does not accurately represent speakers' intuitions. Generally, speakers cannot name a number of wheat where if one grain were to be removed from that number, the heap would turn from being certainly and unequivocally a heap to being only a borderline case of heap-ness. The supervaluationist response to this counterargument is to claim that while *there exists* a cut-off point, there is no *particular* point that is the cut-off (Hyde 2018). This makes a controversial logical claim (that there are true existential statements for which there is no true instance) and, I argue, is still not properly intuitive.

An alternative to supervaluationism comes in the form of many-valued or degree-valued approaches, where the extension of a predicate such as *tall* is divided into numerous degrees (sometimes infinite degrees), each possessing a different degree of truth (Hyde 2018). Under this model, *tall* denotes a function from individuals to scalar values (i.e. degrees) and is converted into a property by degree morphology (Kennedy 2011). In English, this is often a null morpheme, although Kennedy (2011) argues that *-er* is an example of degree morphology. Degree-valued theories have been criticized on the grounds that they imply that speakers produce a quantitative ordering scale in order to use and evaluate vague terms (van Rooij 2011a). A degree-based approach is relatively sensible for terms like *tall*, as it makes sense for speakers to develop a quantitative scale of heights in order to use and evaluate statements about tallness

and shortness, but quantitative scales make less intuitive sense for terms like *good* or *strange*. That being said, the degree-valued approach is capable of modeling essential features of comparatives that other models cannot (as I will discuss later in this section and in section four). Although I argue in favor of a pragmatic handling of the Sorites paradox, non-Sorites examples of comparison still require a semantic model, and in this paper I adopt a degree-based model for non-pragmatically-precluded comparison.

Another prominent approach to the Sorites is the contextualist solution. Contextualist solutions vary, but they share the core belief that the extension of vague expressions is context-dependent. This was first proposed by Kamp (1981), whose solution included the concept of *context change*, which holds that as a speaker proceeds through a Sorites series, the valuation function that determines the truth conditions of the Sorites predicate is revised with every step. Contextualist approaches generally employ the idea that vague adjectives are evaluated with respect to context-determined comparison classes. For example, if someone states that

(4) Nooria is tall

the truth of this utterance is determined by the set of individuals that Nooria's tallness is being evaluated against. If the relevant comparison class is the set of all basketball stars, then *Nooria is tall* may be false, but if the relevant comparison class is the set of all women, then *Nooria is tall* may be true.

In this paper, I treat the notion of the comparison class as essential to the evaluation of vague predicates. A degree-based semantics also employs comparison classes,

sometimes by incorporating them directly into the semantic composition or by assuming that they restrict the domain of the measure function the predicate produces (Kennedy 2007). For example, if the comparison class of (4) is the set of all women, then the domain of the measure function *tall* produces is restricted to the set of all women. The foregrounding of comparison classes leads to an important observation about the nature of comparison: any utterance in the positive form, such as (4), may be turned into an instance of implicit comparison by stating the comparison class directly as in (5), rather than leaving it to extralinguistic context (Kuczynski 2006, Kennedy 2011).

(5) Compared to all women, Nooria is tall.

In a sense, all utterances with vague adjectives are comparative.

Another important component of most contextualist and degree-based approaches to the Sorites is the intransitivity of indistinguishability. Suppose that there are three people—Shar, Ismail, and Rook—whose heights are very similar but not exactly the same. Perhaps Rook is a centimeter taller than Ismail and Ismail is a centimeter taller than Shar. If someone measured their heights with a ruler, it would be easy to distinguish them with respect to tallness, but it is harder to distinguish their heights with the naked eye. Suppose a speaker states (6a-c) about these people.

(6) a. When I look at Shar and Ismail, I can't tell who is taller.

b. When I look at Ismail and Rook, I can't tell who is taller.

c. However, when I look at Shar and Rook, I can tell that Rook is taller than Shar.

(6a) means that the speaker finds Shar and Ismail indistinguishable with respect to tallness. In (6b), the speaker states that they find Ismail and Rook indistinguishable with respect to tallness as well. If indistinguishability is transitive, it follows that Shar and Rook must also be indistinguishable with respect to tallness. But this is untrue; it contradicts (6c). Therefore, indistinguishability must be intransitive.

Degree-based approaches to vagueness account for the behavior of indistinguishability by modeling vague predicates with semiorders. A semiorder is a type of structure denoted by $\succ$ that stores items in a manner that satisfies the following constraints (Silk 2019):

(7) Irreflexivity: $\forall x : x \not\succ x$

Interval-order: $\forall x, y, z, w : (x \succ y \wedge z \succ w) \rightarrow (x \succ w \vee z \succ y)$

Semitransitivity: $\forall x, y, z, w : (x \succ y \wedge y \succ z) \rightarrow (x \succ w \vee w \succ z)$

A relation $\sim$ can be defined from a semiorder where $x \sim y := x \not\succ y \wedge y \not\succ x$. This relation represents indistinguishability; if $x \sim y$ then $x$ and $y$ are indistinguishable with respect to the predicate in question. The semiorder allows indistinguishability to be intransitive. There are various ways to employ semiorders; I will return to this in sections four and five.

# 3 A pragmatic approach to the Sorites paradox

Proponents of the intransitivity of indistinguishability often argue that this defuses the Sorites paradox by rendering the inductive premise—e.g. "Removing one grain of wheat from a heap will not change the fact that it is a heap"—logically incorrect. The inductive premise only works if transitivity is assumed, which it should not be. The argument is that when speakers' intuitions indicate that the inductive premise is correct, they are wrong. The paradox is not a paradox, but the illusion of one.

I argue against this approach to the Sorites on two grounds. My first objection is that speaker intuitions should not be discounted. The goal of semantics, and of pragmatics, is to understand the machinery that underlies meaning in language. Semantic approaches to the paradox that work to invalidate its premises do not properly account for the fact that natural language users feel intuitively that those premises make sense[1]. I advocate a pragmatic approach, which holds that the paradox's inductive premises seem valid because they are valid and that the paradox's logical conclusion seems invalid because it is invalid. The incoherency is because the semantic rules of language are not necessarily built to accommodate language use that goes against what we should do and what we normally do. Instead, we have pragmatic guidelines that push us away from using vague terms to describe Sorites series.

My second objection is that the intransitivity of indistinguishability only defuses

[1]Eight out of eight independently consulted English speakers confirmed that they felt the premises of the paradox were intuitively reasonable.

the Sorites when it is stated in terms of mathematical induction, as in (2). The paradox still arises when it is formulated in terms of a thought experiment. Imagine that you are seated in a stadium alongside ten thousand other people. Suddenly, a genie arrives and announces that he has a challenge for you. He says he will ask you a series of questions that you must answer truthfully to the best of your ability while never contradicting any statement you have made previously. He flicks his fingers and magically compels everyone in the stadium except you to stand up and arrange themselves in a line from shortest to tallest. The height of the person at the beginning of the line is about four feet and the height of person at the end of the line is about seven feet. He points at the person at the beginning of the line and asks you if, compared to everyone in the stadium, that person is tall. You say, *no, that person isn't tall.* He asks if you can tell the difference in height between the first person in line and the second person in line. You say that you cannot; to you, they are indistinguishable with respect to height. *If they are indistinguishable with respect to height*, he asks, *can the second person be taller than the first?* You respond, *no.* He says, *So, if the first person is not tall, then the second person cannot be tall either.* You agree. Then the genie points at the second and third people in line and asks you if you find that they, too, are indistinguishable with respect to height. You say that you do. He asks, *so, can the third person be taller than the second?* You respond, *no.* He says, *So, if the second person is not tall, then the third person cannot be tall either.* You agree. The genie continues down the line in this fashion. Each person is indistinguishable from the people to their left and right, and ultimately the genie forces you to declare that the last person in line, whose height

is seven feet, is not tall. In this thought experiment, indistinguishability is never used transitively—the genie never asks you to claim that two people are indistinguishable when that is untrue—but the paradox is produced regardless. The reason the paradox does not cause problems with our ordinary use of words like *tall* is because genies are not real. In real life, scenarios like this are pragmatically precluded and it is extremely rare for anyone to intentionally flout that pragmatic rule.

To my knowledge, the only other proposal for modeling comparison based on a pragmatic handling of the Sorites paradox is van Rooij (2011b). My analysis diverges from van Rooij's in that he combines the pragmatic approach with the concept of partiality, whereas I do not. Partiality is a concept that owes much of its thinking to three-valued logics[2]. They are similar in that they both consider the possibility that someone may not be *tall*, but they may not be *not tall* either. The core idea is that in a Sorites series, there is an unacknowledged gap between the individuals who possess the vague property in question and the individuals who do not. The individuals in the gap can neither be assigned the predicate or its antonym. Van Rooij (2011b) contends that the appropriateness of a predicate is determined by the nature of the comparison class that it is applied to. He argues that a comparison class is only pragmatically appropriate if "the gap between the last individuals who have property $P$ and the first that do(es) not" is "between individuals $x$ and $y$ such that $x$ is clearly, or significantly, $P$-er than $y$."

[2]In a three-valued logic, utterances can be true, false, or a third, indeterminate truth value that is neither truth nor falsity.

There are flaws in this framework. Partiality "solves" the issue of the nonexistent boundary between items that possess a vague property and items that do not qualify by creating many more arbitrary boundaries that are even less representative of speaker intuition. Partiality requires that speakers be able to sharply delineate between individuals that are definitely tall and individuals that definitely fall in the gap between *tall* and *not tall*, which speakers cannot always do. Additionally, I contend that the pragmatic inappropriateness of a forced march Sorites paradox cannot be solely reduced to the nature of the relevant comparison class. Van Rooij (2011b) argues that the use of vague predicates in comparison classes is discouraged whenever it is possible to order the elements in the comparison class so that each element is indistinguishable from the previous with respect to the vague predicate. However, it is not problematic to use an adjective such as tall in a context where a Sorites series is possible, so long as that ordering is not actually present. In the genie-and-stadium example I provided, the issue was the genie flouting the rules of speech, not the comparison class. Imagine that the genie never arrived. The game begins and you find yourself frustrated because you cannot see over the head of the person in front of you. *That person is tall*, you remark. This is perfectly felicitous even though the comparison class is the set of all people in the stadium, just as it would have been if the genie had forced you through the Sorites[3]. It is not the comparison class that renders a vague predicate inappropriate,

[3]Perhaps the comparison class for an utterance like this is not the set of all people in the stadium but the set of all humans in the world. In that case, the argument still stands. A genie could also magically compel all humans in the world to stand in a line and ask you to walk through the Sorites with them

but the Sorites series itself.

# 4 Vagueness and explicit comparison

Many linguists and philosophers operate under the assumption that implicit comparison is vague, but explicit comparison is not (e.g. van Rooij 2011a, van Rooij 2011b, Kennedy 2011). Their models of comparison take the non-vague nature of explicit comparison to be the main factor that distinguishes explicit comparison from implicit comparison, and therefore their models are built around this fact. In this section, I go over van Rooij (2011b)'s and Kennedy (2011)'s models for comparison in English in order to show how they are influenced by the founding assumption that explicit comparison is not vague. Then I demonstrate that explicit comparison is, in fact, vague. In the next section I propose a new model based on this contention.

Van Rooij (2011b) and Kennedy (2011) focus on examples like (8), where it is felicitous to use the implicit comparative but not the explicit comparative. Say that there are two individuals, Rekha and Ji Su, where Rekha is two centimeters taller than Ji Su.

(8) a. Rekha is taller than Ji Su.

as well. In general, comparison classes do not automatically result in paradoxes. Alternatively, we could also consider a scenario in which the genie arranges the ten thousand inhabitants of the stadium in a line, then immediately points to the person standing at the very end and asks you, *Compared to everyone in the stadium, is this person tall?* The felicitous response would be *yes*, even though the comparison class is the same as in the forced march Sorites I previously described.

b. # Compared to Ji Su, Rekha is tall.

Van Rooij (2011b) asserts that for every vague predicate and comparison class, it is possible to derive a semiorder structure (see (7)) that encodes the relationship between the vague predicate and the comparison class. The indistinguishability relation $\sim$ can be interpreted differently depending on the needs of a model, and van Rooij uses $\sim$ differently than I do; for van Rooij, Rekha and Ji Su are indistinguishable with respect to tallness because (8b) is infelicitous. For (8), the comparison class $c$ consists of Rekha and Ji Su, so we will say that $c = \{r, j\}$. The semiorder (denoted by $\succ$) supervenes over a real-valued function $f$ that represents height. The symbol $\epsilon$ can be thought of as a margin of error.

(9) Compared to Ji Su, Rekha is tall

iff $r \succ j$

iff $f(r) > f(j) + \epsilon$

If the difference in height between $r$ and $j$ is less than $\epsilon$, then Rekha is not tall compared to Ji Su and $r \sim j$. If the difference in their heights is more than $\epsilon$, then Rekha is tall compared to Ji Su.

Van Rooij explains the difference in acceptability between (8a) and (8b) by arguing that for explicit comparison, there is no margin of error; $\epsilon = 0$. Rather than producing a semiorder, explicit comparison produces a weak order. Specifically, for every vague predicate/comparison class combination, there exists a semiorder (implicit comparison)

and a unique most refined weak order that can be derived from that semiorder (explicit comparison). This strict weak order $>$ can be defined as follows:

(10) $x > y$ iff$_{def}$ $\exists z : (x \sim z \wedge z \succ y) \vee (x \succ z \wedge z \sim y)$

Instead of an indistinguishability relation, the weak order has what van Rooij calls an indifference relation, $\approx$, where $r \approx j$ iff$_{def}$ $r \not\succ j$ and $j \not\succ r$. The indifference relation is an equivalence relation, so it is transitive. Additionally, the model in (10) presupposes the existence of an imaginary or hypothetical "witness", $z$, that $x$ and $y$ are being related to. In the case of Rekha and Ji Su, the hypothetical "witness" might be a person half an inch taller than Rekha or a person half an inch shorter than Ji Su. Van Rooij acknowledges that adding a witness constraint is formally unwieldy, but points out that degree-based theories of comparatives essentially assume a hypothetical witness for every possible degree, so his approach is ultimately less involved than the alternatives.

Kennedy (2011) also uses semiorders to model comparison, but in a very different way. His approach is degree-based, and the real-valued function that his semiorder supervenes on does not automatically include a margin of error as van Rooij (2011b)'s does. Instead, he differentiates the semiorder as applied to implicit comparison from the semiorder as applied to explicit comparison by denoting one as $\succ_!$, roughly indicating "significantly greater than." Van Rooij contended that the comparative is derived from the implicit/positive form, but Kennedy contends that both are derived from a more abstract source. Following Fara (2000), he models the implicit/positive morpheme as

(11). Here, **stnd** is a function that takes in an adjective $g$ and a comparison class $c$ and outputs a context-appropriate standard of comparison.

(11) a. $[\![\text{POS}]\!]^c = \lambda g_{<e,d>} \lambda x.g(x) \succ_! \mathbf{stnd}(g)(c)$

b. $[\![\text{POS tall}]\!]^c = \lambda x.\mathbf{tall}(x) \succ_! \mathbf{stnd}(\mathbf{tall})(c)$

The predicate $g$ is true of the $x$ iff the degree of $x$'s $g$-ness exceeds the standard of comparison by a significant amount. What counts as a significant amount is interest-relative; it changes depending on the context and the speaker's goals. Similarly to van Rooij (2011b), Kennedy absents the "significant amount" requirement from his model of the comparative morpheme (12).

(12) a. $[\![\text{MORE}]\!]^c = \lambda g_{<e,d>} \lambda y \lambda x.g(x) \succ g(y)$

b. $[\![\text{MORE tall}]\!]^c = \lambda y \lambda x.\mathbf{tall}(x) \succ (\mathbf{tall})(y)$

An individual $x$ is *g-er* than an individual $y$ iff the degree of $x$'s $g$-ness exceeds the degree of $y$'s $g$-ness.

Both of these models have useful elements, but because they treat the comparative as not vague, they are unable to fully account for the behavior of vague predicates. The three features that make a predicate vague are (a) the predicate occurs in utterances with contextually variable truth conditions, (b) there exist borderline cases where it is difficult to discern whether or not the predicate applies, and (c) the predicate gives rise to the Sorites paradox (see (1)). For contextually variable truth conditions, consider the example of Rekha and Ji Su, whose height differs by two centimeters. In some contexts,

two centimeters is a significant enough difference that a speaker might describe Rekha as taller than Ji Su, but in other cases it is not a significant difference at all. For example, perhaps Rekha and Ji Su both want to ride a rollercoaster, but a difference of two centimeters means that only Rekha is tall enough to ride; in this case it would make sense to say that Rekha is taller than Ji Su. In another context, that statement might be less felicitous. Consider a scenario in which Rekha is an actor and Ji Su is Rekha's stunt double. The director decides that a height difference of two centimeters is not significant enough to make Ji Su an inadequate stunt double. For the purposes of film-making, Rekha is not taller than Ji Su. This suggests that explicit comparison does, in fact, involve an interest-relative margin of error. Similarly, the interest relativity of the margin of error creates borderline cases; Rekha and Ji Su might be just similar enough in terms of height that a speaker would find it difficult to say if Rekha is taller than Ji Su or if they are the same height. This is not just a matter of a speaker lacking sufficient information—they might know that Rekha's height is exactly three micrometers greater than Ji Su's height and be unsure if three micrometers is a *significant* enough difference to claim that Rekha is taller than Ji Su.[4]

As for the Sorites, let us revisit the genie example. Once again, a genie arranges ten thousand people in a line from shortest to tallest, and once again, the change in

[4]One possible counterargument to my claim about vagueness and explicit comparison is that the behavior of explicit comparatives sometimes seems closer to that of imprecise terms, which need not be vague. To that, I would say that imprecision does not give rise to the Sorites. Only vagueness does.

height as the line progresses is so gradual that each person is indistinguishable with respect to height from the people beside them. Suppose that the shortest person is named Beck and the tallest person is named Nooria. This time the person begins at the end of the line and asks you, *Is Nooria taller than Beck?* You say that yes, she is. The genie points to the person to Beck's left, who is indistinguishable to Beck with respect to height. The genie asks, *Is this person as tall as Beck?* You say that yes, they are. *So,* the genie says, *if this person is as tall as Beck, and Nooria is taller than Beck, is Nooria taller than this person?* You say that yes, Nooria is taller than them. The genie then moves to the next person in line and asks you to confirm that they are as tall as the person preceding them. You confirm this. The genie asks, *Since this person is as tall as the one before them, and Nooria is taller than the one before them, is Nooria taller than this person?* You say that she is. The genie proceeds down the line until they reach the person next to Nooria and asks you if Nooria is taller than them. You say that she is, even though Nooria is indistinguishable from the person beside her, which should mean that she is not taller than them at all. The Sorites paradox has emerged from an instance of explicit comparison.[5]

[5]For those still unconvinced that comparatives are vague, Silk (2019) maintains a compromise position. He does not consider quantitatively based terms like *taller than* to be vague, but states that more numinous terms like *more preferable than* are vague. That being said, I think there are some flaws in Silk's selectivity here, not least because it is predicated on the idea that it is impossible to create the Sorites paradox from *taller than*, which I disprove in this paper. Silk contends that *taller than* involves a sharp cutoff point, whereas expressions like *more preferable than* do not. But the exactness of that cutoff point depends on the interests of the speakers involved, and even the sharpest

# 5 A modified model for comparison

The new semantic model for comparison in English should account for the vagueness of explicit comparison. In this paper, rather than beginning from scratch, I modify an existing model of comparison. Van Rooij (2011)'s proposal for comparison relies fundamentally on explicit comparison producing a weak order structure, which cannot account for the intransitivity of indistinguishability or for the creation of the Sorites paradox. Any attempt to modify van Rooij's proposal in the manner I suggest here would involve modifying explicit comparison as a semiorder, so it makes sense to instead focus on modifying a degree-based model like Kennedy (2011), where semiorders are already understood to be involved in explicit comparison.

As it happens, Kennedy (2011) is a suitable candidate for modification because Kennedy's model for the positive form already involves something similar to a margin of error. (11) stipulates that *x is P* iff the degree of *x*'s *P*-ness is *significantly* greater

cutoff points can prove elusive, as the genie scenario I have presented here demonstrates. Additionally, *more preferable than* may have a less strict cutoff point than *taller than* in most situations, but this is not universal. Perhaps a person with an incredible ability to sense differences in tastes is declaring the relative preferability of various cups of coffee based on how much sugar the coffee contains. The super-taster can taste the difference that a single sugar granule makes, which means that for them, no two cups of coffee are ever indistinguishable. Because there is no indistinguishability in this scenario, the cutoff point is exact and there is no vagueness. (It is important to note that this is not something that can only happen with explicit comparison. The supertaster would also be able to eliminate vagueness with the positive form as well. For example, the supertaster could declare that a cup of coffee is *good* if and only if it contains fifty-seven sugar granules, no more and no less.)

than a context-appropriate standard of comparison. Rather than denoting this with $\succ_!$, I represent this by adding a variable $\epsilon$, which is the margin of error.[6] In a degree-based approach, a semiorder supervenes over a real-valued function $f$. I incorporate the margin of error into this function so that $g(x) \succ g(y)$ iff $f(g(x)) > f(g(y)) + \epsilon$. I propose the following amended models for the positive and comparative morphemes, where $\epsilon_{comp}$ is the margin of error for the explicit comparative and $\epsilon_{pos}$ is the margin of error for the positive form.

(13) a. $[\![\text{MORE}]\!]^c = \lambda g_{<e,d>} \lambda y \lambda x . g(x) \succ g(y)$

b. $[\![\text{MORE tall}]\!]^c = \lambda y \lambda x . \mathbf{tall}(x) \succ (\mathbf{tall})(y)$

c. $g(x) \succ g(y)$ iff $f(g(x)) > f(g(y)) + \epsilon_{comp}$

(14) a. $[\![\text{POS}]\!]^c = \lambda g_{<e,d>} \lambda x . g(x) \succ \mathbf{stnd}(g)(c)$

b. $[\![\text{POS tall}]\!]^c = \lambda x . \mathbf{tall}(x) \succ \mathbf{stnd}(\mathbf{tall})(c)$

c. $g(x) \succ g(y)$ iff $f(g(x)) > f(g(y)) + \epsilon_{pos}$

Because the values of $\epsilon_{pos}$ and $\epsilon_{comp}$ are interest-relative, their values are not fixed. However, $\epsilon_{comp}$ is always less than or equal to $\epsilon_{pos}$. To be sure, the case in which $\epsilon_{pos}$ and $\epsilon_{comp}$ are equal is highly unusual, but experimental work by Syrett et al (2004) suggests that $\epsilon_{pos}$ can lower and become equal to $\epsilon_{comp}$ under certain circumstances. In the experiment, participants were given two objects that differed only slightly with respect to a quality such as *big* or *long*. The experimenter made requests of the participants of

[6] Silk (2019) proposes something similar, but Silk does not consider the relationship between the margin of error in the explicit comparative and the margin of error in the implicit comparative.

the form "Please give me the big one" or "Please give me the long one." In ordinary circumstances, it would not have been felicitous to describe one of the objects as *the big one* or *the long one*; $\epsilon_{pos}$ would have been greater than $\epsilon_{comp}$. However, the circumstances of the experiment led the participants to treat this as felicitous and to select one of the objects and give it to the experimenter. The acceptability of the positive form in this instance likely stems from the high salience of the vague predicate in question and from the fact that an utterance like "Please give me the big one" presupposes that one of the objects in the comparison class qualifies as big. My inference here is tentative; it is difficult to determine with certainty whether these experimental conditions led to $\epsilon_{pos}$ being exactly equal to $\epsilon_{comp}$ or merely very, very similar. That being said, Syrett et al (2004) is, at the very least, highly suggestive of potential equality between $\epsilon_{comp}$ and $\epsilon_{pos}$.

So far, I have focused on the predicate *tall* for the sake of clarity. One of the reasons *tall* is simple to use as an example is because it is one-dimensional; that is, an individual's degree of tallness is determined by only one quality, height. Height is represented formally by the function $f$, which allows a semiorder to be produced. For more-dimensional predicates such as *good* or *strange*, degrees supervene onto a combination of different qualities (van Rooij 2011a). The degree-based approach encounters its most formidable challenge in more-dimensional predicates, since it is clear that more-dimensional predicates supervene onto $f$ far less intuitively than tallness does onto height. More-dimensional predicates often involve qualities that are wholly non-quantitative, such as charm or unpleasantness, which indicates that a strictly

quantitative reading of $f$ should not be necessary. Additionally, speakers can uphold a felicitous discourse with one another that liberally employs predicates like *good* without the definition of *good* being directly established beforehand. Conversations about goodness can even be felicitous when the discourse participants all have radically conflicting notions of what qualities constitute goodness.

A full investigation of degrees and more-dimensionality is beyond the scope of this paper, so I will simply state that the function $f$ does not necessarily correspond to a quantitative measure. The most important part of the semiorder structure for my purposes is indistinguishability ($\sim$) and the margin of error ($\epsilon$). However, I will briefly note how the model I propose addresses one phenomenon that arises from more-dimensionality: incomparability. Consider a speaker who believes that the only kinds of cleverness are skill with numbers and skill with people. The speaker makes the following statements:

(15) a. Emma is better than Luis at using numbers.

b. Emma is better than Luis at dealing with people.

c. Emma is cleverer than Luis.

d. Anjali is worse at manipulating numbers than Emma.

e. Anjali is better at dealing with people than Emma.

f. When it comes to cleverness, Anjali and Emma can't be compared.

Anjali is better than Emma at one of the skills that determine cleverness and worse

than Emma at another. Therefore, Anjali and Emma are incomparable with respect to cleverness, as per (15f). Consequently, (16a) and (16b) are infelicitous.

(16) a. # Emma is cleverer than Anjali.

b. # Anjali is cleverer than Emma.

Under the degree-based model I propose, this occurs because the cleverness of Emma does not succeed the cleverness of Anjali in the semiorder, rendering (16a) false. The cleverness of Anjali does not succeed the cleverness of Emma in the semiorder either, and so (16b) is rendered false as well.

Any two items $x, y$ where $x \not\succ y \wedge y \not\succ x$ must be indistinguishable, so even though Emma and Anjali are distinguishable with respect to skill at manipulating numbers and with respect to dealing with people, they are indistinguishable with respect to cleverness. Under this model, incomparability is understood as a form of indistinguishability that manifests in cases that involve more-dimensional predicates.

# 6 Conclusion

This paper has sought to provide two insights. The first is that the Sorites paradox does not interfere with ordinary use of vague predicates in comparison because any discourse that would produce the paradox is pragmatically precluded. The logical inconsistency the paradox induces is not the fault of a flawed semantics because speakers do not have strong semantic intuitions about speech acts that are so beyond the bounds of probable speech. The second claim this paper makes is that non-pragmatically-precluded

instances of comparison are best modeled in a degree-based framework that includes a margin of error in the extension of both the comparative and positive morphemes. A possible avenue for future research would be investigation into the relationship between comparison, more-dimensionality, and $f$ within a degree-based model. If degree-based models are incapable of fully accounting for more-dimensional behavior, then it would be fruitful to apply the formal principle of the margin of error to theories of vagueness that this paper has not pursued. It might also be illuminating to explore the ramifications of this pragmatic approach to the Sorites to other aspects of vague language, such as the distinction between absolute and relative gradable adjectives.

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